TRANSACTIONS

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CONTENTS.

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THE ZOOLOGICAL SOCIETY.

I. *On the Dentition and Osteology of the Maltese fossil Elephants, being a Description of Remains discovered by the Author in Malta between the years* 1860 *and* 1866.

By A. Leith Adams, *M.B., F.R.S., F.G.S.*

Read June 24, 1873.

[Plates I. to XXII.]

I. Introduction.

THE discovery of remains of large quadrupeds in a fossil state in the superficial deposits of the island of Malta has been recorded by one of its earliest historians[1]; and subsequently the geologist Dolomieu[2] detected teeth of *Hippopotamus*; but no further attention seems to have been given to the subject until of late years, when the contents of other cavern- and fissure-deposits disclosed remains of extinct species of elephants, also exuviæ of large rodents and aquatic birds, descriptions of which are contained in the sixth volume of the Society's Transactions[3]. Associated with the above were reptilian remains, with indications of the presence also of Carnivora, which, however, were represented only by traces of fierce gnawing on several elephants' bones from the Zebbug cave.

The geological conditions in connexion with the animal exuviæ from Zebbug have been fully detailed[4]; it only remains to describe the reptilian bones thoroughly, so as to complete the osteology of the Maltese fossil fauna collected by Admiral Spratt, C.B.

In the following I will attempt to define the characters and relations of the teeth

[1] Abela's 'Della descrittione di Malta,' 1647. [2] Appendix to St. Priest's 'Malta.' [3] Pages 119, 227–307.

[4] "On the Bone-caves near Crendi, Zebbug, and Melliha in the Island of Malta," by Capt. Spratt, R.N., C.B., F.R.S., F.G.S., Quart. Journ. Geol. Soc. vol. xxiii. page 283.

and bones of the fossil elephants discovered by me during five years explorations in the caves, fissures, and alluvial deposits of these islands[1]. My collections comprehend remains of several hundreds of elephants of all ages, from the unborn calf to the aged. Although the large bones are for the most part imperfect, such is not the case with the small bones and teeth, many of which are entire and in good states of preservation. Although the following descriptions are strictly anatomical, it appears to me important that some notice should be furnished also in relation to the physical aspect and localities where the remains were discovered, seeing that frequent allusion will be made to particular deposits where certain specimens were found. The accompanying map, therefore, shows the surface formations and names of all the ossiferous caves, fissures, and alluvial soils hitherto recorded. These may be arranged in the following chronological order.

The Cave of Melliha (see Map No. 1) was discovered accidentally in 1840. It existed in the Upper Limestone, and contained remains of *Hippopotamus pentlandi* and perhaps a much smaller species. The teeth and bones were contained in a conglomerate formed of blue marl and much-rounded and water-worn fragments of the parent rock.

The Gandia Fissure (No. 2) was first discovered (accidentally) in 1857, and was reopened by me in 1865. It was a gaping rent in the calcareous sandstone, and contained the red soil of the surface intermixed with fragments of the parent rock, among which were numerous entire and broken teeth and bones, chiefly of the largest elephant, with a distal extremity of the radius of *Hippopotamus*[2], a few bones and teeth of *Myoxus melitensis*, and large bones of birds, evidently *Anseres* and other aquatic forms. All were huddled together without any order whatever.

The Malak Cave (No. 3) was discovered (also accidentally) in 1858. It seems to have been a cavern opening only horizontally. The deposits on its floor were of precisely the same character as those of Melliha, with the same description of animal remains, and the addition that a solitary molar of one or other of the elephants was discovered by me in the conglomerate, which was composed of blue marl and fragments of the Lower Limestone in which the cavern was formed. Many of the above-mentioned remains had been much injured from rolling; but many molars of *Hippopotamus pentlandi* and *H. minutus* were perfect. On the top of this deposit lay several inches of red soil and cavern-earth infiltrated by calcareous drippings; and profusely intermixed were abundant remains of *Myoxus melitensis*, birds' bones, and entire recent land-shells. Here there were none of the pronounced indications of turbulent aqueous action which are seen in the substratum; and a line of demarcation divided the two formations.

The Zebbug Cave (No. 4) was discovered by chance in 1859. It was situated in the calcareous sandstone, and contained red and blue clays, with numerous remains of the various species of elephants and birds described by Falconer, Busk, and Parker in the

[1] The geological details are described in my work, 'Natural History and Archæology of the Nile Valley and Maltese Islands,' p. 161: Edmonston and Douglas, 1870.

[2] Pl. XI. fig. 21.

sixth volume of these Transactions. There were, besides, reptilian remains, which have not yet been described.

The MIDDLE CAVE (No. 5) was discovered by me in 1862. It was a horizontal tunnel without any roof-communication, and opened on the same terrace, and was within a few yards distance of the Malak Cave. The parent rock was the Lower Limestone. The cave was packed to the roof with about sixteen feet of red soil, showing distinct bands of stratification and a gradual process of filling up. At various horizons (evidently different cave-levels) I found remains of *Myoxus melitensis* in conjunction with teeth and bones of an *Arvicola* not apparently distinct from the Bank-Vole, besides bones of large birds, small frogs, and recent land-shells, the last absolutely identical with species now living on the islands.

The MNAIDRA GAP (No. 6) was discovered by me in 1863. It was a large opening in the Lower Limestone, within a few yards, and only a few feet above the level, of the Middle Cave. It was filled to the top with red earth and blue clay intermixed with masses of the calcareous sandstone, more or less rounded and waterworn, with a superficial drift of a calcareous red earth. From top to bottom, but chiefly in the deeper parts among the stones, were discovered portions (indeed, apparently entire skeletons) of Elephants, in conjunction with enormous quantities of the bones of *Myoxus melitensis* and of large aquatic birds, including the *Cygnus falconeri* of Parker, also fragments of Chelonians[1], with recent land-shells belonging to *Helix*, *Clausilia*, and *Bulimus*.

Among the surface-deposits of the MALAK FAULT (No. 7) I discovered in 1863 remains of the largest form of Elephant, including a much mutilated skull with penultimate true molars. The upper limestone of this depressed portion of the coast-line is covered by a surface-deposit many feet in thickness, composed of fragments of the parent and other rocks mingled with red soil, and indicating water-action, as if the scourings of the surface had been washed "pell-mell" over the cliff on which the Malak, Middle, and Mnaidra remains were deposited, and formed a talus now nearly eaten away by the waves.

The GAP OF BENGHISA (No. 8) was found by me in 1864. It is situated in the calcareous sandstone and is almost level with the sea. It is a triangular-shaped hollow about thirty-two feet in height, facing the sea, which is rapidly disintegrating its contents. Here, among blocks of the parent rock and red soil alternating with bands of pebbles and fine red loam, lay remains of Elephants, but more especially of the smallest form, which seems to have greatly predominated. The geological conditions here are eminently suggestive of the aqueous forces that hurried the exuviæ into the gap. The bones and teeth of the *Myoxus*, and bones of a large fresh-water Tortoise, and a small Lizard were also discovered, besides recent land-shells of species now residing on the island.

The LEONARDO FISSURE (No. 9) was discovered by me in 1864. It existed in the

[1] I have described these remains in Quart. Journ. Geol. Soc. vol. xxii. p. 594.

calcareous sandstone, and contained red soil and angular fragments of the parent rock intermixed with calcareous infiltrations. Here portions of a skeleton of the smallest form of Elephant, containing the last true molar *in situ*, were exhumed.

The SHANTIIN FISSURE (No. 10)[1] was discovered in 1870, accidentally, when quarrying the calcareous sandstone. It was situated within a short distance of Gandia Fissure, and seems to have contained precisely similar deposits, with remains (as far as I can make out) almost if not entirely belonging to the largest form of Elephant, with traces also of the *Myoxus*[2].

The importance of the discoveries made in the caverns and alluvial deposits of the Maltese Islands during the last fifteen years have been fully appreciated by competent authorities; and here I feel it a duty to record, as far as my own researches are concerned, that the prosecution of my explorations in Malta and the illustrations of this communication have been materially assisted by liberal grants accorded from time to time by the British Association for the Advancement of Science.

II. DENTITION.

General Remarks.

The contour and direction of the incisors of the Maltese elephants do not appear to differ from each other, nor from what obtains in recent species; and the characters are alike. A transverse section shows the same "engine-turning," whilst the removal of the external laminæ displays distinct "longitudinal channelling," as seen in Pl. XI. figs. 11 & 14. The latter is perhaps more pronounced than usually noticed in other species. The transverse section varies between elliptical and round, the former being usually observed near the sheaths, the latter towards the middle and distal extremity.

When a fully developed molar of any of the Maltese fossil elephants is sawn longitudinally and vertically, it will be found to present the usual succession of compressed and elevated ridges, thinning towards their summits, which, in the colline[3], are made up of several digitations. These vary in number and size according to the circumstance whether they happen to belong to thick or thin plated ridges; in the latter they predominate. The ridges of the upper molars are usually straight and upright, and remarkable, as in *Elephas antiquus*, for their great height, being more than double the breadth of the crown. The lower molars, even the last of the series, have their ridges sometimes much retroflexed, as for example in Pl. VIII. fig. 9; but this is by no means

[1] This rock-cavity was explored by Dr. Caruana, F.G.S., and discovered since I left Malta. See Quart. Journ. Geol. Soc. vol. xxvi. p. 434, and Author's work on Malta, p. 169.

[2] During the formation of a dock at Valetta a few years since, fossil remains of *Cervus dama*, and teeth of Horse and Fox were discovered in a rock-fissure, and were determined by Mr. Busk, F.R.S.

[3] As several terms will be used in the sequel with reference to the enamelled ridges, it is advisable that they should be at once known. "Colline" is applied to the unworn ridge, whether talon or plate. "Ridge" includes all the enamel laminæ. "Plate" excludes the "anterior" and "posterior talon."

constant, whilst also, as seen in the same figure, instead of being erect, several of the last plates and posterior talon are reclinate, a condition common enough in the last true molars of other species. The external surface of a plate when denuded of cement, presents, as seen in Plate II. figs. 3 & 5, perpendicular ridges more or less parallel, and always situated towards the middle of the plate, their number varying in plates of the same molar; however, as seen in fig. 3, they are more or less concurrent with the central digitations. Their outline varies considerably, being either rounded or subangular; but there is usually one much larger than the others, with its inner surface hollow and triangular, so as to form "the angulation," which is a prominent feature of the disk when ground down below the digitations.

Besides these prominent ridges there are numerous small and finely defined ribs separated by inosculating channellings, which converge and become faint towards the digitations, as seen in fig. 5. Again the outer surface of the enamel is marked by transverse wrinkling or wavy puckerings, which are extremely fine in germ molars; whilst in teeth in wear they become rough and granulated, in order that the cement may be firmly attached to their surfaces. The figs. 4 & 4 *a* display the interior surface of a plate, against which the ivory is packed. Here the only feature on the enamel is a series of vertical striæ like the external channellings, with the above-mentioned "angular expansion" forming a furrow with abrupt sides, sometimes extending up and down in an unbroken or an irregular manner. It is situated, in upper molars, about the middle; and in lower, from the arcuation of their crowns, it is usually ex-central. Its abutment on the machærides of the enamel not only increases the triturating capabilities of the crown-surface, but, as just remarked, it forms a conspicuous feature on all well-worn disks.

These channellings, puckerings, and angular expansions vary considerably; the latter, however, are always present at some time or other during the attrition of a plate, their absence being usually noticed in newly invaded crowns, which, when half worn, often display the "angulation" in a pronounced degree. The transverse section, as in fig. 7, shows a granulated outline on the cement side of the enamel, which is caused by the above-mentioned rugous channellings and wavy lines. These, in descriptions of the disks, are named by Falconer "false or spurious crimping." I shall allude to the condition frequently, using the expressions "false" or "faint" crimping according to the nicety or obscurity of the appearance.

It is evident therefore that the irregularities of the machærides of worn disks are owing to the above conditions, whilst the digitations and their obliquity, together with their intervening sulci, furnish the irregular and often excessive festooning of newly invaded crowns. Whenever the enamel is very thick its surface-roughness is not so well developed; and even in thin-plated molars it is not always pronounced.

Besides these characters there is, especially in lower molars, a central expansion of the disk, which increases when the wedge is being ground down to *a*, as may be supposed from fig. 6. It varies likewise in individual instances and in upper and lower molars, sometimes being scarcely apparent, as observed in fig. 7. The parallelism of the disks of fig. 7, and of all crowns like it almost worn to the enamel-reflections, is in consequence of the angle at which the ridges are placed, thus diminishing from above downwards the interval between them, which, as shown in fig. 6, is greatest towards the summits. Thus fig. 7 might represent a transverse section of a crown at *a* of fig. 6. From the curving of the lower molars these disks of wear show their horns directed somewhat forwards, the anterior machærides being slightly concave, whilst the posterior are slightly convex: see Pl. IV. fig. 5. The outlines of the crown vary; the upper molar, however, is generally broad in front, narrowing rapidly towards its posterior; whilst the contour of the lower teeth displays discrepancies, which, in combination with other data, go to establish characters which will be pointed out in the sequel.

The above are seemingly more or less common to all the Maltese fossil Elephants, to wit:—first, great height of plates, which differ in thickness of their ivory, cement, and enamel; second, mesial expansions and angulations of worn disks, with fine or faint crimping of the machærides.

In some points they resemble the crown-patterns of the African Elephant and *E. antiquus*, only that the rhomb outline of the disk is by no means so pronounced as in the former: and whilst they assimilate in the height of ridges, mesial expansions, and angulations to *E. antiquus*, there is the absence of the great crimping of the enamel plates so generally characteristic of this species.

As regards the numerical estimate of their ridges, collectively, they belong to Falconer's subgenus *Loxodon*, and yield a formula almost analogous to that of *Elephas meridionalis*; and whilst differing from one another, they equally, irrespective of the usual character of the milk- and true molars, display thick- and thin-plated varieties, which require careful study and comparison in order not to magnify or underrate their values. I therefore made it an object beforehand to collate all evidence on this head with respect to other known species of this genus. An excellent example is shown in the so-called *Elephas priscus*, which Falconer, deceived by the incompleteness of specimens and their thick plates, placed in the first instance in his subgenus *Loxodon*; but he subsequently regarded the condition as only a form of *Elephas* (*Euelephas*) *antiquus*[1]. Again, in the usually thin-plated molar of the Mammoth there are considerable discrepancies. Mr. Davies, of the British Museum, than whom very few have had a greater experience in manipulating teeth of fossil Elephants, more especially of the above species, has furnished me with the following pertinent observations on the subject in question. "From an examination of numerous molars of *Elephas primigenius*, found in England and elsewhere, I have long thought that there are two distinct varieties, which are easily recognized, the molars of one being formed of thin plates, separated by narrow intervening layers of cement, the other composed of thicker plates and having wider interspaces. This last form is more

[1] Quart. Journ. Geol. Soc. vol. xiii. p. 319, and Palæont. Memoirs, vol. ii. p. 251.

common than the first; and the inward dimensions are partly due to a thicker enamel, but more so to the thicker dentine of the plates.

"This conclusion as to the varieties is not derived from the worn surfaces of the teeth, but from the space a given number of plates occupy in any portion of an antero-posterior line midway between the grinding-surface and the base of the molar.

"As an illustration I send you the measurements of the spaces which *eight* plates occupy in six upper ultimate molars of corresponding size, and of small individuals.

	inches.	
1. From Eschscholtz Bay	2·8	Thin-plated.
2. From Ballingdon, Herts	2·9	
3. From cavern near Wells	2·9	
4. Ilford	3·6	Thick-plated.
5. Brighton	3·7	
6. Erith	4·0	

"In a very large tooth of this species, dredged off Happisburgh, the same number of plates fill a space of 4·7.

"But the teeth of fossil Elephants are so variable in size and character, that it is impossible to draw a line by measurements between the thin-plated and the thick-plated varieties; I distinguish them more by general appearance and character of the teeth, than by the assistance of compass and rule. All the thin-plated molars are shorter, and the setting of the plates much more compact. I believe, from my personal experience, that the varieties are local; but I cannot positively assert it."

What has been designated the "talon-complication" is, as regards the molars of the Maltese fossil Elephants, quite as embarrassing as in other species. The varieties of form and shape assumed by the first and last ridges prove, at all events, the necessity of invariably including all enamelled laminæ in the ridge-formula, whether springing from the body of a plate, or in common with it arising from the base at the reflections. Sometimes, however, they are rudimentary, forming small digitated splints, or enamelled eminences, or a talon-shaped ridge, so that it is difficult to decide whether or not such should be included in the estimate; and this, as regards certain molars, is of considerable importance with reference to specific distinctions, as will be shown presently. Dr. Falconer lays much stress on the number of ridges, combined with their characters, as diagnostic of species of Mastodon and Elephant; indeed, as regards the latter, he has founded the subgenera *Stegodon*, *Loxodon*, and *Euelephas* entirely on dental features. It must, however, I opine, be generally admitted that, invaluable as are such data when taken as characteristic of types or forms, both the characters and ridge-formulas are apt to vary, not only in allied species, but, as just observed, in members of the same species. Indeed, to arrive at even an ordinary estimate, it is necessary to examine a much larger assortment of materials than come usually within the reach of a single observer.

1. *Milk-incisors.*

No specimen of the milk-tusk was discovered by me similar to the very perfect and characteristic tooth (Pl. I. fig. 1) from the Zebbug collection, which I have reproduced from Dr. Falconer's drawing[1] to show the contrast between it and a much smaller specimen (fig. 2). The figure 1 was supposed by Dr. Falconer to represent the milk-incisor of *Elephas melitensis.* It is of the same dimensions as the tooth in two uterine skulls of African Elephants, 708*j* and 708*n* in the British Museum. But the pulp-cavity in the two last and in fig. 2 extends almost to the crown; whereas it is obliterated in fig. 1, excepting a small foramen at the proximal extremity for nutrient vessels. As regards relative dimensions, the tooth is rather smaller than that of the recent species, and therefore, as surmised by Mr. Busk[2], may have belonged to the largest form, which ordinarily seems to have been under the average size of the African and Asiatic Elephants. The crown has an investing shell of enamel on the top, which thus shows, as far as yet known, a peculiarity confined to the forms of the Maltese Elephants and the African.

The almost entire incisor (Pl. I. fig. 2) from Mnaidra Gap represents what I opine is the milk-tusk of a very small form of Elephant. The outline is cylindrical, with a gentle curve; it is rather compressed towards the proximal, and somewhat truncated at the distal extremity, with a defined dark stain on the enamel 0·5 inch from the tip, possibly the alveolar impression. The outline of the hollow pulp-cavity is nearly a perfect oval, with the larger end upwards. Like the last it is not only tipped, but entirely enveloped in a remarkably fine shell of glistening enamel, which, although partially rubbed off on the part that extended beyond the gum, is well seen elsewhere, as also the minute surface-channellings running lengthways. The dilated blunt point seen in fig. 1 is here wanting; and, but for attrition of the enamel, it would be difficult to believe that it ever resembled the other in form. But I find that the shape of the milk-incisor varies considerably, as does the permanent tusk, in the Asiatic Elephant, being often misshapen and stunted, especially in females. It is difficult, therefore, to surmise to what form of the Maltese Elephants the above belonged. From its small dimensions I should be inclined to place it with the smallest-sized teeth to be described in the sequel.

2. *Permanent Incisors.*

Tusks, sometimes entire, but generally in fragments, accompanied bones and molars, more especially wherever there were indications of entire skulls having been conveyed into the gaps and fissures. Indeed, from the quantities of ivory found wherever molars were plentiful, and the numbers of short and straight specimens, it may be surmised that the tusk was always fully developed in adults, and existed also in both sexes. It

[1] Palæontological Memoirs, vol. ii. pl. 11. fig. 3, *a* & *b*; Trans. Zool. Soc. vol. vi. pl. 53. fig. 1, *a* & *b*.

[2] Trans. Zool. Soc. vol. vi. p. 284 (foot-note).

seems impossible, however, to attempt to classify the smaller fragments; I shall therefore proceed at once to a consideration of the largest. Two of the latter, of about the same dimensions, were discovered in Mnaidra Gap lying close to the last true molars (Pl. VII. fig. 2, and Pl. VIII. fig. 7), and belonged to different individuals. The more perfect tusk showed an unbroken length of 4 feet 2 inches from the apex of the pulp-cavity, where the girth was 15 inches, the average circumferences of the other tusk being 13·5 inches at the alveolus and 13 inches at the fractured distal extremity (a section of which is shown, Pl. XI. fig. 12), thus representing a tusk which could not originally have been under 5 feet in length. The curve was gradual, sweeping gently downwards, forwards, and inwards. A somewhat smaller incisor is shown by the fragment, fig. 11. Another fragment of a large tusk from the same situation gives a girth of 15 inches in front of the alveolar opening; but the largest fragment was discovered by Dr. Caruana, F.G.S., in Shantiin Fissure[1]. It was 21 inches in length, with a circumference of 17 inches. A skull containing what I consider to be the first true molar of the largest form (Pl. VIII. fig. 5), held also an entire tusk, which measured 2 feet 2 inches in length, with a maximum girth, just in front of the alveolus, of 7 inches.

Sections of *all* the permanent incisors in my collection (and they are very numerous) display well-marked "engine-turning," and "surface-channelling" more pronounced than I have observed in those of either of the recent species (see Pl. XI. figs. 11–15). Although tusks as criteria of the size of the Elephant are at best fallacious[2], it is clear that the owners of the largest of the above equalled the dimensions of an Elephant at least from 6·5 to 7 feet in height. The latter, as far as I can make out from my own collection, was about the greatest height attained by the largest form of Maltese Elephant. The tips of the tusks, large and small, seemed, as in the living animal, to have varied considerably, as will be seen from the representations on Pl. XI.; perhaps the obtuse points belonged to females. The termination of the pulp-cavity is seen at *a*, fig. 14.

An instructive specimen, showing the permanent tusks in place, is represented in Pl. I. fig. 18; both are entire, with a fragment of the left molar *in situ*. The latter, for reasons stated in the sequel, is, I apprehend, the last of the milk-series, and as such would represent the same stage of growth as observed in the recent species, but in a much smaller Elephant. The right incisor (*b*) has been displaced; but the left may be said to be in place, or nearly so. The fragment in the alveolus, figured and described by Busk[3], would seem to have belonged to a somewhat younger individual. The portion shown, Pl. XI. fig. 13, was presented to me by the owner of the property where the Zebbug cave exists, from which it was obtained. The specimen gives about 7·5 inches of the central portion of a tusk, the maximum girth of which is 6 inches, and from the curvature indicates a full-grown animal, and no doubt also of the

[1] Quart. Journ. Geol. Soc. vol. xxvi. p. 435.

[2] See Baker's 'Nile-Tributaries of Abyssinia,' p. 533.

[3] Trans. Zool. Soc. vol. vi. pl. 52. fig. 46.

same small form. In this specimen all the characters of the Elephant's tusk are well shown, the "engine-turning" being especially distinct.

3. *First or Preantepenultimate Milk-molar; Second or Antepenultimate Milk-molar.*

In all known species of the genus *Elephas* both the first and the second milk-molar, theoretically, have two divergent fangs; the only exceptions apparently are among the Maltese fossil Elephants, which show a functionally developed second tooth with only one straight fang, as seen in Pl. I. fig. 6, and others referred to by Falconer, and published in the sixth volume of the Society's 'Transactions'[1].

With reference to the theoretical first or preantepenultimate milk-molar, rarely developed in either fossil or recent species, there is one very interesting specimen in the British Museum.

The African skull containing this condition is No. 708*b* of the osteological catalogue. It is the same referred to in the 'Fauna Antiqua Sivalensis,' pl. 14. fig. 4, left side, *a*, and by Blainville in his 'Ostéographie,' pl. 9. figs. 1, 2. The appearances of the dentition are as follows:—The milk-incisor and its enamelled tip is just protruding beyond the sheath, with a club-shaped point as seen in the Zebbug fossil (Pl. I. fig. 1), the former being 1·4 inch in girth. In the UPPER JAW the second or antepenultimate is in full wear, with one ridge of the next tooth invaded. The former is 0·8 by 0·7 inch, and composed of three plates and two talons; the latter is 2·3 by 1 inch, and is composed of five plates and two talons; behind all is the empty alveolus of the last milk-tooth.

The LOWER JAW (RIGHT) contains the antepenultimate and penultimate molars. The former is in full wear, with three ridges of the latter invaded. The antepenultimate is 0·8 by 0·4 inch; its fangs are *furcate*, with a pronounced depression or pressure-mark below the crown posteriorly, as in the fossils to be described presently. The penultimate is 2·2 inches by 1·1 inch, and made up of six plates and two talons.

The LEFT LOWER RAMUS contains the first or preantepenultimate, composed of *two plates* and *two talons*; the length of the crown is 0·65 by 0·4 inch. The antepenultimate is also composed of *two plates* and *two talons*; its length is 0·85 by 0·6 inch. *The fangs in both are divergent*; but the posterior of the preantepenultimate is *more* divergent than either of the antepenultimate, and absolutely crosses the anterior fang of the latter, which, like the other root, is inserted more perpendicularly. The penultimate is of the same dimensions as that of the right ramus; and the same number of ridges are invaded. *No septum* divides the *pre*- from the *ante*penultimate, and the latter and the penultimate; so that the grinding-surface on the left side is not more extensive than on the opposite. Indeed the *three* successive teeth are close together, whereas there is a septum between the *ante*- and *penultimate* teeth in the right side. Thus the additional tooth takes up the space of the ordinary septum.

[1] Page 286, and pl. 53. fig. 2; see also Palæont. Mem. vol. ii. p. 297.

The highly interesting portions of upper and lower jaws (Nos. 91, 90, Pl. II. figs. 1, 2) are unfortunately by no means perfect. By good luck, however, a small part of the upper jaw in front of the third or penultimate molar has been preserved. Here, close to the tooth and somewhat internally, at *b* is a distinct and rounded fang with a smaller central canal. A little further down at *c* there is another, but considerably smaller, ivory stump sticking in the ramus, the distance between them being about 0·6 inch. There is no appearance of an alveolus, such as obtains in the last-named and other species. The posterior root seems to be the largest; and both are standing *quite* erect; so that unless the tooth they upheld had two perpendicular instead of divergent fangs; I see no way of explaining the condition than by the hypothesis that instead of one there were two separate molars in place at the same time, each with single erect fangs; *i. e.* the first and second milk-molars were developed in the upper jaw, which, as far as I know, is an anomaly. However, these are the facts, look at them how we may; Mr. Busk, who examined the fragment of jaw referred to, is of opinion with me that it holds indications of the *entire* milk-series, as will be reverted to frequently in the sequel. As to the lower jaw in this instance, I am unable to state whether or not the same condition obtained, as the anterior portion has been removed close to the third milk-molar, leaving it and the collines of the last milk-molar in place. However, from the very young and uterine lower Zebbug rami described and figured by Busk[1], it would appear that the first milk-tooth, as in recent and other extinct species, was often, if not as a rule, suppressed. At the same time, from what is shown by the African instance, it may, when developed, have performed its function in common with the second.

1. The entire upper second or antepenultimate milk-molar (No. 105, Pl. I. fig. 3) I discovered in a fragment of jaw, with the penultimate in germ behind it. The latter was composed of eight ridges, and equalled in size the penultimate milk-tooth (fig. 13) attributable to the largest form of Elephant. The crown of fig. 3 is composed of four collines. The anterior is triangular and short, and occupies the inside front; the third is the highest and broadest, with its digitations *very* slightly touched by wear, showing the owner was not unborn. All the ridges rise from the common base, the first two being modified with single digitations. The fang has been broken off close to the crown; its hollow base is still evident. The ridges are thick. The length of the crown is 0·5 inch. There is no possible likelihood of any additional ridge having existed in this specimen, which might be said to hold three plates and an anterior talon, just as anatomists may choose to look on the latter.

2. No. 67, fig. 5, is entire, with the recent loss only of a figment of the second ridge. The first is placed like the preceding, and is of the same pyramidal shape. There is a distinct posterior talon appendage adhering to the last ridge. The crown has the tips of the second and third ridges just touched by wear; it is narrow in front and broad

[1] Trans. Zool. Soc. vol. vi. p. 276, pl. 52. figs. 42, 43, & 45.

posteriorly. The single hollow fang has been recently broken off about 0·4 inch below the crown. There is a pressure-hollow 0·3 inch broad on the upper and posterior side of the fang. The tooth is made up of five ridges, or three plates and two talons. Here the first and last ridges may be called modified ridges; at all events the posterior fairly claims to be considered a talon. The crown is 0·55 inch in length. The ridges are moderately thick, but not quite so large as in the last.

The above is probably a lower molar, and does not seemingly differ in character from the last. The anterior ridge also rises from the common base, but is not quite so large as in fig. 3.

3. Specimen No. 103 (fig. 4) might, from the figure, be considered a good deal larger than either of the foregoing; and this is the case to a trifling extent; but from injury some time or other there is a lengthening of the crown which is not natural. The enamel also of the posterior talon has been denuded, and the single hollow fang was broken off recently at about 0·5 inch below the crown. The pressure-hollow, 0·3 inch in breadth, and a scar are well seen on the back part of the fang. There is no indication of wear on the crown, which from its narrow front might have belonged to the lower jaw. The first and last ridges claim the character of talons, being simple splints. It contains the same ridge-formula as the last. The length is about 0·6 inch.

The ridges in this and fig. 5 are almost the same thickness. From its breadth the above may have been an upper tooth.

4. No. 109 (fig. 6) is a well-worn crown. There is seemingly a trace of an anterior ridge which had been worn out, possibly by pressure or attrition, leaving the enamel of the next bare and rough. The flat, single, straight, solid fang is entire. It is compressed laterally, with a small opening at the extremity for the nutrient vessels, and is 0·8 inch in length. The enamel on the posterior ridge has been denuded, and there are two caries-like erosions, one immediately under the crown behind, and another in front.

Although only three ridges remain, it may be there were two more. The length of the crown is 0·4 inch, and, although well worn, shows no pattern of any value for comparison with succeeding teeth.

The enamel of the plates in this molar is not seemingly so thick, nor are the plates as in any of the preceding; and altogether the tooth would appear to have belonged to a smaller animal.

Mr. Busk has kindly allowed me to compare Admiral Spratt's collection of Zebbug molars, figured and described by Dr. Falconer, with the above; and seeing that, combined with my own, they comprise all the first or second milk-teeth of the Maltese Elephants yet discovered, I must briefly refer to them also.

The similarity between the lower tooth described by Falconer[1] and the last is very striking, even in the *caries*-like erosions just under the crown, posteriorly, where a

[1] Palæont. Mem. vol. ii. p. 297 and pl. xii.; Trans. Zool. Soc. vol. vi. p. 53. fig. 2.

second fang would ordinarily diverge. But it is clear that if any thing of the kind did exist it must have been of very diminutive size, and came off at right angles to the main root, which here, as in my specimen, is flat. It has three worn ridges, with a posterior talon. The crown is 0·4 inch in length. There is a less perfect specimen in the collection, showing a crown on the point of being shed. Here the base of the fang presents indications of having been single; and although only three ridges are left in a space of 0·5 inch, there are traces of a lost ridge on the fore and on the hind plate, also well-marked pressure on the base posteriorly.

It seems clear therefore that the single straight perpendicular fang of the Maltese elephants supported all the ridges, and had *no divergent fang*. This has been further confirmed by Falconer and by Busk; the latter discusses the subject in a note in his monograph[1]. He is of opinion, moreover, that the fangs were connate; and certainly on the flat side of fig. 6 there is a slight tendency to a central depression lengthways, as if the two had grown together.

It is scarcely necessary to indicate the small dimensions of the above teeth as compared with other known species of elephants. I may state, however, that among a large series of instances of antepenultimate molars I find the smallest specimens of the Asiatic are 0·6 inch in length, whereas none of the African are below 0·8 inch, and the majority are fully 1 inch in length.

As to their specific characters, it would be difficult, excepting on the score of size, to make out that they belong to more than one form of elephant. However, on account of the larger dimensions and seeming thickness of plates, it might be that the molars (Pl. I. figs. 3, 4, & 5) belonged to a larger form of elephant than fig. 6 and the two Zebbug specimens. As to their claims to be considered either first or second milk-molars, it is clear that fig. 3 belonged to the latter, although holding a ridge less than figs. 4 & 5. This being the case, the probability is that they are likewise second or antepenultimate milk-teeth. At all events, whether first or second milk-molars, there can be but one opinion as to the unusually small size of all their owners.

4. *The Third or Penultimate Milk-molars.*

Of all the dental materials of the Proboscidea discovered by me in Malta the majority are referable to this member of the series.

Besides several specimens from Gandia Fissure, collected by Dr. Caruana, Mr. Welch, and myself, and now in the Museum of the University of Malta, my own collection furnishes upwards of thirty examples of the penultimate or third milk-molar, the greater number being entire, or in conditions which admit of ready determination. Moreover. whilst furnishing valuable odontological data, they also supply grounds for speculation as to the causes which brought about the destruction and aggregation in small areas of so many very young and immature elephants as compared with the adult

[1] Trans. Zool. Soc. vol. vi. p. 287.

and aged. This subject, however, has been fully discussed by me elsewhere[1]. I shall therefore proceed at once te a consideration of their anatomical characters.

As regards dimensions the specimens constitute two series, graduating regularly from the smallest to the largest, the extremes of length in upper teeth being 1·6 to 2 inches, against 1·3 to 2·4 inches in the lower jaw.

A *Series*.—The smallest penultimate milk-molar in my possession—indeed, I believe, the most diminutive third milk-tooth of any recent or fossil species of elephant hitherto figured and described, is represented by the entire and beautifully preserved specimen of the left-side lower jaw No. 14 (Pl. I. figs. 8 & 8*a*). The one described by Falconer[2] is not quite entire; and although apparently belonging to the same type, it is a little larger, seeing that with the loss of its anterior talon it contains six ridges in 1·3 inch, whereas fig. 8 holds seven ridges in the same space. The latter molar is well worn, so as to fully display the character of the crown-pattern, which is precisely like that of the other, and bears also a resemblance to the disk of *Elephas antiquus* and the African species. This character pervades generally all molars of Maltese fossil elephants, with faint crimping near the middle of the disk, which is expanded, and shows a small angulation, as in *E. antiquus*. On the anterior talon of fig. 8 there is a distinct pressure-scar, 0·2 inch broad, and the usual pressure-hollow posteriorly at *b*. As regards comparisons, it is almost needless to state that the above is about half as long and one third as broad as even the smallest penultimate milk-molar of any known species of the genus.

The somewhat imperfect upper molar (No. 2, figs. 7 & 7*a*) shows satisfactorily that it originally held the same number of ridges as the last in about 1·6 inch. Here the pressure-scar (fig. 7*a*, *b*) is 0·6 inch broad, and indicates a succeeding tooth impinging steadily on the posterior talon. The fangs are consolidated, and the crown is considerably arcuated externally, seeing it is an upper molar. Although as far advanced in wear as fig. 7, the machærides are more crimped, whilst the central dilatation and angulations are also pronounced.

The two perfect and very instructive upper and lower teeth (Nos. 91 & 90) belonging to the same skull have been already noticed in connexion with the foregoing members of the milk-series. They are represented *in situ* (Pl. II. figs. 1 & 2). The upper penultimate milk-molar in fig. 1 has a ridge less than any of the foregoing, just as obtains in the antepenultimate (Pl. I. fig. 3). It bears a close resemblance to the entire specimen of the penultimate milk-molar of Falconer's *E. melitensis*[3], only that it contains seven ridges in 1·4 inch, whereas fig. 1 holds six ridges in 1·5 inch; nevertheless these two teeth are very much alike, and contrast with the upper molar just described in their thick plates. The investing cement in Falconer's molar has been denuded; but in fig. 1 it is present, and gives a thick-plated aspect to the crown. Immediately in front of fig. 1 there are

[1] Nat. Hist. & Arch. of Nile Valley and Malta, p. 161.

[2] Trans. Zool. Soc. vol. vi. pl. 53. figs. 4 & 4*a*.

[3] Ibid. figs. 6 & 6*a*.

the two stumps sticking in the jaw, as just recorded, besides a scar on the enamel of the anterior talon, internally, 0·4 inch in breadth; but the most suggestive part of the specimen is the succeeding alveolus, in which the collines *a* of the last milk-molar lie horizontally, furnishing a maximum breadth of *one* inch. The crown of the penultimate tooth is not sufficiently worn to show the pattern. The lower ramus No. 90 (fig. 2) has been broken across in front just clear of the tooth, which, however, has a deep scar on the enamel made by the antepenultimate. The last ridges are not perfectly consolidated. The entire length of the crown is 1·8 inch, in which there are seven instead of six ridges in the upper tooth. The last milk-molar *a* is seen *in situ*, showing a breadth of colline of about 0·8 inch. As in the upper the antepenultimate and the first milk-tooth also were possibly in wear at the same time, seeing that the digitations of the first four ridges only are invaded. The colline *a* is nearly entire and well shown behind, presenting dimensions equal to those of No. 44 (Pl. IV. fig. 3), which appears to belong to the last milk-molar of this pygmy form of elephant.

Other teeth referable to A series are seen in my collection in the British Museum. For example, No. 1, holding seven ridges, is an entire upper molar, 1·7 inch in length, with a crown like figs. 1 & 2, just coming into wear, whilst No. 7 is more attrited, and No. 8 is of the lower jaw, with only the first three ridges slightly worn.

All these teeth demonstrate the presence of an upper and lower penultimate milk-molar, holding seven ridges, or five plates and two talons.

Intermediate in size between the above and B Series are a number of small lower teeth, somewhat larger than the former, with figmentary posterior talons raising the ridge-formula by one ridgelet. They differ, however, in no other particulars, and may be regarded as belonging to A type, with the usual variety of an additional ridge.

The difficulty in deciding what should be called a plate and talon is shown in the lower molar, No. 75 (Pl. I. fig. 9). Here the first ridge is quite independent of the second, and the last is a mere triangular splint attached to the seventh ridge. Thus this molar might be said to contain seven plates and a posterior talon in a space of 1·7 inch.

The rhomboidal tendency of the disks is here also apparent, with slight crimping about the middle; but the crown is not quite half-worn.

Conditions precisely the same as in fig. 9 are shown by the ridge-formulæ in Nos. 3, 4, 6, & 10, which represent lower molars in various stages of wear, the half-worn crown of No. 6 displaying disks in no way distinct from those of Pl. I. fig. 8. These molars gradually increase in length up to No. 9 (fig. 15), which is 2 inches in length, with its seventh plate convex, and a triangular figment at *a* constituting a posterior talon. A similar specimen of a lower molar is shown by No. 62, which holds seven ridges in 1·8 inch, neither of which, however, might be considered other than plates, the part of the surface of the seventh ridge which gave rise to the little ridgelet in the preceding being hollow in this specimen. As these, however, are all lower teeth, the occasional addition of a ridge is not uncommon; thus it may be that the normal number is seven, or, in other words, five plates and two talons. They are, however, slightly larger than No. 14 (fig. 8), yet doubtless of the same form.

B *Series.*—An upper molar holding eight ridges in 2 inches is well shown in crown No. 60 (Pl. I. fig. 13). It is worn not quite half down, so that the crimping of the machærides, as in fig. 7, is pronounced. It is a broader tooth, however, with very thick plates, each being as much as 0·3 inch; indeed their size gives quite a character to the ridges. The posterior talon is a broad digitated splint, rising about the middle of the seventh ridge, the anterior talon being semicircular, and worn to the common base.

The fragments Nos. 89, 97, & 85, of upper molars just commencing wear, are referred to this variety. Of other upper molars of B Series, or what might be called the thick-plated type, No. 104 (fig. 16) represents eight independent ridges in a space of 2·2 inches, followed by Nos. 76, 82, 77, & 54 of my collections in B. M. The last, represented in fig. 14, is the largest penultimate milk-molar, and contains eight ridges in 2·4 inches. None, excepting No. 82, are worn sufficiently to fully develop their rhomboidal disk, which, however, is beautifully shown on its crown. In regard to its posterior talon-shaped ridge, so often dwarfed in A series, it is well developed in all of the largest penultimate milk-teeth; and although convex in the above, it rises for the most part from the common base with the other collines, so as to be classed as a talon only on account of its more curving outline.

The largest lower molar (fig. 14) is as large as small instances of the penultimate milk-molar of the African Elephant, which ordinarily contains the same number of ridges. It does not differ, however, from the other large specimens in its ridge-formula and crown-pattern.

Summary.—From the foregoing I think it must be inferred that they at least represent two elephants differing in size:—one of dwarf dimensions, holding ordinarily seven ridges in its upper teeth; and another, larger form, with eight ridges. The likelihood of an intermediate form is not at all clear. As regards crown-patterns, the same appearances prevail throughout A & B series. In newly invaded crowns there is much crimping; but when half-worn in the smallest, intermediate, and largest, as seen in fig. 8 and Nos. 6 & 82, we find the rhomb-shaped outline, with the angulation of *Elephas antiquus*, but there is faint instead of pronounced crimping.

The thickness of the plates does not seem, unless in the largest molars, to be diagnostic, as we find thick- and thin-plated specimens among the smallest and intermediate-sized teeth. In the largest, however, it would seem to be general, with rugosities on the enamel of the posterior talon, and which we shall find are also prominently shown in the largest last milk-molars.

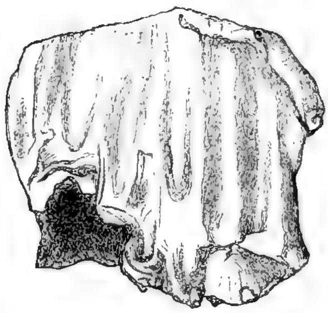
The fragment of the lower molar, holding six ridges in a space of 1·5 inch, shown in jaw No. 41 (Pl. I. fig. 12), and its profile view (Pl. VI. fig. 2), is by no means perfect enough to enable me to decide as to its position in the series, further than by comparison with tooth and jaw No. 91 (Pl. II. fig. 2). It is clear that the former belonged to a larger animal; nor, as will appear in the sequel, is the broad crown in keeping with the last milk-teeth attributed to the smallest form; but I find that the largest penultimate milk-molar (Pl. I. fig. 14) gives the same number of ridges in a like space, more especially when taken close to its enamel reflections posteriorly, which is the horizon displayed in fig. 12. It might therefore have represented the penultimate tooth of the largest form, nearly worn out, and the last of the milk-series coming into wear. Reference will be made to the jaw itself when I come to consider the cranium.

5. *The Fourth or Last Milk-molar—First True Molar.*

I shall now refer to several large and interesting series of molars, all of which are in the British Museum. They comprehend teeth differing widely in size and characters; but in consequence of possessing the same ridge-formula, and having been more or less intimately associated in the same deposits, it appears necessary that they should be brought together, so that their distinctions may be more easily compared. The ridge-formulas in the following vary between ten and eleven ridges, or eight or nine plates and two talons; in one instance there are twelve ridges in a lower molar, where, however, an extra ridge (or even two) is not uncommon in all known species of the genus.

A *Series.*—The small upper molar, No. 45, here shown, and its upper aspect in

Fig. 1.



Last Upper Milk-molar. Nat. size.

Pl. I. fig. 11, is unfortunately not quite entire, having lost in all probability two, if not three, of its posterior ridges, leaving eight ridges in a space of 1·8 inch. The pressure-scar is roughly shown on the enamel of the anterior talon, but not distinctly. It is, however, clearly defined on the front of the fragment No. 16, which, in all points, is of the same type. Here the scar is 0·4 by 0·5 inch. Now it is important, with reference to the position of these teeth in the dental series, to consider how far there is evidence to give them a claim to the position of a last milk-tooth. This is probably proved, not only by dimensions, as compared with the preceding, but from the circumstance of the breadth of the scar on the anterior talon, which, in virtue of its dimensions, could not have been caused by any of the antepenultimate milk-molars just described.

The disks of the specimens not being sufficiently worn to display the pattern, little can be recorded on this point further than that the only full-developed disk of fig. 11 shows faint crimping. The dentine and cement are in about equal proportions; and the enamel is not thick.

I am disposed to associate with the members of this series the fragment of an upper jaw, No. 46 (Pl. I. fig. 18), containing the two permanent tusks and a morsel of an upper molar, already referred to. The tooth, although on the point of being shed, shows a large flat posterior fang, with two *middle* round fangs in front (*a*, *a*), which alone would incline me to the belief that this is a fragment of a last milk- instead of a penultimate milk-molar. The specimen, therefore, might have represented the last of the milk-series disappearing, with the first true molar almost in full wear, and the tusks protruding for some distance beyond their alveoli; it is just possible, however, that the fragment may be that of the penultimate tooth, where, however, the intermediate roots between the large anterior and posterior fangs are far more diminutive, especially in upper molars. The development of the tusks would seem also opposed to this view.

There is no lower molar in my collection allied, as regards size and other characters, to No. 45 (fig. 11) and its series; but the long narrow tooth considered by Falconer to belong to the last of the milk-series of *Elephas melitensis*[1], might have belonged to the same type as No. 45. It holds ten ridges in 2·3 inches. The disks, as regards pattern, are precisely like those of Pl. I. fig. 8, to which, as regards size and ridge-formula, it might fairly claim to be the successional molar.

B *Series*.—The two upper molars, Nos. 18 & 19 (Pl. I. figs. 10 & 17), are decidedly larger than the last, but not beyond the limits of variability observed in known species of elephants. The more perfect of the two (fig. 10) has lost its last ridge and fangs, with a considerable portion of the inferior aspect of the crown.

The following profile view (fig. 2) shows its length, 2·6 inches, in which there are nine ridges. Fig. 17 has lost recently three of its central ridges, but was entire when discovered, and held ten ridges in a space of 3 inches. There are large well-defined pressure-scars on the anterior talons of both molars, more especially on the latter, where the impression is 0·5 by 0·6 inch. I would correlate with the above Nos. 17 & 12 of the Collection. The latter represents four well-worn disks, showing central expansions,

[1] Trans. Zool. Soc. vol. vi. pl. 53. fig. 5, and p. 589. This remarkable tooth, Dr. Faloner remarks, "is unique as regards the complexity of its crown conjoined with such small dimensions," seeing that it contains ten ridges in the same space occupied by the eight ridges we have seen in the largest penultimate milk-molars just referred to. Certainly the posterior talon in the above is a mere figment, but neither more nor less than frequently obtains in all molars. Altogether the crown of fig. 5 is so long and so narrow that I have been sometimes disposed to consider it an instance of two extra ridges in a lower penultimate milk-molar. It is, however, equalled nearly by No. 44 (Pl. IV. fig. 3), which, however, is a larger tooth.

angulations, and faint crimping, which decrease towards the cornua. The ridge is remarkable for the profusion of its digitations, as seen in fig. 10.

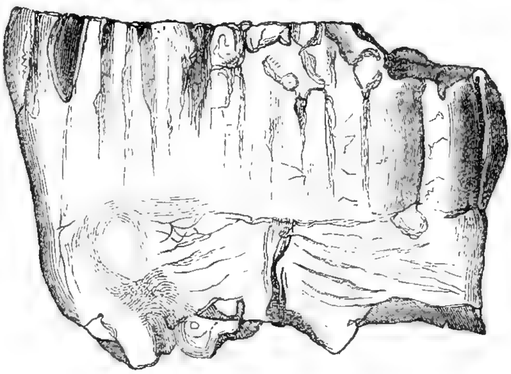
Fig. 2.

Last Upper Milk-molar. Nat. size.

The colline (*a*) shown in Pl. II. fig. 1 equals in breadth those of figs. 10 & 17, which might therefore fairly be considered the last milk-molars of the same pygmy form.

There is a perfect upper molar, said to belong to the Zebbug collection, although, strange to say, it is not referred to by Falconer in his description of the teeth. It has however, been figured and described by Mr. Busk in a note appended to Falconer's

Fig. 3.



Last Lower Milk-molar? Nat. size.

memoir[1]. This specimen displays ten ridges in a space of 2·9 inches, and in characters agrees very well with the above.

[1] Trans. Zool. Soc. vol. vi. p. 290. I have examined the specimen carefully, and compared its exterior with other molars from Zebbug, and find they agree in mineralogical characters, only that the white incrustation on the cement is very much thicker in the above. Considering that the specimen must have been with Dr. Falconer when he wrote his description of the last upper milk-molar of *Elephas melitensis*, it seems very strange that he should have selected a fragment of an analogous tooth when he had such a perfect specimen of the same type before him.

The entire lower molar, no. 44, of which the accompanying woodcut (fig. 3) and its crown view (Pl. IV. fig. 3) will give a good idea, contains eleven ridges in 3 inches.

The talons here are mere appendages. The crown, like that of the last milk-molar of *E. melitensis* (Falc.), is long and narrow, the disks are also rhomboidal, with little, even, faint crimping; the central angulations, however, as usual, are apparent. Indeed, in regard to dimensions, this tooth might fairly claim to be the lower molar of Pl. I. figs. 10 & 17, and of the upper tooth described by Busk.

C *Series*.—The two left lower molars, No. 66 (Pl. VI. figs. 5 & 5*a*) and No. 67 (Pl. V. fig. 2), are precisely of the same type. They differ, not only in size but in configuration and other characters, from any preceding lower molars. The entire specimen No. 66 (Pl. VI. fig. 5) contains eleven ridges in 4·2 inches. Unlike No. 44 (Pl. IV. fig. 3), the crown is much arcuated, and instead of being narrow in front is broad and rounded on the internal border and narrows posteriorly. The plates, moreover, are thicker, being 0·34 instead of 0·3 inch. Indeed, altogether the tooth has very much the aspect of a true molar. The crown, like the other, is long and narrow; and the discal pattern (Pl. VI. fig. 5*a*) shows the pronounced expansions and angulations[1], with very little faint crimping and numerous digitations. The enamel is not thick; but the plates are large as compared with No. 44 (Pl. IV. fig. 3).

The septum (*a*, fig. 5) still remains; but as the crown was just being invaded, we should not expect the next tooth to have made great progress; however, the slope on the back part shows there was pressure being exerted.

The entire and remarkable upper molar described by Falconer as either the first or the second true molar of his *Elephas melitensis*[2], holds eleven ridges in three inches. At first sight one would be disposed to place it in the D series, with the molars referred to the last milk-teeth of the largest form, which it and the specimen in my collection, No. 24 (Pl. II. fig. 9) closely resemble, but only in the crown-pattern[3].

The latter contains only seven of the anterior ridges, the remainder having been lost. As far as the specimen goes, however, it may be called a *fac simile* of the Zebbug tooth. They differ from the last milk-molar above mentioned in the greater breadth of crown and great height of ridges, which, however, are not nearly so thick, there being, for instance, five ridges in 1·4 inch in Pl. II. fig. 9, whereas there are only four in the same space in Pl. III. fig. 4.

The profusion of the digitations is noteworthy, as they are especially plentiful on the collines of all the thin-plated milk- and true molars. Altogether these teeth appear to

[1] The central rib or ribs which give this feature to the crown are more pronounced in some specimens than in others, and more especially in those referable to the smallest form. See Pl. II. fig. 5, where these ridges are seen side by side in a plate of an analogous tooth to the above.

[2] Vol. vi. pl. 53. figs. 9 & 9*a*.

[3] Compare my specimen (Pl. II. figs. 9 & 9*a*) and Falconer's figures 9 & 9*a* with the disks of Pl. IV. fig. 2*a* and Pl. III. fig. 4.

me to exceed other upper molars in both collections with regard to the following—viz. the greater height of the crowns, the length as compared with the breadth of the crown, and the thinness of the enamel and plates[1]. To what position in the dental series do they therefore belong? Are they the opposing molar to the narrow-crowned teeth (Pl. VI. fig. 5, and Pl. V. fig. 2) which we have just seen carry the same number of ridges in a space of 4·2 inches?

In the thinness of the enamel and absence of crimping on the machærides of well-worn disks the two are precisely alike. The plates of the lower molars are much thicker. This, however, does obtain more or less in the lower jaw, just as the crown is narrower by a good deal.

As regards relative length, it is nothing uncommon to meet with much discrepancy in this respect between upper and lower first true molars, to even a greater extent than in the above. Lastly, in the short, stumpy outline of the upper Zebbug molar, with the pronounced pressure-hollow below its posterior talon, made by the advancing septum, we find precisely the same conditions in other species of Elephant, and in Pl. III. fig. 3, which I have assigned to the same position in the dental series of the largest form[2].

D *Series.*—The perfect and highly suggestive upper molar No. 61 (Pl. III. figs. 4, 4*a*, & 4*b*) contains ten ridges in 3·2 inches. There is a well-defined pressure-scar on the enamel of the anterior talon, 0·6 by 0·8 inch in breadth, which equals the base posteriorly of the largest upper penultimate milk-molar (Pl. I. fig. 13). The talons here are well shown. The crown, just commencing wear, has not the pattern well developed; but in No. 65 (Pl. IV. figs. 2 & 2*a*), which doubtless belongs to the same series, we find a half-worn crown displaying decided mesial expansions, slight tendencies to angulation, with faint crimping extending even to the cornua. These characters are continued in the still more attrited crowns of Nos. 13 & 52 of the Collection. The fangs are well shown in No. 65, Pl. IV. fig. 2; and the posterior pressure-slope (*a*) is also exceedingly clearly defined. The rugosities or digitations of the collines are excessive, extending to the posterior talon, as seen in Pl. III. fig. 4*b*, where the investing cement has been purposely removed. This latter character is common also to the largest penultimate milk-teeth, as shown by Pl. I. fig. 14.

The lower molar referable to this type is, I apprehend, well shown in No. 49 (Pl. III. figs. 5 & 5*a*). As regards relationship I scarcely think there can be a doubt of the

[1] The thickness of the enamel on the crown of Falconer's figure (Trans. Zool. Soc. vol. vi. pl. 53. fig. 9) is exaggerated. I have compared the actual specimens with Pl. II. fig. 9, with which its machærides agree very closely.

[2] There is, moreover, this character, almost peculiar to first true molars: viz. the tooth is generally very much broader at the base of the crown than other members; and although they vary much in size individually, the specimens collectively of all first true molars, upper especially, seem to be shorter and stumpier teeth than any other of the intermediate members.

connexion between it and fig. 4. Here we have ten ridges in 3·3 inches; for although the fore part of the crown is somewhat distorted in consequence of an ancient fracture, the measurement is not invalidated in any material way.

As in the upper tooth, the same thickness of enamel and the *very much* digitated posterior talon (figs. 5 *a* & 4 *b*) are present, just as, I repeat, obtains in the largest penultimate lower milk-molars.

Precisely the same characters are continued in the lower molar No. 63, the crown of which is not so far invaded as that of fig. 5; and although the anterior talon has been recently removed, there are nine ridges in a space of 3·2 inches. It will therefore be seen at a glance that the members of this series differ in size and characters from any of the foregoing.

E *Series.*—The largest of the class of molars holding ten to eleven ridges is beautifully represented in the perfect crown No. 39 (Pl. III. figs. 3 & 3 *a*), which is an upper molar commencing wear. It holds ten ridges in a space of 4·3 inches. The pressure-scar on the enamel of the anterior talon is 0·6 by 1·2 inch in breadth.

Another suggestive specimen of an upper molar of the same type, but belonging to a larger individual, is presented by the tooth No. 71 (Pl. VIII. fig. 5[1]). It shows a more worn crown, and is embedded in a portion of the jaw, to which reference will be made in the sequel. The latter is omitted in the figure. The tooth holds ten ridges in a space of 5·2 inches. Probably the first ridge is worn out, seeing that the large anterior fang which ordinarily gives support to three has only two ridges on it, and the first disk is ground down to the enamel reflections, with a pressure-scar in front.

The lower molar No. 72 was found in a ramus close to the jaw which contained the above. It is entire, and contains twelve ridges, including a diminutive posterior talon, in a space of 5·5 inches. The crown, as usual in lower molars of this series, is much arcuated, almost like a bow, and similar to No. 37 (Pl. IV. fig. 4), which shows a well-worn crown entire. It holds eleven ridges in about 5 inches. A third lower molar (No. 51) is represented on Pl. IV. fig. 5. The contrast between it and the preceding is merely one of size, there being eleven ridges in 4·2 instead of 4·8 inches; consequently it is of the dimensions of the upper molar, Pl. III. fig. 3, just as Pl. IV. fig. 4 consorts with Pl. VIII. fig. 5, both of which are a little larger.

The characters of all the members of this and D Series are remarkably alike. As compared with the other teeth they have thick plates, with thick enamel, and the ridges are well apart, with abundance of cement between them.

The lower molars of this series are all much arcuated, as usually observed in true molars, whilst there is little or no bending in D Series. This, however, is not always to be depended on. Again, the crown patterns show a repetition of the same characters in D and E Series.

[1] The tusk found in the skull which contained this molar has been referred to at page 9.

There is central expansion and angulation, with irregular crimping in newly invaded, and fine crimping on the cement-side of the well-worn disk.

Summary.—In the first place, from what has just and previously been stated, with respect to the molars I have assigned to the position of penultimate milk-molars, it seems to me evident that none of the foregoing can be referred to a more youthful condition than the last of the milk-series. Before, however, attempting to classify these complex varieties of molars, we must bear well in mind that there is a wide individual difference, as regards size, between specimens of last milk and first true molars in all known species of elephants. I find among the materials in the British Museum, and the fine collection of molars of the Asiatic Elephant in the Royal College of Surgeons, that this difference is remarkable. In the palæontological collection of the British Museum there are specimens of the last milk-molar of the Mammoth, holding the same number of ridges, with fully one inch difference in length; indeed, as stated by Falconer, "often the antepenultimate true molar of a large variety may be nearly as large as the penultimate of a small one"[1]. Therefore slight differences in size, other points being equal, must be received with considerable caution.

1. Reverting to the fragments of jaws (Pl. II. figs. 1 & 2) containing the penultimate and germs of the last milk-teeth, I find that the collines of the latter in both rami are slightly longer and broader than the largest plates of A Series, but agree exactly with those of B Series. Now, with reference to the members of A Series, although differing perceptibly in dimensions from B Series, they all maintain the same ridge-formula, the same crown-pattern, and thickness of plates; in fact they are distinct only as regards size. If a comparison between the upper molars Nos. 45 & 18 (Pl. I. figs. 10 & 11) is made, it will be found that their relative lengths are 2 and 2·8 inches; and the last lower molar of Falconer[2] and No. 44 (Pl. IV. fig. 3) give proportional lengths of 2·3 to 3 inches, which will be found by no means remarkable individual differences between teeth holding the same number of ridges, or one of which (as in the case of No. 44) has an extra ridgelet. I am therefore disposed to conclude that A and B Series represent the last milk-molar of a small form or species of Elephant, whose antepenultimate and penultimate milk-teeth are exhibited by Pl. I. fig. 6 and fig. 8.

The ridge-formula, therefore, of its milk-molars would stand 5 : 7 : 10–11, or, without talons, 3 : 5 : 8–9, which, with the exception of an occasional extra ridge in the lower jaw, is precisely the same as that deduced by Dr. Falconer from the Zebbug collection.

2. The two upper and two lower molars comprising C Series are distinct from any other specimens in my collection; and being from different localities, there is no likelihood that their peculiar outlines are to be ascribed to casual or individual peculiarities. At all events they would appear to claim the position of true molars, each holding eleven ridges. As compared with the last milk-molars of the smallest form, they agree with

[1] "On the Mastodon and Elephant," Quart. Journ. Geol. Soc. vol. xxi. p. 317.

[2] Trans. Zool. Soc. vol. vi. pl. 53. fig. 5.

regard to the thin enamel and plates; but the comparisons as regards length present anomalies in the upper molar. Thus the difference in length between the members of A Series and the Zebbug upper molar[1] is not by any means disproportionate; but the members of B Series are about the same length, although not nearly so broad, nor are their crowns so high. Nevertheless, allowing for individual differences, it might be concluded that this series represents the *first true molar* of the smallest form, which ordinarily held eleven ridges, or nine plates and two talons.

3. Reverting to the antepenultimate milk-molar (Pl. I. fig. 3) it has been stated that the jaw which contained it held also a germ penultimate milk-tooth of the dimensions of the largest specimens (to wit, figs. 13 & 14), which differ from the smaller penultimate milk-teeth (figs. 7 & 8) in size, ridge-formula, and development of the crown-constituents. The former moreover display a highly rugous and digitated condition of the collines, especially posteriorly, as seen in fig. 14. Now all these characters are repeated in the members of D series, viz. the upper molar (Pl. III. figs. 4, 4*a*, & 4*b*) and the lower (figs. 5 & 5*a*), whilst the proportion in length between the two sets stand, as regards upper teeth, as 2 to 3·2 inches, and in lower as 2·4 to 3·4 inches. Indeed these molars differ collectively so widely from their congeners in crown-pattern, plates, and size, that I scarcely think there can be a doubt as to their independent characters. The thickness of the plates and enamel as compared with other milk-molars, the less rhomboidal-shaped disk, and the presence of pronounced crimping of the machærides on newly invaded, and faint crimping on well-worn crowns, seem to me to distinguish these much larger teeth from those of the smallest form.

The ridge-formula, therefore, deducible from the above data would, as regards the milk-series of the largest form, stand as 5 : 8 : 10–11, or, without the anterior and posterior talon, 3 : 6 : 8–9, being one ridge more in the penultimate milk-tooth than obtains in the smallest form.

4. If we admit the members of D series to represent the last milk-molar of the largest form, there can be, I think, little doubt that E series will illustrate its successional first true molar. Irrespective of size, which entirely excludes the latter from all the preceding, their relatively thicker plates and enamel claim for them the position of true molars. As regards the thickness of plates and cement and discal pattern, however, they bear a close resemblance to the last milk-teeth just referred to, as may be seen by comparing Pl. VIII. fig. 5, and Pl. III. figs. 3, 3*a*, and Pl. IV. figs. 4 & 5, with Pl. III. figs. 4, 5, and the other well-worn crown of the latter (Pl. IV. fig. 2*a*). The relative proportions between the last milk-teeth and members of E series are, as regards upper molars as 3·2 to 4·3 inches, and lower as 3·4 to 5 inches.

The ridge-formula, therefore, of the *first true molar* of the largest form of Elephant would stand as in its last milk-tooth, viz. ten to eleven ridges, or eight to nine plates and two talons.

[1] Trans. Zool. Soc. vol. vi. pl. 53. figs. 9 & 9*a*.

6. *Second True Molar.*

I shall now describe three series of molars containing apparently twelve ridges, or ten plates and two talons.

A *Series.*—The two rami Nos. 100 & 101 (Pl. V. figs. 1 *a* & *b*), with their associated molars *in situ*, are very interesting. They are evidently the right and left of the same individual. The right has been rolled, thus giving a rotundity to it which is not seen in the other; on the contrary, the left has been flattened by pressure, and was also found in the gap of Benghisa, firmly impacted between blocks of stone. They thus well exemplify the geological conditions under which they were deposited. These I have fully described elsewhere[1].

Unfortunately both rami have been broken across at a short distance behind their teeth; but there are apparently data for establishing the position of the latter in the dental series. The more perfect of the left side shows clear evidence of twelve ridges in a space of 5·6 inches, irrespective of the oval-shaped fragment of dentine in front, which, judging from the opposite tooth, may have formed a base for a semilunar anterior talon, such as is seen in the last true molar (Pl. VI. fig. 1 *a*). In Pl. V. fig. 1 there is no trace of a preceding tooth in front; and considering that all the ridges, excepting the last three, were in wear, we should expect a succeeding tooth to be making advances, and the former to have been pushed further forwards, seeing that they extend for $2\frac{1}{2}$ inches behind the anterior border of the coronoid process, and nearly to the angle of the jaw. They are remarkably long and narrow; and taper gradually, with a small posterior talon at *c* on the right tooth, the same having been lost on the opposite. Although the cement is not injured, there is a void behind as if it had held the germ of an advancing tooth; indeed this is so apparent that I am much inclined to regard the above as penultimate true molars. A fragment of a similar tooth is represented in Pl. II. figs. 8 & 8 *a*.

B *Series.*—1. The molar No. 42 B (Pl. XI. figs. 10 & 10 *a*), *in situ*, is nearly perfect, having only lost its last ridge, probably by the same accident which cleared away all the jaw posterior to the tooth. The lost posterior talon, however, is preserved in the detached tooth (42 A) of the other ramus; but the crown of the latter is much distorted through injuries received when the molar was fresh. It is probable, from the gap *a*, fig. 10, that a fragment of the preceding tooth was in wear. I think, from the circumstance that the double anterior fang in 42 A distinctly supports *two* plates and a field of dentine in front, with a machæris of what may probably form portion of its semilunar talon, we may very fairly surmise that this tooth held twelve ridges in a space of 6·3 inches.

The question is, therefore, is this a penultimate or a last true molar? Unfortunately all the portion posteriorly is lost, so that there is no direct evidence of a successor; but though all the ridges except the last two are invaded and there are no indications of

[1] Author's 'Nat. Hist. and Arch. of the Nile Valley and Malta,' p. 189.

severe pressure on the enamel of the last ridge, at the same time it seems pretty generally the case that the succeeding tooth does not commence to attrite the predecessor until the latter has about one third of the crown worn out. Again, the crown does not graduate, like last teeth, towards the posterior talon; moreover the heel is only about 2·5 inches behind the anterior margin of the coronoid, and the plates (see fig. 10 *a*) are arcuated as in teeth that are being pushed onwards. These facts dispose me to regard the above as being penultimate true molars.

The discal pattern displays the expansions and excentral angulations of a well-bent lower molar. The enamel is in no wise thick; and there is scarcely a trace of crimping. The crown, as obtains in certain last lower molars, is broad in front and narrow posteriorly.

2. The almost worn-out fragment of an upper molar No. 50 (Pl. II. fig. 7) contains seven and a half ridges in 2·8 inches, and, from dimensions and consistence of enamel and discal pattern, might have belonged to this series, the crowding and parallelism of the plates being, as previously shown, a result of the advanced stage of wear.

C *Series.*—1. The upper molar No. 38 (Pl. III. fig. 1) represents a broader crown than ordinarily obtains, from the circumstance that the plane of attrition is oblique instead of horizontal. As to its claims to the position of second true molar I think there cannot be much doubt. There is a broad pressure-scar on the posterior aspect. The double anterior fangs have been broken off close to the crown, and support only the first ridge, which is worn to the common base; therefore, allowing for the loss of one plate and the anterior talon, we are seemingly justified in concluding that the original formula amounted to at least twelve ridges. There are ten ridges in a space of 5·4 inches, which with those worn out would make up the length to fully 6·5 inches. The well-worn and perfect condition of the disks shows the decided pattern of the largest form as displayed in the well-attrited crowns of its preceding teeth. The contrast between the above and Pl. II. fig. 7 is remarkable. Although the latter is almost worn out, it displays seven disks in a space of 3 inches, which is precisely the dimensions of another fragment of a similar tooth in germ (see No. 69 of the collection).

2. Another well-worn fragment of an upper tooth of the same type as No. 38 is shown in No. 80 (Pl. VIII. fig. 4). It contains six ridges in a space of 3·5 inches, which would make the original dimensions about the same as No. 38. Here the shallow disk, with the faint crimping on the cement-side of the machærides, and some arcuations of the plate with the pronounced angulations are well seen; whilst a vertical section of the opposite tooth of the same individual displays the thick intervening cement as compared with the breadth of the plates.

3. But a far more convincing proof of teeth analogous to the above being penultimate true molars is seen in Pl. VIII. fig. 2, where the last of the series is *in situ*, with a fragment (*a*) of the penultimate also in place. The latter holds six ridges in a space of 3·3 inches.

4. The lower molar referable to this series is well shown in the fragment No. 81 A (Pl. III. fig. 2). It has, like the others, a well-defined pressure-scar posteriorly.

5. There is another, posterior portion (No. 81 B) of evidently the opposite tooth of perhaps the same individual. This specimen shows a pronounced *posterior* pressure-scar 1·3 inch in height by 1·6 inch in breadth. Here also the cement is in excess. Allowing for the displacement of the machærides by the longitudinal fracture in fig. 2, the expansions of disks, angulations, and faint crimping are very evident. The enamel is nearly 0·2 inch in thickness[1]; and had it not been for the clear indications of an advancing tooth, the two specimens might have been fairly considered to belong to the last of the series. Fig. 2 contains four plates in 2·5 inches, which would make the tooth to have been from 6·5 to nearly 7 inches in length.

Summary.—It seems to me evident from the foregoing data that all the molars just described cannot fairly claim to be considered other than penultimate true molars. That they have no title to the position of antepenultimate true molars is proved, not only from the preceding molars, but from their ridge-formula, crown, constituents, and fangs.

1. I shall in the first place consider their individual affinities. As regards the dimensions of the molars in A & B series and their rami, it must be allowed that the contrast as regards both is seemingly at variance with any assumed specific relationship. The molars (Pl. V. figs. 1*a* & *b*) contrast with that of Pl. XI. figs. 10 and 10 *a*, in respect of outline and crown-constituents, the ridge-formula and dimensions being equal. Thus the crown of the first is long and narrow, whilst that of the latter displays a broad rounded front, narrowing posteriorly after the manner of the last true molars (Pl. VII. fig. 2). Again, there are decidedly broader bars of cement between the plates in Pl. V. fig. 1 than in fig. 10; but they agree as regards the thickness of the latter, and enamel, and the pattern of the disks.

2. The rami differ also. Allowing that Pl. V. figs. 1 *a* & *b* have been much injured, whilst Pl. XI. figs. 10 & 10 *a* has lost a portion of its posterior border; nevertheless the discrepancies in the dimensions, as will be seen when I come to consider them, render it extremely likely that, if both jaws hold penultimate true molars, the owners belonged to forms or species differing much in size, also in the configuration and crown-constituents of their molars.

3. As regards C series, there is a considerable difference in respect of size between its members and either of the other two series. With A series there is no affinity whatever; and most assuredly a comparison between the two surfaces in wear, alone, at once proclaims them distinct in every respect. Again, as compared with B series, unless the latter is allowed to be a small variety or a sexual condition, I see no manner of arriving at any other conclusion than that these penultimate teeth represent three distinct forms of Elephant; and yet as regards length the members of B & C series

[1] The enamel is broader than shown in the figure.

are alike. But the difference in the thickness of the plates and their enamel is certainly very great; yet when the same elements in equivalent molars of the thick- and thin-plated varieties of *E. antiquus* are compared we find more astounding differences.

(1) Assuming A series to represent the second true molar of the smallest form, the length of the first molar would be to the second as 4·2 to 5·6 inches.

(2) Allowing B series to belong to a variety of thin-plated molars of the largest form, and C series a larger thick-plated sort, their lengths, as compared with the first true molar, would stand as 6·5 and 7 inches to 4·2 and 5 inches. Now, as individual differences in the size of first and second true molars in all other known species vary very much, there is nothing in these discrepancies very discordant as compared with them. In the African Elephant the first true molar often varies in the upper jaw as much as an inch in individual molars holding the same number of ridges; and the like is the case to a greater extent in the Asiatic, whilst teeth referable to the second true molar of the Mammoth, and holding eighteen ridges, I have found to vary as much as 2 inches.

7. *The Third or Last True Molar.*

The last of the dental series is well represented in my collection by several entire specimens, which therefore fix in certain instances the dimensions, ridge-formula, and characters of this important molar beyond reasonable doubt. At the same time there are conflicting data in regard to the characters of specimens; and, as in the penultimate milk-molar, they form a series graduating from what is evidently a very small last molar up to a large one; and this progression is so gradual that I find it difficult to separate the intermediate from either of the extremes, which, however, differ widely in characters as well as dimensions. Although certain types held 14 to 15 ridges, or 12 to 13 plates and 2 talons, it is not evident that all I have considered last true molars contained so large a ridge-formula.

A *Series* (thin-plated).—1. In the first place I will select as a type of this series the finely preserved molar considered by Falconer to represent the last upper molar of the *Elephas melitensis*[1]. This tooth I have carefully compared with similar specimens in my own collection, more especially No 28 from Mnaidra Gap, with which it agrees very closely; indeed so similar are they in general characters that, were it not that both belong to the right side, it would at first sight be difficult to discriminate the differences, which, however, are important. No. 28 has an additional ridge; and a portion of its posterior talon has been recently broken off. In front there is a field of dentine, where doubtless another ridge or ridges existed; and whilst ten ridges are contained in 4 inches in the Zebbug specimen, there are eleven in 4·4 inches in No. 28. Dr. Falconer has pointed out that in the former the large front fang and its ridges have disappeared by absorption and attrition; and as this root usually upholds three ridges, it is fair to surmise that the Zebbug molar may have originally been about 5 inches in length, perhaps a

[1] Zool. Trans. vol. vi. p. 296, Palæont. Memoirs, vol. ii. p. 292, pl. xi. figs. 1 & 1 *a*.

little more; and this is precisely the estimate to be aimed at by computing the loss in the same way in No. 28.

In upper last true molars of the African, Asiatic, Mammoth, and *E. antiquus*, and, indeed, in all representatives of the genus, there is a decided graduation of the ridges towards the last, or posterior talon, which is commonly dwarfed in size. Moreover the usual flattening just below the latter, *invariably* present in other members of the series when well worn, is as a matter of course not observed in the 3rd true molar. Now as regards these distinctions I must state that, whilst the Zebbug molar and No. 28 display a pronounced similitude to the pyramidal-sided outline of the last of the series, there is a flattening at the base of the posterior talon in both, which, with all due deference to Dr. Falconers's opinion to the contrary as regards the former, I submit is not unlike a pressure-hollow made by the septum of an advancing tooth. Again the difference in length and breadth between the last plate and hind talon in both gives an abruptness posteriorly which, as far as I have seen of recent and fossil last upper true molars, seems to me exceptional[1]; but at the same time I am willing to admit considerable variations on this head.

In respect of general characters the foregoing, although smaller, agree in a remarkable manner with the following, and more especially in the pattern of the worn disks, which, I repeat, are well shown in the Zebbug specimen figured and described in the 'Palæontological Memoirs'[2]. The crown-constituents are pretty evenly distributed; the plates are not thick; and the enamel, dentine, and cement are not in excess. The disk widens towards the middle, with abrupt angulations and faint crimping on the cement-sides of the machærides.

I feel therefore much disposed to associate these two specimens with the penultimate lower molars, Pl. V. fig. 1, and reckon that the Zebbug molar has lost a plate and a talon, and No. 28 the latter only; so that their original lengths would have been about 4·8 inches.

2. The upper jaw of my collection, No. 86 (Pl. IV. fig. 1), containing two molars *in situ*, presents several important characters. It will be observed that all the ridges are invaded, and yet the teeth occupy a very large expanse of the jaws. The last ridge on the right side is preserved, and behind it a considerable fragment of the back portion of the alveolus; there is no abrasion of even the cement of the posterior talon *a*; nor is there the pressure-slope usually present when a tooth comes to be so far attrited.

Irrespective of the masses of dentine in front, and the single machæris, *b b''*, the

[1] Mr. Davies has inspected the Zebbug specimen, and agrees with me in this opinion. As regards the anterior fang, which is not in the specimen, it must be stated that it is very rarely found in upper molars unless when far advanced in wear.

[2] Vol. ii. p. 292 and pl. xi., and figs. 1 and 1 *a*, Zool. Trans. vol. vi. p. 296. I have ascertained all data in connexion with this tooth from repeated careful examinations of the specimen, the profile and crown-view of which is well seen in Palæont. Mem. ii. pl. xi. fig. 1 *a*.

remainder of the ridges (nine) are contained in a space of 4·2 inches; so that by making the same allowance for the lost portion as in the cases of the Zebbug molar and No. 28[1], there would have been fourteen ridges in about $5\frac{1}{2}$ inches, *i. e.* supposing the teeth to have been last true molars. At all events it is clear that their ridge-formulas *exceeded* ten plates and two talons. This is further shown by the following, which represents the palatal region containing a fragment of the left and almost the entire right molar *in situ.*

3. The specimen in the B. M. (No. 87) has been much injured, and the posterior talon has been recently lost. The crown is not nearly so far advanced in wear as the last, the four posterior ridges being intact. There is a small field of dentine in front, 0·3 inch, and sufficient to have maintained an extra ridge. As the tooth stands, there are thirteen ridges in 5·5 inches; and from its state of wear it may be said to be entire, with the exception of the loss of the last ridge. In crown-constituents it repeats precisely the characters of the preceding, and from its long graduating crown indicates at all events the usual contours of the penultimate and last upper true molars. The crown-pattern in Pl. IV. fig 1 and No. 87 are precisely alike, and also correspond with the two preceding. Now, in comparison with No. 28 and the Zebbug molar, it will be found that the two just described contain an extra ridge in a given space; thus the two former hold seven ridges in the same space occupied by six ridges in the two latter.

4. One of the most characteristic and instructive specimens in my collection is the portion of a right lower ramus, No. 95 (Pl. VI. fig. 1), containing an entire molar (fig. 1 *a*) which has been detached and is represented of the natural size in order to show its outline. Here we have the character not rare in last true molars of recent and fossil species when the posterior ridges become reclinate, so that the posterior talon *c* (fig. 1 *a*) is nearly horizontal. The tooth in this instance fills the ramus, so that its base posteriorly reaches to *b* (fig. 1), or in other words, within a short distance of the opening of the dental foramen. There is an indication of the bony alveolar septum behind; so that, to all appearance, the only conclusion we can come to is that the molar is the last of the dental series. It contains fourteen ridges in about 6 inches. Excepting the ten disks in wear, the remainder of the collines are more or less hidden by the investing cement; but their tips are determinable.

It will be seen from fig. 1 *a* that the ridges are crowded, and that the enamel is decidedly *thin* as compared with the upper teeth; there is faint crimping, however, with central expansions and angulations on the well-worn disks. It may be here observed that the surface in wear represents the entire attrition-plane, as no fragment of a preceding molar is noticeable. From this circumstance, therefore, and the space occupied by the tooth, it seems to me to afford conclusive proof of its being a last true molar of a very small species of elephant.

[1] I have invariably estimated the average width of the ridges by measurements taken at the base of the crown, so as to overcome the errors likely to arise from measuring disks in various stages of wear.

B *Series* (thick-plated).—The series I shall now describe comprehends several teeth remarkable for their small size and the *thickness* of their plates and enamel.

1. The most suggestive instances have been figured and described by Falconer as the last lower true molars of his *E. melitensis*[1]. Two of his specimens (figs. 12 & 13) display the fan-shape or reclinate aspect of the last few ridges, as seen in Pl. VI. fig. 1 of A series, and one of them a peculiarity, or rather a diseased condition of wear, observed occasionally in domesticated elephants. The most perfect, however, is shown in fig. 11. This long narrow and *very thick-plated* molar holds eleven ridges in 4 inches. The front fang has evidently been ground away, and with it not only three ridges but possibly part of the succeeding; thus, allowing for their loss, it was surmised by Falconer that the crown originally held twelve or thirteen ridges, in a space, I calculate, of about 5·4 inches, which brings the molar nearly to the dimensions of Pl. VI. fig. 1. And also, like the penultimate molars (Pl. V. fig. 1), it displays a very long and narrow crown, with the plates separated by much intervening cement. Three molars equivalent to the above are represented in my collection by the right and left specimens of the same individuals Nos. 35 A & B (Pl. IX. figs. 1, 1*a* & 2, and Pl. II. fig. 10). None of these, unfortunately, is entire.

The first shows a tooth in place, and the fellow of the other ramus detached. The lower jaw which held them lay close to a portion of the vertebral column (Pl. XI. fig. 9), of which two of the vertebræ are seen also in Pl. IX. figs. 3 & 4. The fragment of the molar No. 15 (Pl. II. fig. 10) was also discovered along with the above. Whether or not these molars are referable to the last of the series of a dwarf elephant, there can be no question whatever as to the matured state of the vertebræ, seeing that all their epiphyses are *completely* consolidated, as will be further noted when I come to describe them.

Reverting to the right ramus, Pl. IX. fig. 1, it is unfortunately imperfect, but sufficiently complete to show that the molar extends far back near to the angle of the jaw; the septum *c* is well seen in the figures. On the inner aspect the dental canal has been laid open, showing a fragment of the triangular-shaped plug running up towards its opening. The infiltration of calcareous matter into this porous osseous substance, however, has considerably obscured the original character; but no capsule or hollow cavity is apparent therein, such as obtains in alveoli of all intermediate teeth, even when the crown of the molar in its immediate front is commencing wear; and considering that here only four of the last collines are entire, I think, under the circumstances, there should have been indications of a succeeding molar in the above situation. It is impossible, however, to be positive on this point, in consequence of the loss of substance.

Reverting to the molars, the more perfect (figs. 1 & 1*a*), I calculate, holds ten ridges in 4·5 inches; it will be seen that the first disk on fig. 1*a* is worn to the enamel-

[1] Zool. Trans. vol. vi. pl. 53. figs. 11, 12, and 13.

reflections with a field of dentine in front; perhaps a fragment of the preceeding molar may have been in use at the same time. The anterior fang has been broken off or is worn out, and has left no indications of its presence on the lower surface of the crown; it is difficult therefore even to surmise what may have been the original length and ridge-formula of this tooth. But supposing Dr. Falconer's estimate of the above[1] correct, this specimen, provided it held fourteen ridges, would have been originally about the same dimensions. They agree moreover in their characters; but figs. 1 & 2 are narrow-crowned as compared with the Zebbug teeth; yet the same thick plates, thick enamel, central expansion, abrupt angulations *without even faint* crimping, are common to all. Indeed, as regards the thickness of the enamel, it may be stated that the average of the larger plates in the Zebbug (fig. 11) and the above is 0·5 inch, which is excessive as compared with the lower molar of B series.

2. The fragment No. 15 (Pl. II. figs. 10 and 10 *a*) shows what appears to me to be a left lower molar commencing wear. It is displayed chiefly with the view of indicating the outline of the crown in front, thickness of ridges, and the fore fang, which is here quite traceable and gives support to two plates besides a diminutive anterior talon. All these molars show considerable arcuation of the crowns—more, however, in the above and the Zebbug specimens than in Pl. IX. figs. 1 & 2.

It is apparent therefore that there is no evidence whereby the precise ridge-formulas of these teeth can be ascertained. Dr. Falconer, reasoning from analogy, as in the upper molar[2] just referred to, gave the lower molar fourteen ridges. And I think his hypothesis is now much strengthened if we allow the members of this series to be only thick-plated varieties of A series; and considering what has been already shown, and what will be further displayed in the next series, it seems to me a fair deduction that the above are only varieties of the same molar represented by the *entire* thin-plated tooth, Pl. VI. figs. 1 & 1 *a*, where we have fourteen ridges.

C *Series*.—1. The reclinate condition of the last ridges, pointed out in Pl. VI. fig. 1, is repeated in the thick-plated molars 43 A & B (right and left), the former of which is represented in Pl. VIII. fig. 9. It is one of a pair found *in situ*. The left is much injured; but fig. 9 is fairly entire, having lost recently a few of its anterior ridges supported by the long front double fang. The fan-shaped expansion of the last five ridges prolongs the length beyond what would have obtained had they been erect. Allowing for the loss of the three ridges ordinarily borne on the anterior fang, we may fairly surmise that this tooth held originally fourteen ridges in a space of certainly 7 inches. The graduation of the posterior ridges must always add to the length of a tooth.

The disks here, as usual, show the central expansion, with angulations and faint crimping; and, as compared with B series, this may be also called a thick-plated molar;

[1] Zool. Trans. vol. vi. pl. liii. fig. 11.

[2] Pal. Mem. vol. ii. pl. xi. fig. 1.

but although its enamel is not so thick as that of B series, it is altogether a much larger tooth, with a different configuration.

As to the position of No. 43 A & B (fig. 9) in the dental series, had it not been for the posture of the last ridges, the pronounced retroflexion of the central plates would naturally indicate the pressure of a succeeding molar; but considering these facts and that all the ridges except the last five are touched by wear, and there are no traces of pressure on the posterior talon, I can see no more feasible conclusion to arrive at than to consider the above to be a last true molar of an elephant larger than any of the owners of the teeth in A or B series, from which it differs in configuration as well as dimensions and crown-constituents, although the outline of the disk is much alike in all.

2. Two beautiful and highly suggestive examples of what must be considered last true molars, are represented by the entire specimens Nos. 64 & 59 (Pl. VII. figs. 1 & 2 & 2*a*). The former, an upper tooth, shows fourteen ridges, including the pygmy digitated posterior talon *a*, in a space of 7 inches. Attached in front, although not shown in the figure, are two plates of the penultimate molar. As the crown is just being invaded, of course its pattern is not developed; the machærides are therefore well crimped, and the plates and enamel thick.

The next, No. 59 (figs. 2 & 2*a*), is a much arcuated lower molar; the last ridge, although rounded and finger-like, rises like the others from the common base to the same level as the penultimate. There is a slight flattening on its base internally, but no trace of what could be called a pressure-mark. The crown is broad in front, tapering steadily posteriorly. The anterior talon is large and semilunar; and the anterior fang seems to support it and the succeeding plate only. Here we have fourteen ridges in 6·5 inches.

The crown-constituents are precisely the same as in the last. The disks show central expansion, with angulations and faint crimping.

Another pair of upper molars, Nos. 70 & 58 (Pl. VIII. figs. 2 & 3), are larger than No. 64, but only slightly; and as their posterior ridges were not quite consolidated, they have become somewhat displaced and are encased (fig. 2) in a fragment of the jaw. This tooth holds, in front, the fragment (*a*) of a penultimate molar already noticed. The figs. 2 & 3 contain each fourteen ridges in 7·3 inches; none of the digitations of the four ridges in wear being obliterated, there is of course excessive looping. Their crowns are rather narrower as compared with Pl. VII. fig. 1, just as the lower molar No. 56 (Pl. VIII. figs, 8 & 8*a*) compares with the crown of No. 59 (Pl. VII. fig. 2).

The molar, Pl. VIII. fig. 8, is markedly narrow throughout, and held, no doubt, an extra ridge, as there are fourteen in the space of 7·4 inches, and clear indications of the loss of one or more posteriorly. The last three ridges, however, were broken off and reunited; so that there may be a slight excess thereby given to the length. The remarkable feature in this molar and the two preceding is that their enamel is not so thick as in Pl. VII. figs. 1 & 2; but the difference is not very material.

This is also evident in a very much worn upper molar, No. 79, where the crown is almost ground down to the top of the penultimate ridge with the rudimentary and digitated posterior talon at its base. Here fourteen ridges are held in space of 7·2 inches; there is much parallelism of the disks, and a comparative thinness of plates; and their enamel is quite in keeping with the last. Possibly these may be only sexual differences. In all the above teeth the discal pattern is alike, showing very faint crimping of the machærides in well-worn crowns, with the central expansion and angulation. Less perfect molars of the same dimensions are represented by Nos. 57 and 40 of the Collection.

The nearly perfect upper molar No. 93 (Pl. VIII. figs. 1 & 1 *a*) contains fifteen ridges in 7·5 inches. It differs from the foregoing only in the presence of an extra ridge. The posterior talon here is only a diminished ridge rising from the common base with the others.

A fragment, No. 68 of the Collection, is referable to the same type.

A mutilated lower molar, No. 36, with several of its ridges depressed from an injury when the tooth was fresh, is no doubt on this account considerably lengthened, from the infiltration of matrix at the seat of fracture. The last ridge here is of the same character as in Pl. VIII. fig. 2, with the same flattening internally at its base. The cement has been removed by accident from the tops of the last three collines, which alone are unworn; therefore the tooth is far advanced and under all circumstances should have maintained indelible marks of pressure on its last ridge, which is not the case.

Probably No. 36 did not exceed materially the dimensions of any of the foregoing, to which it assimilates in all particulars; only the enamel is, if any thing, thicker. The worn disk shows the faint crimping and pronounced central angulations.

D *Series* (thick-plated).—The members of this series are unfortunately very imperfect; but what remain transcend in dimensions any of the foregoing.

1. A fragment, No. 78, shows six and a half of the posterior ridges of an upper molar in a space of 4·3 inches; so that if the tooth held fourteen ridges, like the preceding, it must have been fully 9 inches in length. It is remarkable for the massive appearance of the plates; and although the crown is considerably abraded, its disks are well shown. The three anterior pretty well indicate the original dimensions of the plate; the first, being the broadest, was no doubt one of the central ridges. It is 2·5 inches in breadth, and 0·5 inch in thickness, which would equal the same in the second true molar of *Elephas antiquus*. The last three ridges display large circular digitations in pairs, which are from 0·5 to 1 inch in breadth. The parallelism of the plates is of course pronounced, seeing that the section is close to the base. There is distinct faint crimping of machærides and abrupt angular expansions; the latter, however, are not very conspicuous, but quite as much so as obtains in the members of C Series.

2. The fragment of a lower molar, No. 55 (Pl. VIII. fig. 7), was unfortunately all that could be saved of an entire tooth after having been knocked about by the workmen. It was found close to the last, and, indeed, may have been the opposing tooth of the same

individual. Here the last six ridges are contained in a space of 4·6 inches, and the average of each plate is about 0·7 inch, which, supposing it held fourteen collines, would have made the original length about 9·5 inches. The breadth of the central plate, *a*, is about 2·5 inches. The posterior talon is firmly attached to the last plate, which displays four large circular digitations (not three, as rendered in the figure); and yet, although thus far worn, there is no indication on the talon of the presence of an advancing tooth. The disks show well-marked faint crimping and disposition to central expansion and angulation, with an abrupt bending forwards of their horns. The tusk found along with this tooth has been already referred to at page 9.

It may be stated, as regards relative dimensions with the other last true molars, that the marked discrepancy between the members of C and D Series as regards thickness of plates is fully as great, if not more conspicuous than between the members of A and B Series.

Summary.—1. Whether or not all the members of A Series represent the last true molar, it is clear to me that they belong to the same type or form. At all events it would appear clear that the upper molars, Nos. 86, 87 & 95, claim to be considered as belonging to the last of the dental series. The latter, however, as compared with the teeth (Pl. V. fig. 1) which I have assigned to the second true molar of the smallest form, give a very small proportion indeed for second and third true molars; but considering that the enamel and plates of No. 95 are remarkably thin as compared with the upper teeth, it is just possible that it belonged to a small individual, male or female.

2. The teeth represented in B Series have certain claims to be separated from the foregoing. In dimensions and outline they agree. I must, however, allow that there is a remarkable difference in the thickness of the plates and enamel, as in the absence of sculpturing on the latter; but otherwise it would be difficult to draw distinctions. The only likelihood that they belong to the same form as A Series is by discarding the thick plates as a cause of separation, which Dr. Falconer[1] has done, believing that the upper Zebbug molar referred to in A Series and the lower Zebbug teeth of B Series are individual instances of what he considered to be the upper and lower last true molars of his *Elephas melitensis.* In this opinion as regards the thin and thick plates I am disposed to concur, applying the rule to them that obtains in the case of the Mammoth and *Elephas antiquus.* Consequently the last true molar of the smallest form may have ranged between 5 and 6 inches in length and held ordinarily fourteen ridges, *i.e.* twelve plates and two talons—which in comparison with the Asiatic Elephant would place them with its last milk-molar, which holds the same ridge-formula in about the same space.

3. The materials of C Series being for the most part entire renders the determination of their ridge-formula and crown-constituents a comparatively easy proceeding. If No. 42 (Pl. XI. fig. 10) is to be accepted as a penultimate true molar, there is every probability that it was the predecessor of C Series.

[1] Trans. Zool. Soc. vol. vi. p. 291.

The configuration of the latter varied, no doubt, individually, as obtains in all known species, some crowns being longer and narrower and holding an additional ridge. The worn disk, however, might have always been much the same; and although the enamel was thick as compared with the penultimate molar, it was in no way, as regards C Series, remarkable, the ridge-formula of which seems to have varied from fourteen to fifteen ridges or twelve plates and two talons, which were contained in from 6·5 to 8 inches.

4. The two imperfect but highly suggestive members of D Series seem to stand to those of C Series as the thick- and thin-plated molars of A and B Series, only that the latter do not show the decided larger dimensions we find between D and C Series. Again, just as the second true molar, Pl. XI. fig. 10, was correlated with the last true molars of C Series on the score of dimensions, so we find a proportional agreement between the large molars of C Series and the large upper and lower penultimate molars, Pl. III. figs. 1 and 2.

Now such discrepancies suggest the question as to whether we are to assume the previous existence of two forms of Elephant, a small and a large, each displaying characters in last true molars similar to what obtains in other species of Elephant, or to consider the wide differences of the plates specific characters. If we adopt the latter, then the forms indicated by the last true molars would be doubled, which, considering the ridge-formula and crown-constituents, cannot be well admitted. Hypothetically I am disposed, from a consideration of the molars and what obtains in other members of the genus, and from what will appear when I come to consider other portions of the skeleton, to believe that the C and D series and the largest penultimate true molars, Pl. III. figs. 1 and 2, belonged to full-grown individuals of the largest form, and that in dimensions their teeth equalled and sometimes exceeded the ordinary dimensions of the penultimate true molar of *Elephas antiquus*, which usually held the same ridge-formula in from about 8·5 to 9·5 inches.

From the foregoing data the ridge-formulas of the molar series are deducible apparently as follows[1]:—

Large Form.

Milk-Molars.	True Molars.
5 : 8 : 10–11.	10–11 : 12 : 14–15.

Small Form.

Milk-Molars.	True Molars.
5 : 7 : 10–11.	10–11 : 12 : 14.

III. Cranium.

I have no evidence of the configuration of the dome of the cranium in any of the Maltese fossil Elephants. Besides abundant remains of fragments of the skull, including the petrous portions of the temporal bone which contained the internal ear, there is a condyle of the lower jaw (Pl. VIII. fig. 6). It is of the right side, and evidently belonged

[1] The two talons are included.

to a full-grown individual. As compared with recent species it shows measurements slightly less than that of an Asiatic Elephant, with the last milk and first true molar in wear. I shall now proceed to describe the maxillæ of the molars just referred to; but beforehand, by way of comparison between the same points in recent species, it may be stated that the lower maxilla in the Asiatic and African Elephants appears to differ in the following particulars:—

1. Commencing at the condyle, we find a decided neck in the Asiatic, whereas in the African the slope is continuous more or less to the angle without any sudden constriction at the condyle.

2. The outline between the angle and condyle bulges out, or is more convex, in the Asiatic than in the African, where the margin is narrower; so that, if a line be drawn transversely near the base of the coronoid process, it will furnish a relatively greater breadth in the former.

3. The rostrum is more pointed in the African, and the chin and upper jaw are more produced, whilst the diasteme, from being nearly perpendicular in the Asiatic, is at a much lower angle in the African.

4. The coronoid generally is more erect in the African, whilst it is higher, and its apex overhangs more or less in the Asiatic, forming a concave anterior border. This, however, is not constant, as demonstrated by the specimen No. 2846 of the lower jaw of an African Elephant in the Royal College of Surgeons.

5. The dental foramen is larger and more gaping in the Asiatic, and opens out just under the condyle, whilst it is situated lower down in the African.

6. The mentary foramina are usually two in the African, and situated just below the front of the tooth in wear, and invariably at some distance from the border of the diasteme, near which they are placed in the Asiatic.

7. The symphysial gutter is generally more open and shallow in the African than in the Asiatic or in the Mammoth.

The only entire portion of the brain-case is a left exoccipital from Benghisa Gap. It is almost, if not quite, identical in size, and has also many characters in common with one described by Busk[1]. Its dimensions are:—extreme height 2 inches; breadth at the constricted part above the condyle 1·1 inch; condyloid articular facet 1 by 0·4 inch; surface of the ex-basioccipital synchondrosis 0·6 by 0·4 inch. The cerebellar fossa is very concave, with no well-marked hollow for the lateral sinus. The opening of the paramastoid cells is seemingly not so large as in the Zebbug specimen, and is separated from the cerebellar fossa by a ridge which slopes gradually, not abruptly as in the Zebbug bone. The posterior aspect is flat, especially internally. The margin of the jugular sulcus is very sharp, above which is the thickest part of the bone, it being 0·4 inch. The surface close behind the edge of the jugular sulcus is even, as in the other, and the ex-basioccipital synchondrosis projects well in front. With scarcely an

[1] Trans. Zool. Soc. vol. vi. p. 272, pl. 52. fig. 42'.

exception it will be found that this specimen and the other agree; and moreover, as he has pointed out, the same obtains in the African. As to the age of the individual, from the large paramastoid cells it would appear that the owner was not an unborn calf, and probably the penultimate milk-tooth of the smallest form was in use.

1. The portions of left upper and lower jaws, Nos. 91 & 90 (Pl. II. figs. 1 & 2), to which reference has been made in the preceding account of the milk-series, are too imperfect for any comparative purposes of importance. The ramus of the lower jaw gives the following:—The depth of the jaw at the middle of the third or penultimate milk-molar and from the alveolar border is nearly 2 inches, and the maximum thickness at the same point is about 1·3 inch; in a ramus of the Asiatic Elephant[1] presenting the third milk-molar in full wear (here it is just being invaded), the former is 2·4 inches, and the latter 1·6 inch.

2. The suggestive fragment of a left ramus, lower jaw, No. 41 (Pl. I. fig. 12, and its reduced profile view in Pl. VI. fig. 2), is a cast of a specimen I found in Gandia Fissure with other remains ascribable to the largest form. It contains a nearly worn-out milk-tooth; the left ramus has been broken off close to the symphysial canal, which, however, is entire and extends posteriorly through the socket of the succeeding tooth, which must have been nearly in full wear. There is no trace of the preceding molar, whilst the concave anterior aspect of the alveolar socket of the successor is preserved, giving a depth of 2·3 inches, and indicating, by the breadth of the pressure-scar (0·8 inch) on the posterior aspect of the fragment of the tooth in position, that the former was rapidly replacing it.

The following are the dimensions of the jaw:—Height of the ramus at the alveolar border in front 2·7 inches; height at the last ridge 2·5 inches; from the edge of the tooth in front to the middle of the gutter 2·2 inches. The diasteme inclines nearly vertically, with a sharp undulating border curving outwards. Although the rostrum has been broken off, it is quite apparent that it never could have been prominent; and therefore as regards these two characters the jaw presents a resemblance to the Asiatic. The symphysial canal is broad and shallow, and therefore more like the African Elephant's. The antero-posterior length of the gutter above is 2·5, and the inferior junction 2 inches. The mentary foramina, as in the African, are large, and situated about half an inch from the free margin of the diasteme.

The comparison with recent species gives these instructive data. The dimensions of the lower maxilla of a very young African Elephant agree with the above almost to a nicety, only that the diasteme in the former, although of the same length, is by no means so perpendicular. The stage of growth is represented by the permanent incisors just appearing at the entrance of their alveoli. The antepenultimate milk-tooth is worn to its common base; and six ridges of the succeeding molar are in use, the breadth of the base of the skull at the occipital condyles being 4 inches, which would indicate an individual as large as the owner of the atlas, Plate XIII. figs. 1 & 1 *a*.

[1] No. 2668, Osteological Catalogue, Royal College of Surgeons.

Now the youngest possible stage of dentition ascribable to fig. 12 is that where the penultimate is rapidly disappearing, and several ridges of the last milk-tooth are in full wear. This condition is closely represented in No. 2667, Royal College of Surgeons, showing the cranium of an Asiatic Elephant where the eight anterior ridges of the last milk-molar are in wear, with a fragment of the preceding still remaining. A condition similar to the last is further shown in the well-articutlaed skeleton No. 1602 in the University Museum, Oxford, to which I shall have occasion to allude frequently in the sequel. This specimen gives a height of 3 feet 8·5 inches at the shoulder. In the first the diasteme is 4·3 inches, and height of the alveolar border in front 3·8 inches, thus indicating a jaw of much larger dimensions than fig. 12.

There is an interesting comparison to be drawn between the above and the fragment (No. 21310) of a lower ramus of the *Elephas antiquus* in the Palæontological collection, British Museum. The penultimate milk-molar is in full wear, holding eight ridges in a space of 2·7 inches; evidently the last milk-tooth was also invaded. The height of the ramus at the alveolar border in front of the former is 3·3 inches. From the front of the penultimate molar to the middle of the gutter 2·7 inches, height at the middle of the molar 2·9 inches, thickness at the same point 1·8, length of the cylindrical canal 1·9, height of the alveolus of the three milk-molars 2·8. The diasteme is apparently not so perpendicular as in the fossil.

Supposing Plate I. fig. 12 is of the same stage of growth, it represents a still more advanced stage of attrition, and therefore the ramus would be progressing in size; yet in depth and thickness of the jaw, length of diasteme and symphyslal gutter, the former is considerably the larger, but not more so than should obtain in two Elephants differing considerably in size. The comparison, however, does not make the owner of Plate I. fig. 12 a pygmy as compared with that of 21310, B.M.

3. The left lower ramus No. 96 (Plate VI. fig. 4) has lost its condyle; and the diasteme is broken off close to the front socket *a*, which is nearly 3 inches in length, with a septum, *b*, 0·6 inch thick, dividing it from a posterior alveolus, *c*, about 3·6 inches in length. The greater portion of the coronoid is wanting; and the jaw in general has been considerably denuded; so that there are few reliable measurements obtainable. The contour of the lower border is decidedly like the African Elephant, and precisely like figs. 1 & 3, to which reference will be made presently. Whatever molars may have occupied the empty pits, it is clear, from the great thickness of the septum *b*, that the posterior was in germ. The breadth of the jaw, about the middle of the front alveolus, is 1·6 inch, thus greatly exceeding Plate II. fig. 2; indeed, as regards the dimensions of the alveoli, the ramus, Pl. VI. fig. 4, might have represented an advanced stage of growth to any of the foregoing, and such as would accommodate the last milk-molar of the smallest form in full wear with the first true molar not yet appearing above the jaw. In all points possible for accurate determination, the above and jaw No. 2668, Royal College of Surgeons, above noticed, come close. Here the penultimate is in full wear,

with none of the collines of the last milk-molar invaded. I can well believe, therefore, that fig. 4 belonged to a more advanced stage of growth in a much smaller Elephant. Moreover, from the alveoli being *long* and *narrow*, it is also probable that the jaw would not have held the last of the milk-series of the largest form. The posterior portion of the ramus is not sufficiently entire to show whether or not the sulcus (I shall refer to it presently in the old jaw of the smallest form) was present; and the lower anterior portion is far too much injured to allow of comparisons. It would seem, however, that, like the Asiatic, the dental foramen opened immediately under the condyle, as we shall see presently obtains in the aged jaw, Pl. VI. fig. 1, which, like the one in question, is from Benghisa Gap, so fruitful in remains of the smallest form.

4. The portion of a left ramus, No. 85 (Pl. VI. fig. 3), containing a fragment of a true molar of the smallest form, has unfortunately been injured at the part where a great amount of interest is centred. The jaw altogether is much mutilated. The cylindrical canal is partially preserved, and about 2 inches of the right ramus. The diasteme, however, is destroyed, and the ramus broken across in two places; and although it has been reunited, there is evidently some loss of substances, so that the distance between the alveolar border in front and the gutter is uncertain. What remains of the tooth comprehends the last six ridges. The alveolus, however, is entire; and at its front are the pits for the insertion of the two-pronged anterior fang, and behind them a single hole for the root of the fourth plate, as usually observed in penultimate and last true molars. Altogether the socket of the tooth gives a length of about 6 inches. The posterior talon is flat and concave, showing evident marks of pressure; whilst behind is a large cavity on the floor of which are traces of the dentine and fragments of enamel of a germ molar. All the ridges of the molar, excepting the last, were in wear.

The following are the dimensions of the jaw:—

The extreme length from the posterior margin of the ascending ramus to the edge of the symphysis is very little over 9 inches. This is allowing for a slight loss at the fracture near the latter.

Length of the alveolar border, from the anterior margin of the ascending ramus to the diasteme, 4·8 inches.

Height of the alveolar border at the outer edge of the ascending ramus 3 inches.

Height of the alveolar border in front, near the diasteme, 3 inches.

Transverse diameter at bulge of ramus, below the coronoid, 3 inches. The mandibular portion has much of the straight prolonged outline of the African; and from what remains of the ascending ramus, its outline seems to have been much after the latter and figs. 1 & 4. The symphysial gutter is shallow, and the chin truncated, with only a very small rostrum. Most probably, from the fang-sockets in front of the alveolus, there was a fragment of the first true molar also in wear. As compared with Pl. VI. fig. 1, this jaw and its molar socket might fairly represent the second true molar of the smallest form in full wear. The measurements of the jaw accord well with that of an Asiatic

Elephant holding the fragment of a third, and having nine ridges of the fourth milk-molar invaded.

5. I have stated my views as to the teeth in rami Nos. 100 & 101 (Pl. V. figs. 1 *a* & *b*) being considered penultimate true molars. Both rami are broken off just in front of the diasteme and at the angle behind. Their coronoid processes were also removed, and the contours of the jaws very much destroyed by the rough usage they received when first deposited in Benghisa Gap; consequently they present few, if any, very reliable measurements. From the base of the coronoid to the commencement of the diasteme is 4·4 inches, which is rather greater than Pl. VI. fig. 3, and equal to that of the jaw (Pl. VI. fig. 1) holding the last true molar. The fragment of diasteme, especially on the left, and the rapidly incurving of the chin would indicate a steep slope to the former, and a truncated aspect to the latter. At the angle posteriorly on the right side there is a deep sulcus, which may be the termination of the sharp border and hollow we shall see is pronounced at *b*, Pl. VI. fig. 1. This, however, is not to be looked on as a reliable character as far as Pl. V. fig. 1 is concerned, seeing that the specimen has been severely injured just at the angle of the jaw.

6. The right ramus, No. 95 (Pl. VI. figs. 1 & 1 *a*), when discovered was nearly entire; although from rough usage received when fresh, the condyle had been removed, and the jaw fractured, and its fore part bent inwards, so that there is a void between the molar and the alveolus anteriorly. The diasteme was injured; and the symphysial canal was imperfect, in consequence of the opposite ramus having been broken off close to it. The molar, however, as before noticed, is entire; and there are no traces in the jaw of a predecessor or successor; indeed so crowded is it by the long narrow crown, that the posterior portion of the latter reaches almost to the entrance of the dental foramen, leaving no space for the capsule of a germ molar.

The following measurements of the jaw were procured immediately after the mandible was removed from Benghisa Gap. Since then, from the exceedingly friable nature of the specimen, the greater portion of its anterior extremity has been destroyed during transit from Malta.

The extreme length, from the posterior margin of the ascending ramus to the edge of the symphysis, is about 10·6 inches. This admeasurement is somewhat vitiated in consequence of the fracture.

Length of the alveolar border, from the anterior margin of the ascending ramus to the diasteme 5·5 inches.

Breadth of the ascending ramus in a line with the alveolar border 4·5 inches.

Height of the alveolar border at the outer edge of the ascending ramus 3·5 inches.

Height of the alveolar border in front near the diasteme 3·8 inches.

Length of the diasteme 5·8 inches.

Vertical height of ascending ramus to the neck of the condyle 6 inches.

Transverse diameter at bulge of ramus below the coronoid apophysis 3·5 inches.

Length of crown surface in wear 3·2 inches.

Length of the symphysial gutter 2·2 inches.

The injuries unfortunately have materially destroyed many important characters of this instructive jaw; however, the following are apparent. In the outline of the lower border, with reference to the ascending ramus and prolonged fore part, there is a decided resemblance to the jaws, figs. 3 & 4 of the same Plate, and, consequently to *E. antiquus* and the African Elephant. The diasteme not being preserved, we can only surmise from the fragment *c*, in front of fig. 1, that, like the Asiatic, *E. antiquus*, and fig. 2, it was nearly vertical. The symphysial canal is shallow; and the chin is truncated, without a trace of a beak or rostrum of any size, just as we have seen obtains in all the preceding. The coronoid apophysis rises perpendicularly, with slight beetling over of its crest; and the dental foramen opens just under the neck, which is also a general character of the Asiatic species.

In Mr. Busk's description of the characters of the jaw of his *Elephas melitensis*, he points out a shallow sulcus[1] on the narrow posterior border of the ascending ramus behind the dental foramen. This character is well seen in the African skull, 2845 Royal College of Surgeons, forming a sharp border along the margin of the ascending ramus, and is also very apparent at *b*, fig. 1, forming a pronounced hollow on the posterior margin. Unfortunately none of the other jaws I have referred to the small form of Elephant, excepting Pl. V. fig. 1 *b*, have the portions of their ascending rami preserved, so as to confirm the character; but the fact of its presence in a ramus from Zebbug and Benghisa Gap would seem to place beyond a doubt that it is a regular condition, at all events in the smallest of the Maltese Elephants. With reference, therefore, to the comparative characters of the above jaw, there is apparently a strange commingling of the characters of the *Elephas antiquus* and the two recent species, which is further illustrated by the bones to be described.

As regards relative dimensions—in length, thickness, depth along the alveolar border, and height of ascending ramus, the above and a lower jaw of the Asiatic Elephant, No. 2667 in the Royal College of Surgeons, come very near each other. The latter contains the last milk-molar in nearly full wear, with a fragment of the preceding still in use, which, according to the ordinary specimens, would indicate an individual not over 5 feet in height, if quite as much, and of the dimensions of the *Elephas melitensis* of Falconer and Busk[2].

7. The very interesting but, unfortunately, imperfect lower ramus No. 35 (Pl. IX. fig. 1), the molar of which I have doubtfully referred to the last of the dental series of

[1] Trans. Zool. Soc. vol. vi. p. 236.

[2] As regards Dr. Falconer's estimate of the height of the pygmy fossil Elephant of Malta, he says "it stood between a large tapir and the small unicorn rhinoceros of Java" (Palæont. Mem. vol. ii. p. 299). Mr. Busk computes the height of his intermediate-sized dwarf Elephant at about 55 inches (Trans. Zool. Soc. vol. vi. Table v. opp. p. 306).

the smallest form, is in such an imperfect condition as to scarcely admit of any very accurate measurements.

The breadth of the ascending ramus, in a line with the alveolar border, is about 2·6 inches.

The height of the alveolar border at the outer edge of the ascending ramus is 2·8 inches. The vertical height of the ascending ramus, to the neck of the condyle, is 4·5 inches.

There is one point, irrespective of size, in which this jaw seems to differ from any other specimen in my collection, viz. in the bulging of the ascending ramus posteriorly so apparent in the Mammoth and Asiatic. This is very evident by comparing the above with Pl. VI. figs. 1 & 4. The jaw, moreover, in comparison with the short narrow tooth, is very deep—much deeper, indeed, than that of the recent species, where the penultimate milk-tooth is in full wear, and the individual is fully 4·5 feet in height; whereas another (No. 28, 11A) in the Royal College of Surgeons, with the antepenultimate and part of the penultimate milk-molars in use, is also proportionally very much smaller, although the height of the animal is said to have been 3 feet.

8. The fragment of a left lower ramus, No. 42 (Pl. XI. figs. 10 & 10*a*), containing a penultimate true molar, referred to the largest form, has been broken across immediately behind the coronoid apophysis, and obliquely in front of the tooth, but in such a way that a fragment of the posterior part of the cylindrical canal remains just as observed in the rami Pl. V. fig. 1.

The anterior border of the coronoid has been recently injured; but there is no difficulty in supplying the deficiency; so it will be apparent that the process is high, rising fairly erect, with some overhanging of the front, which is thick as in the recent species. The diasteme (Pl. XI. fig. 10*a*) is decidedly almost vertical. The lower and side portions of the jaw have been much injured; and therefore the following may be somewhat less than had obtained. The height of the jaw at the commencement of the diasteme is 5·8 inches, at the base of the coronoid process in front 3·7 inches; height of the coronoid process 3·3 inches.

The surface of attrition is 4·6 inches; but it is just possible that a small fragment of the preceding tooth was also in wear.

9. The first upper true molar of the largest elephant (Pl. VIII. fig. 5) was found in a skull which had also the lower jaw and teeth in place. Unfortunately the latter were destroyed during the process of removal. I ascertained, however, beforehand, that the height of the ramus in front of the lower molars, as compared with the same in the jaw in Pl. VI. fig. 1, stood as 4·5 to 3·8 inches. Consequently the former belonged to the largest form, as further borne out by the ridge-formula and other characters of the teeth; whilst Pl. VI. fig. 1, we have seen, held the last true molar of the pygmy elephant.

The fragment No. 74 of the collection, of a lower jaw, contains portion of a last milk-tooth in use, and the germ of the succeeding one in place: both are imperfect; but from the height of the collines of the latter, I should be inclined to regard this specimen as representing the above stage of growth. The fragment furnishes no useful measurements as far as the jaw is concerned.

10. The portion of a cranium No. 86 (Pl. IV. fig. 1) holds what appear to be the two last true molars of the smallest form. As far as comparisons go, it is slightly larger than No. 87, another but less perfect portion of a skull found close to it in Benghisa Gap. The former has been considerably injured and rolled; and, excepting the relative distances between the molars, and a fragment of the left jaw showing the malar attachment of the zygomoid process and a portion of the floor of the orbital and temporal fossæ, there is nothing of importance to record excepting the dental characters, which have been fully discussed.

The molars are placed obliquely, approximating in front and diverging behind. The intervening space in front is 1·4 inch, at the middle 1·3 inch, and posteriorly 2·5 inches, the extreme breadth of the jaw at the middle of the crowns being 4·7 inches. From the roof of the palate to the crown surface of the teeth is 2 inches. The length of the palate is 7·5 inches. The height of the jaw from the alveolar border to the floor of the orbit in front is 2 inches. The roof of the latter is not clearly indicated.

11. No. 87 furnishes no important data beyond its teeth, the fragment of the skull having been much injured. The breadth of the jaw across the crowns at the middle is 4 inches. From the posterior nares to the front of the right tooth is 4·3 inches.

The dimensions of these two jaws, as compared with recent species, are precisely in accord with the lower, No. 95 (Pl. VI. fig. 1); so that the upper jaw of 2667, Royal College of Surgeons, holding a fragment of the penultimate, with six ridges of the last milk-molar, in wear, not only gives almost identical measurements as regards the breadth of the jaw, but shows the same surface in wear. They differ, however, to a marked extent in regard to the "distance between the floor of the orbit and the alveolar border," which is 3·3 inches in the recent specimen. Now, seeing that there is a very pronounced difference in the two recent species in this respect, just as they differ in the contour of the calvarium; it might therefore be assumed that the pygmy Maltese Elephant partook of the shorter admeasurements of the African, and, like it, presented a more prominent upper maxilla, as evinced by the relatively shorter measurement in the above situation.

12. A fragment of the jaw of a large elephant from Mnaidra Gap (No. 107, collection) is unfortunately of very little value for comparative purposes, unless to show that the owner was a fair-sized elephant, the proportions roughly estimated being about

equal to those of an Asiatic Elephant's lower jaw holding the second true molar in full wear.

Summary.—The above data with regard to the cranium support the inferences drawn from a study of the molars. As regards characters, it seems that the posterior contour of the lower jaw, in the smaller form at all events, partook much of that of the African, but was similar to the Asiatic in the chin, which was truncated, with a high diasteme, and scarcely any rostrum. As regards dimensions, if the comparison between the jaws and recent species is of any value, it appears that the lower mandible of the smaller form attained the dimensions of that of the Asiatic where the last milk-molar is in full wear, and that the lower mandible of the largest form often equalled that of a full-grown but small individual of the recent Elephants holding the second true molar, which would ordinarily give a height of nearly 5 feet to the former, and about 7 feet to the latter.

III. Stylo-hyoid.

A remarkably interesting specimen, to all appearance of an adult state of growth, is represented by Pl. XV. fig. 10 (natural size). It is the left stylo-hyoid of a very small elephant, and was found in Benghisa Gap. As compared with similar bones of the recent species in the British Museum and Royal College of Surgeons, the above differs widely in dimensions. Of a skeleton of the Asiatic Elephant, No. 707 *h* of the Osteological Catalogue of the British Museum, where the last milk-molar is in full wear, and the tusk protruding 7 inches beyond the alveolus, the entire length is 5·5 inches; the cranial facet is 0·5 by 0·2 inch, the latter in fig. 10 being 0·5 by 0·3 inch. The greatest breadth of fig. 10 at *a* is 0·7, that of the above being 1 inch. Altogether in comparison there is a marked difference in dimensions; and when we know that fig. 10 could not have belonged to a fœtal individual, it will be conceded that its owner must have been a diminutive form of Elephant. The specimen differs from the two instances above recorded in the prominence of the ridge at *a*, the relatively shorter neck at *b*, a larger cranial facet, and the rounding of the long arm, which is flat in the Asiatic Elephant.

IV. Vertebral Column.

The mature bones referable to the vertebral column are divisible into two groups easily determinable on the score of size. I shall describe only such as indicate by the complete consolidation of epiphyses that they belonged to adult, if not aged, elephants.

1. The only specimen of an *atlas* is represented in Pl. XIII. figs. 1, 1*a*, & 1*b*, which, in comparison with the fragments in the Zebbug collection, assigned by Busk to the *Elephas melitensis* and *E. falconeri*, gives the following data. I have also placed in the Table measurements of the atlas of a very young Asiatic Elephant, by way of contrast, to show the diminutive dimensions of the owners of the Maltese atlases.

	Height.	Breadth.	Anterior facet.	Posterior facet.	Vertebral canal.	Odontoid canal.	Antero-posterior of transverse process.	Breadth of condyloid cup.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
E. melitensis (Busk) .... (Tr. Z. S. vol. vi. p. 238.)	3·5 (?)		2·5×1·8				2·4	
E. falconeri (Busk) .... (Tr. Z. S. vol. vi. p. 251.)	3·0	5·0[1]	1·6×0·8	1·5×1·0		1·0[1]		3·3[1]
Plate XIII. fig. 1	3·8	6·2	2·1×1·3	1·8×1·0	1·3×1·8	0·7×1·1	2·3	4·2[2]
No. 2723, R. C. S.[3] .... (Asiatic.)	3·8	6·0	1·9×1·4	1·6×1·5	2·0	1·0×1·3		4·5

The three views of the atlas (Pl. XIII. figs. 1, 1*a* & *b*) are given chiefly with the intention of showing the mode of insertion of *a*, the upper arch of the transverse process, and also the general contour of the lower border, and outline of the vertebral and odontoid canals, the same being observed in *E. antiquus*, also in the African Elephant, as pointed out by Busk in connexion with the fragments from which he established characters referable to his *E. melitensis* in contradistinction to the fragment[4] he has assigned to the *E. falconeri*, which, he considers, displays the peculiarities of the Asiatic. In consideration of the difference in size between fig. 1 and the fragments ascribed to *E. melitensis* and *E. falconeri* of Busk, were it not for the obstacles just stated, I should be inclined to attribute the discrepancies to individual differences in size, seeing that relatively there is less difference in dimensions between the extremes than obtains in individuals of the recent and other fossil species.

The portion of a spinal column (Pl. XI. fig. 9) was found close to the jaw and molars (Pl. IX. figs. 1 & 2, and Pl. II. fig. 10). Here seven of the upper dorsal vertebræ are included in a space of 9 inches, and present all the characters of an aged individual. Unfortunately they were much injured during the process of removal, from the very stiff stalagmitic matrix in which they were embedded, their neural arches being lost; the bodies, however, are fairly preserved, of which the first and fourth dorsal are shown (natural size) in Pl. IX. fig. 3 & 4. These and the other vertebræ in Pl. XI. fig. 9, as compared with the far more perfect seventh cervical and middle dorsal de-

[1] Are computed.

[2] There is a skull of an Asiatic Elephant in the Royal College of Surgeons, London, showing the penultimate milk-molar nearly in full wear, with a breadth from the outer margins of each condyle almost identical with fig. 1.

[3] Unfortunately the skull of this very young elephant has not been preserved; but, by computations made from the long bones, I reckon its height to have been about 4 feet at the shoulder. The atlas has the centre of the arch unossified, and the lower arch, with the two centres of ossification, joined by cartilage, with no epiphyses on the transverse processes, the vertebral foramen for vessels being incomplete. This atlas is slightly larger than that of the articulated skeleton in Oxford University Museum, with its third and fourth milk-molars in use, the height at the shoulder being nearly 4 feet.

[4] Trans. Zool. Soc. vol. vi. p. 253.

scribed by Busk[1], give rather smaller dimensions, but nothing in any way remarkable. I have, moreover, bodies of detached vertebræ, mostly from Benghisa Gap, somewhat larger than the Zebbug specimens, whilst that of Pl. X. fig. 5 is considerably smaller than any of the above.

Ribs.—The heads of the ribs (Pl. IX. figs. 6, 6*a*, & 7) offer several very cogent proofs of the small dimensions of one form of the Maltese elephants. The articular epiphyses in fig. 6 are completely consolidated. The same parts, with the tubercle, of fig. 7 have been injured; but a fragment of the former remains, and shows sufficiently, in common with the second rib, that both belonged to adult, if not aged, elephants. The comparison between fig. 6 and the same rib of *Elephas melitensis* of Busk[2] furnishes the following data:—

(1) Largest diameter of head (fig. 6) 0·8 inch: Zebbug (fig. 8), 1 inch.

(2) Short diameter of head (fig. 6) 0·7 inch: Zebbug, 0·85 inch.

(3) Distance between inner border of head and outer surface of the tubercle (fig. 6) 1·7 inch: Zebbug, 2 inches.

The two agree in outline, with the exception that the neck of the Zebbug specimen is longer. As shown in fig. 6 *a*, there is a deep pit, which is also present in the Zebbug and the Asiatic, and mayhap in the African, but not so pronounced. As regards a rib of a very aged individual of the Asiatic in the Royal College of Surgeons, this fossa is relatively smaller. With reference to other characters, in comparison with the second rib in recent species the same narrow anterior margin is common to them; but I think, as far as fig. 6 is concerned, that the outer surface of the tubercle is broader than in the Asiatic Elephant. With reference to fig. 7, its nearly horizontal neck is characteristic of the third rib, to which I have little doubt it belonged. Moreover there is every evidence of its claims to be considered not only the bone of an adult, but, as far as the description and figure go, I am much inclined to associate it with the equally imperfect specimen ascribed by Busk to his *E. falconeri*[3]. Both display precisely the same characters; and the absence of the pit and rotundity between the head and tubercle is only what obtains in other species. The particular characters assigned to the Zebbug specimen are precisely what obtain in the above, and, in conjunction with the decided horizontal neck, seem to me to place both together. I would therefore consider them either the third or fourth ribs; and as far as the dimensions of fig. 7 are concerned, all might have belonged to the same individual. Mr. Busk does not give the dimensions of the Zebbug specimen; but, judging from the figure, I should imagine that it is slightly smaller than fig. 7[4].

[1] Trans. Zool. Soc. vol. vi. pl. 46. figs. 9 & 10.

[2] Trans. Zool. Soc. vol. vi. pl. 45. fig. 8.

[3] Trans. Zool. Soc. vol. vi. pl. 51. fig. 37.

[4] The second and third ribs of 2723 B, Royal College of Surgeons (referred to with the atlas) have no epiphyses, but, as far as dimensions go, are about the same as figs. 6 & 7; and its dorsal vertebræ are of about the same dimensions as those of fig. 9, Pl. XI., only all the epiphyses are easily detached.

2. The largest vertebræ in my collection represent the *cervical* (Pl. XI. fig. 7) and the first *dorsal*, shown in Pl. X. fig. 1. The upper cervical of fig. 7 is possibly the third, and has the body more or less perfect throughout, with the loss of every thing else save a portion of the transverse process. It is convex anteriorly and concave posteriorly, and gives the following measurements:—

	inches.
Height of body	4·5
Breadth of body	4·0
Thickness of body	1·6
Breadth across at the transverse processes	9·0

The other is somewhat larger, and may be the fourth or one of the succeeding vertebræ of the neck; its body only is preserved, and affords about the same admeasurements as the last.

The first dorsal (Pl. X. fig. 1) has only its body and the costal facets preserved. It shows the same characters as the above; only the posterior aspect is less concave: indeed, as proportions go, the three may have belonged to the same individual; moreover they were found close together.

The dimensions of the first dorsal vertebra are as follows—height 4·2 inches, breadth 4·5 inches, thickness 1·8 inch.

Three middle dorsal vertebræ of an elephant of about the same size are shown in Pl. XI. fig. 8. Here the transverse processes and intervertebral substances are completely ossified, and show the owners to have been aged elephants. As compared with recent species, these cervical and dorsal vertebræ equal specimens of the Asiatic Elephant in the Royal College of Surgeons, the Guy's Hospital Museum, and the Army Hospital Museum at Netley, the heights of which skeletons vary from 6·5 to 7 feet at the withers.

My collection displays other detached vertebræ of adult elephants somewhat smaller than the above, with an average height of 3 inches, breadth of 3·5 inches, and thickness of about 1·8 inch.

Pl. X. fig. 4 represents, possibly, a middle dorsal vertebra, showing a rather peculiar triangular-shaped body, with its rib-facets and transverse processes entire. The anterior costal facet is 1·7 by 1 inch, the posterior 1·7 by 1·5 inch, and thickness 1·6 inch; the spine is 5·5 inches. Supposing this to be the ninth dorsal, as it appears to be, it would represent an Asiatic Elephant of the height of the skeleton 2677 A, Royal College of Surgeons, which is computed to have been about 6 feet in height. Several caudal bones in the collection agree with the relative dimensions of the vertebræ.

Ribs.—The two heads of ribs (Pl. X. figs. 2 & 3) well represent aged individuals. The former is most probably a fifth, and displays the two facets *a* and *b*, which, as far as dimensions are concerned, might have articulated with the vertebræ Pl. XI. fig. 8. The other (fig. 3), with its single circular facet, evidently belonged to a posterior dorsal vertebra. There is another single facet on a head of about the same dimensions, besides fragments of the bodies of ribs; all are in keeping with the largest vertebræ.

V. Pelvis.

Although abundant fragments of pelvic bones were met with in the ossiferous deposits, in conjunction with spinal vertebræ and long bones, showing in several cases that entire carcasses had been introduced, it was difficult to obtain portions sufficiently preserved for determination. For example, the femurs from Mnaidra Gap (Pl. XIV. figs. 1 & 2) lay apparently *in situ*, as their acetabula were found close to the heads; and the same was observed in other situations, more particularly in Benghisa Gap, which produced so many remains of the smaller forms. After numerous failures, however, I at last succeeded in saving the portion of a left os innominatum, represented in Pl. XV. figs. 9 & 9 *a*. It was found in the latter deposit in conjunction with what had evidently been at least the greater part of a skeleton. The fissures crossing the acetabulum indicate fractures occasioned during removal, and, being in a weak part of the bone, have more or less followed the course of the original lines of junction of its three elements.

When the above has been carefully compared with the specimen figured and described by Mr. Busk[1] as portion of the pelvis of *E. falconeri*, the following differences will appear in their dimensions.

	Pl. XV. figs. 9 & 9 *a*.	Zebbug ilium. (Tr. Z. S. vol. vi. pl. 50. fig. 31.)
	inches.	inches.
Width of acetabulum (inside)	2·5	2·1
Length of acetabulum	2·3	2·3
Radius of cavity	1·2	1·1
Breadth of cotyloid notch	0·5	0·5
Width of contracted part of ilium above the acetabulum	2·4	2·0

Summary.—1. The two specimens, whilst coming close together in general dimensions, differ pointedly as regards the outline of the acetabulum, which is nearly circular in fig. 9, and ovoid in the Zebbug bone.

2. The former differs from the latter, and apparently also from recent species and the Mammoth, in being more globular, with its sides forming a bee-hive contraction towards the brim, with a beetling of the upper margin, as seen in the profile view, fig. 9 *a*.

3. The cotyloid notch in the African opens by a narrow fissure on to a flat surface close to the obturator foramen, the same parts being relatively larger in the Asiatic and in the two above mentioned.

4. The contour of the obturator foramen differs in the African from that of the Asiatic and Mammoth in having the largest end of the oval uppermost, the reverse being the case in the latter and seemingly also in the fossils just described.

[1] Trans. Zool. Soc. vol. vi. pp. 242, 264, and pl. 50. fig. 31.

5. The triangular surface on the back of the acetabulum is generally concave from side to side, with well-defined borders in the two recent; only it is more expansive in the Asiatic, where the triangular space has an elevated and somewhat rounded ischial side, with a small sharp pelvic border, which is not high, whereas the African is more like an isosceles triangle, and is deepest towards the pubic margin, which is again higher than the last and rounded, the ischial being sharp, with a gradual slope on the pubic side. I am thus particular to note these seeming discrepancies; I doubt, however, if they are regular, inasmuch as the comparison between this space in very large and small pelves of the Asiatic shows considerable differences; the data therefore are not very reliable. As regards fig. 9, its characters therefore would come close to the Asiatic, whereas the Zebbug bone is a good deal more in keeping with the African.

6. Comparing the two acetabula with those of young of recent species, it will be found that neither fig. 9 nor the Zebbug bone are by any means so large as those of individuals of 4 feet in height; however it is just possible that the head of the femur, like the shafts of all the bones, were not only absolutely but relatively shorter and broader than in other species: at all events, the owners of the above were very small elephants as compared with their living representatives.

VI. Scapula and Humerus.

1. The smallest adult scapulæ in my collection are represented by the fragments Pl. XII. figs. 2 & 2*a*, and 3 & 3*a*. Neither shows any indications of youth; and, with the humerus fig. 1, they were found close together in Benghisa Gap. The smaller (fig. 3) is of the right side, and, as far as the dimensions of its glenoid fossa and neck are concerned, agrees very closely with the same parts in the articulated skeleton of a young Asiatic Elephant in King's-College Museum, where the third and last milk-molars are in use, and the height at the shoulder about 4 feet. The girth of the neck of the bone is 8·3 inches. The outline of the fossa is broad, and oblong, like the African, and not so narrow as usually observed in the Asiatic.

A fragment belonging to evidently a smaller individual, is described and figured by Busk[1] as portion of the scapula of his *E. melitensis*.

2. The specimen, figs. 2 & 2*a*, is considerably mutilated, the spine, blade, and portion of the inferior border being lost; but the articular surface is nearly entire. The circumference of the neck was about 9 inches. As regards comparative dimensions, the above and the scapula of the disarticulated skeleton of a young Asiatic Elephant (2723 B)[2] in the Royal College of Surgeons are nearly equal, the latter being somewhat larger. The sides of the fossa in fig. 2*a* are parallel, and its outline much the same as in fig. 3*a* and the Zebbug fragment.

3. The portion of a right humerus (Pl. XII. fig. 1) and a fragment of the centre of

[1] Trans. Zool. Soc. vol. vi. p. 244, and pl. 48. figs. 23 & 23*a*.

[2] The same referred to in connexion with the atlas and other bones.

its shaft, showing the condyloid ridge together with the head of the left humerus, were all discovered together in Benghisa Gap, in conjunction with scapula Pl. XII. fig. 3. The more perfect of the two humeri (fig. 1) has lost its tuberosity; enough remains, however, to enable me to institute some interesting comparisons between it and the head of the humerus from Zebbug. In the first place, as to the dimensions of the humerus in question,—this I ascertained, before removal from its matrix and previous to the inevitable loss of the major portion of the shaft and condyles, to be about 14·5 inches, which is smaller than what Mr. Busk accords to his *E. melitensis*, and $2\frac{1}{2}$ inches larger than the maximum length of *E. falconeri*[1]. It is requisite to state that the epiphysis is completely consolidated in my specimen, indeed more so than the figure might indicate, as in the latter the artist has shown a line which is merely a crack in a thin coating of cement let into a decayed portion. There are two very evident characters common to the humerus of *E. melitensis* of Busk and that now under consideration, and at once conspicuous in comparison with the humerus of other elephants, viz. the proportionally narrow compressed head, and the pronounced shallow and open bicipital groove. Moreover the deltoidal crest, which is low down in the African, is also so situated in my specimen. The humerus on which Mr. Busk has established the pygmy species *E. falconeri* was previously alluded to by Dr. Falconer as belonging to "an early adult individual." The proximal epiphysis is lost; but the distal is consolidated, and the specimen is 9 inches and may have been, according to Busk, 12 inches in length when entire[2]. The difference in relative dimensions between the latter and the two preceding is decidedly remarkable, but in no wise out of keeping with instances among recent species.

1. One of the largest fragments of a long bone referable to the Maltese elephants is shown in Pl. XI. fig. 1. It is the mutilated proximal end of a right humerus found in Mnaidra Gap. The entire limb had evidently occupied the position where the above was found; but only about $1\frac{1}{2}$ foot of the upper end and a fragment of the distal extremity were saved. The great tuberosity and a small portion of the head posteriorly are lost; but the antero-posterior admeasurement of the latter is preserved. This and the breadth are 8 inches and 6 inches respectively. The distal extremity admitted of the determination of the length of the outer condyle (by tape) and the breadth of the olecranon-pit, which were 6·2 and 2 inches respectively. Besides the more open and shallow groove for the bicipital in the African, as compared with the Asiatic and Mammoth, there are other characteristic differences between the humeri of the two recent species. Perhaps a large number of African specimens would show the head to be less globular, as seems to obtain in the individual in the British Museum; if so, we should expect a less circular glenoid cavity of the scapula. Now, as regards fig. 1, if this should be the case, I opine it would assimilate more closely to the African; but with such imperfect materials it

[1] See Table, Trans. Zool. Soc. vol. vi. p. 306, and plate 18. fig. 22.

[2] According to Dr. Falconer's estimate, as shown in figs. 1, 2, & 3, pl. 14, Palæont. Memoirs, he computes the original length of this specimen to have only been 9·6 to 10 inches. See vol. ii. page 303.

is dangerous to hazard an assertion. As to the probable dimensions of the owner of fig. 1; according to the condition of the epiphysis it must have been an aged elephant, and, by comparison with recent species, stood about 7 feet at the withers.

2. Another head and fragment of a shaft of the left humerus of an old elephant is shown in fig. 2. It lay in Mnaidra Gap, with its scapula in close apposition. Of the former only about 6 inches remains. However, the antero-posterior length of the head is entire; but the tuberosity is gone, and there is a recent fracture obliquely across the head, the shaft having been broken across 3 inches below the latter. Of the scapula, only the fragment (fig. 3) of the anterior portion of the glenoid cavity remains. The antero-posterior length of the scapular portion of the head (by tape) is 7 inches, the breadth posteriorly being 3·4 inches. Portion of the anterior surface is lost; but fortunately the opposing surface of the scapula furnishes the required datum, which is 3·2 inches. With the exception of the rather flattened head of the African, there is not enough to enable me to go into further comparisons. As to the age of the individual, there can be no question that the bone belonged to a full-grown elephant, seeing that, although there is a recent fracture across the head, the epiphysial connexion is consolidated and gives every indication of the characteristics of an aged animal. Moreover, if the outlines of the articulated surfaces of their heads are reliable as to dimensions, I find that this humerus, and that of the Sumatran Elephant in the British Museum are about equal, although the arc of the curve in the latter is much more circular. It seems likely, therefore, that figs. 1 & 2 belonged to the largest form, although they differed individually in size, as might readily be expected, at all events to a certain extent.

3. Another head in the collection, from Gandia Fissure, although much mutilated, gives an antero-posterior length very much the same as the last.

4. Another head of a left humerus of a still smaller adult elephant is shown in fig. 4. The bone has been broken across *below* the epiphysial junction, with the loss besides of the great tuberosity. The antero-posterior length (by tape) is 6 inches. Breadth posteriorly about 3 inches, at the middle 4·5 inches, and anteriorly 2·5 inches.

5. Another head gives a rather larger antero-posterior admeasurement, but is likewise too imperfect for further comparisons. It is important to note these gradations, however imperfect the specimens may be otherwise, as they prove that, however much the Maltese elephants may have differed in specific characters, there was a very regular gradation in dimensions between extremes.

Young and immature Scapula and Humerus.

Of these the humerus is represented, first, by a head and fragment of a shaft, secondly by an entire specimen excepting the epiphyses. The first offers only one character of importance, viz. the great shallow bicipital groove, in this respect resembling the adult head, Pl. XII. fig. 1. In the absence of the epiphysis it is of course impossible to indicate the exact outline of the head, the contour of the surface of which is traceable together with the elevated prominence for the tuberosity, and the large hollow for the tendon. This specimen and the outline of the proximal articular surface contrast very favourably with a similar bone described by Busk as that of the adult humerus of *E. falconeri*[1]. There are differences, however, which seem to separate them from Pl. XII. fig. 1. Indeed, in the above the anterior border is far more hollow under the head than obtains in Pl. XII. fig. 1; and the size, at all events of my specimen, is characteristic of the young of a larger elephant, therefore may probably have belonged to the largest form.

2. The next humerus (Pl. XXI. figs. 9 & 9*a*) is interesting in having been found with the ulna and fragment of radius (figs. 10 & 10*a*), besides other bones shown in the Plate and referable to the same individual. This humerus and the fragment of the adult bone of the smallest forms (Pl. XII. fig. 1) seem to agree as far as their comparison will admit; and in general outline fig. 9 is also like the young humerus described and figured by Busk[2].

The following are the characters of figs. 9 & 9 *a*. First, the contour of the posterior border shows a considerable concavity under the head, as in the preceding specimen, and more so than apparently obtains either in Pl. XII. fig. 1 or in the humerus of *E. falconeri*[3].

There is a well-marked depression on the inner side of the posterior angle.

The supinator ridge is more oblique and like the African; but it runs up and joins the posterior border, as in the Asiatic.

The inner condyloid ridge is rounded and thick, the latter being 0·7 inch at the epiphysis of the inner condyle. The deltoid ridge and the bicipital groove (*b*, 9*a*) are unfortunately too much decayed to admit of comparison.

3. The fragment of the scapula Pl. XXI. fig. 8 very possibly belongs to humerus fig. 9; the epiphysis is gone, the head, neck, and a small portion of the body being the only parts preserved.

The circumference of its neck is 3 inches.

4. I now come to point out the interesting fragment of a scapula shown in Pl. IX. figs. 5 & 5*a*. It is in all respects similar to the portion figured and described by Busk[4] as doubtfully belonging to *E. falconeri*. In this uncertainty I fully concur, and cannot, after much trouble, find that either has any possible affinities to the proboscidian scapula, or, indeed, to any recent fossil mammal with which I have had opportunities of comparing them.

The observations made by Busk in regard to the Zebbug specimen apply verbatim to figs. 5 & 5*a*, and show that, to whatever species they belong, they present a community of characters quite peculiar and distinctive.

[1] Trans. Zool. Soc. vol. vi. p. 258, cut 16.

[2] Trans. Zool. Soc. vol. vi. p. 280, pl. 52. fig. 50.

[3] Trans. Zool. Soc. vol. vi. pl. 49. fig. 26.

[4] Trans. Zool. Soc. vol. vi. p. 254, pl. 47. figs. 14 & 14*a*.

VII. Radius and Ulna.

The radius is represented in the collection by three proximal extremities and four distal epiphyses.

1. A head is shown half natural size, Pl. X. fig. 7, and its upper aspect natural size, fig. 7*a*. This bone had evidently belonged to an aged individual, seeing that the neck is enlarged by rugosities and the bony exostosis often noticed in the largest specimens of other species. Although the ulnar margin is not quite entire, it was evidently pretty even; and the general outline of the humeral aspect, whilst neither exactly like any of the recent or fossil species with which I have compared the specimens, is decidedly more like the African and *E. antiquus* than the Indian and Mammoth. The external portion of the articular surface (*a*) is more concave than apparently in other species. The characters of the shafts of the two recent Elephants, if always regular, would seem to differ considerably. Unfortunately I have no entire specimen of the Maltese forms. The above, however, shows the pronounced anterior ridge or shin (fig. 7*b*) so conspicuous in the African, where the same part is rounded in the Asiatic. Again a prominent ridge in the African and fig. 7 rises at *c* close to the inner side of the head, and runs obliquely to near the external malleolus, when it becomes confluent with the former; whereas in the Asiatic the surface is flat below the condyloid face, where a rounded ridge runs down the middle having tectiform slopes on either side, but not nearly so abrupt as in the African and fig. 7. There are seemingly other important differences between specimens of the Asiatic and African radius; however I have not Maltese materials wherewith to compare them. The above specimen, in relation to dimensions, nearly equals that of the Sumatran Elephant in the British Museum, and therefore would represent a rather small-sized Asiatic Elephant.

2. Another head and fragment of about 3 inches of the shaft is considerably injured; it shows however the even (not undulating) outline of the ulnar facet. In size it is somewhat smaller than fig. 7, and has a humeral facet 2·4 inches by 1·6 in the antero-posterior direction.

3. A much smaller proximal end and about three and a half inches of shaft, with the epiphysial junction nearly consolidated, gives a facet of 2 inches by 1·3 in the antero-posterior direction. Here the shaft is rounded near the head in front like the Asiatic; but this may be the character of an immature bone. With reference to the solidification of the proximal epiphysis, it appears that the latter may be completed when the distal end is quite easily detached; and, judging from skeletons of the Asiatic, the former obtains before the animal has cast its milk-teeth.

The central portions of the shaft are all too imperfect for comparison; but there are four detached distal epiphyses evidently belonging to fairly matured animals, if we are to judge from the determined outlines of the facets—the honeycombed and pitted upper surfaces clearly indicating that their owners were not aged, although they might have been full-grown elephants.

1. The radial and ulnar distal apophyses (Pl. XIII. figs. 2 & 3) evidently belonged to the same individual. I shall describe them as being the smallest bones of the forearm, referable to the radius and ulna of the smallest Elephant. Fig. 2, left radial epiphysis, shows a deep concavity for the lunare, which in turn will be shown to present a corresponding convexity in contradistinction to more shallow and even surfaces in the largest specimens. The Asiatic seems to display the former characters, and the African the latter. The projection for the scaphoid, usually prominent in the adult recent and in the following larger fossil specimens, is not observed at *a* in fig. 2, the surface being rounded instead of angular.

2. With reference to the right ulnar epiphysis (fig. 3), it is seemingly remarkable for the concavity and smallness of its cuneiform aspect. The radial facet (*a*) is 1 by 0·7 inch in breadth. As compared with recent species, there are no specimens at all equal to the small dimensions of the above, with at the same time their epiphysis in any wise so matured, which shows fig. 3 to have belonged to a nearly full-grown small Elephant. The cartilaginous epiphysis of the young Asiatic (No. 2723, R. C. S.) agrees well as to relative dimensions, the height of the latter individual being 4 feet.

3. Another radial epiphysis, in every respect similar to fig. 2, but somewhat larger, displays the pronounced hollow on its lunare aspect to a greater extent. The differences in dimensions are noteworthy, the lunare facet in fig. 2 being 2·4 inches by 1·8, whereas in the above it is 2·8 by 2 inches—thus indicating an individual of the dimensions of 707 H, Asiatic, in the British Museum, which, I calculate, stood about 5 feet high.

4. A still larger distal extremity, with a *less* determined lunare convexity and hollow, gives an articular aspect of 3 by 2·3 inches.

Finally, Pl. X. fig. 6 shows the largest specimen, the lunare aspect of which is 3·4 by 2·8 inches. The angle for the scaphoid (*a*) is pronounced in this specimen as in the two preceding, forming a well-defined border on the inner side, of 1·2 by 0·5 inch. As compared with Pl. XIII. fig. 2, the articular aspect is seemingly less hollowed out, with a less prominent convexity, which is repeated, as just observed, in the largest lunaria. The distal extremity of the Sumatran is somewhat larger than fig. 6, which might therefore represent an elephant 6·5 feet in height.

Besides the distal ulnar epiphysis just referred to, there is the upper fragment of a shaft referable to an immature individual, and represented on Pl. X. fig. 9 (half) and 9 *a* (natural size). As compared with recent species and the specimens described by Busk from Zebbug [1], it presents a few important characters. The olecranon-spine is sharp in the Asiatic; and, as far as the single instance in the British Museum admits, it would seem to be more or less rounded in the African; the same obtains in an ulna of *E. antiquus*; in fig. 9 it is very sharp. Again, from the undulating contour of the head of the radius, the radial sulcus is seemingly wider in the African than in the Asiatic; and this explains the larger outer condyle in the Asiatic; moreover the concave external side of the

[1] Trans. Zool. Soc. vi. p. 245 & 260, plate 48. figs. 24 & 25, plate 49. fig. 28.

spine is more pronounced in the African; and in *a*, fig. 9, it is deeper than in either. As to the radial pit (*b*), the loss of the epiphysis somewhat vitiates the outline; but it is decidedly deep and apparently not so open as in the African.

On comparing the above carefully with the fragment from Zebbug, described by Busk [1] as portion of the ulna of his *E. melitensis*, I find little, if any, discrepancies worth mentioning. The measurements of the specimens agree in a remarkable manner; I must observe, however, that the pit or fossa in front of the inner condyle, so pronounced in the ulna of recent species and seemingly indistinct in the specimen of *E. melitensis* described by Busk, is very deep and prominent in fig. 9. The anterior aspect of the shaft is concave, at least as far as the fragment shows, which is to about the commencement of the lower third. The external aspect just under the head is more hollowed out than the internal; and although the above is not quite an adult condition, it most probably belonged to an animal nearly full-grown and of small size, equivalent to the computed dimensions of the owner of the humerus (Pl. XII. fig. 1) and the radius and ulna (Pl. XIII. figs. 2 & 3).

Young and immature Radius and Ulna.

The ulna and the fragments of the proximal end of the radius (Pl. XXI. figs. 10, 10 *a*) were found *in situ* with the humerus fig. 9 and other bones represented in the plate [2]. The larger radius (fig. 15) was broken during removal, and there is a small portion of the centre of the shaft wanting; it is, however, sufficiently preserved for comparison with the young radii figured and described by Busk [3]. Of course the prominent ridges of the old bone are not defined; but the outline of the humeral facet (fig. 15 *a*) resembles that of the old bone (Pl. X. fig. 7 *a*). In this young bone the anterior ridge rises in the upper third, and there is no remarkable flattening under the head as in the African. A transverse section at the middle of the shaft (*b*) gives the outline shown by Busk in the young radius from Zebbug [4]; and the distal epiphysial junction is similar to another [5]. These discrepancies, however, are questionable specific distinctions, and cannot be safely utilized without further data. At all events the above radius, as compared with an African fœtal bone shown by Busk [6], might be considered as representing a young elephant with its middle milk-teeth in wear and of a diminutive size as compared with other elephants. The comparison moveover between fig. 15 and the fragment *a* of a radius attached to ulna, fig. 10, indicates a good-deal older individual.

[1] Trans. Zool. Soc. pl. 48. figs. 24 & 24*a*.

[2] The fragment of skull (Pl. I. fig. 18), the fore-foot bones (Pl. XXI. figs. 1 to 7), also scapula (fig. 8), humerus and ulna (figs. 9 & 10), the fragment of vertebral arch (fig. 11), the rib (fig. 12), tibia (fig. 13), larger tibia (fig. 14), and radius (fig. 15) were all found jammed together under a large stone in Benghisa Gap. See my Work on Malta, page 189.

[3] Trans. Zool. Soc. vi. p. 280, pl. 47. figs. 18, 19.

[4] Ibid. p. 281. no. 19.

[5] Ibid. p. 281. no. 18.

[6] Ibid. fig. 40, p. 277.

The young ulnæ of the collection (Pl. XXI. figs. 10, 16, & 17) furnish a few important differences individually, and also in relation to the above and the Zebbug specimens. I think there is every liklihood that the humerus and forearm-bones (figs. 9 & 10) belonged to the same individual. The olecranon-ridge, like that of the much older bone (Pl. X. fig. 9), is remarkably sharp, like the Asiatic, whereas the same in figs. 16 & 17 is blunt and rounded as in the African; and, considering relative dimensions, they seem to point to specific characters. With reference to the ulna fig. 10, which, with the exception of its distal epiphysis and the usual morsel on the top of the olecranon, is entire, compared with the uterine ulna of the African Elephant[1] just mentioned it is half an inch shorter. With reference to the humeral aspect (fig. 10 *a*) it will be observed:—1st, that the curve for the head of the radius is not quite so shallow as in the African; 2nd, that in proportion the outer facet is *much* smaller than in either of the recent species and Mammoth, but more like that of Pl. X. fig. 9 *a* and the same part in the *E. melitensis* of Busk[2]. Altogether, with the exception of the anterior hollow for the shaft of the radius, so pronounced in fig. 9, the two are much alike.

With reference to all these young ulnæ, including the Zebbug bones referred by Busk to *E. melitensis* and *E. falconeri*, there are several important comparisons to be drawn, which appear to me to point towards the presence of at least two different forms.

1. The posterior angle of Pl. X. fig. 9 and Pl. XXI. fig. 10 is sharp, whereas it is rounded in figs. 16 & 17.

2. The anterior aspect of the shaft in Pl. X. fig. 9 is hollowed out down the middle, which is not the case in any of the others excepting Pl. XXI. fig. 16.

3. The radial pit is very deep in Pl. X. fig. 9, and comparatively shallow in all the others.

4. Just under the pit from which the radial sulcus proceeds in the matured bone, we find the same part concave at *c* in fig. 16 and flat in figs. 10 and 17.

5. The external humeral facet is not remarkably small in Pl. X. fig. 9 *a*; but it is relatively small in Pl. XXI. fig. 10 *a*, and perhaps in figs. 16 and 17. In none, however, is it so much aborted as shown by Busk to be the case in his *E. falconeri*[3].

6. But fig. 16 seems to differ from all in the radial sulcus (*c*) running more obliquely down the front of the shaft, whilst its distal epiphysis (16 *a*) indicates a much larger articular surface than that of the fœtal African Elephant just referred to. Again fig. 17 is a still larger bone than either.

In conclusion, it is just possible that figs. 16 and 17 may belong to the large, and fig. 10 to the small form; at all events, as compared with each other and much older bones, they apparently add to the proofs of the existence of two species of Maltese fossil Elephants, which is further shown by the older small and large radii and ulnæ, which,

[1] Trans. Zool. Soc. vi. p. 275. no. 36. Its length is 4·1 inches and breadth of head in front 1·2 inch, the antero-posterior length of its internal side being 1·5 inch.

[2] Ibid. vi. p. 245.

[3] Ibid. pl. 49. fig. 28 *a*.

considered on the score of dimensions and characters, seem to go hand in hand with these young bones.

VIII. Femur.

The differences between the femurs of the African and Asiatic Elephants have been pointed out by Mr. Busk in respect of their connexions with the Maltese forms[1]; the only question becomes how far a series of specimens of the African Elephant would substantiate the characters represented by the only available instance in the British Museum. The prominence or otherwise of ridges dependent on age must of course be always taken into account, and also the length of time the individual has been in captivity. I apprehend, moreover, that the age for the consolidation of the epiphyses (of the extremities in particular) is much influenced by conditions of life. The African Elephant's skeleton (708 *h*) in the British Museum, although that of a full-grown animal, with the penultimate true molar in wear, has the epiphyses of the long bones detachable, although the individual is said to have been killed in its native haunts; the same obtains in the case of the Chuny; indeed it would seem that even in a wild state the consolidation is not ordinarily completed until the last true molar cuts the gum; consequently the bones I am now about to describe must in general be considered as belonging to aged individuals.

The specimens of femurs of adult Elephants in my collection seem to me to be capable of division into two series.

A *Series.*—The larger is represented by several specimens, differing somewhat in dimensions, as follows:—

Specimen *a* showed a portion of the upper part of a right femur found in Mnaidra Gap, the head of which gave a circumference of 15 inches, with a breadth across the latter and great trochanter of 9·5 inches. Here the epiphyses were completely consolidated.

Specimen *b*, right side, from the same situation, was found entire, but unfortunately came to be disturbed and broken before I could take the exact length of the bone, of which the head and lower condyles are shown in Pl. XI. figs. 5 & 6; however, I surmised it may have been about 33 inches, or, in other words, of almost the precise measurements of that of the Sumatran Elephant in the British Museum. Thus the diameter of the head (fig. 5) was 4·2 inches, least transverse diameter of the shaft 2·9, antero-posterior diameter at the same point 2·3, least circumference 9, transverse diameter of head with trochanter 9, transverse diameter at the line of the lower epiphyses (fig. 6) 5·8, transverse diameter of condyles 5, middle of patellar sulcus 2·4 inches.

Specimen *c*. The next, as regards dimensions, are the portions of right and left femurs, of evidently the same individual, shown in Pl. XIV. figs. 1 & 2. The head of fig. 2 is not shown in the Plate; and the lower condyles and portion of the shaft of fig. 1 were not discovered. Close to the above lay the entire tibia (Pl. XV. fig. 1), with its

[1] Trans. Zool. Soc. vi. p. 248.

astragalus (Pl. XVI. fig. 1) attached to the distal extremity by calcareous matter; so that by almost actual measurement I computed the aggregate length of these two limb-bones to have been about 41 inches—that is, supposing them to belong to the same individual. Reverting to Pl. XIV. fig. 1, although the epiphysial junction is traceable on the head and trochanter major, still the bone, on comparisom with the same in recent species, must be considered to have belonged to a full-grown individual; indeed the epiphyses are far more consolidated than obtains in the African specimen (708 *h*, B.M.) and the Chuny.

Besides what the representation affords, the following measurements refer to fig. 1:—circumference of the head 12 inches, girth of neck 9·5, girth at *a* 12, at *b* 7·7, and at *c* 8·5 inches; transverse diameter of articulating surface of head, by tape 6·7, and by compass 4 inches.

Specimen *d*, the right lower extremity (Pl. XIV. figs. 2 & 2*a*) enables us to determine the probable length of the femur fig. 1. The one in question was entire, but was broken across within eight inches of the distal extremity during removal. The antero-posterior length of the outer condyle (by tape) is 7·8 inches, and of the inner 8·6, the girth at the epiphysial junction *a* being 14·5, and at *b* 8·8. These three femurs are identical as regards characters, although they differ considerably in dimensions; fig. 1, in all its measurements, equals the same parts of 707*h*, B.M., with the last milk-tooth in wear and all the epiphyses of the long bones disunited. Thus, from fig. 1 upwards to the largest, there are gradations representing three feet difference in the height of individuals; and yet, after all, other points being equal, that is no remarkable disparity as compared with individual differences in recent species. But although agreeing in all these respects with immature bones of the latter, it is highly probable, as will be shown presently, that the Maltese fossil Elephants showed relatively broader bones than in either of the living Elephants and the Mammoth.

B *Series.*—The right femur (Plate XIV. figs. 3 & 3*a*) was discovered in Benghisa Gap. The shaft had been greatly crushed and flattened by compression between blocks of stones when deposited in the gully; but the condyles are not much injured, and, with the exception of the head and neck, its length is entire. Mr. Busk computes the femur of his *Elephas melitensis* to have varied between 18 and 20 inches; I have just surmised that the thigh-bone of the largest form attained a length of 33 inches. Making allowances for the loss of the proximal end, we may believe that the one in question, which is 20·5 inches as it now stands, was 22 or 23 when entire. Now these differences in dimensions in old bones make the extremes differ very much in size, more especially the largest and smallest, the latter of which, according to Busk's computation, showed a femur of only 1 foot or 13 inches in length[1]. As regards fig. 3, there can be no question whatever that it belonged to an aged individual, seeing that the condyloid

[1] Trans. Zool. Soc. vi. p. 265, and pl. 50. fig. 30. As far, however, as I can make out, the determination of the femur of this very diminutive form rests entirely on specimens by no means entire, and without their epiphyses.

epiphyses are completely consolidated; moreover the solution of continuity at its upper extremity is through solid bone. The inner and posterior aspects of both condyles are somewhat abraded, so that the outer condyloid pit or fissure appears, in fig. 3 *a*, a little wider than natural. Unfortunately the shaft has been too much crushed to permit of any reliable data being obtained. The antero-posterior length of the outer condyle (by tape) is 6·5 inches, and the internal 7·4; girth at the epiphysial junction *a*, 11·5, and breadth 4·2; transverse diameter of condyles 3·6.

Summary.—A comparison between the members of A Series and the same bone of the African and Asiatic afford the following characters:—

1. The saddle-shaped depression between the trochanter and head, and the length of the neck, in the Mammoth and Asiatic Elephant as compared with the large trochanter major and short intervening hollow of the African are remarkably apparent in Pl. XIV. fig. 1, just as the character of the intercondyloid pit and convergence of the condyles more resemble the African than the Asiatic[1]. Again, the digital pit, which is deep in the Asiatic and the Mammoth, is shallow in fig. 1, and also in the African. The condyles of the two latter also agree in being more unequal in length and having a narrower interspace than the Asiatic and *E. primigenius*, whilst a section across the condyles of the Maltese specimens at the epiphysial junction displays a concave base and large heavy internal angle (Pl. XI. fig. 6) of the African as compared with the more equilateral sides of the Asiatic.

2. Turning to the shaft, like the African our fossil has the posterior aspect of the shaft flat; however, the rudimentary trochanter minor on the posterior and internal angle is quite developed, the same being apparently wanting in the African; there is, moreover, a decided rudimentary third trochanter. Altogether the femur may be said to partake, as regards its head, of the Asiatic, whilst the trochanteric pit, shaft, and condyles resemble the African.

(B Series.) With reference to the femur (Pl. XIV. figs. 3 & 3 *a*), unfortunately there is little in a sufficient state of integrity to admit of accurate comparisons, excepting the condyles. These do not seem to differ from the large form and *E. africanus*; the patellar sulcus (fig. 3 *a*), however, would seem to be deeper than 2 *a*. Again, in the large form and also the Asiatic and Mammoth, the anterior surface, just above the condyles, is narrow as compared with the African; and the femur (fig. 3) suddenly deepens at the point *b*, forming a digital pit and flat surface, whereas at *b* in fig. 2 it is shallower with a rounded surface.

Young and immature Femora.

1. The specimen shown by Pl. XXI. fig. 18 represents the proximal extremity, and, as far as characters are concerned, seems to me an exact resemblance of the adult femur Plate XIV. fig. 1.

[1] See these distinctions in Cuvier, Ossem. Fossil. pl. xi., and Blainville, Osteograph. vol. iii. pl. vi., and British-Museum specimen 708 *h*.

Although the head and great trochanter are wanting, it is apparent that the contour of these parts, as in the above, resembles the Asiatic Elephant rather than the African, as seen by the relative breadth of the head and the shallower digital pit. Again, like the African, it is flat on the posterior aspect; and the rudimentary trochanter minor *a*, as in the old bone, forms a rough prominence on the posterior and internal border. Further, looking at the epiphysial surface and its outline as compared with those of *E. falconeri* of Busk[1], it seems to me that the pronounced hollow caused by the pre-trochanteric fossa in them has no such character in fig. 18, which, in the outline of its head at the same point, resembles the adult bone Pl. XIV. fig. 1, and the fœtal African femur in the British Museum, figured by Busk[2]. As to the outline of the same part in *E. melitensis* (Busk)[3], the bone in question is still more dissimilar, except that both have their anterior surface rounded. Therefore, whatever form Pl. XIV. fig. 1 belongs to, the same type, I apprehend, is Pl. XXI. fig. 18.

2. The next specimen represents about three and a half inches of the distal end of a left femur belonging to a larger individual than the last. It has the rounded shaft and general characters of a young bone. Instead of having the flat surface anteriorly close to the epiphysis at *b*, as shown in Pl. XIV. fig. 3, it is rounded as at *b* in fig. 2 of the same Plate; whilst the lower epiphysial surface shows a longer outline for the internal condyles, as obtains in the adult and in the African. I therefore cannot disassociate this fragment from that of Pl. XIV. figs. 1 & 2 and the last, or, in other words, from the large form.

IX. Tibia.

The materials for determination under this head are confined entirely to the large form.

1. The almost perfect left tibia (Pl. XV. fig. 1) most probably belongs, as just stated, to the femur Pl. XIV. fig. 1, inasmuch as both lay close together, and when approximated to the condyles of the right side (Pl. XIV. figs. 2 & 2*a*) they fit exactly, so as to lead to a belief that a skeleton was deposited in the flesh. The specimen (Pl. XV. fig. 1) is entire as regards length, but was injured during removal, yet not to the extent to prevent the preserving of the following data:—Breadth of upper condyles is 5·3 inches, breadth of external depression 2·5 by 2·4, breadth of internal depression 3·1 by 2·5, girth at middle of shaft 7. The astragaloid aspect is 3·2 by 2·6. The latter is somewhat injured and imperfect; but fortunately the distal extremity of the right tibia (figs. 2 & 2*a*) supplies the defect.

2. The latter represents a profile and lower view, to which was attached in the same way as in fig 1 an astragalus of precisely the same dimensions; indeed, in all probability, all belonged to the same individual.

3. Fig. 3 represents the proximal articulation of a right tibia somewhat smaller than

[1] Trans. Zool. Soc. vi. p. 267. [2] Ibid. p. 277. no. 38 *a*. [3] Ibid. p. 267.

the two just noticed. There is a recent transverse fracture of its shaft, by which about an inch has been broken off; however, I ascertained the following admeasurements beforehand—entire length 13 inches, girth of middle of shaft 5·6, breadth of lower articulating surface 2·8.

These three tibiæ belonged unquestionably to adult elephants; and it will appear that the largest (figs. 1 & 2) belonged to an individual somewhat larger than that of fig. 3. From the closer proximity of the femoral condyles in the African than in the Asiatic and Mammoth, there is consequently a smaller intercondyloid fissure; we should therefore also expect a corresponding convergence of the tibial cups, and that the dividing ridge will be narrower. Now all the characters of the African are apparent in the fossils just described. Moreover, in comparison with the Asiatic, it would appear that the tibia of the African is relatively shorter, at least as far as the single skeleton in the British Museum is compared with an Asiatic of about the same relative age. A small concavity between the spine and external cup, close to the head, is apparent in certain specimens of the Asiatic, but is wanting in the single African and in the fossils. As to the distal extremity, excepting a greater obliquity of the fibular facet in the African and the fossils than in the Asiatic, there do not seem any marked differences in the outlines of the astragaloid surface, further than, perhaps, that the African has it more oval than the Asiatic, whereas the surface fig. 2*a* has an outline intermediate in form and more like that of the Mammoth.

The spine is rounded, and the anterior angle of the shaft is barely traceable to the inner malleolus; consequently the middle and lower third in front are well rounded. On the posterior aspect there is a *deep concavity* below the head; and both outer and inner angles are pronounced on each side: the former can be easily followed to the outer malleolus, whilst the latter is scarcely so well defined, but still traceable. These peculiarities I shall revert to presently in discussing the characters of the young bone: they are present in the Asiatic tibia; but, if any thing, the internal is the more defined. As compared with the same bone in the following, it would seem that, although much less in length, its facets are even larger than those of the Sumatran, B.M. By comparison, I find the tibia of the latter and the admeasurements of Plate XV. figs. 1 & 2 to stand thus:—

	Length.	Breadth across head.	Antero-posterior diameter and breadth of outer cup.	Antero-posterior diameter and breadth of inner cup.	Girth at mid-shaft.	Distal breadth and antero-posterior diameter.	Fibular facet.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Sumatran, B.M.	21	5·5	2·0×2·5	3·0×2·5	7·5	3·2×2·4	2×8
Maltese (Pl. XV. figs. 1 & 2)	14·2	5·8	2·2×2·5	3·2×2·5	7·2	3·3×2·6	2×1

Even the youthful specimen (707*h*, B.M.) with which the fossil is exactly comparable as to length, has much smaller articular surfaces; and therefore the former, belonging to an adult, would represent a somewhat small elephant, which the largest Maltese form was unquestionably; indeed I doubt much if it exceeded 7 feet in height, at least as far as the data I have collected indicate.

Young and Immature Tibiæ.

Of these my collection presents four specimens, besides a very perfect left tibia from Zebbug, presented to me by the owner of the property in which the cave was discovered. The specimens vary considerably in dimensions, and evidently not only represent different stages of growth, but also distinct forms.

A *Series.*—The two shown in Pl. XXI. figs. 13 & 14, as before noted, were found close together in Benghisa Gap, under a large flat block of sandstone, and impacted among red soil with the associated remains shown in Pl. XXI. from fig. 1 to fig. 15 inclusive, all of which clearly evince that the exuviæ of no less than three distinct individuals were huddled together in a small space not over 2 feet square.

The Zebbug and larger Benghisa specimens (Pl. XXI. fig. 14), the smaller (fig. 13) being much eroded externally, agree in every respect, excepting that the former is much larger; both evidently belong to young individuals.

1. They agree with old bones just described in having a *deep* concavity posteriorly below the upper epiphyses (Pl. XXI. fig. 14) with the outer and inner ridges well shown; but whilst the internal is traceable to the inner malleolus, the outer is lost near the middle of the shaft, making the lower and external portion of the latter rounded.

2. There is a distinct flattening on the inner side of the head in all the specimens; but the outer side in these two is also *much flatter* than in the old bones and in the two next to be considered. As to the outlines of the epiphysial aspects (fig. 14*a*), I refrain from expressing any thing like a decided opinion, further than that the upper seem to me to have somewhat broader surfaces for the external condyles than obtains in the two other young bones; at the same time it would seem that the outer is relatively broad also in the adult, as seen in Pl. XV. fig. 3. Should this be the case, the above would be like the African, and the following like the Asiatic.

B *Series.*—The two next young bones are unfortunately imperfect, there being only the head and a portion of the shaft. But although the one is nearly twice as large as the other, they agree in characters which are *distinctly* different from the two just described.

1. The pronounced point in their diagnosis is the *broad shallow* hollow posteriorly below the head.

2. The ridges, although distinct, are not prominent as in the above and the old bones.

3. The external ridge terminates just below the concavity, whilst the internal would appear to be continued further down, probably to the ankle.

4. There is a very decided flattening of the inner side of the head, with a *far more* rounded and convex external aspect, both of which are *very* apparent when the four bones are placed side by side. With respect to the two latter features it may be stated that the same obtains in the adult bones (Pl. XV. figs. 1 & 3), which, however, in regard to the hollowing below the head behind are distinctly more like the former.

5. The external condyloid aspect is seemingly narrower than in the former; but I feel, in the absence of more perfect materials, that I should be verging on hyper-criticism to pronounce a decision on a point which gives so distinctive a character to the same parts in the two recent species.

As compared with the immature bones described by Mr. Busk, I find that the two former agree with his pl. 47. figs. 16 & 17, and the latter with his figs. 15, 20, & 21. He alludes to the nutrient foramen being placed higher up in the latter. This there is no means of proving, from the loss of the parts in which it exists; but in the Zebbug specimen in my possession, equivalent to Pl. XXI. fig. 14, it is placed in the lower third, and therefore in the position assigned to it by Busk.

X. Fibula.

1. The largest specimen of this bone is represented by the distal extremity (Pl. XV. fig. 4). As regards dimensions, it is in accord with the tibia (figs. 1 & 2) and astragalus (Pl. XVI. fig. 1), so much so that in all likelihood all belonged to the same individual, as they were found together. This distal end of the fibula has much the character of the African, the lower margin being slightly concave. Here the obliquity on the tibia just indicated is repeated on this fibula.

2. The smaller distal extremity (Pl. XV. fig. 5) is one of two perfect specimens (right and left) found near each other in Mnaidra Gap; they do not differ whatever in dimensions, and probably belonged to the same individual. Here we find the lower margin deeply notched as in the Asiatic. The tibial facet is not shown in the figure, but is well defined on the bone, and is scarcely so oblique as in the last, and measures 2·3 inches in breadth by 0·8 inch. Both figs. 4 & 5 represent the characters of old bones, although the latter has been broken across at its lower epiphysis. The former represents an individual of the largest dimensions above stated; the latter, one having an astragalus of the dimensions of Pl. X. fig. 10, which will be shown to have some characters in common with the Asiatic and Mammoth rather than the African.

3. An entire detached fibula was discovered in Benghisa Gap, belonging doubtless to the smallest form; the epiphyses were completely consolidated; and, like the others, it displayed all the characters of an old bone. The entire length was 8·6 inches, girth of the proximal end 2·5, girth of the mid-shaft 2, girth of distal end 4·4, breadth of distal end 2·6. A detached distal end of another fibula from the same situation measured 2·2 inches in breadth.

Summary.—Supposing, as Mr. Busk computes, the femur of Falconer's Elephant to be 13 inches in length, the above would be much too large; and if we allow femur Pl. XIV. fig. 3 a length of 22 inches, the proportion would be in excess on the side of the femur.

The femur and fibula of the Oxford-University and King's-College Museum specimens are 21 & 10 inches respectively; so that the maximum femur of *E. falconeri*, being given at 13 inches, would in proportion allow of only 6 inches to its fibula; and seeing that neither of the former was quite 4 feet, I am inclined to think Mr. Busk's estimate may be low for the femur of this pygmy, which, however, may have had shorter thigh- and leg-bones in proportion, just as I have pointed out in the tibia of the large form.

Patella.

A *Series.*—1. Four specimens referable to the larger form were discovered in Mnaidra and Gandia, and one belonging to the small form in Benghisa Gap. With reference to the former, the patella Pl. XV. fig. 8 is of the left side; the maximum breadth of its inner facet is 1·8 inch, and of the outer 1·3, the greatest thickness being 2·2.

2. Another of the same side is more oval in outline; its length is 3·7 inches, breadth of inner facet 1·6, and outer 1·4, the greatest thickness being 2. Both these and a third in the University of Malta, from Gandia Fissure, as compared with any of the femurs above described, seem to represent animals equivalent to the owners of the largest bones in my collection, *i. e.* to an elephant fully 7 feet in height. As compared with that of the Sumatran (British Museum), they are rather larger, seeing that its patella is 3·6 inches in length, the outer facet being 1·3, and inner 1·5.

3. The right and left femurs (Pl. XIV. figs. 1 & 2) had their patellæ evidently attached when deposited in Mnaidra Gap, seeing that between the condyles and the heads of their tibiæ there lay two patellæ, of which the right is shown in Pl. XV. fig. 7, and displays the same sharpness of the outer border as compared with the thickening of the internal, and thus characteristic of the last described, whilst the left, like fig. 8, is oblong. Its articular facets show, the outer 1·2 inch in breadth, and the inner 1·5, thickness 1·9, which are about the dimensions of the patella of the elephant in Guy's-Hospital Museum and in the Netley Hospital, both representing the adolescent stage and individuals about 6·5 feet at the shoulder. I am aware that this comparison does not tally with the relative lengths of the respective femurs; but the data furnished seem to show that the large Maltese form had altogether shorter and stouter extremities than, at all events, the Asiatic species.

B *Series.*—The perfect little patella fig. 6 being found so close to femur Pl. XIV. fig. 3, in Benghisa Gap, and being also of the right limb, renders it highly probable that they belonged to the same animal. The breadth of its external facet is 0·8 inch, and internal 1·1, thickness 1·4.

The characters of the patella in the two recent species are not different; but, as far as materials extend, it would appear that the bone is relatively broader in the African.

If this should turn out to be the case, at all events the last described is more like the Asiatic; but perhaps the left is never so broad as the right.

XI. Carpus.

Scaphoid.—In an articulated skeleton of a youthful Asiatic Elephant in the Museum of the Army Hospital, Netley, the first true molar is coming into wear, and about 1 foot of the incisor is protruding beyond the alveolus. The height of the animal seems to have been about 6·5 feet at the shoulder. The scaphoid in this instance shows distinctly the two points of ossification separated by a central mass of cartilage, the length of the bone being 2·8 inches. Again, in a disarticulated Ceylon Elephant (707*h*, B.M.), showing the last milk-molar in full wear, and a computed height of 5 feet at the withers, we find precisely the same condition of the scaphoid, which is 2·6 inches in length. Thus, whilst showing the unossified stage in the recent animal, they offer comparisons in this respect with the Maltese scaphoids, which, although of the same dimensions, show no traces whatever of the fœtal condition. A comparison between the same bone in the African and Asiatic furnishes the following data, at least as far as a single instance of the former enables me to determine. The outlines are different as regards the contour of the posterior border, which forms a hog's-back outline in the African and Mammoth, and is more or less perpendicular in the Asiatic, where it is relatively narrower at its middle. Again, the radial facet, as shown by Blainville[1], is nearly perpendicular in the latter and Mammoth, and nearly horizontal in the African. The trapezoidal and magnal facets form a triangle in the African, and are slightly concave. In the Asiatic and Mammoth the same are apparent on the magnal aspect; but the entire articular surface is quadrilateral and slightly convex about the middle, and oval at the summit, which is rather concave. These facets in both recent animals and Mammoth rise up the side of a protuberance on the lunare aspect, forming in the African a continuous articular surface where the facets of the different bones are not so defined as in the Asiatic and Mammoth. In my collection there are two adult scaphoids somewhat differing in size, outline, and arrangement of their facets.

1. The largest (Pl. XVII. fig. 10) is entire, with the exception of the anterior portion of the radial and almost the entire lunare facets, also a portion of the posterior inferior angle. The specimen has also sustained two fractures obliquely across its middle, which, however, do not interfere with the outline of the bone. The importance of this integral part in the motivity of the foot is calculated to be influenced by the animal's habits, as would of course the more anterior long bones; hence the necessity of a careful survey of these portions of the extremities. The following are the dimensions of the one in question:—Entire length 3·2 inches, greatest breadth (at the middle) 2·6[2];

[1] 'Ostéographie,' Atlas, iii. pl. v.

[2] This specimen agrees with the dimensions of the scaphoid of the youthful skeleton (2677A, R. C. S.), the dimensions of the Sumatran (B. M.) being 3·7 by 2·5 inches.

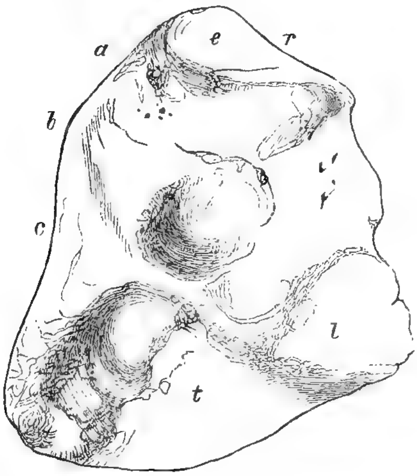
the breadth of the radial facet is 1 inch. The distal articular surface in this specimen differs from any of the recent and the next specimen in the following particulars:—The conjoined surfaces for the trapezoid, trapezium, and magnum form a single rounded facet, which is 2·1 inches in the antero-posterior diameter to 1 inch in length.

Unfortunately the antero-posterior measurement is somewhat vitiated in consequence of the posterior angle being broken off; but I apprehend it was nearly, if not quite, 2·1 inches; and there being no line of demarcation between the facets, it is impossible to define each. The pronounced eminence on the lunare or external aspect, and its large articulating surface, being absent, we might surmise that this scaphoid, owing to the diminished size of the magnal facet, was more erect than obtains in both recent species and in the Mammoth. I find, however, on comparing this surface in old and young bones of the Asiatic that the relative differences between the length and breadth are reversed, so that, as a character, the above is not to be relied on. The upper lunare facet is too much abraded for description; the lower lunare, however, is well defined anteriorly, forming by its sharp and prominent angle an articular surface 1·8 by 0·6 inch. The maximum thickness of fig. 10 is 1 inch.

Now, as regards its connexion with recent species, in outline it is like the African and Mammoth's; but in the form and direction of the radial surface it seems more like that of the Asiatic and Mammoth; whilst it differs from the three in the contour and extent of the distal facets.

2. An almost perfect right scaphoid from Benghisa Gap is shown in woodcut fig. 4,

Fig. 4.



Scaphoid. Nat. size.

which represents a smaller Elephant, but still an adult. It differs from fig. 10 in the following characters:—The radial surface (*r*) has the horizontal aspect of the African;

but the contour of the posterior border (*b*), instead of (as in fig. 10, the Mammoth, and African) forming a hog's back, has a hollow at *c*, and the margin is much thinner. Again, like the Asiatic, there is a flattening at *a*, which is round in the others; and the lunare facets (*l l*) are larger in proportion than in fig. 10. But in the lower border being rounded and the facets covering the side of an eminence in the form of a triangle (*t*), as in the recent species and in the Mammoth, with a decided determinable facet for the trapezoid and magnum, we obtain features which at once distinguish this scaphoid from fig. 10. The following are the dimensions of the woodcut—entire length 2·8 inches, extreme breadth 2·4, radial facet 1·3 by 0·8, aspects for trapezoid and magnum (by tape) 2·2 by 1·4, upper lunare facet 0·8 by 0·5, lower lunare facet 0·9 by 0·9.

The relative dimensions of this scaphoid as compared with recent species would show an animal a little over 5 feet in height; the specimen being somewhat larger than that of 707 *h* (British Museum) just referred to.

Lunare.—This bone is represented in my collections by *four* entire specimens, which differ in size and characters as follows:—

1. The largest (Pl. XVIII. fig. 1) is equal in size to that of the Sumatran Elephant (British Museum). Its dimensions are—maximum length 3·8 inches, breadth 3·3, thickness 2, radial facet 2·5 by 2·5, ulnar 1·4 by 0·7, cuneiform facet 1·6 by 0·5, upper cuneiform facet 1·2 by 0·2. The scaphoidals are abraded; the magnal is 2·7 by 2·6 inches.

2. Another (B), somewhat smaller, of the right foot, from Benghisa Gap, has its length 3·6 inches, breadth 2·9, thickness 1·7, radial facet 2·4, ulnar 1 by 1, cuneiform (abraded), scaphoidal (upper) 1·4 by 0·4, lower 0·8 by 0·3, magnal 2·7 by 2·6. Although these two lunaria are closely allied, as regards size and in proportion they might have fairly appertained to the two scaphoids just described, inasmuch as each pair were found close together in two separate localities; indeed, moreover, as the scaphoids differ, so do the former to some extent. Thus fig. 1 differs from B in its ulnar facet being more perpendicular, the radial and magnal surfaces are not so concave, the latter surface is also narrower. Fig. 1 has consequently an African's character, whilst B is decidedly more like the same bone in the Mammoth and Asiatic. I doubt, however, if these discrepancies are altogether maintainable throughout a series of each; and therefore, although noteworthy, they are to be considered merely provisional; it is strange, however, that two lunaria so nearly of the same dimensions should differ in characters to the extent observable in the two Maltese bones just described.

3. The next lunare (represented, Pl. XVIII. fig. 4) is very like the last described, but it is much smaller, and bears a very close relationship in this respect to the distal ends of the radius and ulna Pl. XIII. figs. 2 & 3, not only in size, but in the configuration of their articular surfaces, just as the less shallow and less convex radial aspects of Pl. XVIII. fig. 1 consort with the opposing surfaces of radius Pl. X. fig. 6.

It is noticeable, however, that in Pl. XVIII. fig. 4, there is a protuberance at the apex of the bone internally, which is not nearly so prominent in the preceding lunaria. The determined hollowing of the upper surface of this specimen resembles that seen in full-grown individuals of the Asiatic—to wit, the Sumatran. The dimensions of fig. 4 are—maximum length 3 inches, breadth 2·5, thickness 1·4, radial facet 2·2, ulnar facet 1·3 by 0·6, cuneiform facet 0·9 by 0·3, lower magnal 2·3 by 2·1. The ulnar facet is oblique.

4. The diminutive lunare Pl. XXI. fig. 1 will be described with the other members of the same foot; suffice it at present to say that in the particulars just stated it is of precisely the same type as Pl. XVIII. fig. 4.

Cuneiform.—Of this important element of the carpus my collection affords no less than seven specimens, which differ considerably in size, and for the most part in characters.

A *Series*.—1. The largest is represented in Pl. XVIII. fig. 2. It is a right cuneiform from Gandia Fissure, so prolific of the remains of the largest form of Elephant. The extremity is wanting, including nearly all the pisiform and external portions of the ulnar and unciform surfaces; the body, however, is preserved, and gives the following admeasurements—extreme breadth 3·1 inches, thickness 2 inches, ulnar facet (antero-posterior) 2·3 inches, upper lunare 1·5 inch, lower lunare 1·6 by 0·5 inch, antero-posterior of unciform 2·7 inches. This cuneiform, although of the opposite side, and from a different situation, might, as regards dimensions, have belonged to the owner of the lunare Pl. XVIII. fig. 1.

2. The left cuneiform shown in Pl. XVIII. fig. 5, although considerably smaller than the above, is, as far as I can make out, identical in character, and may therefore be supposed to belong to a much smaller individual of the same form. It has lost about the same parts as in fig. 2; but the following measurements are procurable: the extreme breadth is 2·4 inches, thickness 1·4 inch, ulnar facet (antero-posterior) 1·8 inch, upper lunare 1·1 inch, lower lunare 1·4 by 0·3 inch, unciform facet (antero-posterior diameter) 2·1 inches.

3. Another, but still more mutilated, fragment of a left cuneiform from Gandia Fissure, of the exact dimensions of the last, completes the list of specimens attributable to the same type. In comparison with the same bone in recent species, figs. 2 & 5 are relatively much thicker, more especially at the external margin of the pisiform facet, where the maximum grossness usually obtains; and seemingly the latter is greater in the Asiatic than in the African. The above have narrow upper and lower articular surfaces, with large concavities and convexities, as obtains also in the Asiatic and not, to all appearance, in the African. The lunare facets, like all the small lateral attachments of the foot-bones, are subject to considerable irregularities, sometimes occupying the entire margin, in others a portion only. The latter is the case in these fossils; but in the African (708 *h*, B.M.) and the cuneiform of an old Asiatic Elephant (no. 2543) in

the Royal College of Surgeons it covers the entire lower margin. It is probable therefore that the three belonged to one species, the largest being that of an adult, the two smaller being immature bones; and this is borne out to some extent by the smoothness of the exterior of the latter as compared with the rugosities and irregularities of fig. 2 [1].

In all apparent differences between the cuneiform of the Asiatic and African Elephants, such as the greater breadth of the ulnar and cuneiform surfaces of the African as compared with the narrow aspects of the Asiatic, there is a remarkable contrast between those just described and the following, which display the characters of the African. Moreover, by the much narrower internal border at *a*, figs. 7, 8, & 9, the lunare face is diminished in height, so that when placed side by side with figs. 2 & 5 there is no difficulty whatever in distinguishing the former from the latter. Whether it is a regular point of distinction or not, on examining various cuneiforms of all ages of the Asiatic Elephant, I find that the fifth metacarpal facet near the extremity is not observed, excepting in bones of aged individuals. Unfortunately none of the largest specimens are sufficiently preserved at the apex to show this surface; however, it is preserved in fig. 8, and even in the very diminutive cuneiform, fig. 7.

B *Series.*—1. The largest specimen (fig. 9) shows the ulnar surface of a right cuneiform. The apex has sustained a recent injury, and the lunare facets are abraded; otherwise the specimen is entire, and affords the following:—extreme length (about) 3 inches, breadth 2·5 inches, ulnar surface (antero-posterior) 2·2 by 2 inches. The pisiform facet is in the form of a right-angled triangle, with the base uppermost; height 1 inch, breadth 1 inch, unciform surface (antero-posterior) 2·2 by 2 inches; thickness at the middle of the pisiform facet 1·4 inch, and at middle of the lunare side 1 inch.

2. An imperfect bone of the same side, showing only a portion of the ulnar surface, is of the same or slightly larger dimensions. The smaller right cuneiform (fig. 8) has its pisiform facet and point considerably abraded, preserving, however, the body entire, with, as just stated, the fifth metacarpal facet on the border of the apex. This specimen, although probably of the same type as the two preceding, has relatively a rather deeper concavity at *a*, on the internal ulnar surface; indeed so contracted is the height of the bone in this situation that there is no room for the lunare facets; and the margins are sharp instead of even; but with these exceptions it agrees with fig. 9. The following are its admeasurements:—entire length 2·5 inches, breadth 2; ulnar surfaces—antero-posterior diameter 1·6, transverse 1·9; unciform aspect—antero-posterior diameter 1·9, transverse 1·8; thickness at middle of pisiform facet 1·1, thickness at middle of lunare side 0·4.

3. Like the preceding, fig. 7 was also found in Benghisa Gap, so prolific of remains of the smallest form. Here the pisiform facet is abraded; but the fifth metacarpal impression is very distinct, and the extremity is completely ossified—a feature of im-

[1] These cuneiform bones agree in characters with specimens in the Palæontological Collection, British Museum, referable to the Mammoth and *Elephas antiquus*.

portance, seeing that it is rarely entire in recent species until the milk-teeth are shed[1]. The entire length is 2 inches, breadth 1·4, ulnar surface (antero-posterior diameter) 1 by 1·5, unciform (antero-posterior diameter) 1·3 by 1·2, thickness at middle of pisiform facet 0·8, thickness at middle of lunare aspect 0·4. The narrowness of the border scarcely allows space for an articulating facet. The characters, therefore, of this diminutive wedge-shaped bone are precisely like figs. 8 & 9. It may be remarked that the cuneiform in the very young skeleton in the Oxford University Museum is 2·5 inches. Thus, in proportion, the owner of the above must have been very little over 2 feet in height, and as compared with the very small, yet perfect, foot-bones (Pl. XXI. figs. 1–7) shows a still smaller Elephant. The claims of fig. 7 to be considered a mature bone rest, as just stated, on the ossification of its apex and the determined outlines of its facets, neither of which is ever seen in young bones; and most assuredly in no other instances of such a small cuneiform are their characters preserved; indeed, in examples of those of recent species of double its size we find the surfaces and apex quite detachable.

Summary.—From the above it would seem that they represent at all events two distinct forms of cuneiform—one, the larger, assimilating to characters referable to the Asiatic, whilst another has several points, seemingly, in common with the African, the two forms showing much variability as to dimensions.

Pisiform.—In the skeleton no. 2677 A, Royal College of Surgeons, to which many of the bones just described bear relative proportions, its pisiform equals the largest (Pl. XVIII. fig. 3), but with this difference, that the former has the distal epiphysis detachable, and the same is not only completely consolidated in the fossil but also in the much smaller pisiform, fig. 6. Blainville figures this bone in the African and Asiatic Elephant[2] as showing the cuneiform facet triangular and the ulnar horizontal in the former, whilst in the latter, he states, the first is oval and the second oblique. These distinctions do not appear in the recent specimens I have examined, where the differences are confined to the general outline of the bone, the Asiatic being more spiral, with a large concavity on its posterior aspect—which character is common also to *all* the Maltese pisiforms, amounting to four perfect and two imperfect specimens. The two largest (right and left), possibly portions of the same animal, were found in conjunction with lunare fig. 1 in Mnaidra Gap.

1. The left is shown in fig. 3.

The cuneiform facet is relatively narrower than obtains apparently in either recent species; and the outline of the bone is more like the African than the Asiatic, especially in being less hollowed out posteriorly. Again, the ulnar facet is more oblique than in any of the living Elephants. The cuneiform surface is flat and oval, its length is 1·1 inch, and breadth 1, the ulnar (antero-posterior diameter) being 1·1 by 0·5. This specimen is also about equal to that of the Sumatran in the British Museum.

[1] The apex of this bone in the skeleton no. 707*h*, B.M., is cartilaginous, the bone being 3 by 2·6 inches.

[2] Atlas, vol. iii. pl. 5.

2. The pisiform of a smaller Elephant is fairly represented by two perfect cuneiforms (right and left) from Mnaidra Gap. They were found close together, and probably belonged to the same individual. In outline and facets they seem to agree with the last, differing only in their smaller size. The right is shown, Pl. XVIII. fig. 6, with its distal epiphysis *completely* consolidated. The distal half of another specimen, of the same size, and a third, a little larger, display the *same character*, only that the external surfaces of all are smooth, and do not show the rugous appearances which characterize the large specimens and old pisiforms of the recent species; the cuneiform facet of fig. 6 is 0·8 by 0·6 inch, and the ulnar 0·6 by 0·4. This bone equals that of the young elephant 707 *h*, British Museum, and therefore may have been equivalent to the cuneiform, fig. 9, whilst, I repeat, it differs from the recent specimen in having its distal epiphysis completely consolidated, whereas in the above it is detachable; indeed the latter obtains even in the pisiform of the Asiatic, with its first true molar in wear. These two pisiforms therefore represent a large and a small Elephant, in accordance with the preceding foot-bones.

Trapezoid.—No trapezium turned up; but an entire right trapezoid was found in Mnaidra Gap, and unfortunately was much injured during attempts to remove it from the hard stalagmite. Pl. XVII. fig. 11, shows its second metacarpal (*a*) and trapezial facet (*b*). The scaphoid facet, which is convex in the African and somewhat concave in the Asiatic, is seemingly more concave in the fossil, and might suit the pronounced concavity pointed out in the smaller scaphoid. The second metacarpal facet is 1 inch in breadth, the trapezial is 0·8, the second metacarpal is 1·2, the magnal 1·1. The extreme thickness of the bone is (about) 1·5 inch. The specimen is in keeping relatively with the scaphoid shown at p. 67, and therefore belonged to a small elephant.

Magnum.—This bone is represented in my collection by no less than five specimens, some of which, however, are but mere fragments. All are remarkable, as compared with recent and fossil species, in being relatively narrower laterally, as will appear from the following comparisons between them and magna of nearly the same length in the Asiatic species. In the first place they admit of being divided into two series, on the score of dimensions and characters.

A *Series*.—1. The largest magnum (Pl. XVII. fig. 13) shows the trapezoidal aspect. It has been considerably abraded on the dorsal surface, and also externally, but is otherwise pretty entire.

2. Another of the right side, and of the same dimensions, has lost part of the lunare surface.

B *Series*.—1. With the exception of the loss of the lower internal angle, the specimen shown in fig. 14 may be said to be almost entire.

2. Another specimen, differing little in size from the last, is also of the left foot. Its anterior surface is completely destroyed; but the posterior articular aspect is preserved, and furnishes the data requisite to complete the loss of substance in fig. 14.

Table of comparisons between the magnum in the Maltese and recent Elephants.

	Length.	Breadth.	Lunare aspect.	Second metacarpal surface.	Third metacarpal surface.	Unciform facet.	Trape-zoidal.	Extreme thickness.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Sumatran (adult) .... (Brit. Mus.[1]).	3·5	2·8	2·6 × 2·5	2·3 × 1·7	2·4 × 1·7	2·3 × 1·5	2·4 × 1·0	2·4
A *Series* (Pl. XVII. fig. 13) .. (Maltese.)	3·4	1·8	2·8 × 1·8	2·2	1·2	2·5 × 1·5	2·3 × 1·0	2.4
B *Series* (Pl. XVII. fig. 14) .. (Maltese.)	2·7	1·4	2·3 × 1·4	1·7 × 0·4	1·9 × 1·3	1·7 × 1·0	1·9 × 1·2	2·0

Besides the narrow lateral dimensions, in which all the Maltese magna seem to differ from recent or fossil species, there is a small protuberance on the posterior margin (fig. 14, *a*) of the second metacarpal facet, which is common to all and also the African, but not apparently to the Asiatic. But the members of A and B series consort with their respective lunaria, inasmuch as the large lunare (Pl. XVIII. fig. 1) has a shallow magnal aspect as compared with the deeper concavity on fig. 4, and just precisely we find equivalent opposing surfaces in Pl. XVII. figs. 13 & 14. At all events, looked on as mature bones, we are justified in accepting them as representatives of a large and a small form.

Unciform.—This bone is represented in my collection by five nearly perfect and one fragmentary specimen. These are divisible into small and large, and seem to agree with the preceding, as far as relative dimensions are concerned.

A *Series*.—The largest specimens amount to three, which are about the same size. One is represented, Pl. XVII. fig. 12, and might, as far as the dimensions of its cuneiform aspect extend, have belonged to the same individual as the largest cuneiform (Pl. XVIII. fig. 2). It is about equal also to that of the Sumatran (B. M.) and the unciform of the articulated skeletons in the Museums of the Army Hospital at Netley and Guy's, London, all of which show the same dental conditions, and are between 6·5 and 7 feet in height. The articular aspects of the fossils show slight differences in the degrees of convexity and hollowing out; and the inclined surface for the apical portion of the cuneiform is not so abrupt in them as in the Asiatic; neither would it appear that the surfaces for the third and fourth metacarpals are quite so concave as in the Asiatic. In these respects they are more like the African[2].

[1] The magnum (16065 in Brit. Mus.), referable to the Mammoth, from Miss Baker's collection, made in Northamptonshire, is even smaller than the Sumatran; and although doubtless belonging to a young Elephant, the facets are *bold* and *well defined*. Had the bone been subjected to calcareous infiltration, it would assuredly have been undistinguishable as regards characters and dimensions from the largest Maltese specimen referable to adult individuals.

[2] Blainville (vol. iii. p. 42) states that the unciform in the Asiatic has no facet for the third metacarpal, and in consequence it differs from the African. As far as 708 *h* (African) in the British Museum, and many Asiatic and Mammoths' ossa magna, also the Maltese are concerned, this facet *is* present.

B *Series.*—1. A smaller-sized unciform, differing also in character, is shown in fig. 9. It is of the left foot, and its upper surface is abraded; and a transverse fracture when the bone was fresh had displaced the metacarpal surfaces, so that little more than its general dimensions can be relied on safely. At a glance it will be seen that it is broader relatively than fig. 12. Now, as we have seen that the smaller cuneiforms (Pl. XVIII. figs. 7, 8, & 9) show this peculiarity as compared with the largest (figs. 2 & 5), the above may be regarded as belonging to the same type or form.

2. Another left unciform (B) is considerably smaller than fig. 9, but displays the like broad cuneiformal aspect. It is important to show their differences in comparison with each other and recent species; I therefore give the dimensions in the following Table:—

Table of comparisons between the unciform in the Maltese and recent species.

Specimens.	Length and breadth.	Cuneiform surface.	Fifth metacarpal facet.	Fourth metacarpal facet.	Third metacarpal facet.	Magnal facet.	Thickness.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Large (Maltese)	3·4×3·2	3·4×2·6	1·5	2·2×2·2	2·3×0·7	2·6×1·2	2·5
Large (Maltese), Pl. XVII. fig. 12	3·3×3·2	3·3×2·4	2·2×1·4	2·1×2·2	2·3×0·7	2·5×1·2	2·4
Large (Maltese)	3·4	3·0	1·3	....	....	2·0×1·1	2·4
Small (Maltese), Pl. XVII. fig. 9	2·5×2·4	2·4×2·4	1·8×1·0	1·8×1·4	1·8×0·4	2·2×0·8	2·0
Small (Maltese)	2·1×2·0	1·8×1·8	1·3×0·7	1·4	1·3×0·5	....	1·5
2677 A, R. C. S. (Asiatic)	3·4×3·3	3·0×2·4	2·2×1·4	2·2×2·2	2·4×0·6	2·7×1·5	2·7
Sumatran Elephant (B. M.)	3·7×3·2	3·5×2·4	2·0×1·6	2·5×1·8	1·8×0·6	2·3×1·5	2·4

It will be seen in this Table that the largest Maltese unciform represents an animal nearly as large as the Sumatran (B. M.); whilst the smallest would indicate an Elephant somewhere, as Dr. Falconer has remarked, about the height of a large Javan one-horned Rhinoceros, with characters differing as regards the configuration of its cuneiform and unciform from the larger form.

Portion of a Left Fore foot found in situ.

Among the very variable materials discovered by me in different localities, one of the most heterogeneous assemblages of Elephantine remains are those figured for the most part in Pl. XXI. They were discovered in Benghisa Gap, firmly packed in red soil, and below blocks of water-worn stones, and lay in a space of not more than 2 feet either way. Along with the bones shown on Pl. XXI. figs. 1 to 15, were also the skull and tusks (Pl. I. fig. 18). The suggestive conditions in which the remains were found have been discussed at some length in my work[1]. I shall therefore proceed to the description of a portion of a left fore foot found along with the other bones. The following specimens raise the question at once, whether or not they are to be considered full-grown, immature, or young bones.

[1] 'Nile Valley and Malta,' p. 189.

When the lunare, unciform, first, second, fourth, and fifth metacarpals shown in Pl. XXI., are compared with the foot-bones Pl. XVI. fig. 3, Pl. XVIII. fig. 7, Pl. XIX. figs. 6, 7, & 9, and Pl. XX. figs. 2, 3, 14, & 16, and in consideration that the epiphyses of the metacarpals are consolidated, and that the prominences on the carpal bones are bold and well defined, I see no possible conclusion to arrive at than that they represent portions of the fore foot of an adult pygmy form of Elephant. Even allowing for the preservative influence of calcareous infiltrations in filling up and consolidating solutions of continuity and preserving the outline of a cartilaginous surface, there is not only the matured aspect of the carpal, but, I repeat, the epiphyses of the metacarpal bones are *completely* solidified.

The left *lunare* (Pl. XXI. fig. 1) might, as regards characters, be considered that of the young of specimen B, or even of the still smaller lunare shown in Pl. XVIII. fig. 4. Here there is the same large sloping ulnar facet, the excavated border for the scaphoid, the deep concavities for the radius and magnum, and the knob at the apex of the bone which characterize the above as compared with that of the largest form (Pl. XVIII. fig. 1). Strange to say, the last is from Mnaidra, and the three others were obtained from Benghisa, so fruitful of remains of the small form. The following are the dimensions of fig. 1—length 1·8 inch, breadth 1·7, thickness 0·9, radial surface 1·5 by 1·1, magnal surface 1·5 by 1·5, ulnar 0·7 by 0·6, cuneiform 1·2. The scaphoidal is abraded. The dorsal surface, as in Pl. XVIII. fig. 4, is more hollow than in the other two larger bones; but these may be, as well as several other characters, only mere individual differences.

Unciform.—There are two specimens precisely alike, and which undoubtedly belonged to the same individual. The right is considerably eroded by decay; but the left (Pl. XXI. fig. 2) is perfect. In outline, and the characters pointed out on the upper surfaces of Pl. XVII. figs. 9 & 12, it seems to resemble the latter more than the other. The following are its dimensions as compared with them—maximum length 1·9 inch, breadth 1·7, cuneiform aspect 1·8 by 1·3, fifth metacarpal facet 0·8 by 0·6, fourth metacarpal facet 1·2 by 1·1, third metacarpal 1·1 by 0·3, magnal 1·4 by 0·5, thickness 1·4.

First Metacarpal.—The difficulties in distinguishing certain of the long bones of the fore and hind feet from each other, more especially among the diversified and often imperfect materials in the collection, are here shown. The characteristic bone (Pl. V. fig. 4) might have as likely been a first metatarsal of the larger form as a first metacarpal of the smaller, but for its diminutive compeer (Pl. XXI. figs. 3 & 3*a*), which was found close to the lunare and unciform (figs. 1 & 2), and the following metacarpal bones, all of which belong unquestionably to the same left foot. The characters I shall describe as diagnostic of Pl. V. fig. 4, are here repeated. Moreover the epiphyses of fig. 3 are consolidated; and the outline and facets are so pronounced, that there is no getting over the belief that it is a matured bone. The knob on the lower aspect of the proximal end and the ginglymoid distal facet, together with the oval and concave trapezial surface, are all pronounced as in any old bone. The dimensions of this very pygmy first metacarpal are sufficiently shown in figs. 3 & 3*a*, to which may be added the anterior facet somewhat eroded; it is 0·6 inch in height by 0·5 inch in breadth. The stumpy little bone, Pl. XIX. fig. 9, has much the same characters as the above, and might represent the first metacarpal; its facets, however, are imperfect. It may be stated that in the Oxford University specimen, and also the very young individual in King's College Museum, this bone is 1·2 inch in length, with its extremities cartilaginous and shrunken.

Its comparative characters, as far as discernable, are:—

1. Like the African, it is short and stout.
2. Like both recent, its trapezial facet is oblong and concave.
3. Like the African, it has a hollow distal articulation.
4. The lower surface of the bone is rather sharp, like the Asiatic; but in none of the Maltese first metacarpals are the lower surfaces exactly like either of the recent species, being blunt, but not flat or tectiform. Take it all in all, this bone, like Pl. V. fig. 4, has greatly the African character.

Second Metacarpal.—Pl. XXI. figs. 4 & 4*a* represent an entire specimen. Here the epiphyses are clearly consolidated, even to the formation of the usual rugous ridges of an old bone. It is rather flat on the dorsum of the shaft, which, as before observed, characterizes the old from the young bone in recent species; it is, moreover, slender, and has perhaps more of an Asiatic character. Besides the dimensions in the figure, the breadth of the mid-shaft is 0·7 inch, the distal articulation is 1·0 by 0·8.

This metacarpal shows the usual obliquity of the distal extremity seen in the second bone of the fore foot, with the internal surface of the shaft sharp and little rounded, and external flat and deep, the lower surface being rather rounded, narrow, and sloping inwards to form the sharp inner border of the carpal facet.

The length of the second metacarpal in the above-mentioned recent young Asiatic Elephants is 2·3 inches respectively, whereas the length of fig. 4 is 1·9 inch.

Fourth Metacarpal.—A careful comparison between figs. 5 & 5*a* and the other diminutive specimens referred to this toe in the hind foot (to wit, Pl. XIX. fig. 6) and the perfect fourth metatarsal figured and described by Busk[1] gives the following:—The above is relatively much broader than fig. 6, the shaft of which is rounded and has little of the internal flattening which distinguishes this bone and that of Elephants in general; moreover the sharp external border of fig. 5 is rounder in fig. 6, the articular surfaces are much broader; they agree in length however. In all respects fig. 5 and the Zebbug bone agree; only the latter is smaller, which is quite in keeping with its being a bone of the hind foot. The following are the dimensions of fig. 5 not shown in the Plate:—height of mid shaft internally is 0·6 inch; the distal

[1] Trans. Zool. Soc. vi. p. 271, pl. 51. figs. 40 *a* & *b*.

articular aspect is 1 by 1. The length of the same bone in the two skeletons just referred to is 2·5 inches in the Oxford-University, and 3 inches in the King's-College specimens; but young bones of the age of the latter are so shrivelled at their extremities that it becomes difficult to obtain the original dimensions. At all events, neither of the above is by any means so small as those three bones, and in particular fig. 5, which is only 1·8 inch in length.

I believe the perfect little sesamoid, fig. 7, which was found under fig. 5, belonged to it; regarded as elephantine and a mature bone, it is unique.

Fifth Metacarpal.—The specimen, fig. 6, may be said to represent an almost perfect miniature of the bones shown in Pl. XIX., more especially fig. 12. Portion of the distal facet has decayed away; but otherwise this very small left fifth metacarpal is entire. The proximal facets are shown at *a*. The phalangeal and the sesamoid facet is 0·7 by 0·5 inch in breadth. The outer surface is rough like an old bone. The fifth metacarpal in the Oxford specimen is 2 inches, and King's-College Museum 1·7 inch in length, whereas the above is only 1 inch in length.

Now, with reference to these small foot-bones, all of which seem to bear so pointedly towards the establishing of a dwarf form of Elephant, it comes to be a question how far they admit of a connexion with the fragments of skull, teeth, tusks, and long bones with which they were associated; and this, in comparison with recent species, is easily answered. It is clear that neither the humerus (fig. 9), ulna (fig. 10), tibia (fig. 13), nor any of the other exuviæ surrounding them, excepting perhaps the portion of the skull (Pl. I. fig. 18), could have pertained to the owner of the above fore foot. Moreover, seeing that the two examples of recent calf Elephants adduced stand respectively about 38 to 40 inches in height, and that Mr. Busk computes his *Elephas falconeri* at between 30 and 36 inches, we may fairly suppose the above ranged between the two last figures, which would, in proportion to the recent specimens, give the same measurements. In no Elephant's bones I have examined, where the milk-molars are in use in the jaws, are the epiphyses united; indeed, as far as the specimens (mostly, however, domesticated individuals) in museums of Great Britain extend, the condition of the metacarpal bones just described is not attained until the second true molar is fairly invaded; and even then the epiphyses of the larger members of the extremities are not consolidated. How far the abnormal habits and food, as compared with the feral state, have to do with the period of union is not quite apparent; moreover, in the primordial state of these pachydermata union may have taken place earlier in life than at present. Suffice it, however, to say that, allowing the fragment of upper molar in the jaw Pl. I. fig. 18 to belong to the last of the milk-series, and that the first true molar was in full wear then, we might suppose that the members of the left fore foot just described belonged to the same individual.

General Summary.—It will be apparent from the foregoing that the bones of the carpus admit of the following:—

1. The *Scaphoid* (Pl. XVII. fig. 10, and woodcut fig. 4) represent two distinct forms, differing in characters and size; and whilst the larger differs in a few points from the other and recent species, it agrees in general outline with the African, whilst the other, representing a considerably smaller foot, displays the configuration and several points distinctive of the Asiatic and Mammoth.

2. The *Lunare* furnishes a greater diversity as to dimensions. The larger (Pl. XVIII. fig. 1) might have belonged to an individual nearly, if not altogether, 7 feet in height, whilst specimen B is in fair keeping with the smaller scaphoid, and fig. 4 belonged to a much smaller individual, and Pl. XXI. fig. 1 to a perfect pygmy. Again, whilst the largest (fig. 1) shows characters of the African, specimen B and fig. 4 show those of the Asiatic and Mammoth, which is seemingly the case with the pygmy lunare (Pl. XXI. fig. 1).

3. The *Cuneiform* seems to follow the same rules, although with less variability in character. Thus the largest (figs. 2 & 5), seemingly large, and the small individuals of one form show a decided Asiatic character, the larger consorting well with the lunare (fig. 1); whilst the smaller cuneiforms (figs. 9 & 8), with their relatively broader upper and lower surfaces, assimilate to the African type, and agree in regard to some with lunare figs. 4 & 9, which might have belonged to the same individual, having been found together. The pygmy bone (fig. 7), indeed, like that of an adult, shows the African characters.

4. The *Pisiform* repeats the characters of a large and smaller form; and, as far as any marked characters extend, both seem to approach the African species.

5. The *Trapezoid* evidently belonged to the smaller form.

6. The *Magnum* agrees in being relatively narrower in all the Maltese than in recent species, and shows varieties as regards dimensions, there being large, intermediate, and pygmy forms.

7. The *Unciform* shows large, small, and pygmy forms, evidently differing in breadth of the upper aspect, as shown by Pl. XVII. figs. 9 & 12, the former being relatively broader. There is, besides, the pygmy unciform shown in Pl. XXI. fig. 2, which is like Pl. XVII. fig. 12.

Allowing for individual differences in regard to age and sex, or even allowing race-characters, I think in the foregoing data in connexion with the carpus, there are good evidences of three, at all events of two, distinct forms of Elephants. The largest may have attained the height of about 7 feet, whilst the smallest bones indicate an Elephant apparently not much over 3 feet in height. Allowing, therefore, for variability to the fullest extent permissible with what is known of other species, the extremes here shown clearly point at least to two species. As regards these distinctions, it seems to me, as far as the carpus is concerned, that very little can be deduced from characters peculiar to either; indeed this may be said more or less of the two recent species; and although I have noted what appear to be discrepancies in the contour and configuration of facets, it must be borne in mind that in the case of the African the above characters rest on what a single specimen displays. Again, we must allow for disparities in specimens of the Asiatic, seeing that the majority of instances are obtained from individuals long domesticated, and therefore subjected to the constraint which would doubtless influence the aspect of the bone, more especially its articular facets.

XII. Tarsus.

Astragalus.—This bone is represented in my collections by seven specimens, belonging to at least five individuals. As regards dimensions, they are divisible into three distinct sizes—a large, a median, and a pygmy, which differ in the following particulars.

A *Series.*—1. The largest astragalus of an Elephant I have examined from Maltese deposits, is shown in the collection by a fragment (A) from Gandia Fissure. It consists of only about 2 inches of the inner portion of a right astragalus, divided perpendicularly by probably a pickaxe. There is preserved the inner antero-posterior length of the tibial facet, which is 3·4 inches by callipers, and 3·8 inches by tape.

2. Two nearly perfect specimens (right and left), the former represented in Pl. XVI. fig. 1, were discovered by me in Mnaidra Gap, each adhering firmly to the distal extremity of the tibiæ Pl. XV. figs. 1 & 2, to which they undoubtedly belonged. The dimensions are:—antero-posterior tibial surface 3 inches by 3·5 inches, navicular facet (by callipers) 3 inches broad by 1·8 inch; the arc (by tape) is 3·5 inches. Outer calcaneal facet has an antero-posterior surface of 2·2 inches, and transverse of 2·3 inches; the inner is 2·5 inches by 1·1; the peroneal is 1·4 inches in antero-posterior by 0·8 inch.

3. Although smaller than the two just described, and as regards dimensions might be classed with B series, there are two perfect specimens (right and left, evidently of the same individual) from Mnaidra Gap; the left is represented in Pl. XVI. fig. 2. The admeasurements of its facets are:—tibial 2·5 by 2·6 inches in breadth; naviculare 2·9 inches broad by 1·5 inch; arc, by tape, 3 inches; peroneal facet 1·4 by 0·7 inch; internal calcaneal, antero-posterior 1·9 by 0·9 inch transverse; external calcaneal, antero-posterior 1·9 by 2·2 inches transverse. The interosseous pit does not, as in the recent and fossil species, traverse the entire breadth of the under surface, but ends in a deep cavity about the middle, so that the two calcaneal facets are not divided by a fossa. This character, moreover, is common to the three forms of astragalus from Malta. The posterior border is curved in all the Maltese forms, with a projecting angle at the internal extremity. The same obtains to a less extent in the Indian, Mammoth, and *E. antiquus*, but not apparently in the African and *E. meridionalis*, the margin being almost even in them. Both in recent and in all other fossil species I have examined, with the exception of the astragali of B and C series, the tibial facet is nearly surrounded in front and internally by a sulcus, which in some specimens insulates the articular surfaces altogether; in others the valley terminates near the inner and posterior angle. Now, while the latter obtains in the above Maltese specimens, they differ from any recent or fossil I have seen

in the circumstances that the anterior sulcus ends short of the peroneal facet, as seen in figs. 1 & 2, moreover it is not so broad in them, and ends abruptly instead of shallowing out towards the external extremities; so that the undulating anterior margin of the tibial facet, observed in the recent species and in the next two series, is wanting in A series.

As regards dimensions, the largest of these astragals do not represent an animal quite 7 feet in height; the admeasurements of fig. 1 almost equal the young Asiatic species (2677 A, Royal College of Surgeons); and the fragment A belonged to an Elephant nearly as large as the Sumatran in the British Museum, whilst fig. 2 was probably that of a younger individual of the large species.

B *Series.*—The left astragalus of my collection, Pl. X. fig. 10 (and figured by Mr. Busk in his monograph[1]), differs considerably from any of the above. It was found in Benghisa Gap in conjunction with other remains here described as belonging to the smaller form. Although of the dimensions or thereabout of Pl. XVI. fig. 2, the two differ as follows:—1. The tibial surface is even in fig. 2, and concave in that under notice. 2. In fig. 10 the tibial surface is relatively broader in the antero-posterior, and shorter in the transverse admeasurement. 3. There is a much deeper naviculare facet, which, for the size of the bone, may be said to be enormous. 4. The inner and posterior tuberosity is projecting far beyond the posterior margin of the tibial surface. 5. The anterior sulcus is narrower than in the other Maltese forms, and runs out at the external extremity, instead of terminating abruptly short of the fibular facet. 6. The interosseous fissure almost divides the two calcaneal facets, the internal of which is not raised so much above the level of the others. 7. The anterior border of the tibial facet is undulating, as in the recent species and Mammoth. These features give quite a different aspect to the bone than is observed in any recent or fossil astragalus which has come under my notice. The greater portion of the fibular facet has been attrited; otherwise the specimen is perfect and affords the following admeasurements:—

Length of antero-posterior diameter 3·1 inches, breadth 3·3 inches, height 2·1 inches; tibial facet 2·5 inches (antero-posterior) by 2·2 inches; naviculare facet 3 inches (transversely) by 2 inches, by tape (arc) 3·7 inches; outer calcaneal facet 1·9 by 1·3 inch; inner calcaneal facet 1·8 by 1 inch[2].

C *Series.*—The question in regard to the astragalus I am now about to describe being considered that of an adult has been sufficiently answered by Mr. Busk[3]. I may state in addition that the same bone, belonging to the skeleton of a young Indian Elephant (2723) in the Royal College of Surgeons, has the inner calcaneal facet nearly

[1] Trans. Zool. Soc. vi. p. 270.

[2] The skeleton of a young Indian Elephant in the Museum of King's College, with the two milk-molars in full wear and four ridges of the last milk-molar invaded—the height at the shoulder is 4 feet, the tibial facet of the astragalus is 2·5 inches in antero-posterior and 2·6 inches in transverse diameter.

[3] Trans. Zool. Soc. vi. p. 269, and p. 270. no. 30 *a* & *b*.

divided by cartilage, with an enormous shallow valley extending the entire breadth of the lower surface, whereas the one in question is very much smaller in dimensions. Again the pit on the peroneal face, wanting, apparently, in all astragals of very young elephants, is here fully developed. The sulcus, as in the large forms, terminates in a deep pit near the centre; and the external calcaneal facet shows no trace of the fœtal condition. With the exception of an injury to the central portion of the tibial surface the bone may be said to be perfect, and is represented in Plate XVI. fig. 3, and also by Busk[1]. Like the last the anterior sulcus traverses the anterior margin of the tibial facet; but it is broader and shallower, and there is a similar undulation of the margin; the posterior internal angle, however, is not nearly so pronounced, and resembles that of A series. But in all the recent astragals I have examined this tuberosity is stouter than in any of the Maltese, and is not ossified in the recent specimen 2723, Royal College of Surgeons. The pygmy, however, displays the curving outline above noticed on the posterior border of the tibial facet.

The saddle-back hollow on the upper surface, so patent in the last described, is not apparent in this, neither the proportionally large navicular facet; so that, with the characters common to A series, it is more allied to them and the recent species than to B series. The small astragalus belonging to no. 2723, Royal College of Surgeons, compared with fig. 3, gives the following dimensions.

	No. 2723, Roy. Coll. Surg.	Pl. XVI. fig. 3.	Remarks.
	inches.	inches.	
Breadth	3·0	2·2	In 2723 the humerus is 16·5 inches, whilst the tibia is 11 inches, and the transverse length of the astragalus is 3 inches. The Oxford-Museum Elephant has a femur 22·5 inches, tibia 12 inches, and astragalus 2·6; about the same dimensions are shown in the skeleton in King's-College Museum, the three being about 4 feet in height. Mr. Busk computes the femur of *E. falconeri* at 13 inches, which, with Pl. XVI. fig. 3, would be small; but, as before observed, the femur was evidently not that of an old animal.
Antero-posterior length	2·3	2·0	
Tibial facet	1·7 × 2·4	1·7 × 1·7	
Naviculare facet	2·4 × 1·3	1·9 × 1·0	
External calcaneal	1·6 × 1·3	1·4 × 0·8	
Internal calcaneal	2·0 × 0·6	1·5 × 0·7	
Peroneal	1·2 × 0·7	1·3 × 0·6	

Besides the immature specimen figured and described by Busk from Admiral Spratt's collection[2], I obtained from Mnaidra Gap another example of the same diminutive form. But the tibial surface only was preserved, and measured 1·3 inch in the antero-posterior diameter, and 1·5 inch in the transverse diameter, showing an astragalus of still smaller dimensions; I am not certain of the age of the owner, however, seeing that the bone was imperfect.

[1] Trans. Zool. Soc. vi. p. 269, and p. 270. no. 30 *a* & *b*.

[2] Trans. Zool. Soc. vi. p. 269, pl. 47. fig. 14.

The complete state of ossification of fig. 3, as compared with very much larger astragals of recent species, shows that it was the matured bone of an elephant evidently not much over 3 feet in height.

CALCANEUM.—There are two types or forms, in three specimens, two of which are precisely alike, whilst a third is slightly larger and differs from them in the following:—

A *Type.*—Pl. XVI. fig. 4 represents a right calcaneum with the greater portion of the astragaloid and the entire cuboid and peroneal facets denuded. It is an old bone, however, the epiphyses being completely consolidated. As none of the articular surfaces are preserved, there is little to add to the admeasurements given in fig. 4. The height is 3 inches; total length about 4·6 inches. The peculiarity, as distinguished from the other two and also the same bone in the Asiatic and Mammoth, is the broader upper surface of the heel, which, in this respect, assimilates to the African and *E. meridionalis*; but there is a Mammoth's calcaneum in the Beechey collection, British Museum, like the last. As to the curving or "saddle-back" of the heel, this would seem to be more decided in the three Maltese specimens than in any of the recent, where, however, ordinarily it is well developed, excepting in one massive heel-bone of *E. meridionalis*, where the upper surface is quite straight. From an inspection of numerous recent and fossil calcaneums, I find the groove in the front tuberosity for the tendon of the tibialis is always pronounced in old bones, and scarcely developed in young heel-bones of individuals of recent species much larger in dimensions than any of the Maltese elephants, which is, of course, another indication of the specimens in question having belonged to full-grown individuals.

As regards the dimensions of the owner of fig. 4—although doubtless it belonged to an adult, and, as compared with recent species, to one of the height of that assigned to the rather small tibia Pl. XV. fig. 3, with which it was associated in Mnaidra Gap, this individual probably did not exceed 6 feet in height, consequently might stand as a small-sized male or ordinary female of perhaps the largest form.

B *Type.*—1. The calcaneum Pl. XVI. fig. 5 (right limb), and a less perfect specimen of the opposite foot were both discovered in Benghisa Gap, in conjunction with other bones, including the lunare and cuneiform, Pl. XVIII. figs. 4 & 9; all are doubtless referable to the smaller Elephant. The epiphyses are completely consolidated, and the bone uninjured, with the exception of the loss of a portion of the internal astragaloid facet. As just observed, it displays the narrow upper surface of the heel of the Indian and Mammoth so pointedly as to at once distinguish it from the last. Here the interosseous pit, as in the Maltese astragals, is broader about the middle than in, at all events, any recent bones I have seen. Again, the cuboidal facet is apparently more extensive in the fossil, stretching across the bone, and is not so oval, which peculiarity agrees with the opposing surface of the cuboid, as will be shown presently. The saddle-shaped heel seems to be more decided in this instance than in the last specimen, and to as great an extent as in the Indian, the arc of the circle being fully 0·7 inch[1]. The peroneal facet is also

[1] This might, like the large articular facets of the other foot-bones to be noticed in the sequel, have added to the activity of the animal; a high heel would throw more weight on the anterior portion of the foot.

less oblique than in the recent species. With reference to the astragaloid facets, and particularly the inner, which is the last to become ossified in the genus, there are seemingly no differences between the adult recent and the extinct. The figure of Blainville showing, as Busk remarks, the inner facet in both the astragalus and calcaneum divided into two, in what must have been a full-grown African Elephant, seems an accidental irregularity, as that of 708 *h*, British Museum, shows no division whatever. The dimensions of fig. 5 ae ars follows:—

Length 3·9[1] inches, height 2·7 inches, upper articular surface 2·6 by 3·0 inches, outer facet 2·4 inches by 1·3, inner facet 1·9 by 1 inch, peroneal 1·4 by 0·7, cuboidal 2 by 0·8.

2. The less perfect specimen (B) of the left foot of a somewhat larger individual is precisely of the same form, the only determinable difference being a proportionally larger fibular facet, which is 1·5 by 1·1. The line of junction of the distal epiphysis is here more patent than in the other.

NAVICULARE.—By way of comparison between old and young bones so as to enable me to determine the following imperfect specimens in my collection, I find, as regards the Indian Elephant, that, in common with the other parts of the skeleton, the naviculare of the adult has the facets more defined, with adventitious rugosities externally, whereas the latter are wanting in young bones. This leads me to divide the Maltese naviculares into old and young, or large and small, of which there are three gradations and five specimens.

The naviculare, like certain other foot-bones, is completely ossified in the Elephant at an early age, so that, but for such characters as the above, we might be apt to ascribe young bones to the small forms of Elephant; and therefore I feel that much care is requisite in determining the two naviculars shown in Pl. XVII. figs. 7 and 8. This is not the case, however, with the three larger specimens illustrative of the largest Maltese elephant, of which I shall now define the characters of its navicular from two (right and left) nearly perfect and one mutilated left specimen from Mnaidra Gap. The latter, however, is the largest of the three; and its characters comply with the data just advanced, and indicate an individual fully 7 feet at the withers. The cup shows a well-defined brim, with the usual incidental rough exterior of the old bone in contradistinction to the absence of adventitious surfaces in the young and, perhaps, adolescent Elephants. The maximum thickness is 1 inch; the calcaneal facet is 1 by 0·5 inch (precisely the same as obtains in the Sumatran, B. M.). From the abraded state of the bone, the other facets are not clearly defined; but, in comparison with the astragals described, this naviculare might have belonged to the largest, and thus somewhat exceeded the next, which is represented in Pl. XVII. fig. 1, being one of a pair which seemingly belonged to the same individual, as both were met with in very close proximity. Indeed, as regards relation, astragalus Pl. XVI. fig. 1 and its compeer of the opposite

[1] As compared with the King's-College specimen referred to, these two heel-bones are considerably larger; the length of the former is 3·2 inches.

side, and tibiæ Pl. XV. figs. 1 & 2, had every appearance of forming portions of the same skeleton. The two naviculars in question (right and left) agree in dimensions; but fig. 1 is the more perfect, and is in accord in every respect with that of 2677 A. Royal College of Surgeons. The linear dimensions of the bone in question are well shown in the figure. The calcaneal facet is 1·1 by 0·4 inch; whilst the arc of the cup, by tape, is 3·3 inches. The same admeasurement on the convex surface, which is considerably abraded so as to denude the facets, is 4 inches. The cuboidal facet has its outline preserved, giving a surface of 2 inches by 1; the others are not defined, consequent on abrasion. Thus, whilst the naviculars of the recent Indian (2677 A, R. C. S.) and the above closely consort as to dimensions, the same may be said of the astragals referred to them; indeed, to follow the comparison further, it may be repeated that the tibiæ of the two differ inasmuch as the former is 14 and the latter 17 inches in length, thus giving a shorter and stouter leg-bone to the fossil, just as obtains in the African in comparison with the Indian, more especially, however, in the dimensions of the toe-bones, as will appear in the sequel.

3. The small right naviculare Pl. XVII. fig. 7 has all the characters of a young bone; I therefore hesitatingly refer it to the smaller form. The facets extend to the margins, as in the immature individual. The following are the dimensions of this specimen—breadth 2·6 inches, depth 1·7 (about), arc of the astragaloid facet 2, arc of anterior surface 2·8, thickness 0·8. The lower part of the bone being lost and a perpendicular fracture prevent further reliable measurements.

4. The smallest naviculare (fig. 8) had precisely the same characters as the last, but is more imperfect; as far as relative comparisons go, it consorts well in dimensions with astragalus Pl. XVI. fig. 3; whilst fig. 7 is equal to that of the Oxford skeleton, being 2·5 inches in length, and therefore also very small, but much too large for astragalus Pl. XVI. fig. 3.

Summary.—Taking the navicularia generally, they indicate cogently one form of the bone of the largest hind-foot bones I have yet described, and, doubtfully, intermediate and pygmy forms.

Cuboid.—There are three specimens of this bone in my collection, two of which are fragments. They are divisible into large and small.

1st. A *Type.*—The largest (represented in Pl. XVII. fig. 4) has lost its lower part, including nearly the entire calcaneal and fifth metatarsal facets, by accident—enough, however, remaining to establish its dimensions as compared with the bones just described. It is too large for the naviculare (fig. 1), and also exceeds the dimensions of the same bone of 2677 A, R. C. S.; but it equals that of the Sumatran (B. M.) and the largest fossil naviculare. The maximum thickness of the fragment at the middle of the fourth metatarsal surface is 1 inch. It is the front aspect that is shown in the figure, the margin *a* being the internal or cuneiforme attachment. The naviculare facet, unlike that of the recent, is not isolated by a furrow, and is even only feebly indicated by a dividing ridge, below which is the horizontal facet for the calcaneum, the maximum breadth of which is 2 inches.

2nd. A similarly mutilated, but much smaller, right cuboid from the same locality shows the entire navicular and fourth metatarsal and also the internal surfaces, the portions containing the calcaneal and fifth metatarsal facets being lost.

At a glance one might be disposed to place the last specimen among the young bones, only that the facets are pronounced; however, if it is that of an adult, it must have belonged to a very small individual. Its characters are pointedly the same as noted in fig. 4.

In the first place, as far as the outline is preserved, the two specimens show much the same configuration in contradistinction to the next specimen, from which they appear to differ in several particulars. For example the rounding-off of the angles and general rough and irregular outline distinguish fig. 4 from fig. 5, the margins of which are far more prominent. Thus the two former may assimilate to the recent species; but which in particular cannot, unfortunately, be ascertained, from the fragmentary condition of the specimens. The length of the internal side in fig. 4 is 2·4 inches; and here, instead of the facets being two as usual in cuboids of recent Elephants, also in that of the next to be described, the entire upper half of the internal surface is occupied by the cuneiform articulation, with deep excavations on the lower part. The navicular facet is oval, instead of being quadrilateral as in fig. 5; its height is 1·1 inch, and the breadth 0·9. The fourth metatarsal surface is 1·2 by 1·1 inch. The latter differs also from that of fig. 5 in its more oval outline and flat surface.

It seems, from a comparison between the afore-mentioned skeleton of the African Elephant and numerous specimens of the Indian, that their cuboids differ considerably, whilst in the former the external is the longest side, the internal next, and the base the smallest. In the Indian the latter is also the smaller, but the two other sides are about equal. I do not know, however, how far the above would be borne out by an equal amount of instances of African cuboids, which, unfortunately, are not at present forthcoming in collections.

B *Type.*—The perfect and very characteristic cuboid (fig. 5) would seem to differ in these respects from both recent species, presenting nearly the form of an equilateral triangle; and although there are no adventitious rugosities on the sides, still the facets are so sharply defined on the anterior and posterior surfaces, that one can have little hesitation in pronouncing the bone to be that of a full-grown individual. The figure represents the naviculare facet below, with the calcaneal above, and its abnormality, to which I shall refer presently. The following are its dimensions—upper surface 2·6 inches, internal 2·6, external 2·5, calcaneal facet (*c*) 2 by 1·2. The naviculare (*m*), owing to the more triangular configuration of the bones as compared with recent species, is more erect than is apparently the case in them or in any fossil cuboid I have examined; its height is 1·6 inch, and breadth 1·1.

I do not know how far it may be an individual peculiarity, but, as may be noticed in the figure (5), the calcaneal facet (*c*), which is perfectly horizontal in the recent and, as far as I have been enabled to observe, in the Mammoth, is in this particular instance divided into two facets (*c*, *c*) by a prominent ridge and broad fossa, which completely isolate the inner one from even the naviculare. Again, in cuboids of full-grown recent species and even in the young of the Indian, the naviculare and calcaneal surfaces are separated by a deep furrow, which is replaced in all the Maltese elephantine cuboids by ridges.

The division of the calcaneal facet does not show a corresponding solution of contiguity in any of the heel-bones described. Again, the fossil displays a deeper intermediate hollow between the fourth and fifth metatarsal surfaces than is apparently the case in recent or the two just noticed. It is the symmetry of outline, however, of fig. 5 as compared in some measure with fig. 4, but chiefly with all other cuboids belonging to living and extinct Elephants that I have examined, that gives to the specimen in question an apparently distinctive character.

The anterior and posterior cuneiform facets occupy the margins instead of the entire upper surface, as in the two last; the former is 1 by 0·3 inch, the latter 0·7 by 0·2.

Summary.—In compounding the various characters and dimensions of the above cuboids, as far as their conditions will allow, there seems to me no pronounced similarities in outline between any of the fossils and either recent or any extinct species. Whilst as regards dimensions fig. 4 might well represent an Elephant as large as the Sumatran in the British Museum, and fig. 5 an individual of nearly 5 feet, the other specimen would not accord with the astragalus Pl. XVI. fig. 3, but with an animal of rather smaller dimensions than the owner of Pl. XVII. fig. 5, although the two latter seemingly differ in characters. At the same time, whilst we are bound to notice every little distinction in such an inquiry as the one in which I am engaged, I feel that what appears to be a specific character may turn out to be only an individual abnormality; and this I am quite prepared to accept in regard to what has been stated of fig. 5. At all events we may fairly conclude that the collection represents the cuboid of a large and a small form of Elephant.

External Cuneiform.

There are two examples (right and left) from Mnaidra Gap; the naviculare surface of the former is represented in Pl. XVII. fig. 2. Both refer to the largest forms, and, as regard dimensions, might have belonged to two individuals of nearly the same size; the larger is evidently of the size of the owners of the largest astragalus, naviculare, and cuboid just described.

The outline of the bone in the two recent species does not differ materially; the usual irregularity of the lateral facets seems common to both living and extinct species. Thus the above and the Sumatran and an external cuneiform (36612) of a Mammoth in the Palæontological Collection, B. M., have only one anterior facet for the second or middle cuneiform, and the lower cuboidal facet is concave in all;

whereas in the African (708 *h*) and an old foot of the Indian (2543, R. C. S.) there are two facets for the second cuneiform.

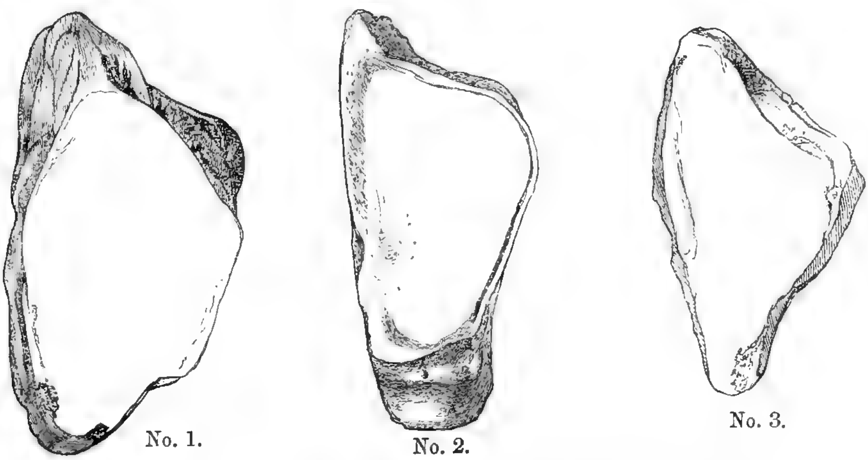
1. The right cuneiform (Pl. XVII. fig. 2) appertains most probably to naviculare fig. 1, both having been discovered side by side. Like it, the bone in question is scarcely equal to the same of the young Asiatic (2677 A), which is somewhat smaller than the other fossil cuneiform above-mentioned of the left foot from the same locality.

2. The second specimen, like the last, shows all the characters of the mature bone, with its rough exterior and well-marked facets. The entire length and breadth are 2·8 by 1·7 inch, thickness 0·8. As usual, the naviculare surface is concave and 2 by 1·4 inch, the same, or almost the same, being the dimensions of the metatarsal; the latter, however, does not show the exact boundaries of its articular surfaces, which Cuvier seems to consider diagnostic of the feet of the two living species [1].

Middle Cuneiform.

The only representative of this bone in my collection is the perfect specimen represented in Pl. XVII. fig. 3. It shows the anterior surface of a left meso-cuneiforme from Mnaidra Gap, where it was discovered in close proximity to the external cuneiforms just described, and in all probability belonged to the larger of the two. The apex (*a*) is here rounded, such as is usually observed in the young bone of the Indian and Mammoth, the adult (including the African) having it more or less curved. But the

Fig. 5.



Middle Cuneiform of the African (1), Asiatic (2), and Maltese (3) Elephants.

dorsal surface rises to a point (*b*) internally, and is also distinct from either recent bones, which, again, differ more or less from one another. At all events, that of 708 *h* (African,

[1] Ossem. Fossiles, tome i. pp. 497 & 572.

B. M.) is singularly shaped as compared with many Indian specimens of different ages. These differences are very apparent in the woodcuts.

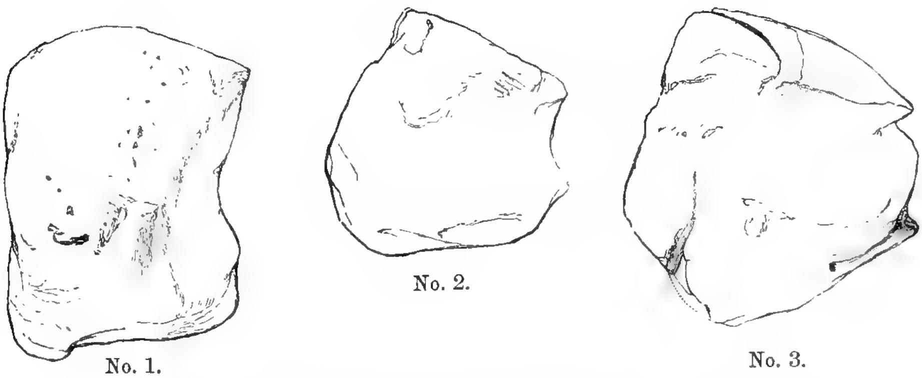
Again, in the fossil and Mammoth Sumatran and old Indian the anterior surface is concave, whereas in the African (708 *h*) it is rather convex. The facets for the internal and external cuneiforms seem to vary in extent and number in different individuals of recent species and in the Mammoth.

The following are the dimensions of fig. 3—thickness 0·8 inch, anterior facet 1·2 by 1, posterior 1·1 by 1·1.

Internal Cuneiform.

The two left internal cuneiforms shown at Pl. XIX. fig. 1, and Pl. XVII. fig. 6, seem to differ from any recent or fossil equivalents I have examined in being relatively shorter and broader. Thus, whilst this bone does not appear to differ much in outline in the African and Asiatic, there are these disparities between them and the internal cuneiform of the Maltese elephants. This arises from the obliquity of the facets which contract the inner border, thus:—

Fig. 6.



No. 1. No. 2. No. 3.

Internal Cuneiform of the Asiatic (1) and Maltese (2 and 3) Elephants. Nat. size.

The greater obliquity of the navicular facet in the African as compared with the Asiatic is therefore a character also of the Maltese specimens, which, however, have it in excess; moreover they differ from the recent in having these surfaces broader, with much less developed facets for the middle cuneiform.

How far do they differ from one another? As regards outline there may be said to be little, if any, point of distinction worthy of note, unless it be that Pl. XVII. fig. 6 has a rounder and relatively narrower distal extremity (*a*) than that of Pl. XIX. fig. 1 (*a*); therefore it is a more slender bone, and may have belonged to the smaller form.

1. The specimen, fig. 6, was found in Benghisa Gap with other feet-bones referable to the smallest form. The total length is 1·5 inch, and greatest breadth 1·4. The

naviculare surface is semilunar, with a narrow facet for the second cuneiform on its external margin; the former is 1·1 by 0·6 inch, and the latter 0·8 by 0·3. The distal facet is nearly circular, its height to breadth being 1 to 0·8 inch. The scar usually present on the external surface near the distal end for the second metatarsal facet is not seen in the above specimen, which I observe is also the case in certain instances in the Asiatic. The dimensions of the cuneiform, with the other tarsal bones just described, and compared with those of recent species, would indicate an Elephant of about the height of the *Elephas melitensis* of Falconer.

2. The left cuneiform, Pl. XIX. fig. 1 (from Gandia Fissure, so prolific of the remains of the largest form), establishes the presence of a fair-sized Elephant, and is in keeping with the largest foot-bones in my collection. The distribution and outline of its articular surfaces are very much like the preceding; the scar for the second metatarsal is large, and situated lower down than usually observed. A portion of the upper and anterior margin has been broken off recently; otherwise the specimen is entire, with the exception of a fracture through the anterior border. The dimensions of the specimen are as follows—entire length (about) 2 inches, greatest breadth 1·8, naviculare facet (about) 1·5 by 0·7, distal 1·4 by 1.

Summary.—The tarsus furnishes the following data:—

The astragalus indicates an Elephant nearly 7 feet in height, with two individuals not so high, but evidently of the same type or form. Another shows peculiarities distinct from the foregoing, and equal in size to the smallest of the large form; whilst a pygmy form is seemingly established by the little astragalus, Pl. XVI. fig. 3. The heel-bones display discrepancies and show two forms—one a small individual, perhaps, of the largest, and another (fig. 5) a full-grown individual of an intermediate form. The naviculare establishes a full-grown Elephant of the large form; and, provided the smaller navicularia, Pl. XVII. figs. 7 & 8, belong to the adult condition, we have the intermediate and pygmy forms also represented. In the cuboid the two larger forms are well displayed; and the internal cuneiforms do so likewise, whilst the middle and external cuneiforms appear to belong entirely to the large form.

XIII. Metacarpal, Metatarsal, Phalangeal, and Sesamoid Bones.

I have carefully compared the metacarpal, metatarsal, and phalangeal bones of many examples of the Asiatic Elephant, including the continental and insular varieties, and find that there is very little difference in the outline even between young and old. Unfortunately there is only one example of the African Elephant's skeleton in London, and, as far as I know, in Great Britain; so that the same cannot be asserted in its case; however, in comparison with the former, and taking the relative ages of the two species, I find there are considerable differences between the bones of the feet of, for example, 708 H (African), B.M., and the Sumatran, B.M., or the very old bones of the articulated feet of the Indian (no. 2543, R. C. S.). I propose, therefore, to point out these differences, whatever their values may be worth, inasmuch as I find in the large assortment of foot-bones in my collection that several admit of being classed with the African and many with the Asiatic Elephant.

Moreover there are difficulties to be encountered in deciding equivalent metacarpals and metatarsals as well as phalangeals of fore and hind feet of the recent species. What must this be when we are determining those of several fossil forms of divers dimensions, such as the objects now under consideration, many of which are imperfect? Considering, therefore, the diversified and numerous materials in my collections, I think the safest and best way will be to describe the same toe of either foot in succession.

My comparisons of an adult African with numerous examples of the fore and hind feet of the Asiatic show that the long bones of the latter are relatively more slender and symmetrical in form than in the former; indeed, so pronounced is this, that I cannot subscribe to the opposite view entertained by Cuvier, who says that the first, second, and fifth metacarpals are relatively greater in the Indian, and that the first metatarsal is smaller and more pointed in the African, and its second metatarsal much more slender in proportion[1]. At least, as far as the African (708 H) compares with the Chuny and other Asiatic adult Elephants of the corresponding stage of growth, these bones seem to me relatively larger; but much may be owing to whether or not the individual had led a wild or a domesticated life.

First Metacarpal, first Metatarsal, and their phalanges.

1. These bones are apparently shorter in the African than in the Asiatic; and there is less difference in length between the first metacarpal and first metatarsal in the latter than between the same bones in the African, the first metatarsal being small as compared with the equivalent bone of the fore foot.

2. In both recent species the trapezial facet of the first metacarpal is *oblong*, and the cuneiform-facet of the first metatarsal *circular*.

3. The upper surface of the digital aspects of the first metacarpal and first metatarsal in the African is hollowed out, and the under surface of the same articulation is flat; whereas in the Indian the former is almost convex and the latter concave.

4. The lower aspect of the first metacarpal and metatarsal is sharp in the Asiatic, and flat in the African. A general remark in connexion with adult recent, as compared with the fossil, is, that in all skeletons and specimens of the former I have examined containing the second *true* molar in wear, the epiphyses of the toe-bones were detachable, whereas in all I shall describe they are completely consolidated. In 708 *h* (African) and the Sumatran, British Museum, and Chuny, Royal College of Surgeons, they are *not* united.

A *Type*.—1. The largest first metacarpal, with possibly its digit, is shown in Plate XIX. fig. 2 & *a* & fig. 5. Both display the characters of the African, and, as regards

[1] Ossemens Fossiles, tom. i. p. 571.

relative dimensions, are in keeping with the largest fossil carpal bones, and about equal to the same parts of an Asiatic between 6 and 7 feet in height.

B *Type.*—2. A different form of bone (with its phalanx, fig. 5) is shown in Plate V. fig. 4; it is one of a pair found close together, and of the same dimensions. The oblong proximal facet is concave, whilst the distal is broad, expansive on the margins, and deeply grooved, and flat below, as in the African. The digit was doubtless well defined, and may be that shown in figure 5; it was found in the immediate vicinity. The inner side of the former is convex, and the outer hollow; length 1·8 inch, trapezial facet 1·2 by 0·8 inch, digital facet 0·9 by 0·9 inch. This toe must have given a character to the foot, and permitted unusual pliability, just as was surmised of the saddle-backed dorsum of the calcaneum Plate XVI. fig. 5, referred also to the small form. That the above belongs to the fore foot is shown by the oval outline of the trapezial facet.

3. The similar-shaped pygmy fore-foot bone, Pl. XXI. figs. 3 & 3*a*, already described, demonstrates at all events the characters of Pl. V. fig. 4, as compared with Pl. XIX. fig. 2. Another, less perfect pygmy of the same form is seen in Pl. XIX. fig. 9.

The following I refer to the first metatarsal:—

A *Type.*—1. The digit, Pl. XX. figs. 1, 1*a*, and its phalanx *b*, fits very closely to the small internal cuneiform, Pl. XVII. fig. 6.

2. The still smaller specimen, Pl. XX. fig. 2, and another of about the same dimensions, with circular, instead of ovoid, proximal facets, and perpendicular grooves on the distal aspects, are 1·2 inch in length. The height of the proximal facet is 1·1 inch, of the distal extremity 0·9 inch, cuneiform 0·8 by 0·6 inch, and digital facet 0·8 by 0·6 inch.

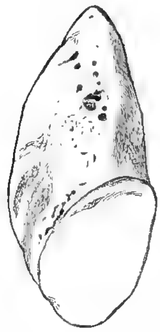
Of these three, although fig. 1 is much larger than fig. 2, they do not differ in respect of outline; and clearly the two belong to the metatarsi of an intermediate and a very small form; the latter, however, is not by any means so diminutive as the first metacarpal (Pl. XXI. fig. 3), thus showing how very much variability there was in regard to the dimensions of the feet-bones.

The terminal phalanges of the first metacarpal differ doubtless individually to some extent. In the African it would appear to hold a semilunare and concave facet, which is irregularly hollowed out in the Asiatic; they differ seemingly also in outline.

The first-metatarsal phalanx of the African is shown in the accompanying woodcut (p. 92). A smaller but similar bone is represented on Pl. XIX. fig. 8; and another, (fig. 14) has a very concave facet at *a*. I have placed the last with the fifth toe at page 105.

This bone is rarely preserved on skeletons or in cabinets; it is usually very small. In the African alluded to it is in the form of a small cone, with an oblique articular surface. Evidently it is subject to modifications in outline in the same species; but the pointed character and smaller size, as compared with the fore foot, distinguish it. No doubt it is subject to considerable variability in both feet, although generally of sugar-loaf form.

Fig. 7.



Ungual phalanx, first toe, hind foot, of the African elephant.

Summary.—The foregoing data seem to indicate the presence of a large, intermediate, and very small form of Elephant, the former represented by Pl. XIX. fig. 2 and Pl. XX. fig. 1, whilst the same bones in the smaller are shown by Pl. V. fig. 4 and Pl. XX. fig. 2. These distinctions seem to me fairly borne out by the articular facets for the trapezium and internal cuneiform, irrespective of dimensions.

But supposing even that they belong to either foot, they all represent old bones, and display remarkable discrepancies as to the dimensions, more especially the first-toe bones Pl. XX. figs. 1 & 2, and Pl. XXI. fig. 3, as compared with Pl. XIX. fig. 2.

Second Metacarpal, second Metatarsal, and their phalanges.

A comparison of the second metacarpal in the Mammoth, African, and Asiatic shows no appreciable differences. In old animals the upper surface is rather flat; but in younger bones it is round; the only point is, as formerly observed, that generally the Asiatic and Mammoth have the long bones of the feet and digits longer, more slender, and more symmetrical than the African.

The second metatarsal in the latter and Mammoth has its upper surfaces rather more hollow and like the second metacarpus than obtains in any Asiatic I have examined. In all recent Elephants, and several second metatarsals of the Mammoth, the scar for the internal cuneiform is pronounced. There seems, moreover, as Cuvier points out, a decidedly larger surface for the external cuneiform in the Asiatic than in the African.

The second metacarpal and second metatarsal proximal phalanges in the African are deeply saddle-backed at their distal extremities and relatively broader bones than those of the Asiatic, which have the same part even, with the obliquity of the surface outwards, and a rugous scar on the inner side, where there is a hollow in the African. Of course the deep ginglymoid articular surface of the African produces a corresponding inequality on its phalanges.

The only entire specimen in my collection, referable to the second metacarpal, is the very diminutive bone, Pl. XXI. figs. 4 & 4*a*, described at page 76.

The second metatarsal is represented by three entire specimens, referable to individuals of larger stature. There are distal extremities, however, of both metacarpals and metatarsals and entire phalanges referable to the large form, and which differ materially, not only in dimensions, but in the following characters:—

1. Reverting to the fore foot, Pl. XX. fig. 12 illustrates what I take to be the proximal and mid phalanges of the second toe, left fore foot of the largest form. Both bones agree in outline with those of the Asiatic, and represent an individual of about the assigned ordinary dimensions I have ascribed to the largest form. The entire length of the former is 1·7 inch, the proximal and distal articulating aspects being 1·5 by 1·3 inch and 1·3 by 0·7 respectively.

2. Two specimens of the mid phalanx, besides that in the figure, are somewhat smaller, and may have belonged to the same digit in the hind foot; and, judging from the contours of their proximal facets, the distal aspect of the first phalanx of the hind foot presented the same appearance as that of the fore, and consequently followed the Asiatic Elephant, just as much as I shall now point out obtains in Pl. XX. fig. 17, which represents the characters of the African.

3. This characteristic phalanx will be seen, by fig. 17, to present a deep saddle-back distal articular surface, which is not the case in fig. 12.

With reference to the former, there are four specimens, two of which differ considerably in dimensions, although otherwise they are all much alike, whilst two are evidently of the same skeleton. There is moreover a mid phalanx which fits exactly to fig. 17, and another which suits a larger specimen. These three phalanges are distinguished from each other by the two largest having ovoid proximal facets, and therefore probably belonging to the *fore*; whilst the two latter (right and left) are smaller and have circular facets, and may belong to the *hind* foot of the same form. The former is 1·6 inch, and the latter 1·3 inch in length.

The distinguishing character, I repeat, of these first phalanges of the second toe, whether of the fore or hind foot, is the large, *scooped-out* distal articular aspect, with a scar on its inner side, and a *sharp protruding ridge* bounding it externally.

As regards their characters in comparison with all recent and fossil species, I find the same bones in the fore foot of the Mammoth very similar; and the same obtains in the African, 708 *h*. As to dimensions the young Ceylon Elephant, 707 *h* in the British Museum, with the last milk-molar in full wear, has the equivalent bones of the same dimensions as the last.

4. The entire second metatarsal, Pl. XX. figs. 5 & 5*a*, presents the following characters. The specimen is entire, and differs from either of the recent species generally, but agrees with the next I shall describe, in having its shaft rounded instead of the sharp internal and flattened external border. The facets for the three cuneiforms are here by

no means defined, as shown in fig. 5*a*. The scar for the internal cuneiform is wanting, as not unfrequently occurs in the Asiatic species; it is, however, present in a similar specimen of the right side, of slightly larger dimensions than the above. Moreover there is no ridge between the middle and external cuneiform-facets; but the facet for the third metatarsal (*b*, fig. 5) is well shown on the upper and external margin, with a deep irregular-shaped pit, *c*, which intrudes on the posterior face of the bone which, but for the absence of *any* facet on its internal border, could with difficulty be distinguished from a fourth metatarsal.

5. The perfect specimen of a left second metatarsal, Pl. XX. figs. 3 & 3*a*, at once assigns its position. The protuberant scar, *b*, for the internal cuneiform, and the ridge dividing it from that occupied by the external cuneiform, with a prominent facet for the third metatarsal on the external side, coupled with the diminutive dimensions of the bone, at once proclaim the presence of a very small form of Elephant, inasmuch as the epiphyses are completely consolidated.

By way of comparison with recent species, fig. 3 and the second metatarsal of the King's-College and Oxford-University Museum skeletons, are of precisely the same length, indicating an individual about 4 feet in height.

Third Metacarpal, third Metatarsal, and their phalanges.

The relative proportion of the third metacarpal in the African and Asiatic Elephants seems to me to be in favour of the bone being longer and more slender in the latter. It would appear, moreover, that the inner, outer, and lower surfaces are more flat and

unciforme a.l.c. less rounded in the African, its ~~cuneiform~~-facet being also much broader, and the aspect for the magnum not so concave.

As regards the third metatarsal, the only seeming difference is the more rounded internal surface of the African specimen.

The first phalanx of the third metacarpal in the African is a stouter bone, with less of the compressed sides of the Asiatic; and its distal articular surface is less saddle-backed. And, of course, the second phalanx has a proportionally more even articular surface; the proximal facet is nearly quadrilateral in the African, and almost oval in the Asiatic. The same characters are apparent in their equivalents of the hind foot.

How far these distinctions will be borne out in a series of specimens of the African Elephant remains to be shown.

The specimens in my collection and those from Zebbug, already described by Busk, represent much diversity in size; and although it is extremely difficult, indeed seemingly impossible, to assign to each their proper position, I think, that all the following are referable to the third fore or hind digit. I shall arrange them in series according to dimensions.

A *Series.*—The largest third metacarpal bones are represented by three specimens, differing very little in size, but more in characters. The largest (Pl. XIX. fig. 10) gives the following dimensions—length 4·6 inches, breadth midshaft 1·8 inch, magnal facet 1·6 inch in breadth, second-metacarpal facet 0·5 inch in breadth, fourth-metacarpal facet 1·2 by 0·7 inch, phalangeal facet 1·8 by 1·9 inch. The above and another specimen differ from the third in having the sides of the shaft flat, whereas it is rounded in the latter. The upper and lower surfaces are flat, as in the African, to which they are further connected in having narrow shafts, broad unciform-facets, and less concave magnal surfaces, as compared with the Elephant of Asia.

The relative dimensions of these specimens equal the same in an Asiatic Elephant about 6·5 feet in height.

B *Series.*—Plate XIX. figs. 4 & 3 represent the inner aspects of third and fourth metacarpals of the right foot of doubtless the same individual, from Benghisa Gap. With reference to fig. 4, it not only differs considerably in size, but also apparently in the following characters, from the members of A series. It is less slender, the shaft is quadrangular, the inner side being broad and the lower flat inclining outwards. Its dimensions are:—length 3·4 inches; breadth, middle of shaft 1·6; height of shaft at middle *internally* 0·7 inch, ditto *externally* 1·2 inch; second-metacarpal facet 1·4 by 0·5 inch, magnal ditto 1·7 by 1·2 inch, unciform ditto 1·7 by 0·5 inch, fourth-metacarpal ditto 1·6 by 0·6, height of proximal extremity 1·8 inch, distal articulation 1·7 by 1·5 inch.

The above is considerably shorter than the same bone of 707*h*, British Museum, and might therefore indicate an Elephant not over 4·5 feet in height. But relatively the facets and breadth of the shaft are not so much different, thus confirming previous data in regard to the long bones already noticed.

C *Series.*—A specimen, unfortunately not entire, but clearly referable to the third toe, is shown in Pl. V. fig. 3. Its facets have been injured recently, so that any data to be derived from them are lost. It is hollow on the dorsal aspect, like fore-foot bones generally. The second metatarsal, Pl. XX. fig. 5, would relatively agree with the above, in which case it might represent the third metatarsal of the smaller form, and become the equivalent hind-foot bone to the type which C series represents. Pl. V. fig. 3, moreover, as will be noted presently, agrees with Pl. XX. fig. 6, which I assign to the fourth toe, hind foot; so that the three might fairly represent the third metacarpal and second and fourth metatarsals of an Elephant nearly 5 feet in height.

D *Series.*—The members of this series are remarkable for their diminutive size, whether looked on as metacarpal or metatarsal bones. Their claims to be considered old bones are well established by the complete anchyloses of their epiphyses. The two shown in Pl. XIX. figs. 6 & 7, and the very small but well-ossified patella Pl. XV. fig. 6, were got close together in Benghisa Gap.

From the usual characters of the toe in question, fig. 7 seems to me to represent the third metacarpal or metatarsal, whilst the broader shaft and facets place fig. 6 with the bones referable to the fourth toe. With reference to fig. 7, although considerably eroded by decay, its length is entire and is 1·9 inch; breadth of mid shaft 1 inch; depth of ditto 0·6 inch; distal articulating surface 1 by 0·9 inch, the same bone in the fore foot of the Oxford-University-Museum skeleton being 2·5 inches, and in the hind foot 2·1 inches, thus indicating an individual about 3 feet in height.

To match this diminutive bone there is the first phalanx Pl. XX. fig. 16, and almost a *fac simile* represented by Busk [1]. The two are, indeed, so alike that, were it not for the one having been found in the Benghisa Gap and the other in Zebbug cave, they might, as regards dimensions and characters, have belonged to the same individual. In skeletons of recent Elephants of the stage of growth where their bones could in any way come up to the dimensions of those I am describing, they are so diminished by the shrunken cartilage of their extremities as to be scarcely true exponents of the original member.

The remarkable contrast between these small foot-bones and the first, second, and fourth metacarpals shown in Plate XXI. figs. 4–6, and described at page 76, leads me to believe that the former (Plate XIX. figs. 6 & 7) might belong to the hind, and not the fore foot.

I shall now describe phalangeal bones referable to the third metacarpal and third metatarsal bones composing A series, there being no specimens apparently assimilating to the members of B series.

Pl. XX. fig. 8 shows the three phalanges of the third finger as they were found *in situ* in Mnaidra Gap [2]. The dimensions of all the other numerous specimens are very nearly equal, although from different situations. The maximum admeasurements of the first phalanx, shown in Pl. XX. fig. 8, which is the largest, are—length 2 inches, breadth (middle of shaft) 1·4, proximal articulation 1·7 by 1·2, distal articulation 1·3 by 0·8 inch.

Four specimens of the mid and ungual phalanges give about the same dimensions as are shown in the fig. 8.

In comparison with the same bones in the Sumatran, B.M., the above greatly resemble them in outline: but as the metacarpal articulation of the proximal phalanx is almost quadrangular in the African, and almost oval in the Asiatic, there is a pronounced leaning towards the former in the fossil. Thus the Sumatran is 2·5 inches in length, but its proximal articular aspect is only 1·4 by 1·1. Relatively the digit was about the average dimensions I have assigned to that of the large form, whose height was about 6·5 feet at the withers. No doubt the largest form, indeed perhaps all the Maltese elephants, displayed, as surmised from the long bones of the limbs, a relatively greater bulk to height than is observed in recent species, and also in the Mammoth.

A more slender first and second phalanx is represented in Pl. XX. fig. 12, which I suppose may have been the corresponding bones of the hind foot of an elephant even of

[1] Trans. Zool. Soc. vi. pl. 51. fig. 41.

[2] Figs. 8 & 9 were found together, and probably belonged to the same individual.

the size of the owner of the digit shown in fig. 8, the saddle-backed proximal facet and the contraction of the middle of the shaft being like the Asiatic; while the less oval proximal articular surface is like the African, as shown by the same comparison in the Sumatran, where this facet is 1·6 inch by 1·2 to a total length of 2, the same in the fossil being 1·5 inch by 1 to 1·7. Here, again, the articular surfaces are relatively larger. The general characters, however, of this digit both in the fore and hind foot are seemingly more in keeping with the Asiatic than the African Elephant, provided that the specimen of the latter in the British Museum is typical with respect to the aspects of these bones.

Summary.—Allowing a broad margin for individual differences in dimensions in the Maltese elephants, I think it must be apparent that the owners of the foot-bones just described could not well have belonged to the same species; for even allowing A and B series to represent large and small individuals, neither can be permitted to claim the members of C series, which differed in size as much from A series as did the *Hippopotamus major* and *H. pentlandi* from the existent *H. liberiensis* and extinct *H. minutus*[1].

Fourth Metacarpal, fourth Metatarsal, and their phalanges.

The unciform-facet seems to be generally convex in young and adolescent stages of the fourth metacarpal, and becomes almost flat in the aged. This is observable not only in the recent species, but seems to be the case also in the Mammoth and the fourth metacarpal referable to *E. antiquus.* The fourth metatarsal seems to be relatively larger in the African; its tarsal articulating surface is more triangular, with more even sides, whilst the cuboidal facet is less concave than in the Asiatic. The distal articulating surfaces and contours of the shafts do not vary much. The Sumatran or insular variety would appear generally to differ from the continental, and also the African, in having all its articular surfaces more hollowed out and prominently defined. No bones in my collection differ more in dimensions than those referable to the fourth fore and hind toes.

I shall divide them into what I may call *types*, in the order of their size and characters.

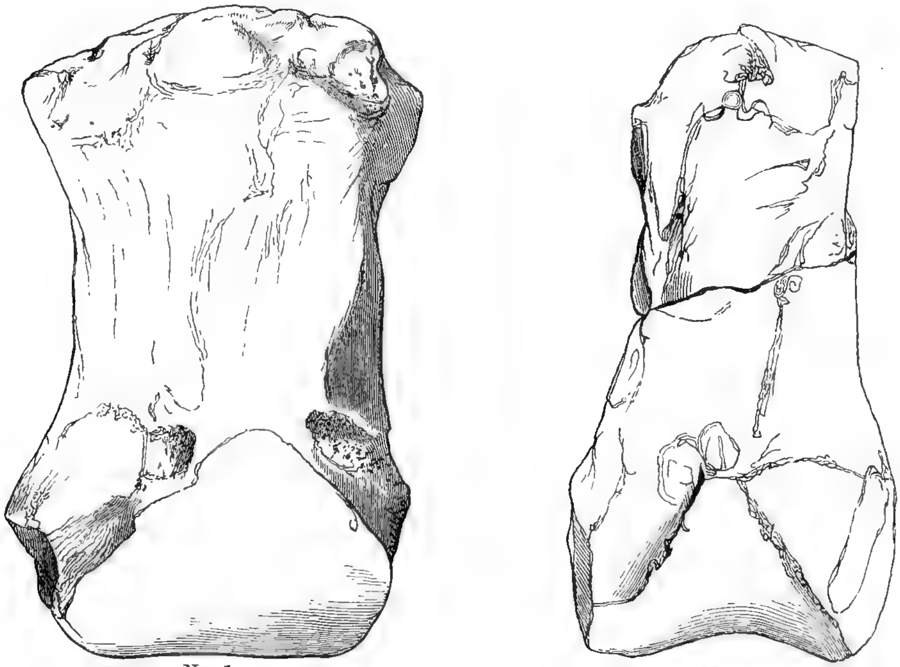
A *Type.*—1. The largest, an imperfect left metacarpal, has its distal extremity much abraded, with the greater part wanting, but preserves the following:—entire length 4·4 inches (about), some abrasion at distal extremity; breadth (midshaft) 1·8, height of proximal end 2, unciform-facet 2 by 1·8, facet for third 1·8 by ·6, facet for fifth 1·3 by ·5. The unciform-facet is slightly convex.

2. A rather smaller but more perfect specimen of the right side, in relative proportions equivalent to the third metacarpal (Pl. XIX. fig. 10), is shown in no. 1, woodcut fig. 8. Its dimensions are as follows—length 4 inches, breadth (middle of shaft) 1·8, depth of ditto 1·2, anterior articular surface 2 by 2 inches, posterior articular surface (unciform)

[1] This diminutive Riverhorse seems to have been contemporary in Malta with the *H. pentlandi* and the fossil Elephants. See 'Pal. Mem.' vol. ii. p. 307, and my work on Malta, p. 214. Thus there were pygmy and large Elephants and Hippopotami on the area at the same time.

1·8 in breadth, breadth of third metacarpal facet 0·7. This bone is as long as that of 707 *h* B.M., but is very much broader in every way.

Fig. 8.



No. 1. No. 2.

Fourth metacarpals of Maltese elephants.

B *Type.*—What is evidently a left fourth metacarpal is shown in woodcut no. 2. Although nearly the same length as no. 1, it is a much more slender bone, and has its shaft far more rounded. Thus, whilst the former partakes of the characters of the African, the latter is more in keeping with the Asiatic species, especially the insular variety in the British Museum, seeing that the articular surfaces are well defined, the distal being even concave. It may just, however, represent a youthful bone of the same elephant as described in A series, though the epiphyses are completely consolidated. Its dimensions are—length 3·6 inches, breadth of middle of shaft 1·4, greatest depth of mid-shaft 1·2, anterior articular facet 1·8 by 1·5. The proximal facet is too much injured for description. The claims of this specimen to the position assigned to it seem to me good; but to whatever bone of the fore or hind foot it may belong, there can be less doubt but it is very different from the members of A type; and, as I shall now point out, it is still more distinct from those of C type, which differ little from it in length, but very much in breadth.

C *Type.*—The fourth metacarpal and the third metacarpal, Pl. XIX. figs. 3 and 4, belong to the same foot. They were found side by side, and evidently owed their perfect states of preservation to having been surrounded in a stalagmitic red soil, whilst the other members of the same foot decayed away in the looser material around them. The above fig. 3 is altogether a much stouter bone than D type, and in outline resembles the members of A type. Its proximal facet is like that of the African, with even sides. The unciform-surface is flat, sloping outwards. Length 3·1 inches, breadth of midshaft 1·7, depth internally 1·1, depth of posterior articular surface 2, unciform-facet 1·8 by 1·6, third-metacarpal facet 1·5 by ·6, fifth-metacarpal facet 1·2 by ·5, anterior articular surface 1·7 by 1·7.

It is evident that the owner of figs. 3 and 4 must have possessed a short and broad foot.

The same element of the hind foot is still more various, and not only as regards size, but in characters even of specimens that do not differ in other particulars. At all events there are seemingly remarkable diversities in these respects in connexion with the middle toes; but probably a large series of recent specimens would show like individual discrepancies. Thus in one out of four specimens of the fourth metatarsal, all of which, as regards size, are about equal, I find the cuboidal facet, instead of being concave laterally as in the Asiatic, is convex towards its outer side for a deeper depression in the opposing surface; so that we have the characters, as it were, of the two recent animals in the large form. Of course, did these bones show evidences of youth, the diagnosis would be of no value; but, like all the others I am describing, they are the remains of full-grown and aged individuals.

A *Type*.—The perfect right fourth metatarsal shown in Pl. XX. fig. 4 is the one just referred to. What has been stated as regards the outline of the proximal articulating surface in the recent animals is, as far as the African species, well represented in this specimen, only that the dorsal surface is not so rounded. The dimensions of three of the specimens are the same; two from Mnaidra Gap belong to the right, whilst the other from Gandia Fissure is of the left hind foot. The following are the dimensions of Pl. XX. fig 4:—length 3·1 inches; breadth, middle of shaft, 1·6; depth internally at middle of shaft 1; depth of posterior articular aspect 2 inches; cuboidal surface 1·6 (depth) by 1·9; third metatarsal facet ·9 by ·6; fifth metatarsal facet 1·1 by ·5; anterior articular surface 1·7 by 1·7. There are, moreover, irrespective of what has just been pointed out in connexion with the cuboidal aspect, differences in the contours of these three bones which make me almost doubt the value of the diagnosis I have noted between the African and Asiatic; nevertheless, in attempting to correlate the characters of these diversified elephantine bones, it seems requisite that all individual distinctions should be noted. Referring to the forms of the specimens in question, whilst fig. 4 resembles what I have pointed out as characters of the African, we find a second specimen, more slender, with a concave cuboidal facet and much of the outline of the Asiatic, and a third with a more concave tarsal aspect and still more concave outer and inner sides; at the same time it would be impossible to assign to either the character of the immature bone. Taken in comparison with the Asiatic, they represent an animal of the usual proportions of the largest form, being of the dimensions of the same bone in the Netley skeleton, and nearly equal, if not equal, to that in the Museum of Guy's Hospital, and 2677 A Roy. Coll. Surg.

B *Type.*—An old bone considerably smaller than the fourth metacarpal, C type, with a convexity of its dorsal aspect almost like a deformity, is nearly entire, with the loss only by decay of portions of the third- and fifth-metatarsal facets. In outline it is like the African; *i. e.* the outer and inner sides of the shaft are even and want the central expansions so apparent in those just described; the cuboidal facet on the dorsal margin is also like the African. The length of the bone is 2·7 inches; breadth, midshaft, 1·5; depth, midshaft, internally ·7; depth of posterior articular aspect 1·5; cuboidal facet 1·3 by 1·3. The articulating surface for the first phalanx is 1·5 by 1·4.

This intermediate-sized fourth metatarsal indicates an animal of the dimensions assignable to the slender-formed fourth metacarpal of B type.

C *Type.*—I have before surmised that Pl. V. fig. 3 and Pl. XX. fig. 5 may represent the second and third metatarsals of the same type; indeed it might be of the same individual. I have also referred to Pl. XX. fig. 6 as being probably the fourth metatarsal[1]. This specimen has a recent oblique fracture across the head and some abrasions of the posterior lateral facets; but otherwise it is entire, and furnishes these measurements—length 2·3 inches, breadth (midshaft) 1·1, depth internally ·8, depth of posterior articular surface 1·4, cuneiform-facet 1·2 by 1, anterior articulating surface 1·3 by 1·1. This bone has much of the general configuration of a fourth metacarpal, and is precisely of the same length as the fourth metacarpal of the skeleton in the Oxford University. It is very doubtful, therefore, whether or not Pl. XX. fig. 6 and the two others are fore- or hind-foot bones; and this will be more cogently indicated when they are compared with the very diminutive fore-foot bone[2] Pl. XXI. fig. 5, and its associates so frequently referred to in connexion with the preceding, and which, in point of type, might be classed with the following.

D *Type.*—I now come to consider a very diminutive fourth metatarsal; it is the same referred to in connexion with its third toe (Pl. XIX. fig. 7); it is shown in fig. 6 of the same Plate. The lower portion of the anterior articulation is lost through erosion; and for the same cause there is a loss of the upper portion of the proximal end; but the entire length is preserved. The latter is 1·9 inch, breadth (midshaft) ·9, depth internally ·7, posterior articulating surface 1, third-metatarsal facet ·8 by ·4; phalangeal articulation is 1 in. in breadth. In the Oxford-University skeleton referred to in connexion with the third metatarsal of the above I find that the fourth bone in the fore foot is 2·5 inches, and in the hind 2·1, thus displaying the same disparities as regards relative lengths[3].

[1] Page 95. [2] Page 76.

[3] It must be understood that the mean length only is taken, as the articular surfaces, from their undeveloped states in the young of this age, make it impossible to ascertain correct dimensions.

As to the characters of the above, its even sides and rounded and slender shaft seem to place it intermediate between what may be the characters of the two recent animals; it has, however, no decided affinities to any of the fossils described. A comparison between this and a fourth metatarsal of *Elephas falconeri* described by Busk[1] shows almost exactly the same proportions; indeed, for any differences worth noticing, they may have belonged to the same individual.

The phalanges referable to the fourth fore- and hind-foot toes, more especially the proximal phalanx (like that of the others), are generally easily recognized; but, with the very extensive materials and the wide disparities we have seen to exist between the specimens of the preceding toes, I find it difficult to place the small specimens in their proper places. The following classification must therefore be subject to criticism.

I have included within brackets the figures 8 and 9 in Pl. XX., for the reason that they are represented in precisely the same state in which they were found; I believe they represent the entire series of phalanges of the third and fourth fore foot of the same individual.

A *Series*.—As regards the dimensions of the opposing surfaces of the fourth metacarpal, phalanx *a* of fig. 9 fits to that of woodcut no. 1, fig. 8; so that with the third metacarpal Pl. XIX. fig. 10, which also fits to Pl. XX. fig. 8, we should have the entire third and fourth digits of the fore foot. Reverting to fig. 9 and *a* its first phalanx, in addition to the data furnished by the figure, its proximal articulation is 1·9 inch by 1·3 in height, and the distal 1·6 by 1. There are several other specimens in the collection slightly larger and very little smaller; but all agree in outline, and are referable to the largest form.

B *Series*.—A smaller form of first phalanx than the preceding is shown in Pl. XX. fig. 13. It has the general features of a fourth metacarpal phalanx, and is of the following dimensions:—length 1·7 inch, breadth midshaft 1·2; the posterior surface is oval and 1·7 by 1·1. The facet for the second phalanx is hollowed out in some degree, with the usual projection of its internal angle; it is ·8 by 1·3 inch. The specimen is as long as the same bone in the young Elephant 707 *h* in the British Museum, which stood about 5 feet in height.

C *Series*.—Pl. XX. fig. 15 represents the first and second phalanges of a fourth digit, possibly of the fore foot, of a still smaller elephant. The facets of the former are—anterior ·7 inch by 1, posterior 1·3 by 1. It must, however, be left an open question whether or not B and C series belong to the fore or hind foot, which of course differ much in relative dimensions, and often very little in characters.

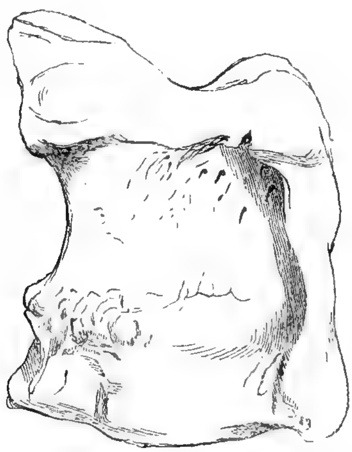
Fifth Metacarpal, Fifth Metatarsal, and their Phalanges.

The internal and external aspects of the fifth metacarpal are more compressed in the Asiatic than seemingly obtains in the African Elephant; hence it is narrower. Like

[1] Trans. Zool. Soc. vi. p. 271, pl. 51. figs. 40, 40 *a*, and 40 *b*.

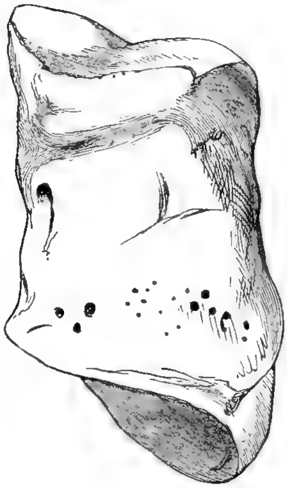
all external bones and exposed surfaces, there are rugosities amounting to exostosis in very old specimens, which, without the ossification of epiphyses, pretty well indicate age. It would seem, moreover, that the upper surface of the fifth metatarsal in the African is broad and expansive, whilst it is narrow and rounded in the Asiatic. The cuboidal facet, as far as 708*h* B.M. is a representative of the African, shows an oval outline, the same being generally circular in the Asiatic. The latter peculiarities are also apparent on the proximal facets of the first metacarpal and metatarsal phalanges of the fifth toe. The first phalanx of the fifth metacarpal digit is longer and more compressed at midshaft in the Asiatic and Mammoth than in the African, with a well-marked saddle-back facet, and contraction of the sides of the shaft, the latter being even in the African. There is a diminutive articular surface on the inner aspect of the distal extremity in the former, whereas the latter shows a more expansive articulation which may have furnished a small terminal phalanx. These differences obtain more or less in the equivalent bone of the hind foot. However, whilst the two bones in the African are nearly of the same length, there is a considerable difference in this respect in the Asiatic, the metatarsal phalanx being conspicuously smaller than that of the fore foot; but I find there is no persistent distinction, some being relatively smaller than others; and, it may be, the same obtains in the African. The comparison, however, in the outlines of the first phalanx of the fore and hind foot in the African shows the latter bone assimilating to the constricted sides of the Asiatic in contradistinction to the same bone in the anterior extremity. Several of these points appear in the outlines, which are of the natural size. Thus no. 1 (fig. 9) is the first phalanx, fifth fore toe, and no. 2 is the first phalanx, fifth hind toe, of the Asiatic Elephant, whilst no. 3 is the first phalanx, fifth fore toe, of the African, the equivalent bone of the hind foot being like no. 2 of the Asiatic. The no. 4 is the first phalanx, fifth fore toe, of the Maltese large form.

Fig. 9.



No. 1.

No. 2



No. 3.

No. 4.

The fifth metacarpal is represented by five specimens, nearly all of which are perfect, excepting a few abrasions. They well support the other bones belonging to the large and intermediate and pygmy forms, not only in dimensions, but also in general characters.

A *Type.*—There are two fifth right metacarpals, of which Pl. XIX. fig. 11 is the more perfect; they differ in scarcely a line as regards relative admeasurements, and are so much like each other in characters that they must have belonged to individuals of the same size exactly.

The length of fig. 11 is 4·3 inches, breadth at middle of shaft 2·1, thickness at mid-shaft 1·4, fourth metacarpal facet 1·6 by 0·5, unciform-facet 2 by 1·5, distal articular surface 2·6 by 2·2, surface for the first phalanx (fig. 11) a to b=1·6 by 1·4.

The flat upper and outer surface and absence of the compressed sides of the Asiatic give quite the characters of the African Elephant to these two specimens, whilst the rugosities on their exposed sides and complete anchylosis of epiphyses proclaim them to be bones of aged animals. These two specimens equal in dimensions the same bone in 2677 A Roy. Coll. Surg., also in the skeletons in Guy's and Royal-Victoria Hospital Museums. The Sumatran is longer, being 5 inches; but its articular facets are quite as large, showing that the fossil was altogether a relatively shorter and broader bone, as obtains in the African.

B *Type.*—The two next might also have belonged to individuals of nearly the same dimensions. They are from left feet; and the more perfect is shown in Pl. XIX. fig. 12. The differences between them and the two just described are that they are not quite so broad in proportion, with sides more compressed, and the shaft rounded instead of the determined flattening on the dorsal and plantar aspects. The unciform-surface is more concave, and the distance between the fourth-metacarpal facet and distal articulation (*a b*) is relatively larger, the intermediate concavity being more shallow, in fig. 12 than in fig. 11.

The external part of the unciform-facet has been recently broken off in fig. 12; but it is preserved in the other specimen, and shows a less pointed extremity than in fig. 11, which is rather more prominent than displayed in the drawing; both, however, have been slightly abraded, so that here the distinctions may not have been so great as the specimens now indicate.

The dimensions of fig. 12 and its sister specimen are:—length 3·2 (3·1); breadth, middle of shaft, 1·9 (1·8); thickness at midshaft 1·4 (1·3); fourth metacarpal facet 1·3 by ·4 (1·1 by ·3); unciform surface 1·6 by 1·4 (1·5 by 1·4); distal articular surfaces 1·6 by 1·4 (lost in the other); facet for first phalanx 1·1 by 1 inch (lost in the other).

These bones are smoother on their upper and outer aspects, and have less the characters of the old bone than the two just described; still their epiphyses are completely consolidated.

A most diminutive fifth metacarpal, at the same time (like the other bones of the same foot) with every indication of consolidation of its epiphyses, is shown in Pl. XXI. fig. 6. It is described with them at p. 77.

A *Type*.—The fifth metatarsal Pl. XX. fig. 7 is the sole representative of this bone in my collections. In all the characters which appear to distinguish the African from the Asiatic, the specimen in question is decidedly akin to the former, and is even more divergent, being as broad as it is long; moreover the navicular aspect has also the outline of the African. In relative dimensions it equals those of the recent Asiatic Elephants with which the fifth metacarpal has just been compared, and even the Sumatran fifth metatarsal in B.M., which is 2 inches in length, with a proximal articulation of 1·6 by 1·2, and a distal of 1·9 by 1·7.

The following are the dimensions of fig. 7—length 2 inches, breadth (midshaft) 1·7, thickness (ditto) 1·3, naviculare facet 1·3 by 1·1, distal articular surfaces 1·7 by 1·5, surface for first phalanx 1·3 by 1·3 (about). The rugosities on the upper and external sides are pronounced. Here we see another convincing proof of the great breadth of the bones to the length as compared with recent species.

The phalanges are divisible into the following:—

A *Type*.—Pl. XX. fig. 10 is unquestionably the first phalanx of the fifth metacarpal left foot. A portion of the internal and lower surface of the distal articulation has been recently removed; but enough is preserved to show that the bone was more conical than in either of the recent species; and whilst it widely differs from the Asiatic, as shown in the woodcut no. 1, fig. 9, it is unlike the African in being shorter and stumpier, although they agree in the absence of the mid contraction of the shaft so apparent in the former and in the proximal phalanx of the fifth metatarsal of the two recent species. It is evident that the second phalanx must have been diminutive, from the small articular surface, which, as before observed, is also minute in the Asiatic; but, as few skeletons possess this bone, and from a comparison of the distal articulations of various fifth metacarpals and fifth metatarsals of the Asiatic, I am inclined towards the belief that there are considerable differences in its outline in individuals. I think, however, as far as the distal articulations of the bones just described extend, that they show relatively more extensive surfaces than in the recent, just as I have observed in the first phalanges of the first and second toes, thus perhaps adding to the pliability of the foot and to the activity of the animal! The proximal facet of Pl. XX. fig. 10 is almost circular; and, only that it is of the opposite side, it fits exactly to the opposing surface of the fifth metacarpal Pl. XIX. fig. 11, being 1·6 inch broad by 1·4 in height. The distal articulation has unfortunately been recently injured, and only a small portion of its very convex facet is preserved, for which a proportionate concave surface would be required. This might be supplied by Pl. XIX. fig. 14, which, if not the terminal phalanx of the outer, must be that of an inner toe; and as regards the latter, it is scarcely applicable, inasmuch as the forms of the opposing surfaces are concave in one, and, although convex in the large form, there is no provision for the projecting lower border *a*, fig. 14, which is accommodated on the lower aspect of the distal articular surface of Pl. XX. fig. 10. I am therefore inclined to consider this bone a second or ungual phalanx of the fifth fore toe of the large form. Its plantar length is 1·4 inch from *a* to the point, but only 0·8 on the dorsal line. The proximal facet is oblique to follow the internal curve of the tips of the fifth toe. There is a scar on the under surface at the tip. The specimen is referred to at p. 91.

B *Type.*—The next proximal phalanx of the fifth digit I shall describe differs much from that of Pl. XX. fig. 10. Its outline is shown in woodcut fig. 9, no. 4 (p. 103), so as to contrast with the others and display its affinities to the Asiatic. Here we have a decided leaning towards the latter; and if the characters shown are borne out by a series of equivalent bones of the two recent, there can be no question in regard to the Asiatic alliance. The one under consideration is slender and concave on its internal border and subconvex externally, with a slight saddle-backed distal articulation and projection inwards of the internal angle. The proximal facet is oval, with the large end directed inwards, and is slightly concave, more especially towards its inner surface. The length of the phalanx is 1·6 inch, breadth at middle of shaft 1·3, proximal facet 1·4 by 1·5 in depth. There is the same inconspicuous facet for the ungual phalanx as in the Asiatic.

C *Type.*—In support of the very diminutive elephantine bones before referred to, there is the remarkably small phalanx Pl. XX. fig. 14. I am doubtful, however, whether to consider it as belonging to the second or fifth toe; but no matter to which, it takes its place with the smallest bones.

In the youngest skeleton of the recent species I have had an opportunity of inspecting (I refer to that in the Oxford-University Museum[1]), the first phalanx of the

[1] The comparisons I have been fortunate enough to obtain from this suggestive example of a very young Asiatic

second toe is 1 inch in the fore and 0·8 in length in the hind foot; whereas the first of the fifth is ·7 in the fore and ·6 in length in the hind foot; whilst fig. 14 is ·7, with a breadth at midshaft of ·8.

The proximal facet in fig. 14 is oval, its broadest end being directed outwards, where the concavity is pronounced. There is space for an ungual phalanx, the distal articulating surface being ·4 inch by ·7 in breadth. The following phalanges seem referable to the fifth toe hind foot:—

A *Type.*—There are several specimens of the form represented in Pl. XIX. figs. 13 & 15, differing a good deal in dimensions. All agree, however, in general characters, and are clearly referable to the external digit. Their proximal facets are slightly concave in the largest specimen and almost flat in the two smaller; it is circular in all, and there is a fossa or pit on the lower aspect of the distal facet, seen at *a* (fig. 13). The outer side is thick and protuberant. The specimens differ considerably in size, the largest being nearly half as large again as fig. 13, but precisely of the same type. The latter fits nearly to the articulating surface of Pl. XX. fig. 7. I think, therefore, as far as relative dimensions extend, that Pl. XIX. fig. 15 might fairly represent the first phalanx of the above metatarsal; at all events the claims of A type to this position in the fore or hind foot seem to me conclusive from the distinctive slope and external flattening so characteristic of the phalanges of the outer toe.

B *Type.*—The most pygmy of all the outer-toe phalanges is shown in Pl. XX. fig. 11, which was found along with the diminutive metatarsals (Pl. XIX. figs. 6 & 7), and, in proportion to these, might fairly represent the first phalanx of their fifth metatarsal. The same characters are observed in it as in the members of A type, only that, being so diminutive, I have considered it best to separate it from them.

Summary.—Comparing these phalanges with the recent species, it is at once apparent that they are like neither; nor, as far as the fore foot is concerned, have they any resemblance to the Mammoth, being so very broad to the length, a character very general with all the Maltese proboscidean bones, whether large or small.

Sesamoid Bones.

It would appear, in aged individuals, that the sesamoid bones, especially on the fourth and fifth manual digits, instead of being in pairs become united. This, however, is not seemingly an invariable rule, and no instance occurs of this condition in my large collection of these bones. As far as it is possible to distinguish the sesamoid bones in the fore and hind feet, and in the different forms of Maltese elephants, I find among the examples (30) considerable differences in size, from which it may be supposed that they belong to the foot-bones just described, with which they were more or less associated.

As compared with sesamoids of recent species, all represent adult animals, being com-

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Elephant have been furnished to me by Mr. Robinson, the Articulator of the Museum, to whom I am also under obligations for the care and trouble he bestowed in obtaining them for me.

pletely ossified, with bold and determined facets and rugosities of old bones[1]. Pl. XX. figs. 18–22 and Pl. XXI. fig. 7 represent what may be considered as belonging to the large, intermediate, and pygmy elephantine foot-bones, with which they agree in the size and configuration of their articular surfaces.

Summary.—A survey of the long bones of the feet furnishes data even more convincing than those of the tarsus and carpus. The first toe of a large, an intermediate, and a dwarf Elephant is well represented, the gradations being not altogether in size, but also in characters, which seem to stamp a distinctness between the two larger forms at all events, whilst the smallest and intermediate appear to resemble each other. The second toe of the largest form is proven by numerous examples showing much the characters of the Asiatic, whilst a smaller and distinct type is African in aspect, as demonstrated by a comparison of Pl. XX. figs. 12 & 17. We have seen much individual variability in each of the larger forms; and now, by comparing the second metatarsal (Pl. XX. fig. 3) with the second metacarpal (Pl. XXI. fig. 4), it will be seen, according to data furnished by recent individuals, that full-grown individuals of the pygmy form ranged from 2 feet up to the minimum dimensions of the intermediate form, which, again, attained the dimensions of the large form, which in no instance, as far as my collection extends, exceeded 7 feet in height. The third toe repeats the conditions just stated; and the fourth comprises a complete series of nearly all dimensions, from the smallest to the largest; whilst the fifth shows the three gradations very pointedly, the two extremes being more or less alike in character, and assimilating to the African, whilst the intermediate would seem to lean towards the Asiatic; but there are so many perplexing discrepancies that I feel quite unable to reconcile the characters of the digital elements of the Maltese and recent species whilst remains of other extinct species are too few and they are generally undetermined.

XIV. Recapitulation.

I shall now in conclusion briefly recapitulate the leading facts, and the inferences I have been enabled to draw from them.

In the first place, it is clear that all the species of Maltese fossil Elephants lived together; for, although certain localities produced more remains of one species than another, all were more or less mingled and in close proximity, and showed by their aspects and the geological conditions around them, that they had for the most part been swept into the hollows and rock-rents through turbulent agency of water. These facts have been clearly proved in my work referring to my explorations in the Maltese ossiferous deposits[2]. Along with the Elephant-bones indications were found of the presence of Carnivora, only, however, by a single tooth and marks of fierce gnawing on

[1] The sesamoid bones are seemingly not ossified completely until the true molars are in wear. In 707 *h*, B.M. (frequently referred to here), with its last milk-molar in full wear, they are mere centres of ossification in shapeless masses of cartilage.

[2] *Op. cit.* p. 161.

the Elephants' bones[1]. The presence of two forms of Hippotamus—one of rather small dimensions (*H. pentlandi*), and teeth of a dwarf form (*H. minutus*, Cuvier)[2]—is shown by the finding of bones and teeth in exactly the same deposit in which the Elephants' remains were discovered. Of other animals there were the gigantic *Myoxi*, besides large birds, Chelonians of various dimensions, and a *Lacerta*, with recent land-shells, several of which seem identical with species now living in Malta[3].

1. Turning to the anatomical characters presented by the collections generally, and my own in particular, the following data in connexion with the *Cranium* of the Maltese fossil Elephants are here recorded:—Although we have no evidence in regard to the configuration of the calvarium in any of the forms, there are a few suggestive points with reference to the lower jaw. From numerous instances, it appears that the lower border of the ramus presents the outline of the African Elephant; but the more erect diasteme and absence of a prolonged rostrum show characters in common with the Asiatic[4]. The symphysial gutter, wherever observed, seems to have been open and shallow; and the dental foramen, at all events in one of the smaller forms, opened just under the condyle, as obtains in the Asiatic species and mammoth. One ramus displaying a molar, to all appearances the last of the series, has its relative dimensions equivalent to those of the young of recent Elephants[5], and of an individual nearly 5 feet in height, and equal to that estimated by Dr. Falconer and Mr. Busk as the stature of the *Elephas melitensis*.

The more diminutive ramus[6], and its teeth, which I have doubtfully referred to the last of the series, might indicate a still smaller form than the above; but the materials are imperfect, and the equivalent Zebbug teeth[7] point to a larger individual, which fully equalled the *Elephas melitensis*; so that, as far as the smaller forms are concerned, there is no cogent cranial evidences of more than one species. As regards a large form, there is abundant proof; but there are no perfect cranial bones, excepting the symphysis described by Busk[8] and a fragment of the middle of a lower maxilla in my collection, both of which clearly show the presence of an Elephant nearly of ordinary dimensions, the former proving that it had a truncated chin.

2. The *Dental* materials are very various and complicated; and as regards the classification I have adopted, it is possible that several of the intermediate molars may permit of different positions than I have assigned to them.

As regards the incisors, the collections indicate a milk-incisor of the size of that of the fœtal African Elephant, with its enamel shell, and a much smaller but similarly constituted tooth, which differs also somewhat in shape from the other; both however, for the reason just stated, preserve the character of the African[9].

[1] Palæont. Mem. ii. pp. 301 & 305.
[2] Author's work on Malta, p. 206.
[3] *Ibidem*, p. 307, & Trans. Zool. Soc. vol. vi. p. 307.
[4] Pl. VI. fig. 2.
[5] Pl. VI. figs. 1, 1*a*.
[6] Pl. IX. fig. 1.
[7] Trans. Zool. Soc. vi. pl. 53. figs. 11, 12, 13.
[8] *Ibid.* vi. pl. 44. fig. 1.
[9] Pl. I. figs. 1, 2.

The permanent tusks represent the contour of the recent species; and evidently they were present in both sexes. The usual sculpturings of the ivory are very pronounced; the specimens moreover indicate the presence of an Elephant somewhat under the ordinary size, with much variety, down even to what must have been a very small form or species [1]. This is proven clearly by specimens that cannot be considered tusks of young elephants.

There are indications in one upper jaw of the first and second milk-teeth [2], besides the third, which is in use, and the last or fourth in germ behind it [3]. At all events the second milk-tooth in one or more of the Maltese elephants differed from that of any known species, in having *one* erect instead of *two*, divergent fangs [4]. The specimens contained in my collection, and in that of Admiral Spratt, do not differ individually in any remarkable extent as regards size; and, apparently, all held the same number of ridges, although in one instance of an upper molar there are distinctly only four instead of five [5]. All, as compared with other species, are very diminutive, and clearly point to their owners having been small elephants.

The molars I have referred to the third or penultimate milk-stage can be arranged in a very gradual progression as to dimensions, *i. e.* from a very small tooth to one nearly equal to an unusually small-sized third milk-molar of the African Elephant [6]. The smaller molars hold five plates and two talons; whilst the intermediate and the largest have six plates and two talons. The talons, however, are very feebly indicated on certain specimens of the intermediate teeth [7], so as to make it not easy to say whether these molars should be included with the smallest or largest.

The crown-patterns differ very little in teeth in the same stages of wear; and there is very little of importance in regard to the crown constituents of a specific character, excepting that the largest molars are readily distinguished by the relative thickness of their plates and rugosities of the digitations, especially on the posterior ridges [8].

It appears, therefore, that the evidences deducible from the penultimate milk-molars indicate the presence of two forms differing very much in size, and to a smaller extent in one or two characters; and their ridge-formulæ are not the same.

The data I have brought together, with reference to the last milk- and first true molar, I freely admit may be subject to different inferences than those here drawn. In all species of the genus there are great difficulties under this head—and on the present occasion in particular, where there are evidently two or more forms of Elephant to be worked out; indeed I find it almost impossible to reconcile all the varieties of molars

[1] Pl. XI. figs. 11–20, and Trans. Zool. Soc. vi. pl. 52. figs. 46 & 48.

[2] I allude to the *pre* and *ante* penultimate milk-molars.

[3] Pl. II. fig. 1.

[4] Pl. I. fig. 6, and Trans. Zool. Soc. vi. pl. 53. fig. 2.

[5] Pl. I. fig. 3.

[6] Compare Pl. I. fig. 8 with fig. 14.

[7] Pl. I. fig. 15*a*. A ridge more or less is common in the penultimate milk-molar of other extinct species—to wit, *E. primigenius* and *antiquus*.

[8] Compare Pl. I. fig. 14 with Pl. III. figs. 4*b* & 5*a*.

with one another, unless a liberal margin be allowed for individual differences in size, which, unfortunately, is the only very distinctive character in many instances. I have therefore, in correlating the various teeth, made such allowances in this respect as seem to me fairly permissible in comparison with individual differences in size of similar molars in well-known species.

The molars I regard as representing the last milk-teeth of the two Maltese fossil elephants agree in holding ordinarily eight plates and two talons, and occasionally an additional ridge in the lower jaw. They are fairly divisible, on the score of size, into three forms, and on the grounds of characters into two apparently distinctive species. The two smaller differ a good deal in size, but not apparently in other particulars; whilst the largest is *at once* recognized, not only from its far greater dimensions, but, as in the case of the preceding molar, by the *thickness of the plates* and the *rugose character of the collines posteriorly.*

The crown-patterns vary slightly in specimens equally worn, there being, seemingly, less faint crimping of the machærides of the disks in the smallest than in the largest. As compared with recent species, the more diminutive teeth would point to a *very small* elephant; whilst the second-sized would indicate an *intermediate form*, between a dwarf and a *small* individual of either of the recent species[1]. If, however, a fair margin is allowed for individual differences, it appears to me that the data prove the existence of only two distinct species, or mayhap one *very* variable species of Maltese elephant.

The teeth assigned to the first true molar are only divisible into two sizes and two very distinctive forms. The smaller, as in the preceding, show a thin-plated molar, remarkable for the great height of the ridges in the upper jaw and the arcuated crown of the lower, with its rounded, broad anterior aspect[2], these characters giving quite distinctive features to the teeth, as compared with the first true molars of the largest species[3]. The Zebbug specimen was doubtfully referred by Dr. Falconer to the second true molar of *E. melitensis*[4]. The largest form of a first true molar is at once distinctive, and, as compared with the largest of the preceding teeth, fully maintains all their characters[5]. All the first true molars maintain the same ridge-formula, which gives eight to nine plates besides talons.

The second true molar of the series presents well-marked differences in dimensions and characters. All the members seem to have ordinarily held ten plates and two talons. They are divisible into large and small molars. The former, again, present certain anomalies as to thickness of plates, which might be considered sufficient to separate them, although in size they do not differ to any very marked extent[6]. The smallest

[1] Compare Pl. I. fig. 11 with fig. 10 and Pl. III. figs. 4 & 5.

[2] Pl. II. figs. 9 & 9*a*, Pl. VI. figs. 5 & 5*a*, and Pl. V. fig. 2.

[3] Pl. III. fig. 3, and Pl. IV. fig. 4.

[4] Trans. Zool. Soc. vi. pl. 53. fig. 9, and p. 296.

[5] Compare Pl. III. fig. 3, and Pl. IV. fig. 4, with Pl. III. figs. 4 & 5.

[6] Compare Pl. III. figs. 1 & 2 with Pl. VIII. fig. 4 and Pl. XI. fig. 10.

molars maintain the long narrow crown, so apparent in the lower molars of the preceding teeth I have referred to this type [1], and represent an Elephant of about the dimensions assigned by Busk and Falconer to the *E. melitensis*; whilst the largest point towards one of the small varieties of recent species, in no instance purporting to be over 7 feet in height.

In correlating all the data in connexion with the last true molar, I have formed an opinion opposed to that of the late Dr. Falconer, as to the position of the upper tooth he considered to be the last of the series of *E. melitensis* [2], and am disposed to place it with the penultimate true molar of the same species. This, however, is not of much importance, seeing that facts, apparently indisputable, are patent, by which we are enabled to confirm the previous evidence of the same small species, and show thereby that its last true molar was only a little larger than the above [3].

The evidence between what are designated *thin-* and *thick*-plated molars, when applied to the penultimate and ultimate teeth, is not of much value specifically, seeing, from what has been recorded in the introduction, that such conditions are common to the above stages of growth in more than one well-known species. It is to be observed, however, with reference to the thin-plated last true molars just referred to, that in the Zebbug collection and my own there are specimens of thick- and thin-plated varieties in a diminutive elephant [4]. It is clear, moreover, that Dr. Falconer did not consider the above a barrier to his belief in the specificity of teeth otherwise equal, from the fact that he correlated a thin- and thick-plated molar [5] as being the last of the series of *E. melitensis*. Under these circumstances one might be inclined to regard the thick plates as only an individual distinction. Considering, however, the smallest last molars collectively, they do represent an elephant varying from what may be called pygmy dimensions up to an animal nearly 5 feet in height. The incomplete condition of the thick-plated molars [6] of the above prevents the determination of their ridge-formulæ satisfactorily, whereas the thin-ridged tooth displays twelve plates and two talons [7].

The largest form displays precisely the same characters as regards thickness of plates as just observed with reference to the smallest; and unfortunately there is the same dubiousness in regard to the ridge-formula of its thick-plated sort [8]. It is different, however, with the thinner-plated type [9], of which there are several perfect specimens, showing that the ridge-formula was ordinarily composed of twelve plates and two talons.

[1] Compare Pl. V. fig. 1 with fig. 2, Pl. VIII. fig. 5, Pl. IV. fig. 3, and the Zebbug tooth in Trans. Zool. Soc. vi. pl. 53. fig. 5.

[2] Trans. Zool. Soc. vi. p. 296, and Palæont. Mem. vol. ii. pl. xi. figs. 1 & 2.

[3] Compare Pl. IV. fig. 1 with Palæont. Mem. vol. ii. pl. xi. fig. 1.

[4] Pl. IX. fig. 1, and Trans. Zool. Soc. vi. pl. 53. fig. 11.

[5] He considered pl. xi. fig. 1 of Palæont. Mem. the last upper molar, and Trans. Zool. Soc. vol. vi. pl. 53. fig. 11 the last lower tooth of the same species.

[6] Pl. IX. figs. 1 & 2.

[7] Pl. VI. figs. 1 & 1*a*.

[8] Compare Pl. VIII. fig. 7 with Pl. VII. fig. 1 or 2.

[9] Pl. VII. fig. 1.

with an occasional ridge, even in upper teeth [1]. Here, again, if disposed to lay stress on the thick ridges, there would be no difficulty in creating two forms; but enough is known of the errors of palæontologists to make me chary in admitting even the two fragmentary yet very remarkable specimens [2] as belonging to species distinct from their thinner-plated compeers [3].

As before remarked, all the Maltese fossil elephants present a crown-pattern which differs very little individually. In crowns newly invaded there is considerable crimping [4]; but as soon as the digitations are worn out, the section shows a disk expanded in the centre, with a decided abrupt angulation and the "fine" or "faint" crimping on the cement side of the machærides [5]. This crimping is always most distinct on thin-plated or moderately thick-plated surfaces, and dies away almost altogether on very thick enamel [6]; however, it is seemingly not constant.

The dentition, therefore, of the Maltese fossil elephants seems to me to confirm the presence of two species, the ridge-formula of whose molars runs thus:—The smallest species holds, exclusive of talons, in its milk-series 3+5+8–9, and in the true molars 8–9+10+12; the large form gives 3+6+8–9 in the former, and 8–9+10+12–13 in the latter.

The nearest known species to which the above assimilate in the numerical estimate of their dental ridges, is the *Elephas meridionalis*; and the closest approximation of the worn crowns and character of the ridges are to the same in *Elephas antiquus*. They differ, however, widely from both, and justly deserve separate positions in synoptical tables of species.

3. A *Stylo-hyoid* of very diminutive size [7], as compared with either recent species, even in their very youthful states, points towards the presence of the smallest form.

4. The *Vertebral Column* displays the elements of what had belonged to two distinct forms differing much in dimensions; indeed by taking several dorsal vertebræ and their ribs, and the atlas and largest cervical vertebræ and their ribs [8], we have represented two mature animals differing in height, as compared with recent species, to the extent of individuals varying from 4·5 up to 7 feet. The decided character of the atlas [9] seems to place the smaller species, as does its lower jaw, for the most part with the African Elephant.

5. The only fragment of a *Pelvis* shows [10], as compared with a similar portion in the Zebbug collection [11], a somewhat remarkable internal arching or "beehive" construction of the acetabulum. Being a mature bone, it represents the smaller form, and in relation to the other specimen is somewhat larger. The two differ decidedly in respect of the

[1] This is the case in Pl. VIII. fig. 1.
[2] Pl. VIII. fig. 7, and No. 78 of Collection.
[3] Pl. VIII. fig. 1, or Pl. VII. figs. 1 & 2.
[4] Pl. II. fig. 9.
[5] Pl. II. fig. 7.
[6] Pl. IX. fig. 1*a*.
[7] Pl. XV. fig. 10.
[8] Compare figs. 7 & 8 with fig. 9 of Pl. XI., and ribs, figs. 2 & 3 of Pl. X., with Pl. IX. figs. 6 & 7.
[9] Pl. XIII. fig. 1.
[10] Pl. XV. figs. 9 & 9*a*.
[11] Trans. Zool. Soc. vi. pl. 50. fig. 31.

depth and form of the femoral cup, which may have given a character to the head of the bone. Mr. Busk considers the Zebbug bone to belong to the pygmy *E. falconeri*; both represent, indeed, very small elephants of adult age.

6. The materials referable to the *Humerus* and *Scapula* in both collections seem to point to three forms. The smallest humerus[1] is not a mature bone, and may have appertained to a small individual of the intermediate form, which, again, by a series of humeri passes into the largest, which we find represented by a fragment of the upper portion of a humerus which might have belonged to an elephant fully 7 feet in height[2].

The smaller form[3] (and indeed the character seems almost general to the small humeri) shows a compressed head—so much so that Mr. Busk in describing the Zebbug specimen states "that, had it been completely detached from the rest of the bone, it might very readily have been regarded as fitted more for a ginglymoid than an enarthrodial joint." The bicipital groove is also very wide and shallow in the intermediate form; unfortunately there are no specimens of the larger sufficiently entire to show how far the latter character is also common to it.

The scapulæ[4] in any ways entire refer altogether to two small individvals, about the dimensions of the smallest adult humerus; their glenoid fossæ have much of the outline of the African species, the same being narrower in the Asiatic.

7. The bones of the *Forearm* are not all of adult animals. One head of a radius[5], showing the decided gnarled aspect of a very old individual, presents much of the contour and character of the African, and is referable to the largest form. There are several detached distal radial, and one ulnar[6], epiphyses belonging to large, intermediate, and small individuals—the first and the last presenting some points rather distinctive, irrespective of size; but the materials not belonging to full-grown, at all events aged individuals, it would be, perhaps, best not to rely on the characters I have pointed out.

8. The *Femur* proves the existence of the intermediate and large forms[7]; but the smallest of the latter is not much larger than the former, whilst the extremes are wide apart.

As to characters, we find the largest showing a pronounced similarity of the proximal extremity of the Asiatic and distal of the African, more especially in the longer neck of the former and more compressed condyles of the latter. As far as the characters of the intermediate-sized specimen have been preserved, it would appear that it does differ from the larger form and either recent species and also the Mammoth. At all events, it seems that the femur, taken in conjunction with these immature bones, indicates two distinct forms, viz. a large and a small Elephant.

9. The *Tibia*[8] represents an adult Elephant; but the bone is shorter and broader

[1] Trans. Zool. Soc. vi. pl. 49. fig. 26.
[2] Pl. XI. figs. 1–4.
[3] Pl. XII. fig. 1, and Trans. Zool. Soc. vi. pl. 48. fig. 22.
[4] Pl. XII. figs 2 & 3.
[5] Pl. X. figs. 7 & 7*a*.
[6] Pl. X. fig. 6, and Pl. XIII. figs. 2 & 3; see also page 57.
[7] Pl. XIV. figs. 1, 2, 3.
[8] Pl. XV. figs. 1 & 2.

than usually obtains in the recent species with articulating surfaces of the same dimensions. The same is distinctly shown in the other long bones. Thus Pl. XV. fig. 1 is referable to a full-grown individual; and whilst considerably shorter than the tibia of the Sumatran Elephant in the British Museum, its condyloid and astragaloid aspects are rather larger. In characters it resembles the African, and in fact belongs to the owner of femur Pl. XIV. figs. 1 & 2, just referred to as that of the largest form.

10. The *Fibula*[1] represents the extremities of individuals equal to the largest, intermediate, and smallest forms, the two former claiming apparent distinctions in relation to the contour of their distal extremities, whilst a very small entire bone is only 8·6 inches in length. The young and immature tibiæ furnish also distinctions which, in the absence of further specimens of the adult condition, need not be discussed.

11. The *Foot-bones*, considered individually and collectively, maintain all the differences already recorded as to the dimensions of individuals, even to a much greater extent; in fact there is a regular gradation in certain instances from the largest to the smallest. The chief characters of the bones may be thus briefly summed up. Of the carpus, the scaphoid[2] shows two series referable to a large and small animal, with points apparently distinctive, the larger partaking of the African outline, and the smaller simulating the Asiatic. The lunare[3] represents three forms, the most remarkable as regards dimensions being the very small specimen belonging to a foot found *in situ*[4]. It would seem that the African character pervades the largest, whilst the intermediate and smallest forms have an Asiatic facies.

The pisiforme shows two old bones referable to the largest and intermediate forms[5], with outlines similar and like the same in the African Elephant. The cuneiforms are suggestive, the largest having much of the contour of the Asiatic, whilst the intermediate and a pygmy bone have the broad ulnar aspects of the African[6].

The magnum repeats the dimensions of large and small individuals, showing, however, in all, this one peculiarity as compared with other elephants—to wit, in being narrower bones.

The unciforme also displays three sizes[7], with slight differences, chiefly in the relatively greater breadth of the cuneiform-aspect of the intermediate form.

12. With reference to the *Tarsus*, the astragalus furnishes three forms, differing in characters, especially the two larger, as well as in dimensions[8]. The calcaneum represents two forms[9], differing in characters, but not much in size; indeed one might represent a small individual of the largest, and the other a full-grown Elephant about the height assumed by Falconer and Busk for the *Elephas melitensis*. The other bones of the tarsus indicate the presence of the large and intermediate forms[10].

[1] Pl. XV. figs. 4 & 8.
[2] Pl. XVII. fig. 10, and woodcut, p. 67.
[3] Pl. XVIII. figs. 1 & 4.
[4] Pl. XXI. fig. 1.
[5] Pl. XVIII. figs. 3 & 6.
[6] In Pl. XVIII. compare figs. 2 & 5 with figs. 9 & 8.
[7] Pl. XVII. figs. 12 & 9, and Pl. XXI. fig. 2.
[8] Pl. XVI. figs. 1 & 3. and Pl. X. fig. 10.
[9] Pl. XVI. figs. 4 & 5.
[10] See Pl. XVII.

13. The metacarpal, metatarsal, and phalangeal confirm previous evidences with respect to the extreme variability in size of equivalent bones[1]. Strange to say, however, whereas the African type was most apparent in the longer bones of the largest, indeed, in all the forms more or less, we have a leaning towards the Asiatic facies in the digits of the former[2], and African characters in the latter[3]; but there is such a commingling of the two recent species even in the same bone, that it is extremely difficult to arrive at any clear decision in relation to the skeleton generally as compared with any known species.

In computing the height and proportions of the Maltese fossil species by comparisons with individual bones of the same length in recent Elephants, it has been apparent that the former are relatively broader, with larger articulating surfaces. This is very evident in the long bones of the largest form, which display these characters in a remarkable manner, and proclaim the fact that, at best, it must be considered a small Elephant. Consequently all the remains of the Maltese fossil species represented stunted forms, varying between what appears to be an adult proboscidean, scarcely 3 feet in height, up to a large form or species fully 7 feet at the withers. These, as far as I am enabled to compute from the collection hitherto brought together, seem to be about the maximum and minimum proportions, or almost.

The individual differences in height in the adult recent species seem to vary between 8 and 12 feet[4]; so that, relatively, the palæontologist, in the absence of anatomical distinctions, is allowed a broad margin on this head.

After a careful survey of almost every collection hitherto made of the remains of the Maltese fossil elephants, it appears to me (1) that the incisive and molar teeth afford good evidences of two species, and, as regards dimensions, they admit of a division into large, intermediate, and small; indeed, as regards the penultimate and last true molars, there seems to me no difficulty in making out four varieties differing considerably in size and to a slight extent in characters. (2) The bones of the cranium, as far as they admit of distinction, show two forms differing in size. (3) There are two distinct forms represented by the vertebræ, with a graduating intermediate series which almost runs into the largest and smallest, the distinctions on this head being altogether in relation to dimensions, the bones generally being too imperfect for further determinations. The atlas, however, shows the characters of the African Elephant, the same obtaining in a perfect seventh cervical vertebra belonging to an Elephant of the same dimensions in the Zebbug collection, and referable to the same small species to which Mr. Busk has given the name of *Elephas melitensis*. (4) The long bones of the extremities display three marked gradations as to dimensions; whilst the bones of the feet demonstrate three or four varieties as regards size. (5) With reference to the young and immature bones generally, there are also clear indications of two species, a large and a small. By making

[1] Compare Pl. XIX. with Pl. XX. & Pl. V. [2] Pl. XX. figs. 8 & 9. [3] Pl. XX. figs. 1 & 17.

[4] See Livingstone's 'Travels in South Africa,' p. 56; Tennent's 'Ceylon,' vol. iv. p. 291; Baker's 'Nile Tributaries of Abyssinia,' p. 533, and 'Albert Nyanza,' vol. i. p. 275.

allowances for individual differences of age and sex, I believe that the bones of the Maltese fossil elephants are divisible into three varieties and two well-marked species, viz. a large and a small Elephant, the latter showing two forms represented by the *Elephas melitensis* of Falconer and Busk, which may have seldom attained a height of 5 feet, and a diminutive or pygmy form named by Mr. Busk *Elephas falconeri*, the smallest bones of which indicate an elephant about 3 feet in height. But there are intermediate-sized bones which easily bridge over the differences between the latter and the *Elephas melitensis*; nevertheless Mr. Busk has pointed out characters appertaining to the two, and is of opinion that they are distinct species[1].

Finally the presence of a much larger species of Elephant among the Zebbug remains has been clearly pointed out by Falconer and Busk; but the bones were very fragmentary and of little use for anatomical descriptions. It has been my good fortune to bring together abundant remains of apparently the same Elephant, the characters of which are as minutely detailed in the preceding pages as it has been in my power to accomplish. I believe they represent the entire dentition and osteology of the greater portion of the skeleton of an Elephant of considerably smaller dimensions than the living species, and seldom exceeding 7 feet in height, whilst the average height may have been between 6 and 7 feet. Thus, probably, the two species displaying the variability as to size which we see common among heads of the two recent Elephants, often approached the limits of each other's growth; and, as otherwise there was not any very marked distinction, it would be difficult to decide the proper place for such remains; hence it may be that here and there I have referred bones to the small species which belong to small-sized individuals of the former. This, however, does not appear of much moment in comparison with the data descriptive of the molars and largest bones, which afford unquestionable evidence of a distinct species.

I have named the largest Elephant *Elephas mnaidriensis*, in consideration of the circumstance that the gap, or rock-rent, from which I obtained the most perfect specimens of its bony structure is situated close to the ruins of the Mnaidra temple, a prehistoric and megalithic structure bearing evidences of the earliest human occupation of the Island of Malta.

DESCRIPTION OF THE PLATES.

PLATE I.

Figs. 1 & 2. First milk-incisors of *Elephas mnaidriensis* and *E. melitensis*: p. 8. Zebbug Cave and Mnaidra Gap.

Figs. 3, 4, 5 & 6. Second or antepenultimate milk-molars of the Maltese Elephants: p. 11–12. Mnaidra Gap; fig. 6, Benghisa Gap.

[1] Trans. Zool. Soc. vi. pp. 235 & 251.

Figs. 7, 7 *a*. Crown and side views of a third or penultimate upper milk-molar of *Elephas melitensis*: p. 14. Mnaidra Gap.

Figs. 8, 8 *a*. Crown and side views of the lower penultimate milk-molar of *E. melitensis*: p. 14. Benghisa Gap.

Fig. 9. Crown view of a lower penultimate milk-molar of *Elephas mnaidriensis* (?): p. 15. Mnaidra Gap.

Fig. 10. Crown view of the 4th milk-molar, upper jaw, of *Elephas melitensis*: p. 18. Mnaidra Gap.

Fig. 11. Crown view of the 4th milk-molar, upper jaw, of *Elephas melitensis* (? *E. falconeri*): p. 17. Benghisa Gap.

Fig. 12. Portion of right lower ramus (profile view of the same, Pl. VI. fig. 2), with fragment of tooth doubtfully referred to the penultimate milk-molar of *Elephas mnaidriensis*: p. 16. Gandia Fissure.

Fig. 13. Crown view, upper jaw, referred to the penultimate milk-molar of *Elephas mnaidriensis*: p. 16. Mnaidra Gap.

Figs. 14, 15, & 16. Views of lower milk-molars referred to the penultimate milk-molar of *Elephas mnaidriensis*: p. 16. Mnaidra Gap.

Fig. 17. Crown of an upper molar referred to the last of the milk-series of *Elephas melitensis*: p. 18. Mnaidra Gap.

Fig. 18. Permanent tusks and fragment of upper tooth referred to the last milk-molar of *Elephas melitensis*: p. 18. Benghisa Gap.

PLATE II.

Figs. 1, 2. Fragments of upper and lower jaws containing penultimate milk-molars of *Elephas melitensis*: p. 14. Mnaidra Gap.

Figs. 3, 3 *a*. Front and profile views of enamel-plates, showing sculpturings: p. 5.

Figs. 4, 4 *a*. Front and profile views of inner or ivory aspect of enamel plates: p. 5.

Fig. 5. Outer aspect of enamel plate, showing ridges and channellings: p. 5.

Fig. 6. Vertical section of enamel plates, showing the relative proportions of elements of the crown: p. 6.

Fig. 7. Fragment of a much worn second upper true molar of *Elephas mnaidriensis*: p. 6. Mnaidra Gap.

Figs. 8, 8 *a*. Crown and side views of the anterior portion of a tooth referred to the second true molar, lower jaw, of the *Elephas melitensis*: p. 25. Mnaidra Gap.

Figs. 9, 9 *a*. Crown and side views of the anterior portion of a molar referred to the first true molar of *Elephas melitensis*: p. 20. Mnaidra Gap.

Figs. 10, 10 *a*. Crown and side views of anterior portion of a molar referred to the last true molar of *Elephas melitensis*: p. 32. Mnaidra Gap.

PLATE III.

Fig. 1. Crown view referred to the second true molar of *Elephas mnaidriensis*: p. 26. Gandia Fissure.

Fig. 2. Fragment of crown referable to second true molar, lower jaw, of *Elephas mnaidriensis*: p. 27. Mnaidra Gap.

Figs. 3, 3 *a*. Side and crown views, referred to the first upper true molar of *Elephas mnaidriensis*: p. 22. Gandia Fissure.

Figs. 4, 4 *a*, 4 *b*. Side, crown, and back views, referred to the upper last milk-molar of *Elephas mnaidriensis*: p. 21. Mnaidra Gap.

Figs. 5, 5 *a*. Crown and back views of the last lower milk-molar of *Elephas mnaidriensis*: p. 22. Mnaidra Gap.

PLATE IV.

Fig. 1. Palatal region, showing last true molars of *Elephas melitensis*: p. 29. Benghisa Gap.

Figs. 2, 2 *a*. Side and crown views of the last upper milk-molar of *Elephas mnaidriensis*: p. 21. Mnaidra Gap.

Fig. 3. Crown view, referred to the last lower milk-molar of *Elephas melitensis*: p. 20. Benghisa Gap.

Figs. 4, 5. Crown views of lower first true molars of *Elephas mnaidriensis*: p. 22. Gandia Fissure and Mnaidra Gap.

PLATE V.

Figs. 1 *a*, *b*. Rami referable to the same individual with second true molars of *Elephas melitensis*: p. 25. Benghisa Gap.

Fig. 2. Crown view, referred to the lower first true molar of *Elephas melitensis* (? *E. falconeri*): p. 20. Mnaidra Gap.

Fig. 3. (?) Third metacarpal of *Elephas melitensis*: p. 95. Mnaidra Gap.

Figs. 4, 5. First metacarpal, and its phalanx, of *Elephas melitensis*: p. 90. Mnaidra Gap.

PLATE VI.

Figs. 1, 1 *a*. Portion of right ramus, with last true molar *in situ*, of *Elephas melitensis*: p. 30. Benghisa Gap.

Fig. 2. Side view (crown aspect, see Pl. I. fig. 12) of portion of right ramus, with a tooth doubtfully referred to the penultimate milk-molar of *Elephas mnaidriensis*: p. 38. Gandia Fissure.

Fig. 3. Portion of left ramus holding a fragment of molar referred to the second true molar of *Elephas melitensis*: p. 40. Benghisa Gap.

Fig. 4. Portion of left ramus, showing the empty alveoli of two teeth referred doubtfully to the last milk- and first true molar of *Elephas melitensis*: p. 39. Benghisa Gap.

Figs. 5, 5 *a*. Side and crown views of a lower tooth referred to the first true molar of *Elephas melitensis*: p. 20. Mnaidra Gap.

PLATE VII.

Fig. 1. Side view of a last upper true molar of *Elephas mnaidriensis*: p. 33. Mnaidra Gap.

Figs. 2, 2 *a*. Crown and side views of a last lower true molar of *Elephas mnaidriensis*: p. 33. Mnaidra Gap.

PLATE VIII.

Figs. 1, 1 *a*. Side and crown views of a last upper true molar of *Elephas mnaidriensis*: p. 34. Mnaidra Gap.

Fig. 2. Side views of a fragment of a second (*a*) and an entire upper last true molar of *Elephas mnaidriensis*: p. 33. Mnaidra Gap.

Fig. 3. Side view of the last upper true molar of *Elephas mnaidriensis*: p. 33. Mnaidra Gap.

Fig. 4. Crown view of a fragment of a second upper true molar of *Elephas mnaidriensis*: p. 26. Mnaidra Gap.

Fig. 5. Crown view, referred to the first upper true molar of *Elephas mnaidriensis*: p. 22. Mnaidra Gap.

Fig. 6. Condyle of a lower ramus: p. 36. Mnaidra Gap.

Fig. 7. Crown view of a last lower true molar of *Elephas mnaidriensis*: p. 34. Mnaidra Gap.

Figs. 8, 8 *a*. Crown and side views of a last lower true molar of *Elephas mnaidriensis*: p. 33. Mnaidra Gap.

Fig. 9. Side view of a last lower true molar referred to *Elephas mnaidriensis*: p. 32. Benghisa Gap.

PLATE IX.

Figs. 1, 1 *a*, & 2. Left lower jaw and true molars *in situ*, with its crown view, and side aspect of the right tooth of the same individual of *Elephas melitensis*: p. 31. Mnaidra Gap. (? *E. falconeri*, Busk.)

Figs. 3, 4. The posterior view of a first dorsal, and anterior view of a fourth dorsal vertebra. These are included with their associated vertebræ in Plate XI. fig. 9, and belonged to the same individual of *Elephas melitensis*: p. 46. Mnaidra Gap. (? *E. falconeri*, Busk.)

Figs. 5, 5*a*. Side and front views of head and glenoid fossa of a scapula, doubtfully referred to the Proboscidea: p. 53. Mnaidra Gap[1].

Figs. 6, 7. Heads of a second and third ribs of *Elephas melitensis*: p. 47. Benghisa Gap. (? *E. falconeri*, Busk.)

PLATE X.

Fig. 1. Posterior aspect of the body of the first dorsal vertebra of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 2. Head of a rib (fifth ?) of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 3. Head of a rib—one of the last six ribs of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 4. Posterior view of a middle dorsal vertebra (ninth ?) of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 5. Anterior aspect of a middle dorsal vertebra of *E. melitensis*: p. 47. Benghisa Gap. (? *E. falconeri*, Busk.)

Fig. 6. Distal epiphysis of the radius of *E. mnaidriensis*: p. 56. Mnaidra Gap.

Figs. 7, 7*a*. Side and crown views of the head and portion of the shaft of the radius of *E. mnaidriensis*: p. 54. Mnaidra Gap.

Figs. 9, 9*a*. Side and crown views of portion of an ulna of *E. melitensis*: p. 55. Benghisa Gap.

Fig. 10. Upper surface of an astragalus of *E. melitensis*: p. 80. Mnaidra Gap.

PLATE XI.

Fig. 1. Side view of the head and portion of the shaft of a humerus of *E. mnaidriensis*: p. 51. Mnaidra Gap.

Figs. 2, 3. Side view of a head of a humerus and anterior portion of the glenoid fossa of a scapula of the same individual of *E. mnaidriensis*: p. 52. Mnaidra Gap.

Fig. 4. Side view of the head of a humerus of *E. melitensis*: p. 52. Gandia Fissure.

Fig. 5. Anterior view of the head of a femur of *E. mnaidriensis*: p. 58. Mnaidra Gap.

Fig. 6. Lower condyles of a femur of *E. mnaidriensis*: p. 58. Mnaidra Gap.

Fig. 7. Third and fourth cervical vertebræ of the same individual of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 8. Side view of three middle dorsal vertebræ of the same individual of *E. mnaidriensis*: p. 48. Mnaidra Gap.

Fig. 9. Dorsal aspects of portion of the vertebral column from the first to the seventh dorsal inclusive (the first and fourth of this column are shown, Plate IX. figs. 3 & 4) of *E. melitensis*: p. 46. Mnaidra Gap. (? *E. falconeri*, Busk.)

[1] A fragment of a scapula seemingly in no ways different from the above is figured and described by Mr. Busk, Trans. Zool. Soc. vol. vi. p. 254, pl. 47. fig. 14.

Figs. 10 & 10 *a*. Crown and side views of left lower jaw containing a molar referable to the second true molar of *E. mnaidriensis*: p. 25. Benghisa Gap.

Figs. 11–20. Fragments of tusks of Maltese fossil Elephants from all the ossiferous deposits: p. 9.

Fig. 21. Distal epiphyses of the radius of *Hippopotamus* (?) discovered in Gandia Fissure, along with proboscidean remains referred to *E. mnaidriensis*. Gandia Fissure.

Fig. 22. Portion of a trapezoid of *Hippopotamus* (?) found with remains of the fossil Elephants in Mnaidra Gap. Mnaidra Gap.

PLATE XII.

Fig. 1. Head and portion of shaft of a humerus of *E. melitensis*: p. 50. Benghisa Gap.

Figs. 2, 2 *a*, 3, & 3 *a*. Heads and glenoid fossæ of scapulæ of *E. melitensis*: p. 50. Benghisa Gap.

PLATE XIII.

Figs. 1, 1 *a*, 1 *b*. Three views of an atlas of *E. melitensis*: p. 46. Benghisa Gap.

Fig. 2. Distal epiphysis of the radius of *E. melitensis*: p. 55. Benghisa Gap.

Fig. 3. Distal epiphysis of the ulna of *E. melitensis*: p. 55. Benghisa Gap.

PLATE XIV.

Fig. 1. Upper portion of a femur of *E. mnaidriensis*: p. 58. Mnaidra Gap.

Figs. 2, 2 *a*. Lower condyles of the opposite femur of the same individual of *E. mnaidriensis*: p. 59. Mnaidra Gap.

Figs. 3, 3 *a*. Greater portion of a femur, with its condyles, of *E. melitensis*: p. 59. Benghisa Gap.

PLATE XV.

Fig. 1. Tibia of *E. mnaidriensis*: p. 61. Mnaidra Gap.

Figs. 2, 2 *a*. Side view and articular surface of the lower extremity of a right tibia of possibly the same individual as fig. 1: p. 62.

Fig. 3. Condyloid cups of a tibia of *E. mnaidriensis*: p. 61. Mnaidra Gap.

Fig. 4. Distal extremity of a fibula of *E. mnaidriensis*: p. 64. Mnaidra Gap.

Fig. 5. Distal extremity of a fibula of *E. melitensis*: p. 64. Mnaidra Gap.

Fig. 6. Patella of *E. melitensis*: p. 65. Benghisa Gap.

Figs. 7, 8. Patellæ of *E. mnaidriensis*: p. 65. Mnaidra Gap.

Figs. 9, 9 *a*. Side and profile views of portion of the os innominatum of *E. melitensis*: p. 49. Benghisa Gap.

Fig. 10. Stylo-hyoid of *E. melitensis*: p. 45. Benghisa Gap.

PLATE XVI.

Fig. 1. Astragalus of *E. mnaidriensis*: p. 79 (belongs to Plate XV. fig. 1). Mnaidra Gap.
Fig. 2. Astragalus of *E. mnaidriensis*: p. 80. Mnaidra Gap.
Fig. 3. Astragalus of *E. melitensis*: p. 81 (*E. falconeri*, Busk). Mnaidra Gap.
Fig. 4. Calcaneum referred to *E. mnaidriensis*: p. 82. Mnaidra Gap.
Fig. 5. Calcaneum of *E. melitensis*: p. 82. Benghisa Gap.

PLATE XVII.

Fig. 1. Naviculare of *E. mnaidriensis*: p. 83. Mnaidra Gap.
Fig. 2. Posterior aspect of an external cuneiform of *E. mnaidriensis*: p. 86. Mnaidra Gap.
Fig. 3. Anterior aspect of a middle cuneiform of *E. mnaidriensis*: p. 87. Mnaidra Gap.
Fig. 4. Metatarsal aspect of a cuboid of *E. mnaidriensis*: p. 84. Mnaidra Gap.
Fig. 5. Posterior aspect of a cuboid of *E. melitensis*: p. 85. Benghisa Gap.
Fig. 6. Internal cuneiform of *E. melitensis*: p. 88. Benghisa Gap.
Fig. 7. Right naviculare (immature ?): p. 83. Mnaidra Gap.
Fig. 8. Right naviculare (immature ?): p. 83. Mnaidra Gap.
Fig. 9. Left unciforme (upper aspect) of *E. melitensis*: p. 74. Gandia Fissure.
Fig. 10. Left scaphoid of *E. mnaidriensis*: p. 66. Gandia Fissure.
Fig. 11. Right trapezoid of *E. melitensis*: p. 72. Mnaidra Gap.
Fig. 12. Right unciforme of *E. mnaidriensis*: p. 73. Mnaidra Gap.
Fig. 13. Internal surface of left magnum of *E. mnaidriensis*: p. 72. Mnaidra Gap.
Fig. 14. Internal surface of left magnum of *E. melitensis*: p. 73. Mnaidra Gap.

PLATE XVIII.

Fig. 1. Left lunare, lower surface, of *E. mnaidriensis*: p. 68. Mnaidra Gap.
Fig. 2. Side view, showing lunare facets of right cuneiform of *E. mnaidriensis*: p. 69. Gandia Fissure.
Fig. 3. Outer aspect of left pisiforme of *E. mnaidriensis*: p. 71. Mnaidra Gap.
Fig. 4. Lower surface of right lunare of *E. melitensis*: p. 68. Benghisa Gap.
Fig. 5. Side view showing lunare facets of a left cuneiform of *E. mnaidriensis*: p. 69. Gandia Fissure.
Fig. 6. Outer aspect of a right pisiforme of *E. melitensis*: p. 72. Mnaidra Gap.
Fig. 7. Upper surface of cuneiforme of *E. melitensis* (? *E. falconeri*, Busk): p. 70. Benghisa Gap.
Fig. 8. Upper surface of right cuneiforme of *E. melitensis*: p. 70. Benghisa Gap.
Fig. 9. Upper surface of right cuneiforme of *E. melitensis*: p. 70. Benghisa Gap.

PLATE XIX.

Fig. 1. Left cuneiforme of *E. mnaidriensis*: p. 89. Gandia Fissure.
Fig. 2. Left first metacarpal and its phalanx of *E. mnaidriensis*: p. 90. Mnaidra Gap.
Fig. 3. The fourth metacarpal, right side: p. 99. } Same individual.
Fig. 4. The third metacarpal of *E. melitensis*?: p. 95. Benghisa Gap. } Same individual.
Fig. 5. Ungual phalanx of first metacarpal of *E. mnaidriensis* (?): p. 90. Mnaidra Gap.
Fig. 6. Left fourth metatarsal?: p. 100. } Same individual.
Fig. 7. Left third metatarsal (?*E. falconeri*, Busk): p. 96. Benghisa Gap. } Same individual.
Fig. 8. Left distal phalanx, first metatarsal, of *E. melitensis* (?): p. 92. Mnaidra Gap.
Fig. 9. Right first metacarpal or metatarsal of *E. melitensis* (?) or *E. falconeri* (?). Mnaidra Gap.
Fig. 10. Right third metacarpal of *E. mnaidriensis*: p. 95. Mnaidra Gap.
Fig. 11. Right fifth metacarpal of *E. mnaidriensis*: p. 103. Mnaidra Gap.
Fig. 12. Left fifth metacarpal of *E. melitensis*: p. 103. Mnaidra Gap.
Fig. 13. First phalanx, left side, of the fifth metatarsal of *E. mnaidriensis* (?): p. 105. Mnaidra Gap.
Fig. 14. Left ungual phalanx (?), fifth metacarpal, of *E. mnaidriensis* (?): p. 104. Mnaidra Gap.
Fig. 15. First phalanx, right side, of the fifth metatarsal of *E. melitensis* (?): p. 105. Mnaidra Gap.

PLATE XX.

Figs. 1, 1*a* and *b*. First metatarsal, left side, with its phalanx, of *E. mnaidriensis*: p. 91. Mnaidra Gap.
Fig. 2. First metatarsal, left side, of *E. melitensis*: p. 91. Mnaidra Gap. (?*E. falconeri*, Busk.)
Figs. 3, 3*a*. Second metatarsal, left side, of *E. melitensis*: p. 94. Mnaidra Gap.
Fig. 4. Right fourth metatarsal of *E. mnaidriensis*: p. 99. Mnaidra Gap.
Figs. 5, 5*a*. Left second metatarsal of *E. melitensis*: p. 94. Mnaidra Gap.
Fig. 6. Right fourth metatarsal of *E. melitensis*: p. 100. Mnaidra Gap.
Fig. 7. Dorsal aspect of fifth left metatarsal of *E. mnaidriensis*: p. 104. Mnaidra Gap.
Fig. 8. Phalanges of third left metacarpal: p. 96. } Same individual of *E. mnaidriensis.*
Fig. 9. Phalanges of fourth left metacarpal: p. 101. } Same individual of *E. mnaidriensis.*
Fig. 10. First phalanx of fifth left metacarpal of *E. mnaidriensis*: p. 104. Mnaidra Gap.
Fig. 11. First phalanx of fifth left metacarpal? of *E. melitensis*: p. 106 (?*E. falconeri*, Busk). Benghisa Gap.
Fig. 12. Proximal and second phalanges of the second left metacarpal of *E. mnaidriensis*: p. 97. Mnaidra Gap.
Fig. 13. First phalanx of fourth right metacarpal of *E. mnaidriensis*: p. 101. Mnaidra Gap.

Fig. 14. First phalanx of the second, or else the first phalanx of the fifth, metacarpal of *E. melitensis*: p. 105 (? *E. falconeri*, Busk). Benghisa Gap.

Fig. 15. Doubtfully, the proximal and second phalanges of the fourth metacarpal of *E. mnaidriensis*: p. 101. Mnaidra Gap.

Fig. 16. The first phalanx of the third metacarpal of *E. melitensis* (? *E. falconeri*, Busk): p. 96. Mnaidra Gap.

Fig. 17. Plantar aspect of the first phalanx of the second metatarsal of *E. melitensis*?: p. 93. Mnaidra Gap.

Fig. 18. Sesamoid referable to third metacarpal,

Fig. 19. Sesamoid referable to second metacarpal,

Fig. 20. Sesamoid referable to fifth metacarpal,

Fig. 21. Sesamoid referable to third metatarsal,

Fig. 22. Sesamoid or else ungual phalanx (?) referable to fifth metatarsal of *E. mnaidriensis* et *melitensis*: p. 106. From Mnaidra and Benghisa Gaps and Gandia Fissure.

PLATE XXI.

Fig. 1. Left lunare.
Fig. 2. Left unciforme.
Figs. 3, 3 *a*. First metacarpal.
Figs. 4, 4 *a*. Second metacarpal.
Figs. 5, 5 *a*. Fourth metacarpal.
Fig. 6. Fifth metacarpal.
Fig. 7. Sesamoid.

} Of the same individual of *E. melitensis*: p. 75 (? *E. falconeri*, Busk). Benghisa Gap.

Fig. 8. Head of young scapula: p. 53.
Figs. 9, 9 *a*. Young humerus of fig. 8.
Figs. 10, 10 *a*, 10 *b*. Ulna and radius of fig. 9.

} Same individual: pp. 53 & 57. Benghisa Gap.

Figs. 11 and 12. Portion of an arch of a dorsal vertebra and rib of a young elephant. Benghisa Gap.

Fig. 13. Tibia referable to the same individual as fig. 8: p. 63. Benghisa Gap.

Figs. 14, 14 *a*. Young tibia of *E. melitensis* (?): p. 63. Benghisa Gap.

Figs. 15 *a*, *b*, *c*. Youthful radius: p. 56. Benghisa Gap.

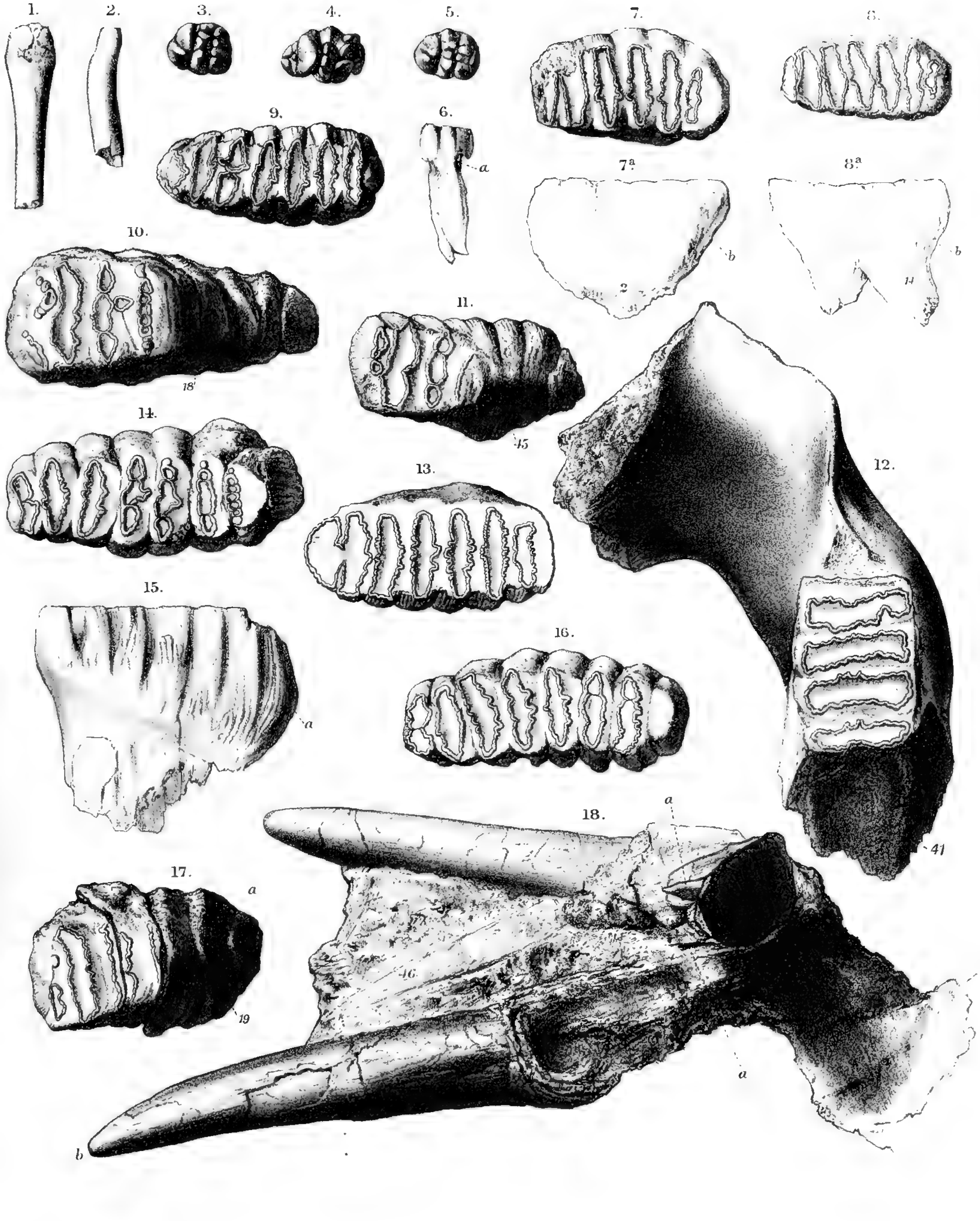
Figs. 16, 16 *a*. Young ulna of *E. mnaidriensis* (?): p. 57. Mnaidra Gap.

Fig. 17. Ulnar fragment of young of *E. melitensis* (?): p. 57 (? *E. Falconeri*, Busk). Gandia Fissure.

Fig. 18. Upper portion of femur of a young elephant (*E. melitensis*?): p. 60 (? *E. falconeri*, Busk). Mnaidra Gap.

PLATE XXII.

Map of the Maltese Islands.



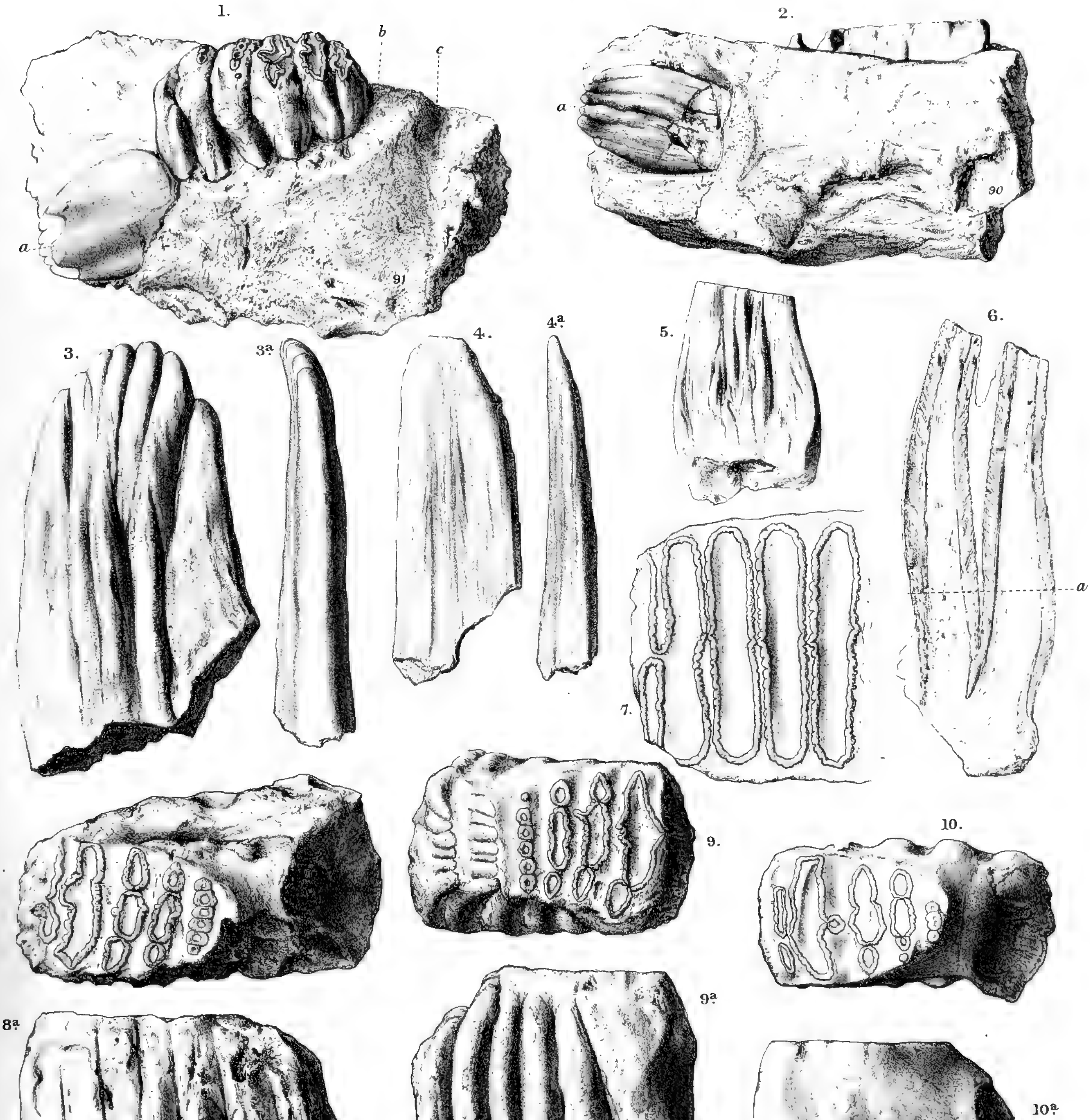
Nat. Size.

C. L. Griesbach.

Mintern Bros.

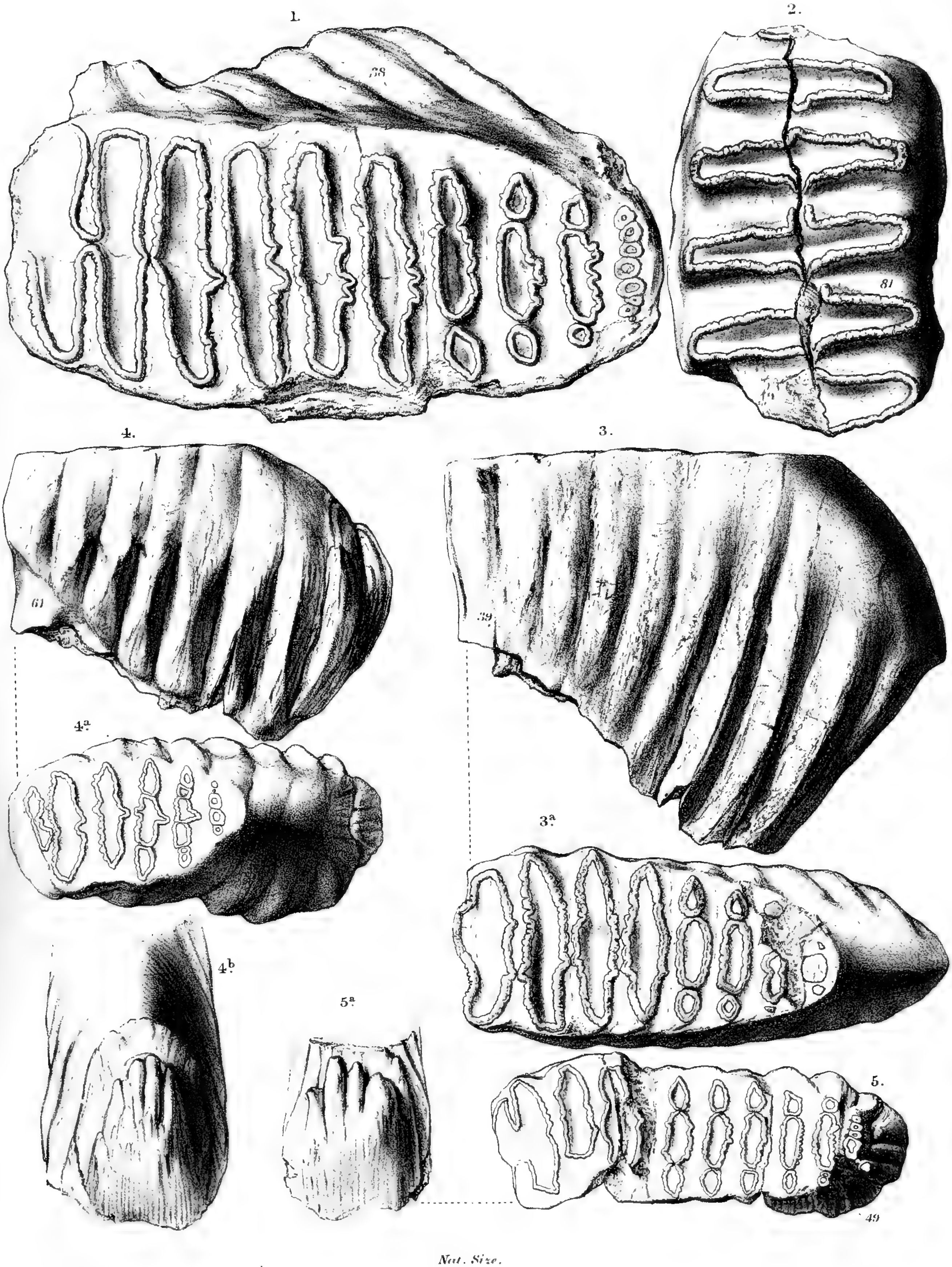
DENTITION

Trans. Zool. Soc. Vol 9. Pl. II



C. L. Griesbach. *Nat. Size.* Mintern Bros imp.

DENTITION.



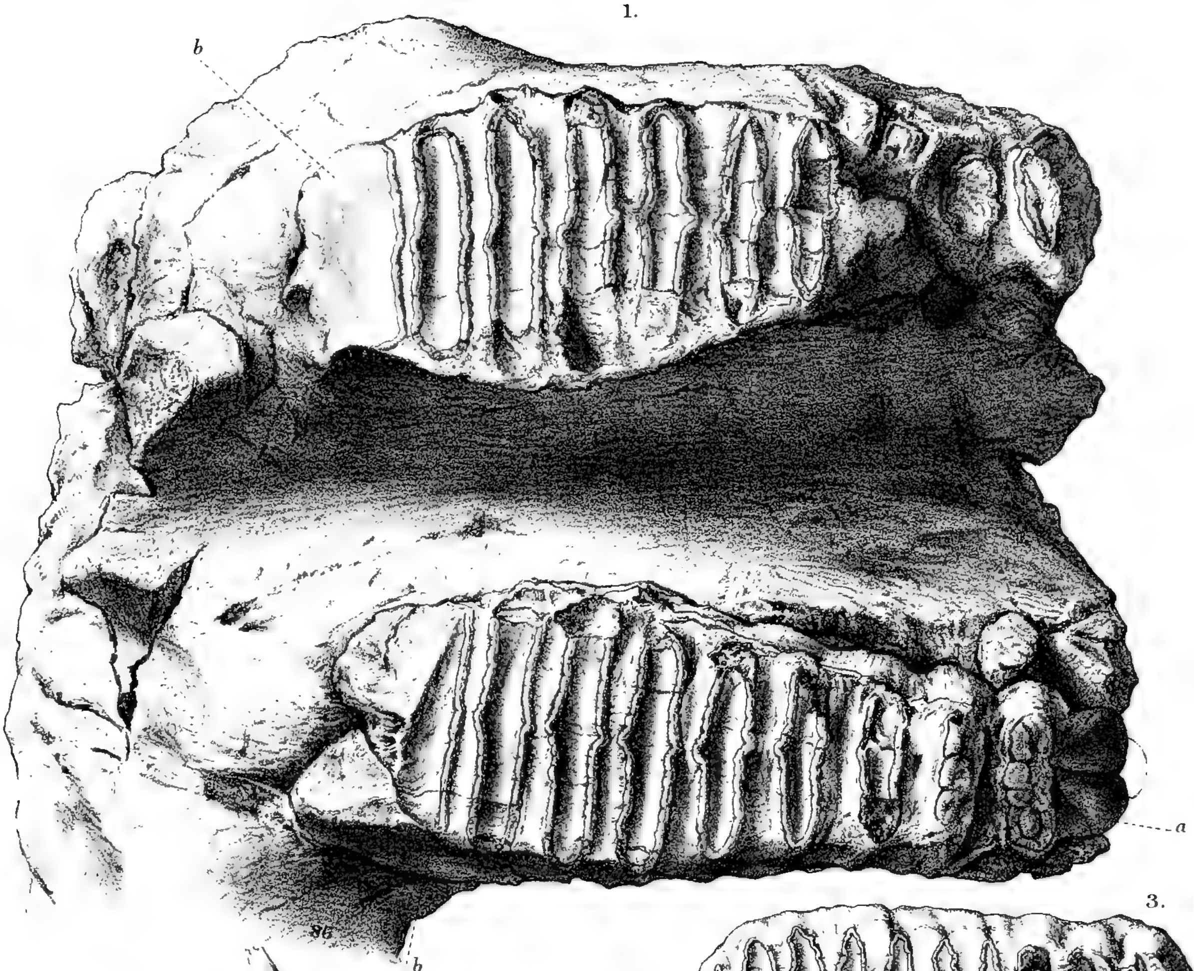
Nat. Size.

C.L. Griesbach

Mintern Bros. imp.

DENTITION.

1.



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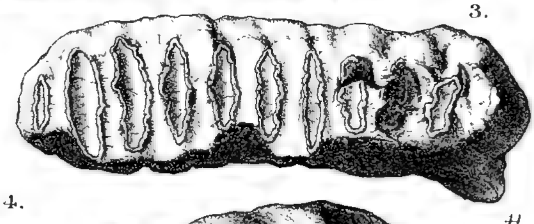
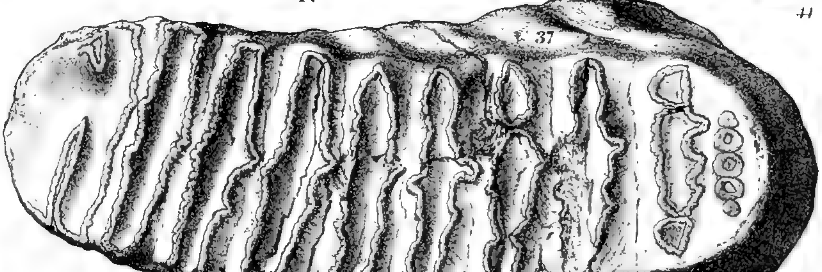
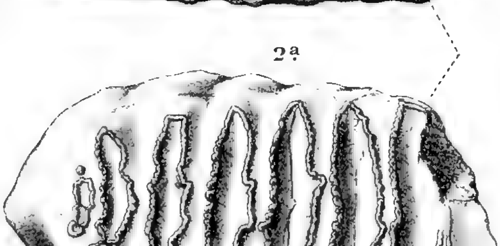


2.

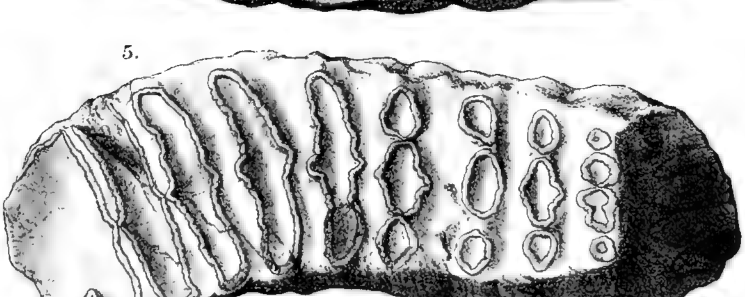
4.



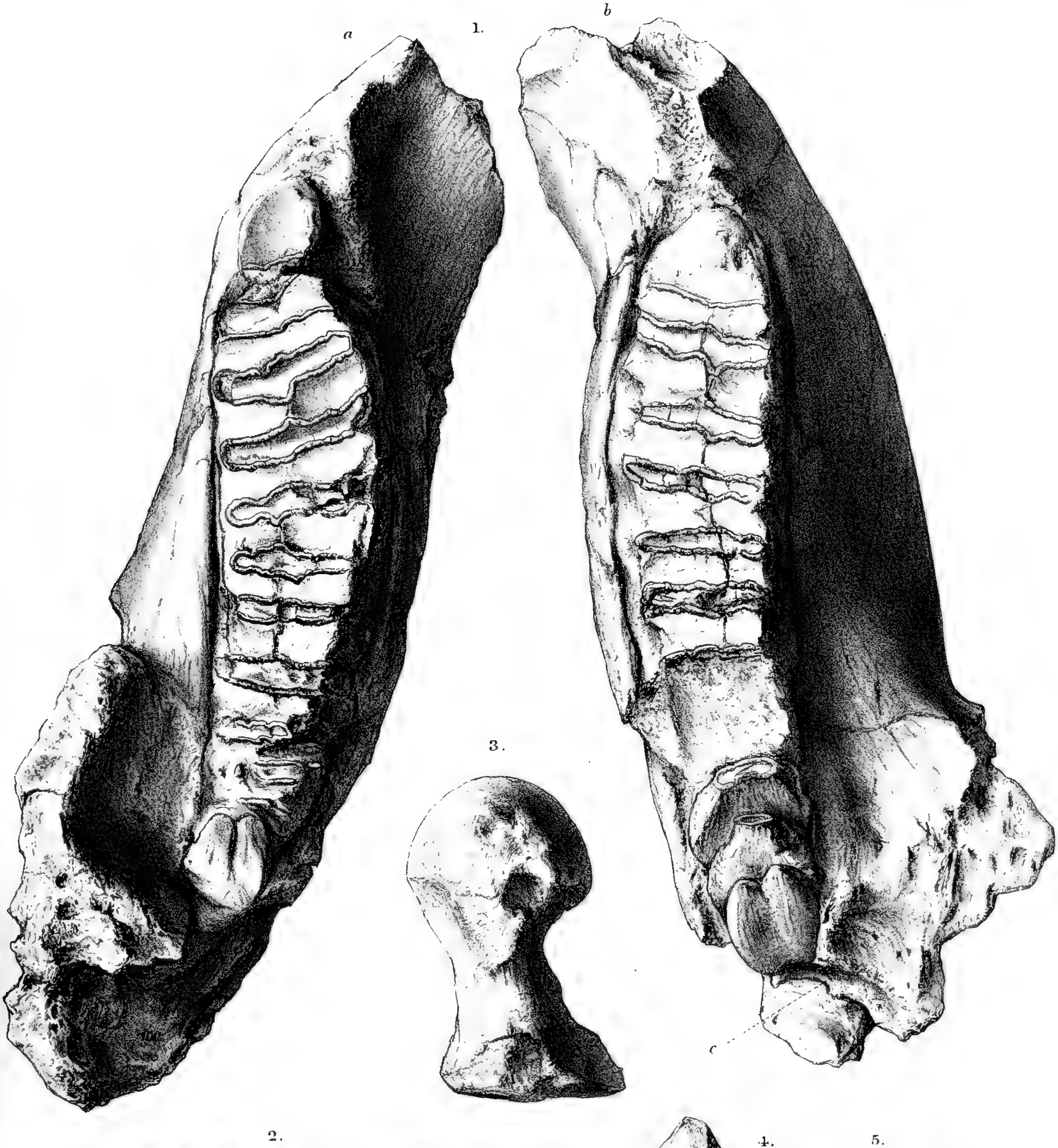
2a.



5.



G L Griesbach. *Nat. Size.* Mintern Bros imp

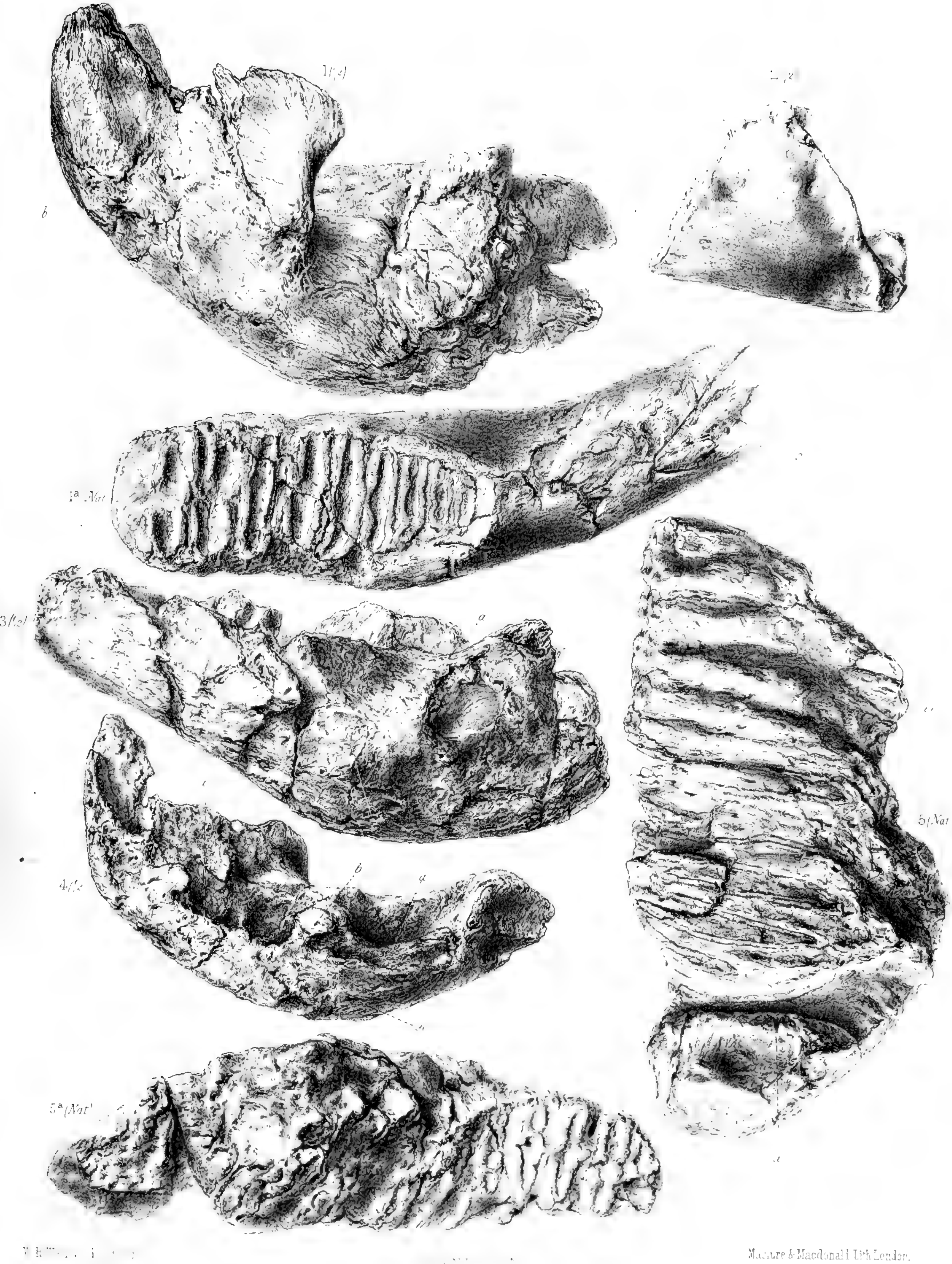


G.L. Griesbach

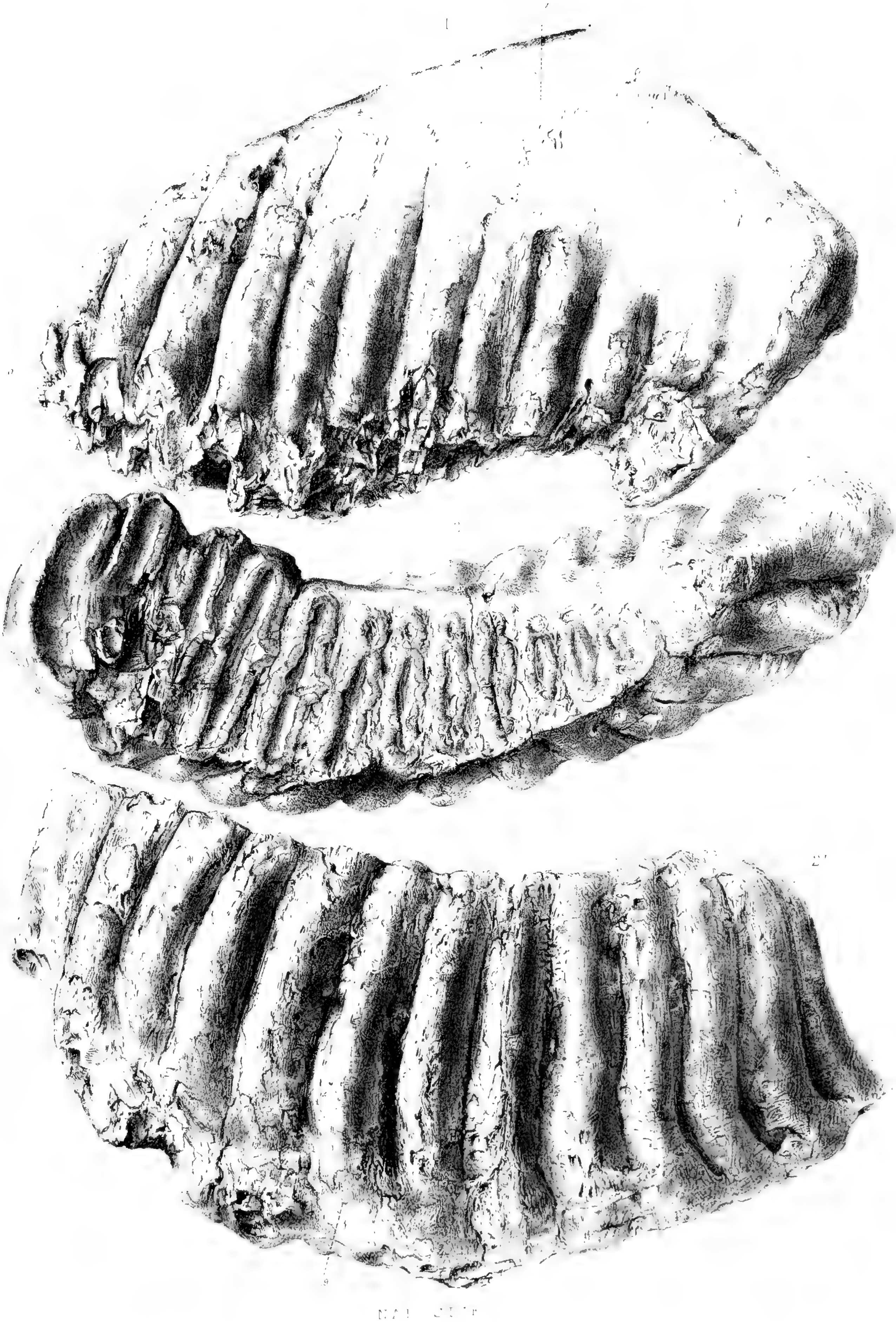
Nat. Size.

Mintern Bros. imp

DENTITION



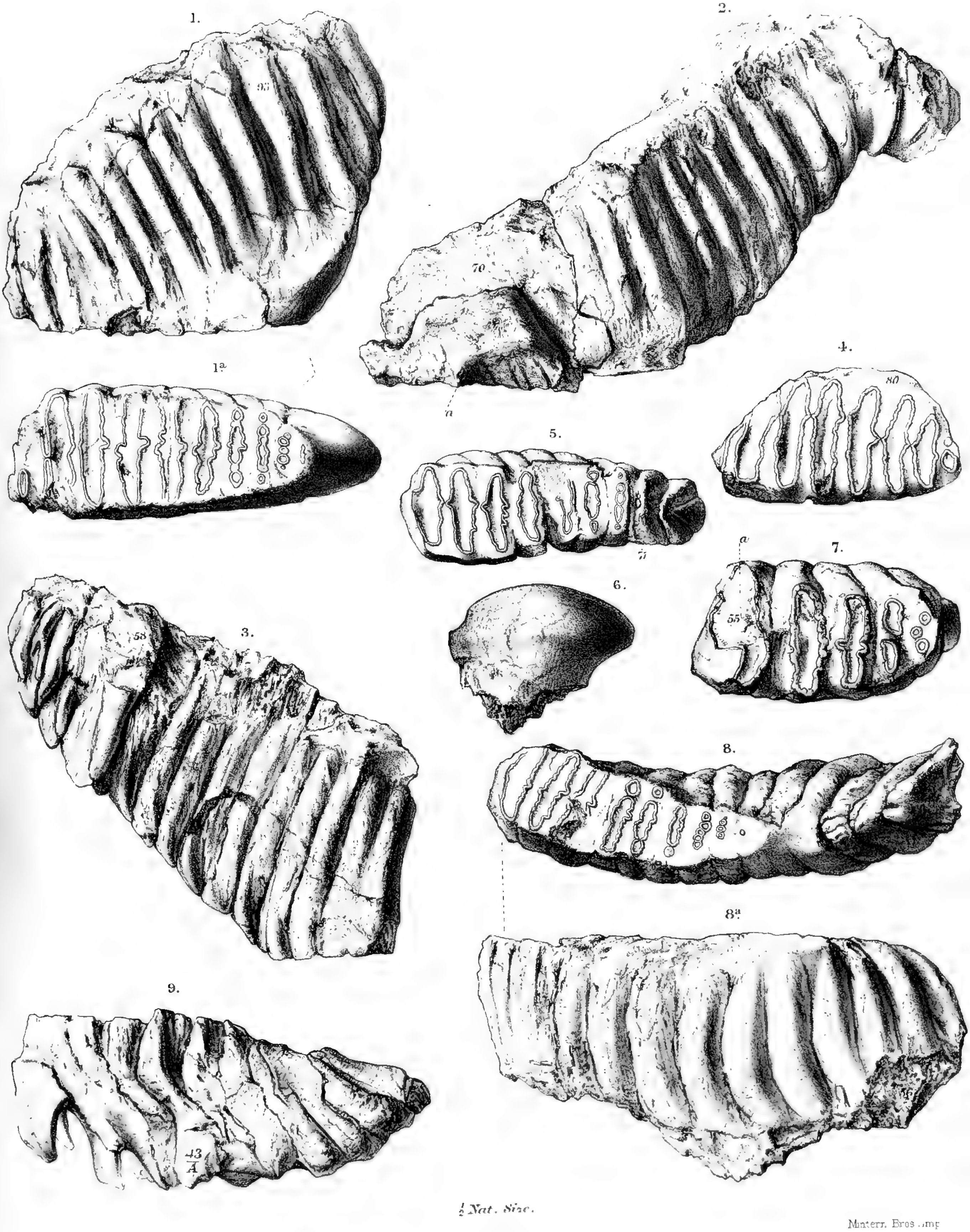
Maclure & Macdonald Lith London.



NAT. SIZE

W. H. Wesley ad nat. lith.

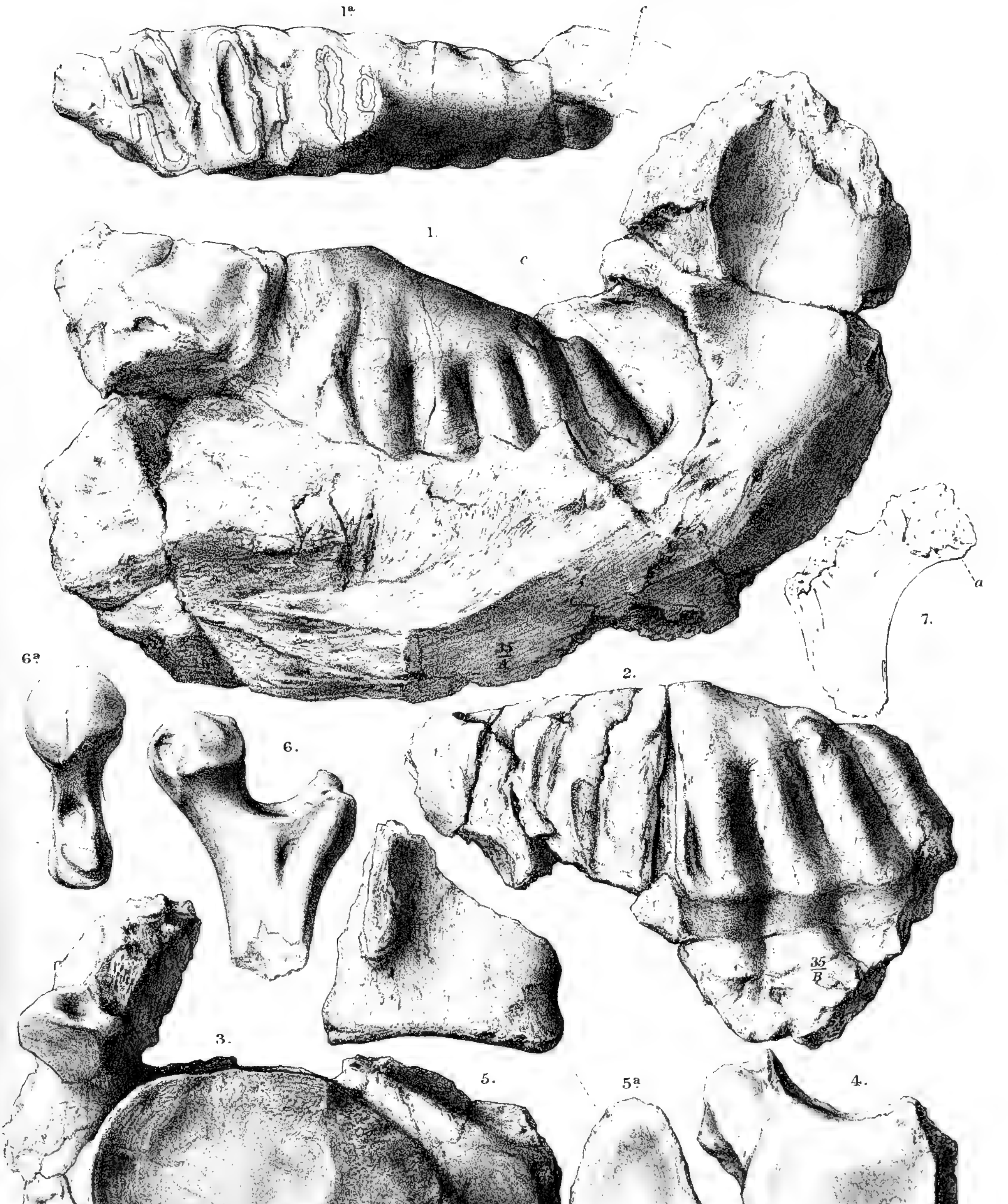
DENTITION



$\frac{1}{2}$ *Nat. Size.*

C. L. Griesbach.

Minterr. Bros. imp.

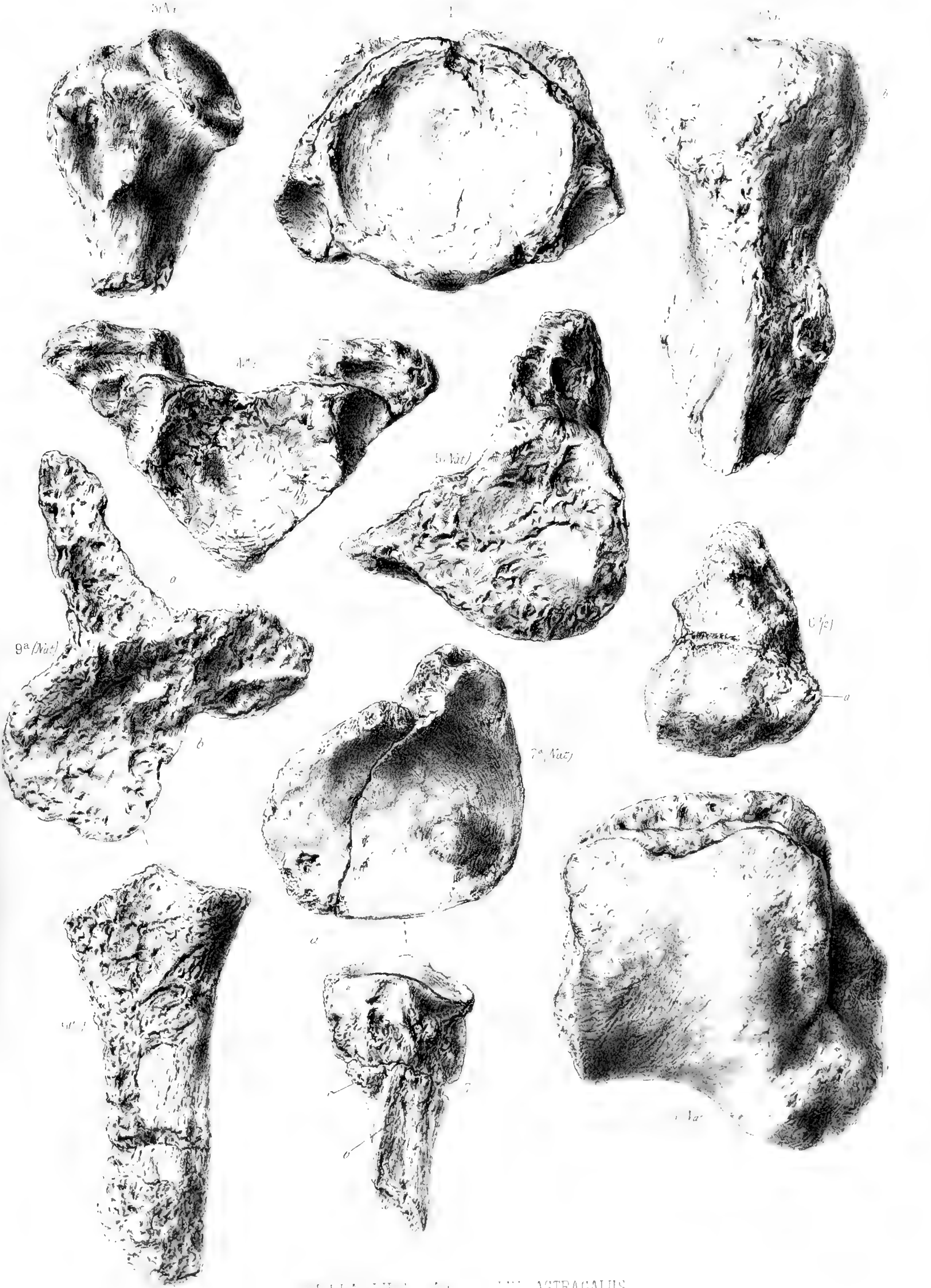


C. L. Griesbach

Nat. Size.

Mintern Bros. imp.

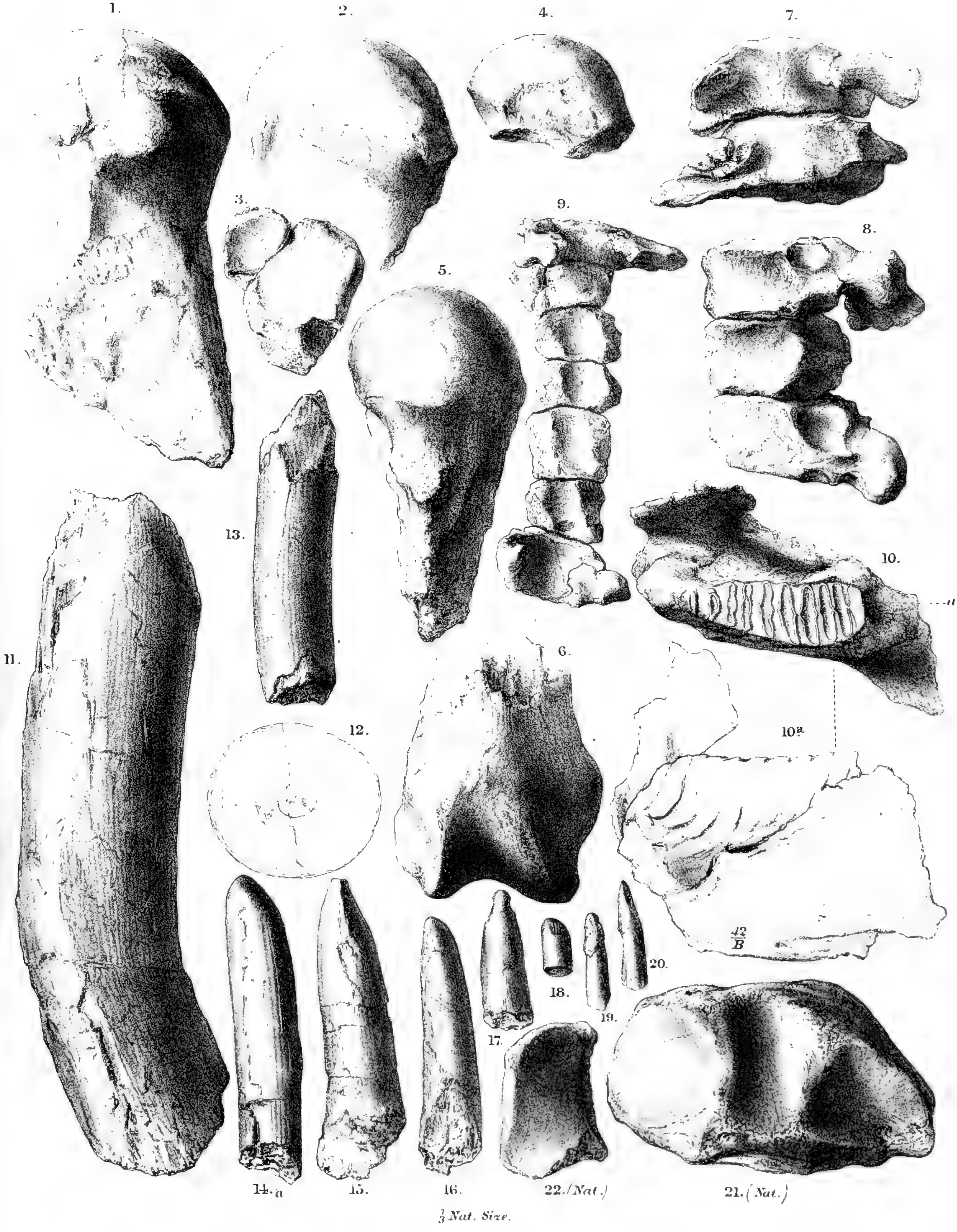
DENTITION SCAPULA RIBS VERTEBRA



ASTRAGALUS

W H Wesley ad nat. lith.

Maclure & MacDonald, Lith London

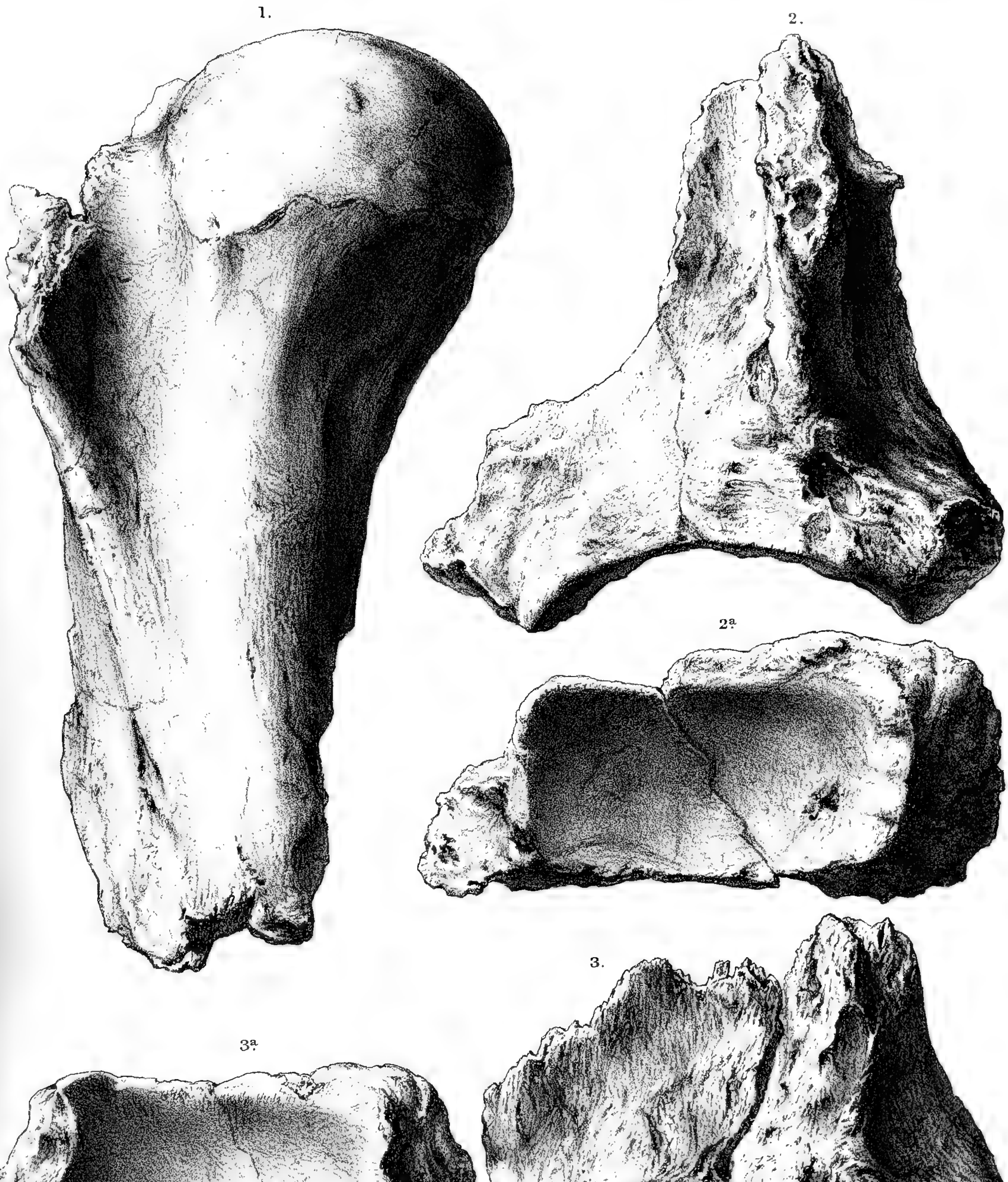


⅓ Nat. Size.

C.L. Griesbach

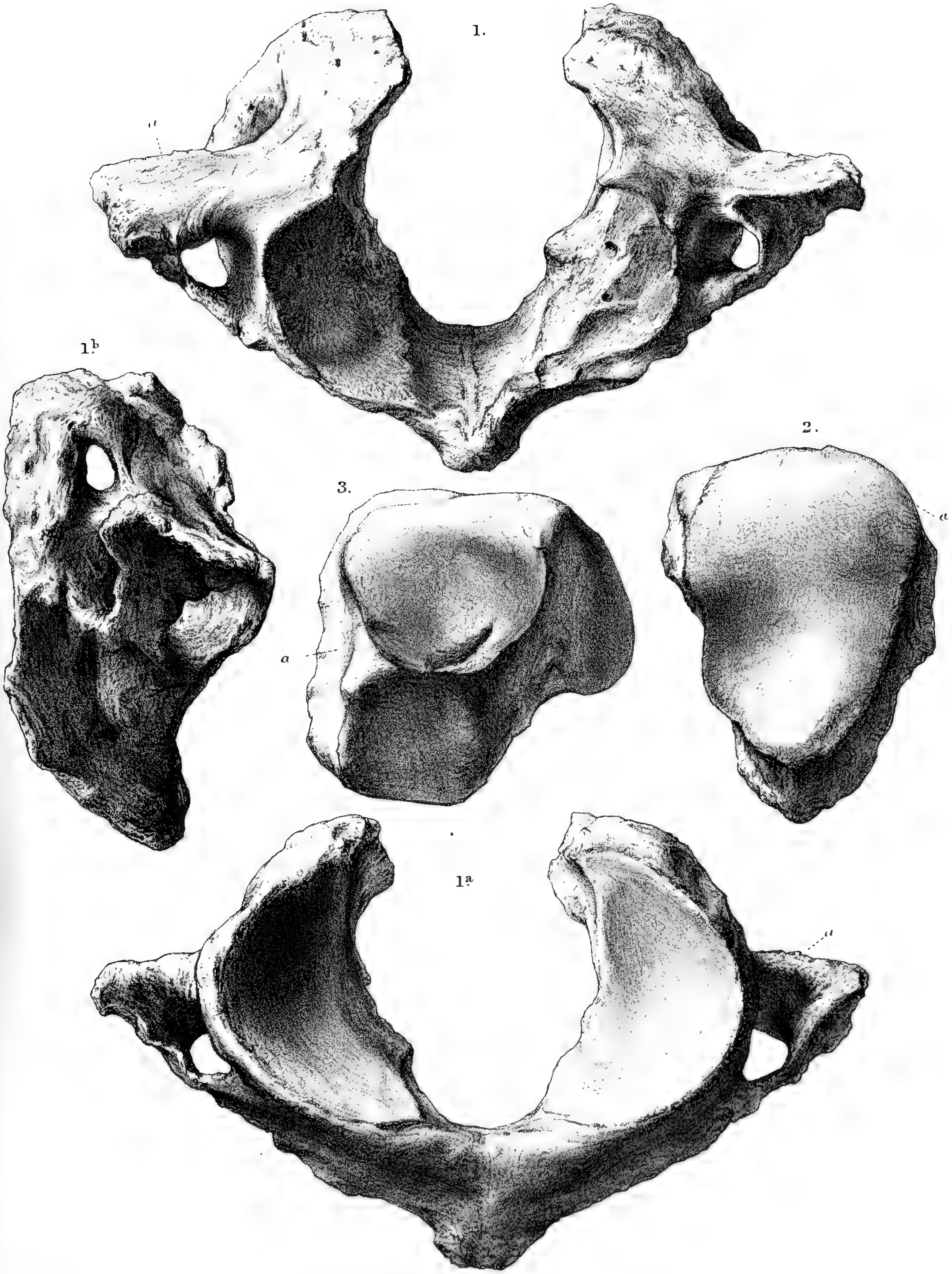
Mintern Bros imp.

TUSKS, MOLAR, HUMERUS, SCAPULA, VERTEBRA, FEMUR
RADIUS OF HIPPOPOTAMUS? TRAPEZOID OF HIPPOPOTAMUS?



C. L. Griesbach. *Nat. Size.* Mintern Bros imp.

HUMERUS SCAPULA

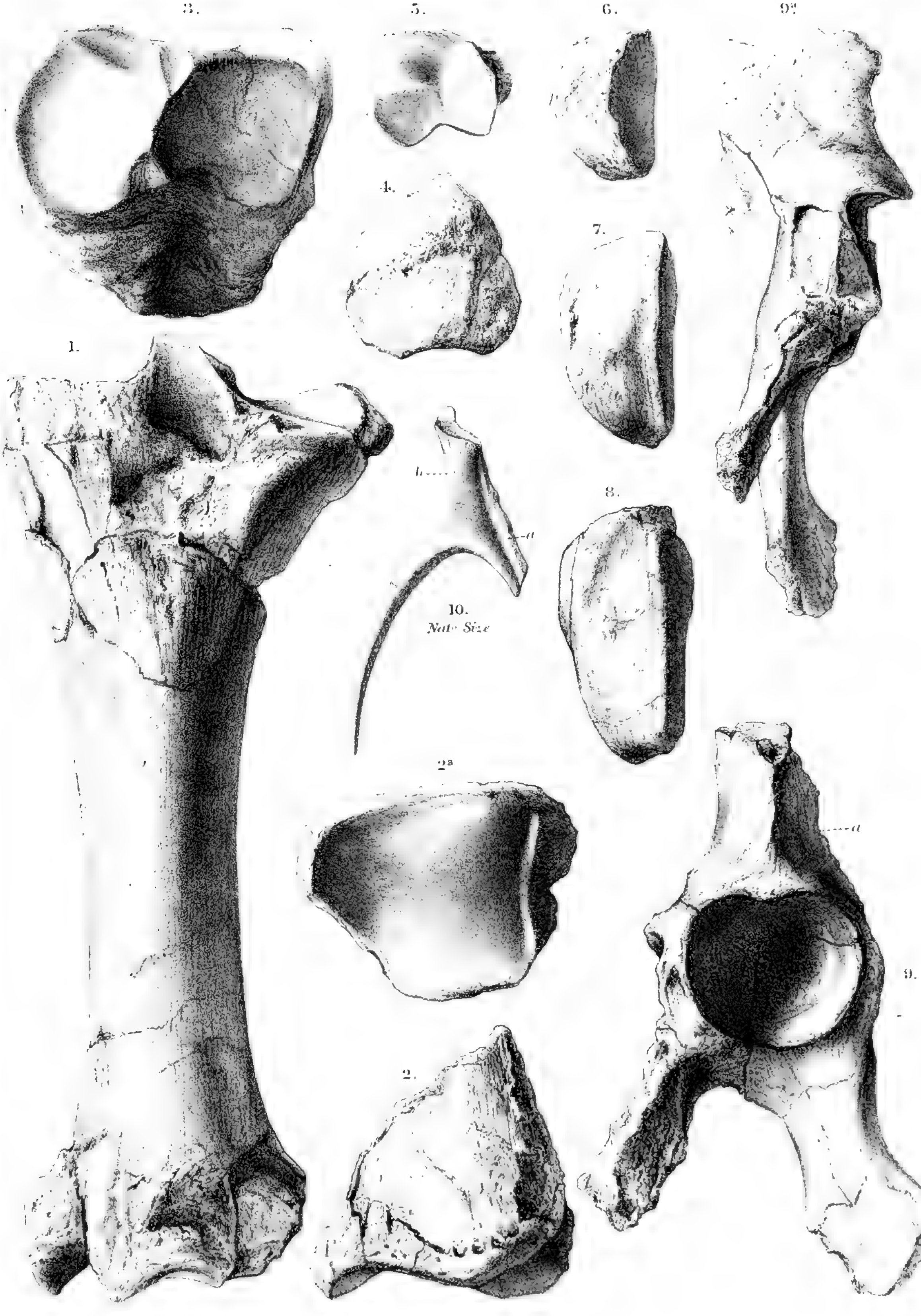


Nat. Size.

Mintern Bros imp.

ATLAS RADIUS ULNA

½ Nat. Size.



½ Nat. Size.

J. L. Griesbach

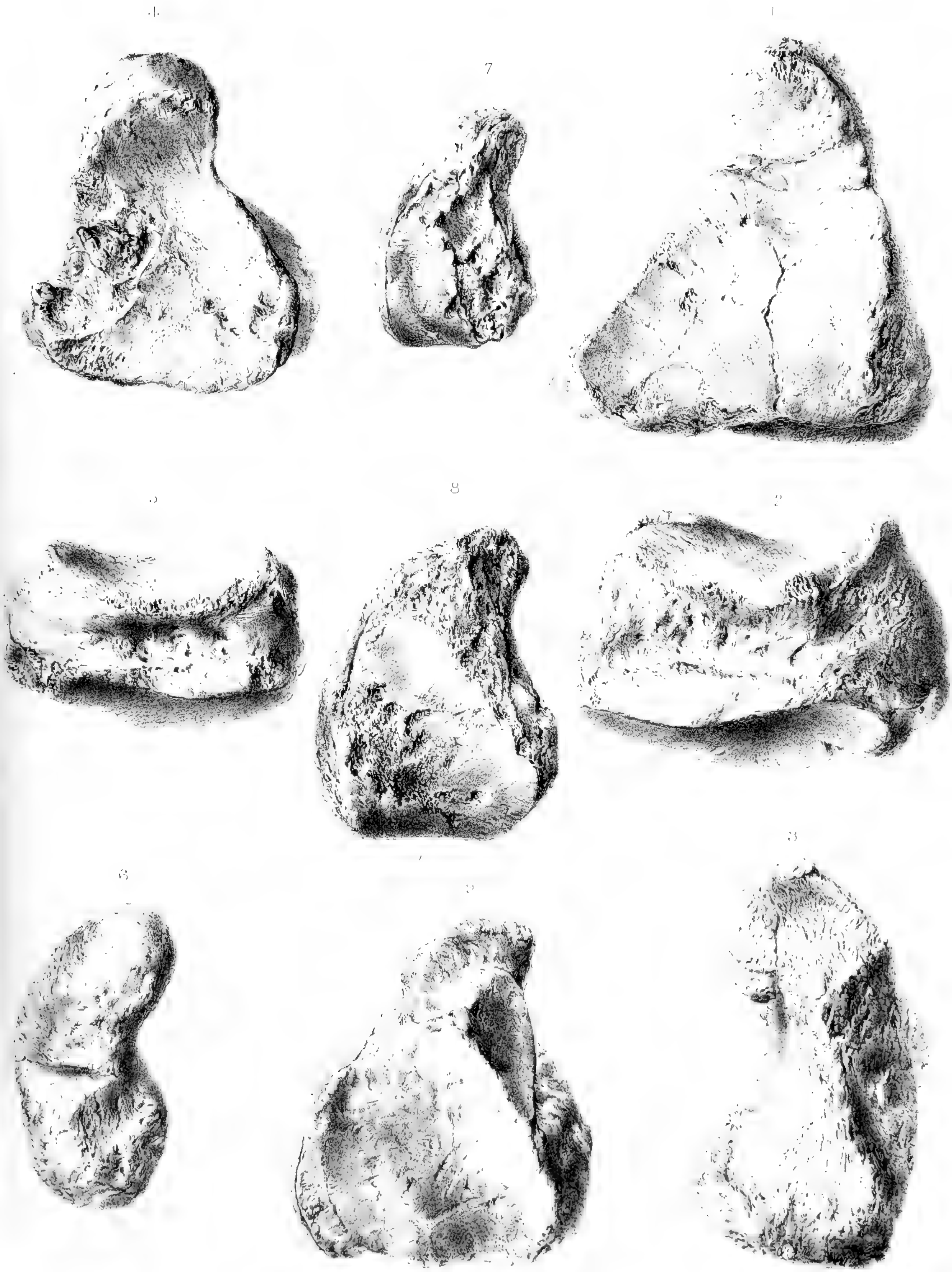
Mintern Bros. imp.

NAT. SIZE

ASTRAGALUS CALCANEUM

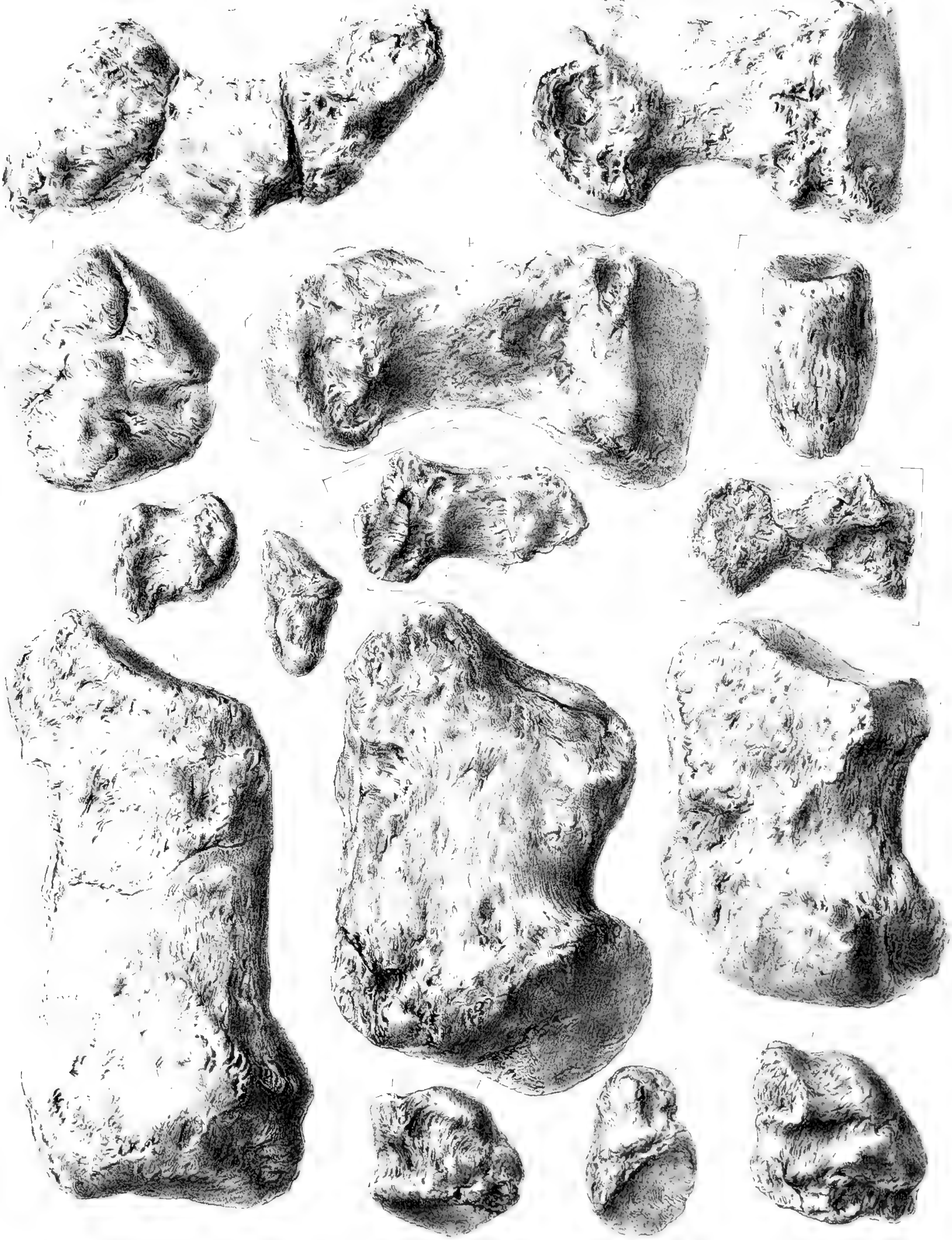
NAT. SIZE.

W H Wesley ad nat. Lith



nat. lith.

Macnee

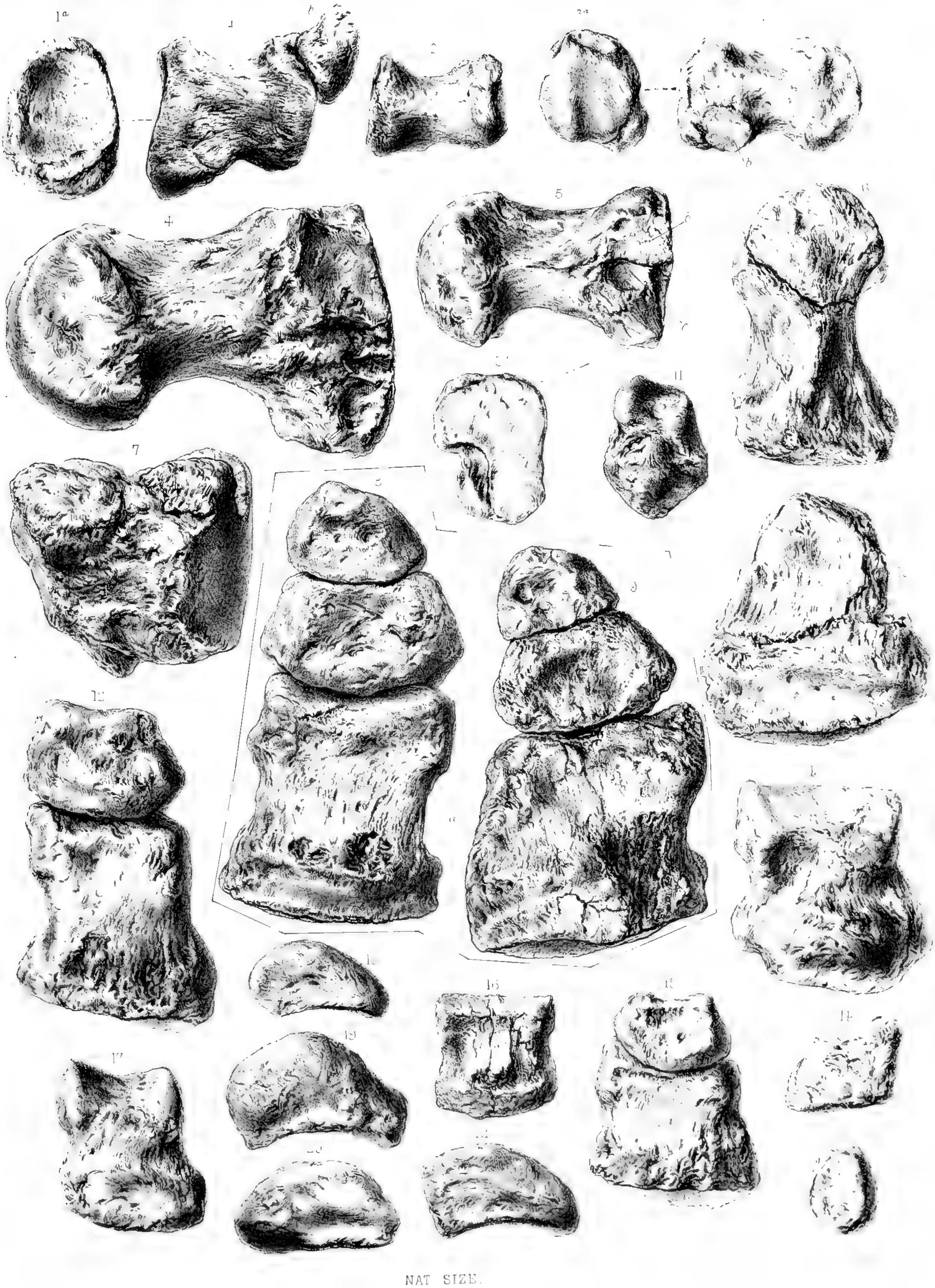


NAT SIZE

TARSUS METATARSUS METACARPUS PHALANX

W.H Wesley ad nat. Lith.

Mintern & Macdonald, Lith London



NAT SIZE.

METACARPUS METATARSUS PHALANX SESAMOID

W.H Wesley ad nat Lith

Maclure & Macdonald Lith. London

C.L. Griesbach

Nat. Size.

Mintern Bros. imp.

UPPER EXTREMITY. VERTEBRA. RIB. FEMUR. TIBIA


MAP OF THE
MALTESE ISLANDS
Shewing the Beds, Faults, and Localities, where Ossiferous Caves, and Fissures, exist.
MIOCENE BEDS
Upper Limestone Yellow
Marl Purple
Sandstone Pink
Lower Limestone Green
Faults .... Ossiferous Caves •• Gaps or Fissures
English Miles
1 2 3 4 5
GOZO
Rabbat
Gozo Fault
COMINO
MALTA
Mellcha Bay
Mellcha Fault
Mellcha Cave
St Pauls Bay
St Pauls Fault
Grand Fault
VALETTA
Citta Vecchia
Rabat
Zebbug
Zebbug Cave
St Leonards Fissure
Marsa Scala
Shantin Fissure
Micabba
Gandia Fissure
Maghlak Cave
Middle Cave
Mnaudra Gap
Elephant Bed
Marsa Scirocco
Pt Benghisa
Benghisa Gap
Filfola I.
14°10'
20'
30'
36°
35° 50'

Edwd Weller

II. *A List of the Birds known to inhabit the Philippine Archipelago.* *By* ARTHUR, Viscount WALDEN, *F.R.S., President of the Society.*

Read June 3rd, 1873.

[PLATES XXIII.–XXXIV.]

IN the month of December 1871 and the first three months of the following year some of the principal islands of the Philippine archipelago were visited by Dr. A. Bernhard Meyer, the well-known German naturalist. During that short period this indefatigable collector obtained a large series of ornithological specimens, representing ninety-six species. The islands visited by him were Luzon, Negros, Zebu, Cuyo, and Guimaras, the last being a small island adjoining the southern coast of Panay, and lying in the channel which separates Panay from Negros. Hitherto most of the authentic so-called Philippine specimens of birds contained in European collections have been procured in Luzon, collected at no very great distance from the town of Manilla, its capital; and nearly all the zoological travellers who have visited the Philippines have confined their researches to the vicinity of that town. It follows, consequently, that "the Philippines," so frequently occurring as a geographical expression in our lists, from the days of Brisson to the recent date of Mr. G. R. Gray's 'Hand-list,' must be taken to mean the country adjacent to the town of Manilla. To this rule Sonnerat is an exception.

After residing at Manilla, and forming collections in the interior of Luzon, Sonnerat visited Antigua, the capital of the island of Panay, and then Zamboanga the chief Spanish settlement in the large island of Mindanao. Panay does not seem to have been revisited by any ornithologist[1]; but in 1839, D'Urville's second expedition in the 'Astrolabe' remained two months at Zamboanga, and obtained a few zoological specimens.

It is possible that the late Mr. Hugh Cuming may have visited all these localities and many others during his long residence in the Philippines; but as his large collection of birds was broken up without being catalogued, and as they were brought to Europe at a time when geographical distribution attracted less attention than now, we possess no published record of the exact localities where his specimens were obtained[2].

After Sonnerat fifty-eight years appear to have elapsed before the Philippines were

[1] At least there does not appear to be any published record of Panay having been again visited, although Mr. Cassin (U.S. Expl. Exped. p. 143) certainly enumerates an example of *Irena cyanogastra* as having been obtained in this island.

[2] A large portion of his ornithological collection was made in the southern part of the island of Luzon (*cf.* P. Z. S. 1839, p. 93); but it has since become scattered, and the origin of many of the individual specimens cannot now be identified.

again visited by an ornithologist, when in 1829 Kittlitz touched at Manilla, and there procured several undescribed species. Since that date Manilla has been visited from time to time by different travellers and exploring-expeditions, and new species have been obtained, which on being brought to Europe have been described and named [1]. In 1871 new ground was broken by Mr. L. C. Layard, who made a small collection of birds in the islands of Negros and Guimaras [2]; and, lastly, Dr. A. Bernhard Meyer has explored the equally unknown island of Zebu. Dr. Meyer having with great courtesy placed the bulk of his collection at my disposal, it was my original intention to have confined myself to a bare catalogue of its contents; but, it having been suggested to me that a complete list of the known Philippine [3] birds would prove more generally useful, and would supply a want much felt in the ornithological literature of the Indian region, I have ventured, with much diffidence, to prepare this catalogue of authentic Philippine birds. It is true that a valuable list of the Philippine birds has already been published (in 1866) by Dr. Eduard v. Martens [4], from which I have derived the greatest assistance; still in it several authentic species are omitted, in some instances titles belonging to the same are treated as belonging to distinct species, and, moreover, some new species have been discovered and described since Dr. v. Martens wrote. Nor in the somewhat intricate synonymy is the subject in all instances exhaustively dealt with; and it has been one of my objects to endeavour to fix on a firm basis the nomenclature of all the birds known to possess a Philippine origin.

The literature of the subject practically commenced with Brisson [5], who in his well

[1] For a full account of the principal ornithological collectors in the Philippines, *cf.* Dr. v. Martens, Journ. f. Orn. 1866, p. 5.

[2] *Cf.* Ibis, 1872, p. 93.

[3] I restrict the term Philippines to that group of islands which is separated from Northern Borneo by the Balabac Strait and the Sea of Mindoro, exclusive of the Sooloo archipelago, and from Celebes by the Sea of Celebes. It may be necessary when the fauna of the Sooloo archipelago is better known, to include it also within the Philippine area; but, on the other hand, when the fauna of the island of Palawan has been investigated, that may have to be separated from the Philippine area. The positions both of Palawan and of the Sooloo Islands (at present all but zoological blanks) are of the highest geographical interest; for Palawan, stretching out for 260 miles, unites the northermost point of Borneo to Luzon through the Calamines, while the island of Mindoro, and the islands of the Sooloo archipelago form a succession of connecting links between Mindanao and the most north-east point of Borneo.

[4] Journ. f. Orn. 1866, pp. 8–31.

[5] No titles were founded on the Jesuit Camel's well-known paper, "De Avibus Philippensibus." The following is a list of the principal authors who have written on Philippine ornithology:—

Brisson, M. J. Ornithologia (1760).

Sonnerat. Voy. à la Nouvelle Guinée (1776).

Vigors. P. Z. S. 1831.

V. Kittlitz. Mémoires présentés à l'Acad. Imp. Sc. de St. Pétersb. vol. ii. (1833). Kupfertafeln z. Naturgesch. d. Vögel (1832–33). Lütke, Voy. autour du Monde (Postels), vol. iii. (1836).

J. F. Meyen. Nov. Act. Acad. C. L. C. Nat. Cur. vol. xvi. suppl. prim. (1834).

Eydoux et Souleyet. Voy. autour du Monde sur la Bonite. Zoologie, vol. i. (1841).

known work published original descriptions of many species said to have been obtained in the Philippines. Most of these are true Philippine species; but several of them were obtained in other parts of the world, and have no claim to a Philippine habitat.

The next, and certainly the most important, writer was the French traveller Sonnerat. He described and figured sixty-five species as having been obtained by him when in the Philippines; but recent researches tend to prove that only thirty are inhabitants of that archipelago. Several of his species remain to this day undetermined; yet the descriptions and figures were probably taken from actual specimens; for, although frequently most inaccurate in the localities assigned, Sonnerat does not appear, like Levaillant, to have wilfully described manufactured species or given false habitats. Besides the species made known in his 'Voyage to New Guinea,' Sonnerat brought to Paris several Philippine specimens, which were subsequently described by Buffon or by Montbeillard, and figured by D'Aubenton. On many of the Brissonian descriptions Linnæus founded titles; and to nearly all the plates in Sonnerat's work Scopoli, and after him Gmelin, gave binominal designations; while some of the species described in the 'Histoire Naturelle,' or figured in the 'Planches Enluminées,' received names from either Ludwig Statius Müller, Gmelin, or Latham, and in some cases from all of these writers. Subsequent authors generally named the species they described; and consequently little difficulty is encountered in the endeavour to recognize their species.

The first and only attempt to construct a complete list of the Philippine avifauna was made by Dr. v. Martens, to whom I have already alluded. That learned naturalist enumerates 194[1] species. From these I have been obliged to deduct 24,—4 from being undeterminable, 7 because they are not found in the Philippines, 2 because the Philippine habitat is not satisfactorily established, and 11 because they bear as distinctive titles the synonyms of species already catalogued under other titles.

Thus the list is reduced to 170 species, to which I have been able to add only 49, making the number of authentically known Philippine birds 219. This number is small, and may be eventually increased when the archipelago has been more completely investigated. Yet it may be fairly doubted whether the Philippines will ever be found to be so rich in species as the remainder of the Indo-Malayan subregion. Our knowledge of this avifauna is not sufficient to support any general conclusions; but enough is known to establish the fact that the Philippine archipelago, like Celebes, is a border

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PEALE. Zool. Un. St. Expl. Exped. 1st edition (1848).

JACQUINOT et PUCHERAN. Voy. au Pôle Sud sur l'Astrolabe et la Zélée. Zoologie, vol. iii. (1853).

CASSIN. Unit. St. Expl. Exp. Ornith. 2nd edition (1858).

E. v. MARTENS. Preussische Exped. nach Ost-Asien. Zool. (1865). Journal für Ornithologie (1866).

WALDEN & LAYARD. Ibis, 1872, p. 93.

[1] The numbering reaches to only 192; but *Dasylophus cumingi*, although catalogued, is not numbered, and the number 154 is repeated.

land, linking, as it were, the Papuan and Indian regions. As we quit the mainland of the Indian region in the south-east, it is well known that the Indo-Ethiopian types diminish in number; and in the Philippines, as in Celebes, they may be said to be at their minimum. But along with them many Indo-Malayan types also disappear from both these insular areas; while, on the other hand, they are replaced by peculiarly Papuan generic forms, and by a few peculiar forms not in numbers sufficient to balance the absence of the Indo-Ethiopian and the Indo-Malayan. We consequently find an ornis more anomalous in its admixture of forms, but poorer as regards species. So far as we know, it may be asserted that, after Celebes, the Philippine archipelago is the least rich in Indian genera and species of all the subareas of the Indian region; while, like Celebes, it is stamped with a marked Papuan character by the presence of *Cacatua* and *Megapodius*, and by its richness in members of the *Psittacidæ*, *Alcedinidæ*, and *Columbidæ*.

A glance at the table below will show the dearth existing in the Philippines of Indo-Malayan forms. Nine of these absent genera occur in Celebes, while the remaining sixty genera are wanting in both areas. On the other hand, thirty Indo-Malayan genera wanting in Celebes occur in the Philippines.

TABLE I.—Showing the principal Indo-Malayan Genera wanting in the Philippines.—N.B. Those occurring also in Celebes are marked with an asterisk.

*Polioaëtus.	Brachypteryx.	Enicurus.	Palæornis.
*Neopus.	*Trichastoma.	Platylophus.	Megalaima.
Ketupa.	Mixornis.	Tephrodornis.	Meiglyptes.
Bulaca.	Malacopteron.	Buchanga.	Hemicircus.
Phodilus.	Macronus.	Dissemurus.	Micropternus.
Batrachostomus.	Alcippe.	Chaptia.	Crysophlegma.
Eurylaimus.	Timalia.	Bhringa.	Tiga.
Psarisomus.	Garrulax.	Hemipus.	Sasia.
Corydon.	Pomatorhinus.	Tchitrea.	Dendrophila.
Cymbirhynchus.	Pteruthius.	*Myiolestes.	Rhopodytes.
Calyptomena.	Analcipus.	Cissa.	Coccystes.
Nyctiornis.	Myiophonus.	Temnurus.	Peloperdix.
Chalcoparia.	Phyllornis.	Dendrocitta.	Perdicula.
*Anthreptes.	Iora.	Crypsirhina.	Pavo.
*Æthopyga.	Brachypodius.	Eulabes.	Argusianus.
*Arachnothera.	Iole.	Ploceus.	Polypectron.
*Prionochilus.	Criniger.	Mirafra.	Euplocamus.
*Geocichla.			

The number of species peculiar to the Philippine archipelago, namely 106, amounts to nearly half of the total of known Philippine birds. This proportion is considerably less in the island of Celebes, where, out of a known total of 205 species, 73 only are peculiar to the island. Not one single species is common to the Philippines and Celebes which does not at the same time possess a more extended range; and *Prioniturus* is the only genus which is common to the two areas and unknown to extend beyond. The Papuan affinities of the Philippine ornis are only generic; for no Philippine species with a Papuan range occurs which does not also range into other areas. On the other hand, the great bulk of Philippine birds, exclusive of the Palæarctic (which are nearly all migratory forms), are Indo-Malayan in character; but here, again, the Indo-Malayan affinities are mostly generic, and not specific—a result easily explained by the fact that, of the 150 Philippine species belonging to the Rapaces, Picariæ, Passeres, and Columbæ, 96 are peculiar to the archipelago.

The table annexed shows that the whole of the Philippine members of the families *Psittacidæ*, *Cuculidæ*, *Bucerotidæ*, *Pittidæ*, *Irenidæ*, *Paridæ*, *Meliphagidæ*, *Nectariniidæ*, and *Dicruridæ* are peculiar to the archipelago, while the greater proportion of the *Strigidæ*, *Picidæ*, *Alcedinidæ*, *Campephagidæ*, *Muscicapidæ*, *Brachypodidæ*, *Corvidæ*, *Treronidæ*, and *Columbidæ* are also unknown beyond its limits.

Table II.—Showing by Families the proportion of Species peculiar to the Philippine Islands.

Families.	Number of Species.	Number peculiar.
Psittacidæ	9	9
Falconidæ	15	4
Strigidæ	4	3
Picidæ	6	5
Trogonidæ	1	1
Meropidæ	2	1
Coraciidæ	1	0
Alcedinidæ	12	7
Capitonidæ	2	0
Cypselidæ	2	1
Caprimulgidæ	3	3
Cuculidæ	9	9
Bucerotidæ	4	4
Laniidæ	3	1
Artamidæ	1	0
Campephagidæ	6	4
Dicruridæ	2	2
Muscicapidæ	6	4
Hirundinidæ	2	0
Oriolidæ	2	2
Turdidæ	2	0
Pittidæ	2	2
Crateropodidæ	2	0

Families.	Number of Species.	Number peculiar.
Irenidæ	1	1
Brachypodidæ	4	3
Saxicolidæ	5	2
Sylviidæ	6	4
Motacillidæ	4	1
Paridæ	1	1
Meliphagidæ	1	1
Nectariniidæ	4	4
Certhiidæ	1	1
Corvidæ	1	1
Sturnidæ	4	2
Fringillidæ	1	0
Ploceidæ	4	3
Treronidæ	10	7
Columbidæ	4	3
Gouridæ	4	1
Phasianidæ	1	0
Tetraonidæ	2	1
Turnicidæ	1	1
Rollulidæ	1	1
Megapodiidæ	1	0
Charadriidæ	8	0
Glareolidæ	1	0
Gallinulidæ	4	1
Rallidæ	8	2
Paridæ	1	0
Scolopacidæ	9	0
Ardeidæ	11	1
Anatidæ	4	2
Procellariidæ	1	0
Laridæ	5	0
Podicipidæ	1	1
Pelecanidæ	6	0
Plotidæ	1	0

By the subjoined table (Appendix), showing the geographical distribution of all the known Philippine species, it will be seen that 11 of the genera are peculiar, namely *Pseudoptynx*, *Dasylophus*, *Lepidogrammus*, *Penelopides*, *Pseudolalage*, *Zeocephus*, *Rhabdornis*, *Sarcops*, *Phaphitreron*, *Ptilocolpa*, and *Amaurornis*.

It will be further observed that the precise habitat of 57 Philippine birds remains still unrecorded, and that out of the total number of Philippine species 91 are recorded from Luzon alone. Of the 102 species known to inhabit other islands of the archipelago, 40 possess also a Luzon habitat. If we assume, which we may fairly do, that the 57 species classed under the general term of Philippine in the table are nearly all, if not all, inhabitants of Luzon, the total number of species known to inhabit that island will be 190. The number of species known to inhabit the remaining islands is given at the bottom of their respective columns, the incompleteness of our knowledge with regard to them being illustrated by the small total of 19 representing the number of authentic species in the large and important island of Mindanao, and also by the entire and enforced omission of many other large islands. Of Mindanao, with an estimated area of 36,000 square miles, the few species we know come from the immediate neighbourhood of Zamboanga. Of Luzon, the whole of the island north of Manilla has yet to be explored. The islands of Palawan, Mindoro, Samar, Leyte, Masbale, Bohol, the Calamines, and the multitude of smaller islands are almost absolutely unknown.

As might be anticipated from analogy with other isolated areas, some of the Philippine islands, although only separated by narrow seas, possess species peculiar to themselves. Although well defined, these are strictly representative forms. Those that are known are given below; and doubtless many more cases of representation will be discovered when the islands have been more thoroughly explored.

Table III.—Showing the Representative Forms which are known to inhabit the Philippines only.

	Luzon.	Panay.	Negros.	Zebu.	Mindanao.
Loriculus philippensis	*				
—— regulus	..	..	*		
—— hartlaubi	..	..	..	..	*
—— chrysonotus	..	..	..	*	
—— occipitalis	..	..	..	..	*
Chrysocolaptes hæmatribon	*				
—— xanthocephalus	..	..	*		
Actenoides hombroni	..	..	..	..	*
—— lindsayi	*				
Penelopides manilla	*				
—— panini	..	*			
Dicrurus balicassius	*				
—— mirabilis	..	..	*		

Only one species is common to a Philippine island and to any one other non-Philippine island—namely *Xantholæma rosea*, which is restricted to the islands of Negros and of Java. *X. hæmacephala*, the common Luzon Barbet, which ranges all over India and is found in Sumatra and the Malay peninsula, does not seem to occur in Negros, where *X. rosea* appears to represent it, as it also does in Java.

It is also a remarkable fact that the only Philippine representative of the highly characteristic Indian family of the *Pericrocotidæ* is the abnormal and only migratory member of the group, *P. cinereus*.

PSITTACI.

PLYCTOLOPHIDÆ.

CACATUA, Vieillot.

1. *[1] CACATUA HÆMATUROPYGIA.

Cacatua minor, Brisson, Orn. iv. p. 212, no. 11, "Philippines."
Le petit Kakatoës à bec couleur de chair, Buffon, Hist. Nat. vi. p. 96 (*patr. non indic.*).
Petit Kakatoës des Philippines, D'Aubenton, Pl. Enl. 191.
Psittacus hæmaturopygius, L. S. Müller, S. N. Suppl. p. 77, no. 51 (1776) ex Buffon; Walden & Layard, Ibis, 1872, p. 96.
Psittacus philippinarum, Gm. S. N. i. p. 331, no. 95 (1788) ex Brisson; O. Finsch, Monogr. Papag. i. p. 310; v. Martens, J. f. O. 1866, p. 21, no. 112.
Lophochroa minor (Briss.), O. Finsch, Nederd. Tijdschr. Dierk. Berigten, 1863, p. xxiii, "Luçon."

Hab. Luzon, Guimaras, Negros (*Meyer*).

No discernible distinction between the sexes, except that in the male (*fide* Meyer) the wing exceeds by about half an inch that of the female.

Dr. B. Meyer has kindly obliged me with the following remarks:—"The Philippine *Cacatua* is *wild* on all the different islands I visited. All my specimens were *shot in the forest*. It abounds on Luzon, Guimaras, Negros, in the forests; there I saw it *myself*; but I do not doubt it will be the same on the other islands."

PSITTACIDÆ.

PRIONITURUS, Wagler.

2. * PRIONITURUS DISCURUS.

Psittacus discurus, Vieillot, Gal. des Ois. i. p. 7, pl. 26, "Mindanao" (1825)[2].
Psittacus spatuliger (♀), Bourjot, Perr. pl. 53, "Mindanao" (1837–8).
Pionias discurus (Vieill.), O. Finsch, Monogr. Papag. ii. p. 401.
Urodiscus discurus (Vieill.), G. R. Gray, Hand-list, no. 8047, "Philippine Isl."
Urodiscus spatuliger (Bourjot), G. R. Gray, *tom. cit.* no. 8048, "Manilla."

Hab. Luzon, Guimaras (*Meyer*); Mindanao (*Cuming*).

An example from Guimaras (♀ *fide* Meyer) has the top and back of the head turning to blue, as in the male, and closely resembles a male from Luzon.

A Luzon individual (♂ *fide* Meyer) has the entire body-plumage bright yellow-green without any traces of blue or verditer about the head. All the lateral rectrices have a

[1] Species with an asterisk prefixed are peculiar to the Philippines.

[2] Dr. O. Finsch (*l. c.*) gives 1834. 1825 is the date on the titlepage of the first volume; but as the work appeared in parts, the date of the second part is probably earlier than even 1825. The plate is quoted in the Tableau Encyclopédique, vol. iii. p. 1369, published in 1823.

broad deep-blue terminal band, much fresher and more intense in colour than in the adult male. Wing slightly shorter; but naked shafts of middle rectrices quite as long as in the adult male. Seemingly first plumage.

Another from Luzon (♂ *fide* Meyer), in the same uniform light green plumage, but with the blue of the terminal caudal band less intense, the wing much shorter, and the shafts of middle rectrices naked only on one side, the naked part not exceeding a quarter of an inch. A still younger bird.

In an old Guimaras male the naked shafts measure an inch only, instead of two and a half or three inches.

If all these examples are correctly sexed, the adult male and female plumages do not differ.

I agree with Dr. O. Finsch (*tom. cit.* p. 404) in uniting *P. discurus* and *P. spatuliger.*

TANYGNATHUS, Wagler.

3. * TANYGNATHUS LUCONENSIS.

Psittacus lucionensis, Brisson, Orn. iv. p. 295, no. 41, "Luçon."
Psittacus lucionensis, Linn., S. N. i. p. 146, no. 31 (1766), ex Briss.
La Perruche de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 80, pl. 44.
La Perruche aux ailes chamarées, Buffon, Hist. Nat. vi. p. 151.
Perroquet de l'isle de Luçon, D'Aubent. Pl. Enl. 287.
Psittacus marginatus, L. S. Müller, S. N. Suppl. p. 77, no. 54 (1776), ex Buffon.
Psittacus gala, Bodd. Tabl. Pl. Enl. p. 17 (1783) ex D'Aubent.
Psittacus pileatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. (85) 86, no. 21 (1786), ex Sonn.
Psittacus olivaceus, Gm., S. N. i. p. 326, no. 76 (1788), ex Buffon.
Psittacus marginatus, Gm., *tom. cit.* p. 324, no. 71 (1788), ex Sonn.
La Perruche aux ailes chamarées, Le Vaillant, Perr. pl. 60.
Psittacus phrygius, Shaw, Gen. Zool. viii. pt. 21. p. 421 (1811), ex Le Vaillant.
Eclectus luconensis (Linn.), O. Finsch, Monogr. Papag. ii. p. 362.
Tanygnathus muelleri, ap. Walden & Layard, Ibis, 1872, p. 95, "Negros."

Hab. Luzon, Guimaras (*Meyer*); Negros (*L. C. Layard*).

An old male from Guimaras, with the whole head, the nape, and cheeks blue, has the uropygium green without a trace of blue.

A Luzon female (*fide* Meyer) has the forehead, crown, and cheeks green, and only the back part of the head and the nape blue, a verditer shade on the uropygium. A Luzon male (*fide* Meyer) exactly resembles the last, but has the middle of the back blue like the nape. Dimensions in all three alike.

CYCLOPSITTA, Hombron & Jacquinot.

4. * CYCLOPSITTA LUNULATA.

Petite Perruche à collier de l'isle de Luçon, troisième espèce, Sonn. Voy. Nouv. Guin. p. 77, pl. 39.
Psittacus lunulatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 86, no. 24 (1786), ex Sonn.

Psittacus torquatus, Gm. S. N. i. p. 351, no. 134 (1783), ex Sonn.; Lear, Illustr. Psitt. pl. 40.
Psittacus loxia, Cuv. Mus. Paris, Lesson, Tr. p. 204, "Manilla," adult (1831); Pucheran, Rev. Mag. Zool. 1853, p. 163; Bourjot, *tom. cit.* pl. 94.
Psittacula squamo-torquata, Bourjot, Perr. pl. 97 (1837–8), ex Lear.
Cyclopsitta loxia (Cuv.), Bp. Rev. et Mag. Zool. 1854, p. 154.
Psittacus lunulata et loxias, O. Finsch, Monogr. Papag. ii. pp. 616, 618; v. Martens, J. f. O. 1866, p. 21, nos. 118, 117; G. R. Gray, Hand-list, nos. 8377, 8376.
Psittacula lunulata, Gray, Schlegel, Mus. Pays-Bas, *Psittaci*, p. 72.

Hab. Luzon, both forms (*Meyer*); Mindanao, both forms (*Cuming*).

P. lunulatus, Scop., and *P. loxia*, Cuv., are treated of as two distinct species by Dr. O. Finsch in his admirable monograph (*l. c.*), but seemingly with some doubt, and chiefly on the ground that he had failed to find, among the numerous examples he had examined, a single individual in a transition phase,—that is, combining partly the distinctive characters of both. Yet as far back as 1853 Dr. Pucheran, in one of his valuable essays on the types contained in the Paris Museum (*l. c.*), more than suggested that *P. loxia*, Cuv., was the same bird as *P. torquatus*, Gm. (=*P. lunulatus*, Scop.). Cuvier's type, it seems, did display, along with the blue collar[1], a few feathers, "prêtes à disparaître," with yellow crescents bordered with black. Professor Schlegel (*l. c.*) without hesitation unites the two species.

From a note on the label of a Luzon example of true *P. loxia*, Cuv., marked thus by Dr. Meyer "*Psittacula lunulata* (not *loxias*, which is the ♂ of *lunulata*)," it is to be inferred that Dr. Meyer considers that the two forms constitute one species. The mode of expression used is, of course, not accurate; for the individual thus noted is actually *P. loxia*, Cuv.; and there is evident confusion in the application of the masculine symbols. But the Doctor's meaning is probably that the blue-collared bird is the male of the necklaced form. Of five examples, three, with blue collars, are marked as males; one with a lunated collar and uropygium is also marked as a male; and the fifth, also with a lunated collar, as being a female. This last has the crescentic markings on the lower back faintly indicated; the three blue-collared individuals do not exhibit a trace anywhere.

From Dr. Meyer's specimens and Dr. Pucheran's remarks on Cuvier's type, the following conclusions may therefore be arrived at:—first, that the blue collar is indicative of the adult male; secondly, that young males possess the necklaced collar, and present crescentic markings on the lower back; thirdly, that females do wear the same plumage as young males. There is, however, no positive evidence to prove that adult females do not put on the garb of adult males, although Dr. Meyer's somewhat confused note makes it likely that they do not.

[1] Dr. Pucheran does not mention the blue collar in so many words; but he refers to the individual as Cuvier's type, and that is described by Lesson (*l. c.*) as having the *tour de la gorge bleu*. Indeed the blue collar is the distinctive character of *P. loxia*, Cuv.

The length of the wing in one young male is greater than in the three adult males, as herewith shown.

1.	♂ adult.	3·87;	iris yellow-brown (*Meyer*):	*P. loxia*, Cuv.
2.	♂ adult.	3·87:		*P. loxia*, Cuv.
3.	♂ adult.	3·86.		
4.	♂ juv.	4·00:		*P. lunulatus*, Scop.
5.	♀	3·75;	iris yellow-brown (*Meyer*):	*P. lunulatus*, Scop.

Loriculus, Blyth.

5. * Loriculus philippensis.

Psittacula philippensis, Briss. Orn. iv. p. 392, no. 87, "Philippines" (1760); Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. Suppl. prim. p. 94, "Manilla."
Le coulacissi, Buffon, Hist. Nat. Ois. vi. p. 169, ex Brisson.
Perruche des Philippines, D'Aubent. Pl. Enl. 520, f. 1.
Psittacus philippensis, L. S. Müller, S. N. Suppl. p. 80, no. 68 (1776), ex Buffon.
Psittacus galgulus, var. *β*, Gm. S. N. i. p. 349, no. 46, ex Briss.
Psittacula rubrifrons, Vigors, Phil. Mag. 1831, p. 147, ♀; Lear, Illustr. Psitt. pl. 41.
Psittacula culacissi, Wagler, Monogr. p. 626 (1832); O. Finsch, Monogr. Papag. ii. p. 705; G. R. Gray, Hand-list, no. 8181.
? *Petite Perruche de l'isle de Luçon*, Sonn. Voy. Nouv. Guin. p. 77, pl. 40. fig. sup., ♀.
? *Psittacus melanopterus*, Scopoli, Del. Fl. Faun. Insubr. ii. p. 86, no. 23, ♀ (1786), ex Sonn.
? *Psittacus minor* (♀), Gm. *tom. cit.* p. 351, no. 135 (1788), ex Sonn.

Hab. Luzon (*Meyer*).

6. * Loriculus regulus.

Loriculus regulus, Souancé, Rev. et Mag. Zool. 1856, p. 22, "*patr. incert*;" v. Martens, J. f. O. 1866, p. 21, no. 114; G. R. Gray, List Brit. Mus.

Hab. Negros (*Meyer*).

A large series of specimens, obtained by Dr. Meyer in the island of Negros, apparently belong to this species of Lorikeet. The origin of Souancé's type is unknown; but an individual obtained by Cuming in Mindanao was identified with Souancé's species by Mr. G. R. Gray (*l. c.*). This example furnished Dr. O. Finsch[1] (Papag. ii. p. 710) with the descriptions cited. The example, however, appears to be no longer extant (Hand-list, no. 8182). Dr. Meyer's Negros specimens agree well with the original description of *L. regulus*, and to that species I provisionally refer them; but until they are com-

[1] Since the above was written, Dr. O. Finsch has described the Mindanao species, *Coryllis regulus* (Souancé) apud Finsch (Papag. ii. p. 710), as distinct from the true *L. regulus*, Souancé, under the title of *Coryllis occipitalis* (Ibis, 1874, p. 208). It will therefore stand in this list as no. "6 bis **Loriculus occipitalis* (Finsch). *Hab.* Mindanao."

pared with actual Mindanao examples their identity must continue doubtful. The peculiarly restricted ranges of the different Philippine species of *Loriculus* render it not unlikely that Cuming's specimens, if really indigenous to Mindanao, may belong to a representative form.

Three examples (♀ *fide* Meyer) are without the orange-red pectoral plastron. In one a large yellow patch replaces the orange-red plastron of the male. In another this yellow space is less distinctly indicated; and in this specimen the feathers surrounding the base of the mandible, and the feathers of the throat, are verditer blue. The remaining under surface of these three examples is more or less light yellow-green, and not dark grass-green as in the adult male. Above the female is hardly distinguishable from the adult *L. philippensis* ♂, the golden occipital patch of the adult male being absent, while the golden nuchal stripe is fully developed. A fourth example (♀ *fide* Meyer) has the entire body green, with the exception of the rump and upper tail-coverts, which are scarlet.

7. * Loriculus hartlaubi.

Coryllis hartlaubi, O. Finsch, Monogr. Papag. ii. p. 701, "Mindanao" (1868).
Loriculus melanopterus (Scop.), G. R. Gray, List Psitt. Brit. Mus. p. 55, *fide* O. Finsch, *l. c.*
Loriculus apicalis, Souancé, G. R. Gray, *tom. cit.* p. 56, *fide* O. Finsch *l. c.* nec Souancé.
? *Petite Perruche de l'isle de Luçon,* Sonn. Voy. Nouv. Guin. p. 77, pl. 40. fig. inf. ♂.
? *Psittacus melanopterus,* Scopoli, Del. Fl. Faun. Insubr. ii. p. 86, no. 23, ♂ (1786), ex Sonn.
Loriculus melanopterus et *apicalis,* G. R. Gray, Hand-list, nos. 8175, 8176.
Loriculus apicalis, Souancé, v. Martens, J. f. O. 1866, p. 21, no. 115, nec Souancé.

Hab. Mindanao (*Cuming*).

The above title was founded by Dr. O. Finsch (*l. c.*) on some examples of a Lorikeet obtained by Mr. Cuming in Mindanao, and contained in the British Museum. One of these individuals Mr. G. R. Gray (*l. c.*) had identified with *P. melanopterus*, Scopoli, and the other with *L. apicalis*, Souancé. The last title belongs with little doubt to *L. indicus* (Gm.) (*conf.* O. Finsch, *tom. cit.* p. 718). The former is based on the two figures given by Sonnerat in his 40th plate (*tom. cit.*). These two figures, though given by Sonnerat as representing the two sexes of a Luzon parrot, belong clearly to two distinct species. The so-called male is described by that author as having the top of the head red, and the throat blue; while the female is said to differ in having the throat and the feathers surrounding the base of the bill red, and in having a yellow spot on the back of the neck. If it had been made clear by Sonnerat that the summit of the head in his so-called female was also red, there would be no difficulty in showing that he was describing an example of *L. philippensis*; and to that species I have already referred his upper figure, although with doubt. The so-called male, represented by the lower figure, on the whole appears to agree best with *L. indicus*; and to this species Dr. O. Finsch has referred it (*tom. cit.* p. 715). Yet it is not impossible that a Mindanao example of *L. hartlaubi* may have been Sonnerat's type; and this view is maintained by Mr. G. R. Gray in the Hand-list. But the title of *melanopterus*, Scop., cannot be used, as it applies to two distinct species; therefore that of *hartlaubi*, O. Finsch, will have, under any circumstances, to be adopted.

What species Dr. v. Martens (*tom. cit.* p. 21, no. 116) intended to indicate under the title of *Loriculus melanopterus* (Scop.), it is impossible to determine. "Kehle blau, ein Flecken im Nacken gelb," does not apply to any *Loriculus* that I am acquainted with.

8. * LORICULUS CHRYSONOTUS.

Loriculus chrysonotus, Sclater, Ibis, 1872, p. 323, pl. xi., "Zebu."

Hab. Zebu (*Meyer*).

The example referred to by Dr. O. Finsch (Papag. ii. p. 711) of *L. regulus* in the British Museum, with nape and back golden, belongs probably to this species.

The following eleven species of Parrots have been described or else enumerated as inhabitants of the Philippines.

(1) *Petite Perruche de l'isle de Luçon, première espèce,* Sonn. *op. cit.* p. 76, pl. 38. fig. inf.

Psittacus pumilus, Scopoli, *tom. cit.* p. 87, no. 26 (1786), ex Sonn.

Coryllis galgulus (Linn.), O. Finsch, *op. cit.* ii. p. 699.

So far as is at present known, this species is restricted to Malacca, Sumatra, and Borneo.

(2) *Petite Perruche de l'isle de Luçon, seconde espèce,* Sonn. *op. cit.* p. 76, pl. 38, fig. sup.

Psittacus leucophthalmus, Scopoli, *tom. cit.* p. 87, no. 25 (1786), ex Sonn.; v. Martens, J. f. O. 1866, p. 22, no, 119, "Luzon."

Psittacus simplex, Kuhl, Conspectus Psittac. p. 66, no. 111 (1820), ex Sonn.

Psittacula passerina (Linn.), O. Finsch, *tom. cit.* p. 648.

Dr. O. Finsch has, with some doubt, identified this Parrot with the well-known South-American species. The learned Doctor, however, separates it as a variety characterized by possessing a blue nuchal spot. Sonnerat is silent as to such a character. Scopoli does not add it, nor does Kuhl. Latham alone mentions a variety of *P. capensis*, Gm. (=*P. passerinus*, Linn., av. juv.), as being represented in one of Lady Impey's drawings, with a blue spot on the lower part of the neck,—the freak of some imaginative native artist? (*conf.* Lath. Gen. Hist. ii. 274, no. 229, var. B).

Mr. G. R. Gray (List of *Psittacidæ* in Brit. Mus. p. 91, no. 26) records *P. leucophthalmus*, Scop., as being contained in the British Museum, and adds Luzon as its origin. Dr. v. Martens (*l. c.*) gives Cuming as the collector of this example. According to the Hand-list, no. 8358, the specimen is no longer extant, and the habitat of the species is left undetermined.

(3) *La petite Perruche de l'isle de Luçon*, Sonnerat, Voy. Nouv. Guin. p. 78, pl. 41.
Psittacus cingulatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 86, no. 22 (1786).
Psittacus melanopterus, Gm. S. N. i. p. 350, no. 132 (1788).
Psittacus micropterus, Kuhl, Conspectus Psittac. p. 67, no. 113 (1820), ex Sonn.
Psittacula cingulata (Scopoli), O. Finsch, Monogr. Papag. ii. p. 677.
A South-American species.

(4) *La Perruche de l'isle de Luçon*, Sonn. *op. cit.* p. 79, pl. 42.
Psittacus signatus, Scopoli, *tom. cit.* p. 26, no. 19 (1786), ex Sonn.
Palæornis cyanocephalus (Linn.), O. Finsch, *op. cit.* ii. p. 40.
Continental India and Ceylon only.

(5) *La Perruche à collier de l'isle de Luçon*, Sonn. *op. cit.* p. 80, pl. 43.
Psittacus guianensis, Scop., *tom. cit.* p. 86, no 20 (1786), ex Sonn.
Psittacus sonnerati, Gm., *tom. cit.* p. 324, no. 72 (1788), ex Sonn.
Palæornis eupatrius (Linn.), O. Finsch, *tom. cit.* p. 11.

This Parakeet Dr. O. Finsch (*l. c.*) has identified, without doubt, with the large Alexandrine Parrakeet of Indian authors. Sonnerat's description, however, does not agree well with that species, nor with any other known to me.

(6) *Psittacus manillensis*, Bechstein, Stubenvögel, p. 612, no. 161, "Manilla;" Kurze Uebersicht, p. 75, no. 50, "Africa, Philippines, especially Manilla" (1811).
Palæornis torquatus (Bodd.), O. Finsch, *tom. cit.* p. 17.

Certainly not a Philippine species.

(7) *Palæornis gironnieri*, Verr. Rev. et Mag. Zool. 1853, p. 195, "Philippines."
Palæornis calthropæ, Layard, J. A. S. B. 1849, p. 800, "Ceylon."

Confined to Ceylon.

(8) *Eclectus linnei*, Wagler; G. R. Gray, List Brit. Mus. *Psittacidæ*, p. 65, no. 1, "Philippines;" Hand-list, no. 8239, "Philippines."

and

(9) *Eclectus ceylonensis* (Bodd.), G. R. Gray, *op. cit.* p. 65, no. 3, "Philippine Isl."
Eclectus roratus (L. S. Müller), G. R. Gray, Hand-list, no. 8240, "Philippines;" are well-known species, restricted to the Papuan subregion.

(10) *Lorius philippensis*, Briss. Orn. iv. p. 225, no. 16, "Philippines."
Psittacus lory, Linn. S. N. i. p. 145, no. 26 (1766), ex Briss.
Lorius tricolor, Stephens, G. R. Gray, List Brit. Mus. *Psittacidæ*, p. 50, no. 4, "Philippine Isl."

North of New Guinea, Waigiou, and Mysol.

(11) *Lorius garrulus* (Linn.), Meyen, Nov. Act. vol. xvi. suppl. prim. p. 95.

A purely Malaccan species, although stated by Meyen (*l. c.*) to come from the more southern Philippine islands.

RAPACES.

FALCONIDÆ.

FALCONINÆ.

HYPOTRIORCHIS, Boie.

9. HYPOTRIORCHIS SEVERUS.

Falco severus, Horsf. Tr. L. S. xiii. p. 135, "Java" (1821); Walden & Layard, Ibis, 1872, p. 98.
Falco guttatus, G. R. Gray, Ann. N. H. xi. p. 371, "Philippine Islands" (1843).

Hab. Philippines (*G. R. Gray*); Negros (*L. C. Layard*).

An example of each of the two following species of Falcons, said to have been obtained in the Philippines, is contained in the Museum at Norwich. Although there is nothing absolutely impossible in either, or both, of these species occurring in the archipelago, I refrain from treating them as authentically ascertained Philippine species, the evidence in favour of their Philippine origin requiring confirmation.

Falco peregrinus, Gm., an adult female, "Manilla"?

Falco melanogenys, Gould, a female, not quite mature, "Philippines"?

HIERAX, Vigors.

10. * HIERAX ERYTHROGENYS.

Hierax erythrogenys, Vigors, P. Z. S. 1831, p. 96, "neighbourhood of Manilla;" Fraser, Zool. Typica, pl. 31.
Falco sericeus, Kittlitz, Kupfert. pt. 1, p. 4, pl. 3. fig. 3, "Philippines" (1832)[1]; Mém. présentés à l'Acad. St. Pétersb. vol. ii. pt. 1 & 2, p. 2, pl. 1, "Luzon" (1833).
Falco gironnierii, Eydoux et Souleyet, Voy. Bonite, Ois. p. 71, pl. 1, "Luçon" (1841).
Ierax erythrogenys, Vig., G. R. Gray, Hand-list, no. 221.
Ierax sericeus, Kittlitz, G. R. Gray, *tom. cit.* no, 222.

Hab. Luzon (*Meyer*).

Kaup in 1850 (Contrib. Orn. 52) united *H. erythrogenys* with *H. sericeus*, applying Vigors's title to the male, and that of Kittlitz to the female. Dr. v. Martens (J. f. O. 1866, p. 9) suggested that the two titles belonged to one and the same bird. Mr. J. H. Gurney writes to me that he considers *H. erythrogenys*, Vigors, to be the female (and probably the young male also) of *H. sericeus* (Kittlitz); also that M. Jules

[1] Strickland (Orn. Syn. p. 104) gives 1809 as the date. This must be an error; for Kittlitz first obtained the pair he described from in the year 1829, when with the Russian corvette 'Senjavin' at Manilla.

Verreaux had ascertained by dissection that *H. sericeus* and *H. erythrogenys* were male and female of the same species. Perhaps it will be eventually shown that the adults of both sexes do not differ in coloration, and that the rufous cheeks are a sign of nonage common to both sexes. Dr. Meyer's examples are all in the *sericeus* plumage; and some are marked by him as male, and others as female. In one of the latter the wing measures a full half inch longer than in the males; and the other dimensions are proportionally greater.

H. cærulescens evinces a somewhat analogous tendency, the white forehead and supercilium of the adults being rufous in a prior stage of plumage. And this is also to be observed in *H. eutolmus*, where, however, the chin and throat are white in the young bird, instead of ferruginous as in the adult.

On the authority of M. de la Gironnière (Bonite, *l. c.*) the Philippine *Hierax* is stated to appear in Luzon only in the spring; and the inference is drawn that it is migratory. Dr. Meyer obtained his specimens in January and April.

In the Hand-list (*l. c.*) Mr. G. R. Gray notes *H. sericeus* as occurring in North China. It is not included in either Mr. Swinhoe's list (P. Z. S. 1871), or in that of M. Armand David (N. Archiv. Mus. vii.). Mr. Swinhoe, however, recently observed a species of *Hierax* in a collection made by Père Heude near Shanghai (Ibis, 1873, p. 95); but he does not identify the species.

Hierax melanoleucus, Blyth, is treated by Mr. Strickland (Orn. Syn. p. 104) as a synonym of *H. sericeus*, whereas the Assamese *Hierax* is a very distinct and well-marked species. It differs in having black cheeks, white lores, a white superciliary stripe continued along the sides of the head to the neck, white shoulder-edge and under shoulder-coverts, and in having all the rectrices except the middle pair with five or more white spots on their inner webs, and all the quills numerously barred with white. In the Philippine species the tail-feathers, quills, and under shoulder-coverts are black, some of the quills being indistinctly mottled with dirty white. It possesses no supercilium; and the cheeks are white.

ACCIPITRINÆ.

LOPHOSPIZA, Kaup.

11. LOPHOSPIZA TRIVIRGATA.

Falco trivirgatus, Tem. Pl. Col. 303, "Sumatra" (1824).
Astur cristatus, G. R. Gray, Ann. N. H. xi. p. 371, "Philippine Islands" (1843).

Hab. Philippines (*G. R. Gray*).

Mr. J. H. Gurney informs me that Philippine examples of this species are preserved in the Norwich Museum.

TERASPIZA, Kaup.

12. TERASPIZA VIRGATA.

Falco virgatus, Reinw., Temm. Pl. Col. 109, ♂, "Java" (1824); Schlegel, Vog. Neder. Ind., Valkvog. p. 59, pl. 12. f. 1, 2, 3, 4.

Nisus manillensis, Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. Suppl. p. 69, pl. ix. (♀), "Manilla in October" (1834), *fide* Sharpe.

Hab. Luzon, January; Guimaras, March (*Meyer*).

TACHYSPIZA, Kaup.

13. TRACHYSPIZA SOLOENSIS.

Falco (*Dædalion*) *soloënsis,* Horsf. Tr. L. S. xiii. p. 137, "Java" (1820); Schlegel, Mus. Pays-Bas, *Astures,* p. 44.

Falco soloënsis, Horsf., Lath. Gen. Hist. i. p. 209, no. 137 (1821).

The Philippine habitat rests on the authenticity of three male examples in perfect plumage in the Leyden Museum, and two in the British Museum, all collected by the late Mr. Hugh Cuming.

AQUILINÆ.

LIMNAËTUS, Vigors.

14. * LIMNAËTUS PHILIPPENSIS. (Pl. XXIV.)

Spizaëtus philippensis, Gurney, Gould, Birds of Asia, pt. 15 (sub *Spizaëtus alboniger*), "Philippine Islands" (June 1, 1863).

Spizaëtus kienerii, Gervais, Guérin, Mag. Zool. v. pl. 35, "Himalayas" (1835) *apud* Schlegel, Mus. Pays-Bas, *Astures,* p. 12, "Luçon," *nec* Gervais.

Hab. Luzon (*Gevers*).

The figure is taken from the first of the two examples described by Mr. Gurney (*l. c.*); and it will be observed that the Philippine bird nearly resembles the small South-Indian and Ceylon race, *L. ceylonensis* (Gm.). *L. kienerii* may likewise occur in Luzon; but the single individual in the Leyden Museum, doubtfully referred to it by Professor Schlegel, does not agree with what is known of either the young or adult plumage of that well-marked species.

Le Secrétaire, Sonn., Voy. Nouv. Guin. p. 87, pl. 50, on which were founded the *Otis secretarius,* Scopoli, Del. Fl. Faun. Insubr. ii. p. 93, no. 83 (1786), and *Gypogeranus philippensis,* Ogilby, P. Z. S. 1835, p. 105, is now known to be indigenous to Africa only, although stated by Sonnerat to likewise inhabit the Philippines.

Cuncuma, Hodgson.

15. Cuncuma leucogaster.

White-bellied Sea-eagle, Lath. Synop. i. p. 33, "*Patr. ignot.*"
Falco leucogaster, Gm. S. N. i. p. 257, no. 43 (1788), ex Lath.; von Martens, Preus. Exped. Ost-Asien, Zool. i. p. 187; Walden & Layard, Ibis, 1872, p. 98.

Hab. Philippines (*v. Martens*); Negros? (*L. C. Layard*).

Spilornis, G. R. Gray.

16. * Spilornis holospilus.

Buteo holospilus, Vigors, P. Z. S. 1831, p. 96, "neighbourhood of Manilla."
Hæmatornis holospilus (Vigors), Vigors, *tom. cit.* p. 170; Fraser, Zool. Typica, pl. 29 (1849).
Spilornis holospilus (Vigors), G. R. Gray, List Birds Brit. Mus., *Accipitr.* p. 10 (1844).
Circaëtus holospilus (Vigors), G. R. Gray, Gray & Mitch. Genera of Birds, i. pl. 7, "juv;" *id.* List Birds Brit. Mus., *Accipitr.* p. 19 (1848); Kaup, Isis, 1847, p. 263, "British India & China" (!); v. Pelzeln, SB. Ak. Wien, 1862, p. 171, "East Indies."

Hab. Luzon (*Meyer*); Mindanao, Cataguan (*Cuming*).

Mr. Blyth (Ibis, 1866, p. 243) extends the range to South China; but the species is not included by Mr. Swinhoe in his List (P. Z. S. 1871). It appears to be restricted to the Philippines.

Milvinæ.

Haliastur, Selby.

17. Haliastur intermedius.

Haliastur intermedius, Gurney, Ibis, 1865, p. 28, "Java;" *op. cit.* 1866, p. 247.
Haliaëtus pondicerianus (Linn.), ap. Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. suppl. prim. p. 69.
Haliastur indus (Bodd.), v. Pelzeln, Reise der Novara, Vögel, p. 7, "Philippines."

Hab. Luzon, April; Guimaras, March (*Meyer*).

The white plumage, more particularly on the head, with black shafts. That of the breast almost as in *H. leucosternus.* The Malaccan Brahminy Kite resembles closely that of India, *H. indus.*

Elanus, Savigny.

18. Elanus hypoleucus.

Elanus hypoleucus, Gould, P. Z. S. 1859, p. 127, "Macassar;" Walden, Tr. Z. S. viii. p. 36.
Elanus intermedius, Schlegel, Mus. Pays-Bas, *Milvi,* p. 7, "Java, Borneo, Celebes" (1862).
Elanus melanopterus, Daud., v. Martens, J. f. O. 1866, p. 9, no. 7, *nec* Daud.

Hab. Luzon (*Jagor*).

Dr. v. Martens appears to be the first and only author who has recorded the existence of a Philippine species of the genus *Elanus.* He identified it with the common African and Indian species. I venture, however, to refer it to the Archipelagic form, *E. hypo-*

leucus, Gould (P. Z. S. 1859, p. 127), which appears to be equal to *E. intermedius*, Schlegel.

BAZA, Hodgson.

19. * BAZA MAGNIROSTRIS.

Baza magnirostris, G. R. Gray, List Birds Brit. Mus., *Accipitr.* p. 19, "Philippine Islands" (1844); Walden, Tr. Z. S. viii. p. 36.

Pernis crassirostris, Kaup, Jard. Contrib. Orn. 1850, p. 77, "Philippine Islands."

Avicida magnirostris (Kaup), Bp. Comp. i. p. 20, no. 5 (1850); *id.* R. M. Z. 1855, p. 534, no. 114.

Hab. Philippines (*Cuming*).

Mr. Sharpe informs me that he considers the Celebean *Baza* specifically distinct from the Philippine (*Conf.* Walden, Tr. Z. S. viii. p. 36).

BUTASTUR, Hodgson.

20. BUTASTUR INDICUS.

Javan Hawk, Latham, Gen. Synop. i. p. 34*, nos. 8, 7, "Java" (1781).

Falco indicus, Gm. S. N. i. p. 264, no. 68 (1788), ex Lath.

Poliornis indicus (Gm.), Walden, Tr. Z. S. viii. p. 37 (1871).

Hab. Luzon, February, April; Guimaras, March; Cujo, December (*Meyer*).

An old female, from Guimaras, with a very broad superciliary stripe, has four distinct dark brown caudal bands. Several Malaccan examples (*mus. nostr.*) perfectly agree with those from the Philippines.

CIRCUS, Lacépède.

21. CIRCUS MELANOLEUCOS.

Black and White Indian Falcon, Penn. Ind. Zool. 1st ed. pl. i. (1769?); Lath. Synop. i. p. 81, no. 65, "Ceylon," ex Pennant.

Falco melanoleucos, Forster, Zool. Ind. p. 12, pl. 2 (1781), ex Lath.

Circus melanoleucus (Gm.), Radde, Reisen Ost-Siberien, ii. p. 116, pl. 2. fig. 1; Gurney, Ibis, 1868, p. 356; Swinhoe, Ibis, 1863, p. 213; Walden & Layard, Ibis, 1872, p. 98.

Circus, sp., Swinhoe, Ibis, iii. p. 263, no. 12, "Manilla" (1861).

Circus cyaneus hudsonius, Schlegel, Mus. Pays-Bas, *Circi*, p. 3, *juv.* "Luçon;" Gurney, *l. c.* no. 3; Ibis, 1870, p. 444; Swinh., Ibis, 1863, p. 214.

Hab. Philippines (*Gurney, Swinhoe, Gevers*); Negros? (*L. C. Layard*).

The Philippine habitat of this Harrier mainly rests on the testimony of Mr. Swinhoe (*l. c.*), and on the correct determination of certain immature Philippine examples in the Museums of Norwich and Leyden by Mr. Gurney.

22. CIRCUS SPILONOTUS.

Circus spilonotus, Kaup, Jard. Contrib. Orn. 1850, p. 59, "Asia;" Swinhoe, Ibis, 1863, p. 215 pl. 5; Gurney, Ibis, 1868, p. 356.

Hab. Philippines (*Gurney*).

Authentic Philippine individuals of this Harrier are contained in the Norwich Museum (*fide* Gurney, *l. c.*). It also occurs in the Malay peninsula.

23. CIRCUS ÆRUGINOSUS.

Falco æruginosus, Linn. S. N. i. p. 130, no. 29 (1766).

A skin of a young female obtained in one of the Philippine Islands by the late Mr. Hugh Cuming, and now in the British Museum, is our only warrant for admitting the Marsh-Harrier as an inhabitant of the Archipelago.

STRIGIDÆ.

SURNINÆ.

NINOX, Hodgson.

24. * NINOX PHILIPPENSIS. (Pl. XXV. fig. 1.)

Ninox philippensis, Bp. Compt. Rend. xii. p. 655 (1855).
Noctua hirsuta philippensis, Schlegel, Mus. Pays-Bas, *Striges,* p. 26, "Philippines" (1862).
Noctua philippensis, Schlegel, Neder. Tijdschr. Dierk. 1866, p. 183.
Athene philippensis, Schlegel, Wallace, Ibis, 1868, p. 22.

Hab. Luzon, January (*Meyer*).

A very distinct form. Each of the major wing-coverts with a bold white drop towards the end of the outer web. Rectrices traversed by six narrow ochreous bands. The cheek-feathers rigid, decomposed, and considerably developed, extending posteriorly sufficiently to cover the ears.

	Longitudo alæ.	caudæ.	
♂	6·37.	3·62.	Luzon.
♂	5·25.	3·62.	Luzon.

BUBONINÆ.

PSEUDOPTYNX, Kaup.

25. * PSEUDOPTYNX PHILIPPINENSIS. (Pl. XXV. fig. 2.)

Pseudoptynx philippinensis, Kaup, Tr. Zool. Soc. iv. p. 244, "Philippines" (1859); Schlegel, Mus. Pays-Bas, *Oti,* p. 14; Mr. G. R. Gray, Hand-list, no. 456.
Bubo philippensis, Schlegel, De Dierentuin, pt. i. p. 10, fig. —.
Syrnium philippense, G. R. Gray, List Birds Brit. Mus., *Accipitres,* p. 105, "Philippine Islands" (1848).
Otus philippensis, G. R. Gray, Gray & Mitch. Genera, i. p. 40, no. 11.

Hab. Philippines (*Cuming*).

An example of this rare Owl, contained in the Leyden Museum, is said to have been obtained in the Philippines by Cuming. The accompanying figure is from the type specimen in the British Museum, obtained by that traveller.

LEMPIJIUS, Bonaparte.

26. * LEMPIJIUS ? MEGALOTIS. (Pl. XXV. fig. 3.)

Ephialtes megalotis, G. R. Gray, Hand-list, i. p. 46, no. 474, "Manilla" (1869) (*descr. nulla*).

Hab. Manilla (?).

A well-marked species, conspicuous by its long ear-tufts, which measure fully an inch and a quarter. The type is preserved in the British Museum, and, although noted by Mr. Gray (*l. c.*) as being a young bird, appears to me to be fully adult.

Light rufous. Feathers of the head and back with very minute black transverse markings, bolder on the long ear-tufts. Under surface tawny rufous, the minute transverse markings being pale brown. Quills alternately barred throughout their length with pale brown and pale fulvous bands. The brown bands more or less dotted with pale fulvous; the fulvous bands here and there with a narrow pale-brown irregular line running through. Rectrices marked and coloured like the quills; but the bands are narrower. Tarsus feathered to the feet, which are naked. Wing 6; tail 2·25; tarsus 1·25.

The figure is taken from the type specimen.

STRIGINÆ.

SCELOSTRIX, Kaup.

27. SCELOSTRIX CANDIDA.

Strix candida, Tickell, J. A. S. B. 1833, p. 572, "Bengal and the upper Provinces;" Jerdon, Illustr. Ind. Orn. pl. 30; Gould, Birds of Asia, pt. xxiv. pl. 2.

Strix amauronota, Cab. J. f. O. 1866, p. 9, "Luzon" (*descr. nulla*) ; *op. cit.* 1872, p. 316, no. 3 (*descr. princeps*).

A single example of a long-legged Grass-Owl was obtained in the Philippines by Dr. Meyer; but the exact locality was not recorded. In its dimensions it agrees with Indian examples, and cannot be separated by any peculiarities of colouring. The description lately published by Dr. Cabanis (*l. c.*) of his *Strix amauronota* perfectly agrees with the example obtained by Dr. Meyer. *S. pithecops*, Swinhoe (Ibis, 1866, p. 396, "Formosa"), according to Mr. G. H. Gurney (*in epist.*), also belongs to the same species. And Mr. Swinhoe (P. Z. S. 1871, p. 344, no. 56) has identified *S. pithecops* with *S. candida*, while Mr. Gould has recently (*l.c.*) united Australian *S. walleri*, Diggles, with the Indian species. In the Liverpool Museum Mr. Blyth identified two Philippine examples of *Scelostrix* with *S. candida* (Ibis, 1865, p. 30). Later (*op. cit.* 1866, p. 251) that gentleman expressed less confidence in the correctness of his original opinion (*conf. op. cit.* 1867, p. 184). But in 1870 (*op. cit.* p. 160) Mr. Blyth surmised that the various species above named would be found to be identical. It is perfectly distinct from *S. rosenbergi.*

PICARIÆ.

PICIDÆ.

THRIPONAX, Cabanis.

28. THRIPONAX JAVENSIS.

Picus javensis, Horsf. Tr. L. S. xiii. p. 175, ♂, "Java" (1820); Walden, Ibis, 1871, p. 164.

Picus horsfieldii, Wagler, Syst. Av. p. 15, no. 5, ♂ (1827), ex Horsf.

Picus leucogaster, Wagler, *l. c.* no. 7, ♀, "Mindanao;" Isis, 1829, p. 509, ♂; Reinw., Temm. Pl. Col. 501, ♂, "îles de la Sonde" (1830).

Dryopicus leucogaster (Reinw.), Malh. Monogr. i. p. 47, pl. 13. f. 4, ♂, 5, ♀.

Hab. Luzon, January and April (*Meyer*); Mindanao (*Wagler*).

The crest in these Luzon examples is of a brighter red than in Malaccan and Javan individuals; it is vermilion, as in *T. crawfurdi,* whereas in *T. hodgsoni* and in Malaccan and Javan *T. javensis* it is blood-red. The proportion of white at the insertion of the quills corresponds with what is found in Malaccan examples (*conf.* Walden, *l. c.*). On the outer web of the fourth primary of a female a small albescent terminal spot is indicated. In the other examples there is no trace. Altogether the Luzon *Thriponax* closely resembles the Javan and Malaccan. By the following table of dimensions it will, however, be seen that it is a smaller bird.

		Longitudo alæ.	Longitudo caudæ.		
T. javensis,	♂	8·25.	7·25.	East Java.	Not quite adult.
,,	♂	8·50.	7·	Malacca.	Adult.
,,	♀	8·37.	7·50.	,,	,,
,,	♀	8·75.	7·50.	,,	,,
,,	♂	8·	7·	Luzon.	,,
,,	♂	7·75.	7·	,,	,,
,,	♀	7·60.	6·50.	,,	,,

MULLERIPICUS, Bonaparte.

29. * MULLERIPICUS FUNEBRIS.

Picus funebris, Valenc. Dict. Sc. Nat. vol. 40, p. 179, ♀, "Philippines" (1826); Malh. Monogr. i. p. 54, pl. 15. fig. 1, ♂, 2, ♀.

Picus lichtensteinii, Wagler, Syst. Av. p. 25, no. 31, ♀, "*Patr. incert*"[1] (1827).

[1] Malherbe (*l. c.*) informs us that Wagler described from the same specimen in the Paris Museum that served as Valenciennes' type.

Picus modestus, Vigors, P. Z. S. 1831, p. 98, ♂, "neighbourhood of Manilla."
Picus punctatus, Lesson, Tr. p. 230, ♀, "*Patr. non indic.*" (1831), *nec* Vieillot.
Picus funereus, Lichtenst. in Mus. Berol., *fide* Cab. Mus. Hein. iv. pt. 2, p. 108.

Hab. Luzon, January and April (*Meyer*).

Belongs to the same section as *M. fulvus* (Q. & G.).

CHRYSOCOLAPTES, Blyth.

30. * CHRYSOCOLAPTES HÆMATRIBON.

Picus hæmatribon, Wagler, Syst. Av. p. 46, no. 95 (♀), "India?" (1827).
Picus spilolophus, Vigors, P. Z. S. 1831, p. 98 (♀), "neighbourhood of Manilla."
"*Picus philippinarum,* Gm."[1], Lesson, Tr. p. 222 (1831).
Indopicus hæmatribon (Wagler), Malh. Monogr. ii. p. 84, pl. 68. f. 1, ♂, 2, ♂ juv., 3, ♀[2].

Hab. Luzon, January, February, and April (*Meyer*).

31. * CHRYSOCOLAPTES XANTHOCEPHALUS.

Chrysocolaptes xanthocephalus, Walden & Layard, Ibis, 1872, p. 99, pl. iv. "Negros."

As yet only known to inhabit the island of Negros.

32. * CHRYSOCOLAPTES LUCIDUS.

Pic grivelé ou grand Pic de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 73, pl. 37.
Picus lucidus, Scopoli[3], Del. Fl. Faun. Insubr. ii. p. 89, no. 51 (1786), ex Sonn.
Pic verd des Philippines, D'Aubent., Pl. Enl. 691.
Autre palalaca ou Pic verd tacheté des Philippines, Buffon, Hist. Nat. Ois. vii. p. 21.
Picus aurantius, Linn., Bodd. Tabl. Pl. Enl. p. 43 (1783), ex D'Aubent. *nec* Linn.
Picus bengalensis, var. γ, Gm. S. N. i. p. 433, no. 13, ex Sonn. et D'Aubent.
Picus philippinarum, Lath. Ind. Orn. i. p. 236, no. 30 (1790), ex Sonn. et D'Aubent.; Malh. Monogr. *Picidæ,* ii. p. 85, pl. 66. figs. 3, 4; v. Martens, J. f. O. 1866, p. 20, no. 101.
Picus palalaca, Cuv. R. An. i. p. 451 (1829), ex D'Aubent.
Picus squamosus, Less. Traité, p. 230, "*Patr. non indic.*" (1831); Pucheran, Rev. et Mag. Zool. 1853, p. 162.

Hab. Luzon (*Jagor*).

Buffon (*tom. cit.* p. 20) mentions as a distinct species, under the name of *Le Palalaca,* a large Philippine Woodpecker, described by both Camel and Gemelli Carreri[4], and said to be of the size of a fowl. The colour of its plumage is stated to be principally green. Dr. v. Martens (*l. c.*) is of opinion that *palalaca* is the native name for *P. philippinarum.*

[1] Gmelin has no such title.

[2] Wagler's types were still in the Paris Museum when Malherbe wrote (*l. c.*).

[3] Scopoli, who had already given the title of *Picus menstruus* to the species figured in Sonnerat's thirty-sixth plate, again quoted the thirty-sixth plate and applied the title cited. But the diagnosis lainly refers to the bird figured in Sonnerat's thirty-seventh plate.

[4] Voy. autour du Monde, *Paris,* 1719, v. p. 269.

YUNGIPICUS, Bonaparte.

33. * YUNGIPICUS MACULATUS.

Le petit Pic d'Antigue, Sonnerat, Voy. Nouv. Guin. p. 118, pl. 77.
Picus maculatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 89, no. 52 (1786), ex Sonn.
Le petit Epeiche, var., Buffon, Hist. Nat. vii. p. 64, ex Sonn.
Picus minor, var. β, Lath. Ind. Orn. i. p. 230, no. 15, ex Sonn.[1]
"*Picus moluccensis*, Gm.," Lesson, Traité, p. 221, "Mindanao," *nec* Gm.; Malherbe, Monogr. *Picidæ*, i. p. 143, "Philippines et Moluques," *nec* Gm.
Picus nanus, Vigors, Blyth, J. A. S. B. 1845, p. 197, "patr. incert.," *nec* Vigors.
Picus validirostris, Blyth, Cat. Calc. Mus. p. 64, no. 305, "*Patr. incog.*;" J. A. S. B. 1849, p. 805, "Philippines or China;" Cab. Mus. Hein. iv. pt. 2, p. 60, no. 207, "Philippines;" G. R. Gray, Hand-list, no. 8582; v. Martens, J. f. O. 1866, p. 20, no. 106.
Picus flavinotus, Malherbe, *l. c.*
Picus maculatus, Jerd. Birds of India, i. p. 279, "Philippines" (1862).

Hab. Luzon (*Jagor*); Panay (*Sonnerat*); Mindanao (*Lesson*).

The synonyms have been brought together as above on the assumption that Luzon, Panay, and Mindanao possess but one species of *Yungipicus*.

Malherbe's opinion that this Philippine Woodpecker is identical with Buffon's *Petit pic des Moluques*, has been satisfactorily disposed of by Dr. Cabanis (*l. c.*).

Picus analis, Temm., MS. (Horsf. Gen. Cat. Jav. Birds, in Horsf. Zool. Res. Java, = *Picus minor*, Linn., ap. Horsf. Tr. Linn. Soc. xiii. p. 177, *nec* Linn.), is recorded by Malherbe (Monogr. *Picidæ*, i. p. 100), from Mindanao, but on very insufficient authority. Sundevall (Consp. Av. Picinarum, p. 25, no. 69), with reason, doubts its Philippine habitat.

Wagler (Syst. Av. *Picus*, p. 24, no. 27) describes his *Picus variegatus* from Manilla as well as from Java; but Dr. Cabanis (Mus. Hein. iv. pt. 2, p. 54) has shown that Wagler had only Javan examples, contained in the Munich Museum, before him. His species is probably the same as *P. moluccensis*, Gm.

The two following species of Woodpecker have been clearly shown by Malherbe (*op. cit.*) to be African, and not Philippine.

Le pic cardinal de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 72, pl. 35.
Picus guineensis, Scopoli, Del. Fl. Faun. Insubr. ii. p. 89, no. 49 (1786), ex Sonn.
Picus cardinalis, Gm. S. N. i. p. 438, no. 51 (1788), ex Sonn.

and

Le pic verd de l'isle de Luçon, Sonnerat, *tom. cit.* p. 73, pl. 36.
Picus menstruus, Scopoli, *tom. cit.* p. 89, no. 50 (1786), ex Sonn.
Picus manillensis, Gm., *tom. cit.* p. 434, no. 43 (1788), ex Sonn.

[1] Gmelin omits all notice of this species.

TROGONIDÆ.

Harpactes, Swainson.

34. * Harpactes ardens.

Trogon ardens, Temm. Pl. Col. 404, ♀, "Mindanao" (1826).
Harpactes rhodiosternus, Peale, Un. St. Expl. Exped. Zool. p. 166, ♂, "near Zamboanga" (1848).
Pyrotrogon ardens (Temm.), Bp. Consp. Volucr. Zygydactyl. p. 14 (1854).
Harpactes ardens (Temm.), Gould, Trogonidæ, pl. 35.

Hab. Luzon, ♂, January (*Meyer*); Mindanao (*Peale*).

Temminck's title was founded on an example of a female from Mindanao, that given by Peale on a male from the same island. This Luzon male agrees perfectly with Peale's description.

MEROPIDÆ.

Merops, Linnæus.

35. Merops philippinus.

Apiaster philippensis major, Briss. Orn. iv. p. 560, no. 12, pl. 43. f. 1, "ex Philippensibus ins.," *descr. orig.* (1760).
Merops philippinus, Linn. S. N. ed. xiii. (Vindob.), i. p. 183, no. 5 (1767), ex Briss.
Grand Guêpier des Philippines, D'Aubent. Pl. Enl. 57.
Le Guêpier vert à queue d'azur, Montb. Hist. Nat. Ois. vi. p. 504, "Philippines."
Le Guêpier daudin, Le Vaillant, Hist. Nat. Guêp. p. 49, pl. 14, "Philippines."
Merops daudini, Cuv. R. A. i. p. 442 (1829), ex Le Vaillant.
Merops javanicus, Horsf. Tr. Linn. Soc. xiii. p. 171, "Java" (1820).
Merops typicus, Hodgs., Gray's Zool. Misc. p. 82, "Nipaul" (*descr. nulla*) (1844).
Merops cyanorrhos, Temm. Mus. Lugd., *fide* Bp. Consp. i. p. 162.
Merops savignyi, Cuv., v. Kittlitz, Lutké, Voy. (Postels) iii. p. 327, "Luçon," nec Cuv.
Merops savignyoides, in Mus. Massen., *fide* Cab. Mus. Hein. i. pt. 2, p. 139.
Merops daudini, Cuv., Swinh. P. Z. S. 1871, p. 348, no. 81, "Swatow."
Merops philippinus et *daudini*, G. R. Gray, Hand-list, nos. 1207, 1208.

Hab. Luzon, February; Negros, March (*Meyer*).

Brisson (*l. c.*) gave a fairly accurate description of this Bee-eater from a specimen in the collection of Madame de Bandeville. But the type seems to have been immature; for Brisson does not mention the pale blue subocular stripe and the elongated middle pair of rectrices. In the plate the tail is depicted as being truncate; and hence the imperfect Linnæan diagnosis "cauda æquali." D'Aubenton's plate (*l. c.*) represents a uniformly dark green bird, with a bright blue rump and tail; the rectrices are even. Le Vaillant (*l. c.*) is severe on Buffon, and criticises both plate and description, suggesting that Buffon had described from his bad plate instead of from the bird itself. The description seems, in fact, to have been taken and the figure coloured from the account given by Brisson, the coppery hues being omitted. Le Vaillant's own plate is equally inaccurate; but in the letterpress he describes the species sufficiently to leave little doubt that the Philippine bird was before him; and he states that he described from three examples in Paris collections, brought from the Philippines by Sonnerat and Poivre. Still it is curious that Le Vaillant likewise figures the bird with an even tail.

Dr. Cabanis (*l. c.*) long since pointed out that examples of this Bee-eater from Ceylon, Malacca, Java, and the Philippines did not specifically differ. One or two recent authors, by adopting the two titles of *philippinus* and *daudini*, according to the habitat of the individuals, seem, however, to disagree with Dr. Cabanis's conclusions. Examples obtained in Luzon by Dr. Meyer, when compared with a large series from Ceylon, India, Upper Burma, Malacca, Sumatra, Java, and Celebes, do not exhibit the slightest specific differences, nor do their dimensions vary appreciably; nor is even the somewhat darker hue of green said to be possessed by the Philippine bird (Cab. *l. c.*) apparent in Dr. Meyer's Luzon specimens.

36. * MEROPS BICOLOR. (Pl. XXVI. fig. 1.)

Apiaster ex Franciæ insula, Brisson, Orn. iv. p. 543, no. 6, pl. 44. f. 2, "Franciæ ins." (1760).
Le Guêpier marron et bleu, Montb. Hist. Nat. Ois. vi. p. 493, ex Briss.
Guêpier de l'isle de France, D'Aubent. Pl. Enl. 252.
Merops americanus, L. S. Müller[1], Suppl. p. 95, ex Buffon (D'Aubent.) (1776).
Merops bicolor, Bodd. Tabl. Pl. Enl. p. 15, no. 252 (1783), ex D'Aubent. nec Vieillot.
Merops badius, Gm. S. N. i. p. 462, no. 10 (1788), ex Briss.
Chesnut bee-eater, Lath. Synop. i. p. 677, no. 9, ex Briss.
Merops castaneus, Lath. Ind. Orn. i. p. 273, no. 10, ex Lath. (1790).
Le Guêpier Latreille, Le Vaillant, Hist. Nat. Guêp. p. 45, pl. 12, "Africa, Ceylon, Isl. of France!"
? *Apiaster philippensis minor,* Briss. *tom. cit.* p. 555, no. 10, pl. xliii. f. 2, "Philippine Isl." (1760).
? *Merops ornatus,* Lath., v. Martens, J. f. O. 1866, p. 17.

Hab. Luzon, April; Negros, March (*Meyer*).

The four examples obtained are in perfect plumage. Seen from above, they exactly correspond in colouring with *M. quinticolor.* Underneath the plumage closely resembles that on the under surface of *M. sumatranus,* Raffles, = *M. cyanopygius,* Less., of Sumatra, Malacca, and Borneo. The head, nape, and back of the latter species are dark chocolate; and it has been hitherto identified by general consent with *M. badius,* Gm. The same parts in these Philippine specimens are bright chestnut. They are without doubt the true *Merops badius,* Gm., founded on Brisson's *Guespier de l'isle de France.* On this Brissonian species all the titles given above were directly or indirectly based.

[1] Müller, for some unaccountable reason, bestowed the title cited, although he states that the species dwells in the Isle of France. This title has priority; but few will adopt it.

Brisson's diagnosis of the upper parts is as follows:—"*Partes capitis et colli superiores, sicut et dorsi suprema, et scapulares pennæ sunt eleganter castaneæ.*" In the French he characterizes the colouring of these parts as being of a "beau marron." With the Philippine bird to compare, it is impossible not to recognize in it the Brissonian species; but in its absence the Malayan Bee-eater satisfies the complete diagnosis, provided we are prepared to read "*eleganter castaneæ*" as meaning chocolate-colour. It is therefore not surprising that the Malayan *Merops* should hitherto have been referred to *M. badius*, Gm.; and we are indebted to Dr. A. B. Meyer for recovering a species so long unrecognized.

Both D'Aubenton and Le Vaillant figure the Brissonian species with a bright chestnut head and back, the latter author, with his accustomed inaccuracy, stating that he had met the bird on the east coast of Africa, near the Caffre country, where it remained about fifteen days; but as the flocks did not remain there longer, and he never saw the species again, he was unable to say whether it nested in that country! It is very questionable if Le Vaillant ever saw the bird at all; for, although the colouring of his plate agrees with the Brissonian description, in the letterpress Le Vaillant says that the chestnut mantle only covers the upper back, while he describes the *head* and the *wings* as blue like the rest of the body. Montbeillard's account (*l. c.*) appears by internal evidence to have been taken from Brisson. D'Aubenton's plate may or may not have been coloured from an actual example; but whether the two figures were composed from Brisson's description or drawn from real specimens, they are of value, as showing the nature of the chestnut colouring of the head and back,—if from the description, by depicting the colour "beau marron"—if from the bird itself, by representing its coloration.

Dr. v. Martens (*l.c.*) introduces *M. ornatus*, Lath., as a Philippine species he had observed preserved in the Military Library at Manilla. He describes it as having the entire under surface of a lively grass-green, and as having no throat-band. Judging by the young plumage of *M. sumatranus*, Raffles, before the chocolate mantle is assumed, it is not improbable that the bird described was a young individual of *M. bicolor*. *Apiaster philippensis minor*, Briss. (*l. c.*), up to now an unidentified species, with the middle pair of rectrices not fully developed, and regarded by Montbeillard (*tom. cit.* p. 500) as being the same as *M. viridis*, Linn., probably was founded on *M. bicolor* in immature dress.

M. bicolor seems to be the species of *Merops* inhabiting Negros, alluded to by Mr. L. C. Layard (Ibis, 1872, p. 96).

The Bee-eater which inhabits Sumatra, Malacca, and Borneo (Pl. XXVI. fig. 2), and hitherto referred to *M. badius*, Gm., will stand:—

Merops sumatranus, Raffles, Tr. L. Soc. vol. xiii. p. 294, "Sumatra" (1821).

Merops cyanopygius, Less. Tr. p. 238, *Patr. non indic.* (1831), ex "Sumatra and Java," *fide* Pucher. R. Mag. Zool. 1853, p. 391.

Melittophas hypoglaucus, Reichenb. Handb. p. 82 (1854).
Melittophas bicolor (Bodd.), ap. Cab. Mus. Hein. pt. 2, p. 137, "Malacca, Borneo, Sumatra," nec Bodd.
Merops badius, Gm., auct. recent., nec Gm.
Le Guêpier de Sumatra, Less., Complem. Buffon, ii. Ois. 2nd ed. pl. —, f. 2 (1840).

According to Dr. Pucheran (*l. c.*), *M. cyanopygius*, Lesson, adult, was founded on a Sumatran and a Javan example. Prince Bonaparte (Consp. i. p. 162) gives Sumatra and Borneo as the habitat. There is probably an error in the assigned Javan origin of this Bee-eater; for its occurrence in Java rests on no good authority. The type of *M. cyanopygius*, Lesson, juv., ex Sumatra, Dr. Pucheran remarks, resembles Pl. Enl. 57. It may be *M. philippinus*, Linn.; for that species inhabits Sumatra; or it may be *M. sumatranus*, juv., before the chocolate plumage of the upper surface, and the blue colouring of the throat have been assumed.

CORACIDÆ.

Eurystomus, Vieillot.

37. Eurystomus orientalis.

Galgulus indicus, Brisson, Orn. ii. p. 75, no. 4, "India orientalis."
Coracias orientalis, Linn. S.-N. i. p. 154, no. 4 (1776), ex Brisson; Un. St. Expl. Exped. Zool. p. 228; Walden & Layard, Ibis, 1872, p. 100.

Hab. Luzon, February; Cujo Island, December; Guimaras, March (*Meyer*); Negros (*L. C. Layard*).

As determined by Dr. Meyer, the sexes do not differ. Javan, Malaccan, Celebean, and Philippine examples are identical.

ALCEDINIDÆ.

Alcedininæ.

Alcedo, Linnæus.

38. Alcedo bengalensis.

Little Indian Kingfisher, Edwards, Illustr. i. p. 11, pl. 11. fig. inf., "Bengal."
Ispida bengalensis, Briss. Orn. iv. p. 475, ex Edwards.
Alcedo bengalensis, Gm. S. N. i. p. 450, no. 20 (1788), ex Brisson; Sharpe, Monogr. *Alcedinidæ*, pl. 68.

Hab. Luzon (*Meyer*).

Le vintsi of Buffon (Hist. Nat. Ois. vii. p. 205), and called by D'Aubenton (Pl. Enl. 756) *Petit Martin-pêcheur de l'isle de Luçon*, is now known to be a purely African species, *Corythornis cristata* (Linn.).

ALCYONE, Swainson.

39. * ALCYONE CYANOPECTUS.

Ceyx cyanopectus, La Fresnaye, Rev. Zool. 1840, p. 33, *Patr. ignot.*; Sharpe, Monogr. pl. 31; Schlegel, Mus. Pays-Bas, *Alcedines*, p. 18.

Hab. Philippines (*Eyton*, *Schlegel*).

Although there is a general concurrence of evidence showing that this interesting form inhabits some part of the Philippines, its exact *habitat* still remains unknown.

PELARGOPSIS, Gloger.

40. * PELARGOPSIS GOULDI.

Pelargopsis gouldi, Sharpe, P. Z. S. 1870, p. 61, "Luzon;" Monogr. pl. 59.

Hab. Manilla (*Cuming*).

DACELONINÆ.

CEYX, Lacépède.

41. * CEYX MELANURA.

Alcedo melanura, Kaup, Fam. der Eisv. p. 15 (1848); Sharpe, Monogr. pl. 39.

Hab. Philippine Islands (*mus. nostr.*); Manilla (*mus. J. Gould*).

42. CEYX TRIDACTYLA.

Alcedo trydactyla, Pallas, Spic. Zool. fasc. vi. p. 10, pl. 2. f. 1 (1769); Sharpe, Monogr. pl. 23; v. Martens, J. f. O. 1866, p. 18, no. 85.

Le Martin-pêcheur de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 67, pl. 32.

Alcedo tridactyla, Scopoli, Del. Fl. Faun. Insubr. ii. p. 90, no. 56 (1786), ex Sonn.

Ceyx luzoniensis, Stephens, Gen. Zool. xiii. pt. 2, p. 106, "Luçonia" (1826).

Alcedo (*Ceyx*) *purpurea*, Gm., v. Martens, *l. c.* no. 86.

Hab. Philippines (*Cuming*).

The absolute identity of the Philippine with the continental three-toed Kingfisher has yet to be established.

43. * CEYX PHILIPPINENSIS.

Ceyx philippinensis, Gould, P. Z. S. 1868, p. 404, "vicinity of Manilla;" Sharpe, Monogr. pl. 24.

Hab. Manilla (*J. Gould*).

Both Messrs. Sharpe and Gould regard the type individual, the only example that has reached England, as distinct from *Alcyone cyanopectus*. In deference to their opinion it is treated here as a separate species, a position I trust future investigation may justify (*conf.* Salvadori, Atti R. Accad. Sc. Torino, iv. (1869) p. 445).

ENTOMOBIA, Cabanis.

44. * ENTOMOBIA GULARIS.

Ispida madagascariensis cærulea, Briss. Orn. iv. p. 496, no. 32, "Madagascar."
Alcedo smyrnensis, var. *β*, Linn. S. N. i. p. 181 (1766) ex Briss.
Le Martin-pêcheur bleu et roux, Buffon, Hist. Nat. vii. p. 182, ex Brisson.
Grand Martin-pêcheur de Madagascar, D'Aubent. Pl. Enl. 232.
Alcedo gularis, Kuhl, Buff. & D'Aubent. Fig. Av. Col. Nom. Syst. p. 4 (1820), ex D'Aubent.
Alcedo rufirostris, Illiger, Mus. Berol.; Kittlitz, Kupfert. pt. 2, p. 10, pl. xiv. f. 2, "Luzon" (1833).
Halcyon gularis (Kuhl), Sharpe, Monogr. pl. 70; Walden & Layard, Ibis, 1872, p. 101.

Hab. Luzon (*mus. nostr.*); Negros (*L. C. Layard*); Zebu (*Meyer*).

Neither in D'Aubenton's plate is the white throat represented, nor in Buffon's description is it alluded to. But Brisson mentions it in his accurate diagnosis, made, as he states, from an example obtained by Poivre in Madagascar.

Mr. Strickland was the first author who suggested the Philippines as the probable only habitat of this Kingfisher (Ann. N. H. 1844, vol. xiii. p. 34).

Dr. v. Martens includes *Entomobia fusca* (Bodd.), as well as this species, in his list of Philippine birds (*tom. cit.* p. 17, no. 79), and quotes Meyen as his authority. Meyen (Nov. Act. xvi. suppl. prim. 94), however, states in decided terms that the Philippine species is distinct from *A. smyrnensis*, L.; and he adopts Illiger's title of *A. rufirostris*. Mr. Sharpe (*op. cit.* pt. x. pl. 79) also includes the Philippines within the range of *A. smyrnensis*, L., but on, apparently, no better evidence than Professor Schlegel's record of a Philippine specimen in the Leyden Museum (Mus. P.-Bas, *Alcedines*, p. 28). The probabilities are that the Leyden example, if really from the Philippines, belongs to *E. gularis* (Kuhl), a title treated by Professor Schlegel (*l. c.*) as a synonym of *A. fusca*, Bodd. The occurrence of *Entomobia smyrnensis* (Linn.)=*A. fusca*, Bodd., in the Philippines rests upon no other evidence whatever, and certainly requires confirmation.

45. ENTOMOBIA PILEATA.

Martin-pêcheur de la Chine, D'Aubent., Pl. Enl. 673.
Le Martin-pêcheur à coiffe noire, Buffon, Hist. Nat. vii. p. 189, "la Chine" (1780).
Alcedo pileata, Bodd. Tabl. Pl. Enl. p. 41 (1783), ex D'Aubent.; Sharpe, Monogr. pl. 3.

Hab. Philippines (*fide* Schlegel, Mus. Pays-Bas, *Alcedines*, p. 27).

That this species inhabits the Philippines is not improbable; but a single example in the Leyden Museum, said to be from those islands, collector not named, appears to be the only evidence of the fact. Mr. Sharpe (*l. c.*) seems to take it for granted; and Professor Schlegel (Vog. Ned. Ind., *Alced.* pp. 22, 54) includes the Philippines, without hesitation, within the range of this Kingfisher.

Alcedo albiventris, Scop.,=*Alcedo luzonica*, Gm., both founded on Sonnerat's *Martin-pêcheur d'l'isle de Luçon*, Voy. Nouv. Guin. p. 65, pl. 31, is a well-known African form.

To *Tanysiptera nympha*, G. R. Gray (Ann. Nat. Hist. 1841, p. 237, "*Patr. incert.*," described from an imperfect specimen of a New-Guinea Kingfisher), Prince Bonaparte (Consp. i. p. 157) erroneously ascribed a Philippine origin; and it consequently found a place in Dr. v. Martens's list (*tom. cit.* p. 18).

Calialcyon, Bonaparte.

46. Calialcyon coromanda.

Le Martin-pêcheur violet des Indes, Sonn. Voy. Ind. ii. p. 212, pl. 118.
Alcedo coromanda[1], Lath. Ind. Orn. i. p. 252 (1790), ex Sonn.; Sharpe, Monogr. pl. 69.
Dacelo coromandeliana (Scopoli), Schlegel, Mus. Pays-Bas, *Alcedines*, p. 24.

Hab. Philippines (*Schlegel*, fide *Verreaux*).

The occurrence of this species in the Philippines rests solely on the somewhat doubtful authority cited.

Sauropatis, Cabanis.

47. Sauropatis chloris.

Le Martin-pêcheur à tête verte, Buffon, Hist. Nat. vii. p. 190, "Bouro."
Martin-pêcheur à tête verte du Cap-de-Bonne-Espérance, D'Aubent. Pl. Enl. 783. f. 2.
Alcedo chloris, Bodd. Tabl. Pl. Enl. p. 49 (1783), ex D'Aubent.
Le Martin-pêcheur à collier blanc des Philippines, Sonn. Voy. Nouv. Guin. p. 67, pl. 33.
Alcedo collaris, Scop. Del. Fl. Faun. Insubr. ii. p. 90, no. 56 (1786), ex Sonn; Kittlitz, Kupfert. pt. 2, p. 10, pl. xiv. f. 1, "Luzon" (1833).
Halcyon chloris (Bodd.), Sharpe, Monogr. pl. 87; Walden & Layard, Ibis, 1872, p. 101.

Hab. Luzon, Zebu, Guimaras (*Meyer*); Negros (*L. C. Layard*).

Actenoides, Hombron & Jacquinot.

48. * Actenoides hombroni.

Acténoïde variée, Hombron & Jacquin. Voy. Astrol., Atlas, pl. 23. fig. 2.
Actenoides hombroni, Bp. Consp. i. p. 157 (1850), ex Hombr. & Jacquin.; Sharpe, Monogr. pl. 115.
Actenoides variegata, Pucher. & Jacquin. Voy. Astrol., Zool. iii. p. 101, "Mindanao" (1853).

Hab. Samboagan, Mindanao (*Hombr. & Jacquin.*).

Dr. v. Martens (*tom. cit.* p. 17, no. 81) describes an example of a Kingfisher he observed in the collection of the Military Library of Manilla in these words:—"*Alcedo*

[1] This species is treated by Mr. Sharpe (Monogr. Alcedinidæ, pp. xiii, liv) as the type of *Entomothera*, Horsf. (Tr. L. Soc. xiii. p. 173, note, 1820). The term *Entomotheræ* was used by Dr. Horsfield (for he wrote it in the plural only) to indicate his second division of the Linnæan genus *Alcedo*, a section within which he embraced *A.* (*Ceyx*) *tridactyla*, *A.* (*Pelargopsis*) *leucocephala*, *A.* (*Calialcyon*) *coromanda*, *A.* (*Sauropatis*) *chlorocephala*, and *A.* (*Entomobia*) *melanoptera*. There is nothing contained in Dr. Horsfield's observations to indicate *A. coromanda* as the type, or even as typical of, his *Entomotheræ*.

(*Entomobia*), sp., above brown, with pale spots; underneath white, with grey spots. Back of the head and on each side a spot at gape, azure blue. Cheeks and throat red brown. Forehead brown, striated with black. Allied to *A. pulchella*, Horsf."

This may possibly be *A. hombroni* in immature plumage.

49. * ACTENOIDES LINDSAYI.

Dacelo lindsayi, Vigors, P. Z. S. 1831, p. 97, adult, "neighbourhood of Manilla;" Sharpe, Monogr. pl. 114; Eydoux & Souleyet, Voy. Bonite, pl. 7; Gray & Mitch. Genera of Birds, pl. 27.
Dacelo lessoni, Vigors, *l. c.*, junior.

Hab. Luzon (*Eydoux & Souleyet*).

This and the last species, together with *Dacelo concreta*, Temm., form a natural subdivision; and I retain for it Hombron's generic title of *Actenoides*, merged by Mr. Sharpe in the unwieldy group he has united under the generic name of *Halcyon*.

Mr. Sharpe (*tom. cit.*) enumerates thirteen Philippine Kingfishers. I have reduced this number to twelve by the exclusion of *E. smyrnensis*. Satisfactory proof of the Philippine habitat of two others, *C. coromanda* and *E. pileata*, is still needed; and the specific validity of *Ceyx philippensis* has yet to be confirmed.

CAPITONIDÆ.

MEGALÆMINÆ.

XANTHOLÆMA, Bonaparte.

50. XANTHOLÆMA HÆMACEPHALA.

Le Barbu des Philippines, Briss. Orn. iv. p. 99, "Philippensibus Insulis" (1760), *descr. orig.*
Barbu des Philippines, D'Aubent. Pl. Enl. 331.
Barbu à gorge jaune, Buff. H. Nat. Ois. vii. p. 102, pl. 5.
Bucco hæmacephalus, L. S. Müller, Suppl. p. 88, "Philippines" (1776), ex Pl. Enl. 331.
Bucco flavigula, Bodd. Tabl. p. 30, ex Pl. Enl. 331 (1783).
Bucco philippensis, Gm. S. N. ed. xiii., i. p. 407, no. 7, ex Briss. (1788).
Capito flavicollis, Vieill. Enc. Method. Orn. iii. p. 1424, "Les grandes Indes" (1823), ex Brisson.
Indian Barbet, Lath. Syn. Suppl. p. 57, no. 18, "India" (1787).
Bucco indicus, Lath. Ind. Orn. i. p. 205, ex Lath. (1790).
Le Barbu à collier rouge, Le Vaillant, H. Nat. *Barbus*, p. 78, pl. 35, "une grande partie de l'Inde."
Bucco rubricollis, Cuv. R. An. i. p. 457 (1829), ex Le Vaill. pl. 35.
Le Barbu à plastron rouge, mâle, Le Vaillant, *tom. cit.* p. 81, pl. 36, "une grande partie de l'Inde."
Bucco luteus, Less. Trait. p. 163, "Pondicherry" (1831); Des Murs, Icon. Orn. pl. 21 (*var. lutea*).
Bucco rafflesius, Boie, Briefe aus Ostind. no. 15, "Sumatra" (1832).
Xantholæma philippensis (Brisson), Bonaparte, Consp. Volucr. Zygodactyl. p. 12 (1854).
Xantholæma indica (Lath.), Jerdon, Birds of India, i. p. 315 (1862).
Megalæma philippensis (Gm.), v. Martens, J. f. O. 1866, p. 20, no. 111.
Xantholæma hæmacephala (Müll.), Marsh. Monogr. *Capitonidæ*, pl. 42, "Umballa" (1870).
? *Le petit Barbu*, Buff. Hist. Nat. Ois. vii. p. 105, "Sénégal."

? *Barbu du Sénégal,* D'Aubent. Pl. Enl. 746. f. 2.
? *Bucco parvus,* Gm. S. N. ed. xiii., i. p. 407, no. 9 (1788), ex Buff.
? *Bucco nanus,* Bodd. Tabl. p. 47, ex Pl. Enl. 746. f. 2 (1783).

Hab. Luzon (*Meyer*); Zamboanga (*v. Martens*).

The Messrs. Marshall (*op. cit.*), after a comparison made between Indian and Philippine examples, arrived at the conclusion that individuals from all parts of India could not be *specifically separated* from the Philippine species. Numerous individuals from Luzon, in Dr. Meyer's collection, enable me on the whole to adopt this opinion. Taken collectively, the Luzon birds, while agreeing in general dimensions with those from various parts of continental India, have a longer and more massive bill; the red occipital feathers extend further back, terminating in a line with the ends of the yellow supercilium; the green of the upper plumage is some shades darker; and the longitudinal centres of the pectoral and abdominal feathers are more boldly marked, and therefore more prominent. To this extent only has the Philippine race become differentiated through time and isolation.

The example described by Brisson (*tom. cit.* p. 10) as that of a female, is evidently that of a young bird. The sexes do not differ.

I have referred *le petit Barbu* of Buffon, and its synonyms, to this species, but with considerable doubt. He described from an apparently immature bird in a plumage I have never seen assumed by the youngest Philippine Barbet; moreover his type was said to be from Senegal[1].

Notwithstanding Le Vaillant's protestations, the bird figured by him (*tom. cit.* pl. 35) clearly belongs to *X. hæmacephala.*

51. Xantholæma rosea.

Le Barbu rosegorge, Le Vaillant, Hist. Nat. Ois. Parad. ii. p. 75, pl. 33, "Java."
Bucco roseus, Dumont, Dict. Sc. Nat. (1st ed.) iv. p. 52 (1806), ex Le Vaillant.
Capito rosaceicollis, Vieillot, N. Dict. iv. p. 500 (1816), ex Le Vaillant; Vigors, Mem. Sir S. Raffles, p. 667, "Java."
Bucco roseus, Cuv. R. A. 1817, i. p. 428, ex Le Vaillant; Walden & Layard, Ibis, 1872, p. 100, "Negros."
Bucco philippensis, apud Horsf. Tr. Linn. Soc. xiii. p. 181, "Java," nec Gm.
Xantholæma rosea (Dum.), Marsh. Monogr. *Capitonidæ*[2], pl. 43 (1871).

Hab Negros (*L. C. Layard.*)

[1] Temminck (Pl. Col. Tabl. Method. p. 56) makes it the same as *X. hæmacephala,* and says that it is the "jeune de l'année." But this is a mere assumption; for though the type specimen, which was preserved in Mauduit's cabinet, was figured in the Planches Enluminées, it was lost or destroyed before Buffon wrote its description.

[2] *Bucco barbiculus,* Cuv. *l. c.*, ex Le Vaillant, *tom. cit.* p. 131, pl. 56, has been referred by Bonaparte (Consp. i. p. 143), by the Messrs. Marshall (*l. c.*), and by Mr. G. R. Gray (Hand-list, no. 8445) to this species. It is, however, palpably founded on *Bucco rubricapillus,* Gm., ex Ceylon. Indeed, under this last species Le Vaillant's

Java and the Philippine island of Negros are the only localities known to be inhabited by this Barbet.

Le Barbu de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 68, pl. 34.
Trogon luzonensis, Scopoli, Del. Fl. Faun. Insubr. ii. p. 89, no. 44 (1786), ex Sonn.
Bucco niger, Gm. S. N. i. p. 407, no. 8 (1788), ex Sonn.

Is an African species, unknown in the Philippines, *Pogonorhynchus leucomelas* (Bodd.), Marshall, Monogr. *Capitonidæ*, pl. 12.

CYPSELIDÆ.

MACROPTERYX, Swainson.

52. MACROPTERYX[1] COMATUS (Temm.).

Cypselus comatus, Temm. Pl. Col. pl. 268, "Sumatra," ♂ (1824).

Hab. Luzon, in January (*Meyer*).

The male is distinguished from the female by having the region of the ears deep rufous; and all the other male members of the genus display more or less rufous on the ear-coverts.

Luzon examples have the wings nearly half an inch longer than Sumatran and Malaccan individuals in my collection. Otherwise no material difference is to be observed.

COLLOCALIA, G. R. Gray.

53. * COLLOCALIA TROGLODYTES.

Collocalia troglodytes, G. R. Gray (*descr. nulla*), Gray & Mitch. Genera of Birds, pl. 19, "*Patr. non indic.*" (1844–49); *id.* List of Birds Brit. Mus., *Fissirostres*, p. 21, no. 3, "Malacca" (1848); Wallace, P. Z. S. 1863, p. 384; v. Martens, J. f. O. 1866, p. 18; Bp. Compt. Rend. xli. p. 977; von Pelzeln, Reise der Novara, *Aves*, p. 40 (1865); G. R. Gray, Ann. N. H. (3) xvii. p. 119, "Philippine islands" (1866); G. R. Gray, Hand-list, no. 748, "Philippines."
Collocalia, sp., Blyth, Ibis, 1865, p. 30, "Philippines."

Hab. Luzon (*Jagor*).

A species belonging to that section of the genus of which *C. francica* may be considered the type. It is the smallest of all the known species of that group, its dimensions not exceeding those of *C. fuciphaga* (Thunb.)=*C. linchi* (Horsf.) A narrow, well-defined, pure white band crosses the rump and constitutes its chief differential character.

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fifty-sixth plate is referred to by the Messrs. Marshall, although Cuvier's title based thereon is made a synonym of *X. rosea*. At least it is to be presumed that this is what is meant by *Le barbu varbichon* (instead of *barbichon*), and by p. 56 instead of pl. 56 (Conf. Marshall, Monogr. *Capitonidæ*, pl. 44).

[1] I cannot find that the title *Dendrochelidon*, Boie, was published prior to 1832.

The two examples on which Mr. G. R. Gray bestowed the above title are still extant in the British Museum, and bear on their labels Malacca as their *habitat.* They were obtained from Cuming; and Mr. G. R. Gray (List of B. *l. c.*) gave Malacca as the origin of the species. Mr. Wallace (*l. c.*), who was the first author who described the types, suggested the Philippines (although with doubt) as a *habitat* of the species in addition to that of Malacca. Dr. v. Martens (*l. c.*) without hesitation identified the Philippine form of *Collocalia* with *C. troglodytes.* And, finally, Mr. G. R. Gray (An. N. H. *l. c.*) in 1866 abandoned Malacca as its *habitat* and substituted the Philippines, to which archipelago he restricted it; and so it stands in the Hand-list (*l. c.*). Mr. G. R. Gray has nowhere stated his reasons for this alteration of the *habitat* he had originally assigned. But there seems to be little doubt that he arrived at a sound conclusion, and that *C. troglodytes* represents one of the Philippine edible-nest constructing Swifts. The Malaccan *Collocalia* is identical with *C. francica.* Whether a species belonging to the *C.-fuciphaga* group is likewise found in the Malay peninsula and adjacent islets is unknown, nor has a species of that group been as yet discovered by any naturalist in the Philippines.

The specimen contained in the Vienna Museum, and stated by Herr v. Pelzeln (*l. c.*) to have been obtained at Manilla by Cuming, so far as description goes, agrees well with the British-Museum types.

CAPRIMULGIDÆ.

Lyncornis, Gould.

54. * Lyncornis macrotis.

Caprimulgus macrotis, Vigors, P. Z. S. 1831, p. 97, "neighbourhood of Manilla;" Gould, Icones Av. pt. 2, pl. —; G. R. Gray, Hand-list, no. 713.

Hab. Manilla (*Lindsay*).

The range of this fine Goatsucker within the islands is quite unknown. The individual noted by Mr. G. R. Gray (*l. c.*) as being a variety from North China, is identical with authentic Philippine examples. It was obtained from Mr. Fortune.

Caprimulgus, Linnæus.

55. Caprimulgus manillensis.

Caprimulgus manillensis, G. R. Gray, List Brit. Mus. *Fissirostres,* p. 7, no. 11, "Manilla" (1848) *descr. nulla*; Hand-list, no. 637.

? *Caprimulgus macrourus,* Horsf., v. Martens, J. f. O. 1866, p. 19, no. 94, "Philippines."

Caprimulgus, sp., Walden, Tr. Zool. Soc. viii. p. 115, no. 2, "Celebes."

Belongs to the same section as *C. albonotatus*, *C. nigripennis*, *C. macrurus*, and *C. schlegelii*. It agrees well with the single Celebean example above referred to. The two type specimens in the British Museum are not fully adult. Outer pair of rectrices with only the terminal portion of the inner web white. Both webs white in the second outer pair. This is probably the species observed by Dr. v. Martens in the collection of the Manilla Military Library and identified by him with *C. macrurus*, Horsf.

56. * CAPRIMULGUS GRISEATUS.

Caprimulgus griseatus, G. R. Gray, Hand-list, no. 629, "Philippines" (1869), *descr. nulla*.

Founded on a single example, in the British Museum, obtained from the Philippines through the Brothers Verreaux. It belongs to the same group as *C. monticola* and *C. affinis*, being intermediate in dimensions. Wing 6·25, tail 4 inches. The type is in very grey plumage. More examples must be compared before its specific distinctness can be established.

CUCULIDÆ.

CUCULINÆ.

CACOMANTIS, S. Müller.

57. * CACOMANTIS MERULINUS.

Le petit Coucou de l'isle de Panay, Sonnerat, Voy. Nouv. Guin. p. 121, pl. 81.

Cuculus merulinus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 89, no. 48 (1786), ex Sonn.; Schlegel, part. Mus. Pays-Bas, *Cuculi*, p. 21.

Petit Coucou de l'isle de Panay, D'Aubenton, Pl. Enl. 814, ex Sonn[1].

Le Coucou à tête grise et ventre jaune, Montbeillard, Hist. Nat. Ois. vi. p. 382, ex Sonn.

Cuculus flavus, Gm. S. N. i. p. 421, no. 45 (1786), ex Montbeillard, ex Sonn.; Walden, Ibis, 1869, p. 332.

Hab. Luzon (*Gevers*); Panay (*Sonnerat*).

On this and its allied forms *conf.* Walden, Tr. Z. S. viii. p. 53.

CHALCOCOCCYX, Cabanis.

58. * CHALCOCOCCYX AMETHYSTINUS.

Lampromorpha amethystina, Vigors, P. Z. S. 1831, p. 98, "neighbourhood of Manilla."

Cuculus xanthorhynchus, Horsf., apud v. Martens, J. f. O. 1866, p. 19, no. 97.

Mr. Blyth in 1842 (J. A. S. B. xii, 1, p. 245) expressed himself unable to see in what the Philippine *Amethystine Cuckoo*, as described by Vigors (*l. c.*), differed from the Javan and Malayan species, and in his catalogue of the Calcutta Museum, no. 354, identified the two forms under Horsfield's title. But there is no evidence that examples had been compared; and no Philippine example was contained in the Calcutta Museum.

[1] There can be little doubt that D'Aubenton figured Sonnerat's type.

All subsequent authors appear to have followed suit, yet without having compared actual specimens. In the 'Conspectus' (i. p. 107) Bonaparte united the two titles, and even left out the Philippine *habitat.* Dr. Cabanis (Mus. Hein. iv. p. 15), Horsfield and Moore (Cat. E. Ind. Co. Mus. ii. p. 706), Dr. v. Martens (*l. c.*), Professor Schlegel (Mus. Pays-Bas, *Cuculi*, p. 32), and Mr. G. R. Gray (Hand-list, no. 9049), all made the same identification; and yet no Philippine examples are recorded as being preserved in any of the Museums these authors had access to.

Cuculus xanthorhynchus, Horsf., extends to Borneo; and it is therefore not of itself improbable that it also occurs in Luzon; but as there is no positive evidence of the fact, it is best to keep the two titles separate until the contrary is proved.

Hierococcyx, S. Müller.

59. * Hierococcyx strenuus.

Hierococcyx strenuus, Gould, P. Z. S. 1856, p. 96, "Manilla;" id. Birds of Asia, pt. viii. pl. 31 "Manilla" (1856); Blyth, Ibis, 1866, p. 362.
Heirococcyx sparveroides (Vigors), G. R. Gray, Hand-list, 9057.

Hab. Manilla (*Gould*).

Hardly separable from *H. sparverioides* (Vigors). Mr. G. R. Gray (*l. c.*) unites the two forms. Mr. A. Hume treats them as distinct; for (Pr. A. S. B. 1872, p. 71) that gentleman states that *H. strenuus*, Gould, inhabits Thayetmyo. Before this identification can be accepted, it will be as well to compare Thayetmyo individuals with the type (the only specimen existing) in the British Museum.

60. * Hierococcyx pectoralis.

Hiracococcyx pectoralis, Cab. Mus. Hein. iv. pt. 1, p. 27, no. 23, "Philippines" (1862).
? *Cuculus hyperythrus*, Gould, P. Z. S. 1856, p. 96, "China;" Birds of Asia, pt. viii. "Shanghai."

Hab. Philippines (*Cabanis*).

Mr. Swinhoe has remarked that the British-Museum specimen of *C. hyperythrus* is labelled "Manilla" (P. Z. S. 1871, p. 305, no. 456).

Coucou à ventre rayé de l'isle Panay, Sonn. Voy. Nouv. Guin. p. 120, pl. 79.
Cuculus flaviventris, Scop. Del. Fl. Faun. Insubr. ii. p. 89, no. 46 (1786), ex Sonn.
Cuculus radiatus, Gm. S. N. i. p. 420, no. 44 (1788), ex Sonn.

Sonnerat's account and figure of this supposed Philippine species of *Cuculus* agrees well with *Cuculus solitarius*, Vieillot[1]; and I have little doubt that Sonnerat in this, as in so many other instances, described from an African and not a Philippine individual. The titles, however, founded on Sonnerat's plates have been much bandied about, and applied to various species of Asiatic Cuckoos, by different authors (*conf.* Blyth, J. A. S. B.

[1] *Cuculus capensis*, Gm., founded on *le Coucou du cap de Bonne-espérance*, Montb. (Hist. Nat. Ois. vi. p. 353), is a Cuckoo in hepatic plumage, which it is difficult to determine.

1842, p. 900; Cat. Calc. Mus. p. 336; Ibis, 1866, p. 362; Strickl. J. A. S. B. 1844, p. 390; Cab. Mus. Hein. iv. pt. 1, p. 29; Jerdon, Ibis, 1872, p. 14).

EUDYNAMIS, Vigors & Horsfield.

61. * EUDYNAMIS MINDANENSIS.

Cuculus mindanensis nævius, Brisson, Orn. iv. p. 130, no. 12, ♀ adult. vel ♂ adolesc., "Ins. Mindanao."

Cuculus mindanensis, Linn. S. N. i. p. 169, no. 3 (1766), ex Briss.; Walden, Ibis, 1869, pp. 330, 340.

Le Coucou tacheté de l'isle de Panay, Sonn. Voy. Nouv. Guin. p. 120, pl. 78, ♀ adult. vel ♂ adolesc., "Antigua."

Cuculus variegatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 89, no. 45 (1786), ex Sonn.

Cuculus panayanus, Gm. S. N. i. p. 413, no. 29 (1788), ex Sonn.

Hab. Guimaras, in March (*Meyer*).

Both examples are of males in full black plumage. Mr. Swinhoe (Ibis, 1870, p. 233) seems to regard the Chinese species, *E. maculata* (Gm.), as distinct from the Philippines, and moreover separates the Hainan form from the Chinese, and identifies it with the Himalayan.

The Guimaras examples have the plumage black shaded with green and not with blue. I add the principal dimensions (in inches) of six known species of the group, taken from males in adult black plumage.

	Longitudo alæ.	Longitudo caudæ.	
E. honorata	7·50	8	Ceylon.
,, ...	7·50	7·75.	Candeish.
E. malayana	7·75	8·50.	Malacca.
,, ...	7·50	8	Java.
E. mindanensis . . .	7·50	8	Guimaras.
,, ...	7·50	7·50.	,,
E. ransomi	8·50	9	Bouru.
E. rufiventer	8	8·37.	Moratai.
E. cyanocephala . . .	8	8·50.	Queensland.

The bill in the Malaccan bird is longer and not so high as that of the Javan.

PHŒNICOPHAINÆ.

DASYLOPHUS, Swainson.

62. * DASYLOPHUS SUPERCILIOSUS.

Phœnicophaus superciliosus, Cuv. Mus. Paris; Drapier, Dict. Class. vol. x. p. 55, "Philippines" (1826); Lesson, Tr. p. 133, "Philippines" (1831); Guérin, Icon. Règne An. pl. 33. f. 1.

Dasylophus superciliosus (Cuv.), Swains. Classif. Birds, ii. p. 324, pl. 286. fig. *a* (1837); Gray & Mitch. Genera, pl. 110.
Phœnicophæus ornatus, Blyth, J. A. S. B. 1842, p. 925 (*Patr. non indic.*).

Hab. Luzon (*Meyer*).

A Luzon example, marked a male by Dr. Meyer, has the bill higher and stouter than another individual from the same island, stated on the label to be a female. Otherwise no difference whatever. In Mitchell's plate (*l. c.*) the white basal portion of the red superciliary plumes is not shown.

LEPIDOGRAMMUS, Reichenbach.

63. * LEPIDOGRAMMUS CUMINGI.

Phœnicophaus cumingi, Fraser, P. Z. S. 1839, p. 112, "Luzon;" Zool. Typica. pl. 53.
Phœnicophaus barrotii, Eydoux et Souleyet, Voy. Bonite, Ois. p. 89, "Luçon" (1841); Atlas *op. cit.* pl. 6.
"*Cuculus decorus*[1], Gravenh.," Bp. Consp. Vol. Zygod. p. 5, no. 19 (1854).

Hab. Luzon (*Meyer*).

Sexes alike. The iris is described by Cuming as being red.

CENTROPODINÆ.

CENTROCOCCYX, Cabanis.

64. * CENTROCOCCYX VIRIDIS.

Le Coucou vert d'Antigue, Sonnerat, Voy. Nouv. Guin. p. 121, pl. 80 (*descr. orig.*).
Cuculus viridis, Scop. Del. Fl. Faun. Insubr. ii. p. 89, no. 47 (1786), ex Sonn.; Walden, Tr. Zool. Soc. viii. p. 58.
Cuculus ægyptius, var. γ, Gm. S. N. i. p. 420, no. 43, ex Sonn. (1788).
Coucou des Philippines, D'Aubent. Pl. Enl. 824; Montbeillard, Hist. Nat. Ois. vi. p. 369.
Cuculus ægyptius, var. β, Gm. *l. c.*, ex Montb.
Cuculus philippensis, Cuv. R. An. i. p. 426 (1817), ex D'Aubent.
Corydonis pyrrhopterus, Vieill. Enc. Méthod. iii. p. 1353 (1823), ex D'Aubent.
Centropus molkenboeri, Bp. Consp. i. p. 108, "Philippines" (1850).

Hab. Luzon, January, February; Negros, March; Guimaras, March; Zebu, April (*Meyer*).

Examples from the islands cited in no way differ. A very distinct species, somewhat smaller than *C. javanensis*, Dumont. Wings deep rufous as in *C. chlorhynchus*, Blyth; remainder of the plumage, tail included, black, shaded with bronze-green. Sexes alike (*fide* Meyer).

[1] I cannot find that Gravenhorst ever published this title.

PYRRHOCENTOR, Cabanis.

65. * PYRRHOCENTOR MELANOPS.

Centropus melanops, Lesson, Traité d'Orn. p. 137, "Java!" *errore* (1831); Pucheran, R. et M. Z. 1852, p. 473; Cassin, Un. St. Exp. Exped. p. 249, pl. 22. fig. 1 (1858); Walden, Tr. Zool. Soc. viii. p. 56.

Centropus nigrifrons, Peale, Un. St. Expl. Exped. 1st ed. p. 137, "Mindanao" (1848); Hartlaub, Wiegmann's Archiv, 18ter Jahrgang, i. p. 107, no. 72 (1852).

Pyrrhocentor unirufus, Cab. Mus. Hein. iv. p. 118, "Philippines" (1862).

Hab. Mindanao (*Peale*).

I have followed Cassin in the above identification of *C. melanops* with *C. nigrifrons*, and I have little doubt, for reasons already stated (Walden, *l.c.*), that *P. unirufus* is the same species in immature plumage.

BUCEROTIDÆ.

BUCEROS, Linnæus.

66. * BUCEROS HYDROCORAX.

Hydrocorax, Brisson, Orn. iv. p. 566, no. 1, pl. 45, "Moluccis insulis," *av. juv.*

Buceros hydrocorax, Linn. S. N. i. p. 153, no. 2 (1766), ex Brisson; Temm. Pl. Col. 283, "Philippines," ♂ *adult.*

Calao des Moluques, D'Aubent. Pl. Enl. 283, *av. juv.*; Buffon, Hist. Nat. Ois. vii. pp. 140, 147.

Le Calao à casque plat, Le Vaillant, Ois. d'Afr. v. p. 127, pl. 240, *rostrum.*

Le Calao roux, Le Vaillant, Ois. Rares, i. p. 13, pl. 6, *av. juv.*

Buceros planicornis, Merrem.[1] *fide* Bp. Consp. i. p. 89.

Buceros platyrhynchus, Pearson[2], J. A. S. B. 1841, p. 652.

Buceros obscurus, Peale, Un. St. Expl. Exped. 1st ed., Birds, p. 125, "Philippines" (1848), ♀ *juv.*, nec Gm.; Hartlaub, Archiv für Naturgesch. 18ter Jahrgang, i. p. 105.

Hab. Luzon. Iris in both sexes yellow (*Meyer*).

It is with some difficulty that we can bring ourselves to recognize the large red-billed Philippine Hornbill in Brisson's description and plate.

The dimensions given by that author fall far short of those possessed by the adult; and a plumage is described which I have not observed, and which is not possessed by a much younger individual, judging by the casque obtained by Dr. Meyer. The figure by D'Aubenton (*l. c.*) bears a striking resemblance to that in the 'Ornithologia,' and would almost seem to have been copied from Brisson's plate. The description, too, given by

[1] The reference to this title, as given by Giebel (Thesaurus, p. 499), is to me unintelligible.

[2] A title published, without description, in his Catalogue of the Birds of the Asiatic Society of Bengal at Calcutta. Mr. Blyth (*op. cit.* 1843, pp. 988, 989) gave a full description of the specimen—although he erroneously identified it with *B. cristatus*, Vieill. Later, in his Catalogue of the Calcutta Museum, p. 43, no. 176, he correctly identified the species.

Buffon (*l. c.*) is incontestably not original, but extracted from Brisson; while Buffon's title seems to have originated in Brisson's assertion that his type inhabited the Moluccas.

Le Vaillant mentions (*l. c.*) that the example in Aubrey's cabinet, Brisson's type, was of a very young bird and much mutilated, both its tail and wings having been cut. It is difficult to decide, on the evidence we possess, how many individuals served as subjects for Brisson, D'Aubenton, and Le Vaillant. If we are to believe the last author, there were in Paris at least three examples:—first, Aubrey's—Brisson's type, and which Le Vaillant says he purchased when Aubrey's collection was sold; second, the subject of D'Aubenton's plate, said by Buffon to have been taken from a set-up specimen, but without mentioning to whom it belonged; third, the example figured by Le Vaillant (*l. c.*), and which he informs us he had acquired a short time previously. But, according to Temminck (*l. c.*), Le Vaillant figured the identical specimen which was the original subject of D'Aubenton's plate, and which at the time Temminck wrote (1824) was still preserved, although much deteriorated, in the Paris Museum.

On the whole, the probabilities are that there never was more than one specimen, and that the Brissonian type, which must have passed from Aubrey's collection to that of the Paris Museum. With Temminck's identification of this specimen as being the young of the large Philippine Hornbill we must rest content. Anyhow we may safely reject Le Vaillant's statement that *le Calao* of Brisson was the young of the *Calao à casque concave* of Le Vaillant, *op. cit.* plates 3 & 5, drawn from manufactured specimens with the heads only of *B. bicornis.* The drawing of the bill (*l. c.*) was made by Le Vaillant from a specimen in the Leyden Museum (*teste* Temm.).

The sexes of this species, as represented by the examples collected by Dr. Meyer, do not differ either in colouring or in dimensions. In a young bird, body-plumage dingy greyish tawny, the bill is entirely black, with the exception of the tip of the maxillæ and the under surface of the rami of the mandible, which are bright blood-red.

Buceros bicornis, Linn., and this species belong to the same natural section of the Hornbills[1].

Hydrocorax philippinensis, Briss. Orn. iv. p. 568, no. 2, "Philippines," a title founded on a head and beak in M. Aubrey's cabinet, and said to have come from the Philippines, is, so far as we know, not a Philippine species, but identical with *B. bicornis,* Linn.

CRANIORRHINUS, Cabanis.

67. *CRANIORRHINUS LEUCOCEPHALUS. (Pl. XXVII. fig. 1, ♂; fig. 2, ♀.)

Buceros leucocephalus, Vieillot, N. Dict. d'Hist. Nat. iv. p. 592, "Moluques" (1816), *fide* Bp. Consp. i. p. 91.

Buceros sulcatus, Reinw., Temm. Pl. Col. 69, "Philippines et Mariannes" (1823); Schlegel, Mus. Pays-Bas, *Buceros,* p. 10.

Hab. Mindanao (*Schlegel*).

[1] To which must be added *B. homrai,* Hodgs., if the Indian bird is specifically distinct from the Indo-Malayan.

Vieillot bestowed the title above quoted on an individual preserved in Temminck's collection, said to be from the Moluccas, and which up to that time had not been described. Bonaparte (*l. c.*) identified the individual thus named with *B. sulcatus*. Vieillot's description leaves it to be inferred that the tail is black, and in that respect does not agree with the male or female of this Philippine Hornbill.

Temminck (*l. c.*) includes the Marianne archipelago within the range of this species—a statement which is contradicted by Quoy and Gaimard (Ann. Sc. Nat. vi. p. 150, note), who affirm from their own observation, that no species of *Buceros* inhabits those islands. In his sketch of the genus (Recueil d'Ois. 36^e livr.) Temminck only assigns the Philippines as the habitat. And Schlegel (*l. c.*) mentions that Temminck's type, still existing at Leyden, came from Mindanao, which is also the origin of the example in the British Museum.

The female differs from the male in having the whole body-plumage black.

PENELOPIDES, Reichenbach.

68. * PENELOPIDES PANINI. (Pl. XXVIII. fig. 1, ♂; fig. 2, ♀.)

Le Calao mâle à bec cizelé de l'isle de Panay, Sonnerat, Voy. Nouv. Guin. p. 123, pl. 82, "Panay," ♀.

Le Calao femelle à bec cizelé de l'isle de Panay, Sonn. *op. cit.* pl. 83, "Panay" (1776), ♂.

Calao de l'isle de Panay, D'Aubenton, Pl. Enl. 780, ♀; Buffon, Hist. Nat. Ois. vii. p. 140, no. 8, p. 145, ex Sonnerat.

Femelle du Calao de l'isle de Panay, D'Aubenton, *op. cit.* 781, ♂.

Buceros panini, Bodd. Tabl. Pl. Enl. p. 48, ex D'Aubenton (1783).

Buceros panayensis, Scop. Del. Fl. Faun. Insubr. ii. p. 87, no. 30, ex Sonn. (1786).

Buceros panayensis, Gm. S. N. i. p. 360, no. 9, ex Sonn. (1788).

Le Calao à bec cizelè, mâle, Le Vaillant, Ois. Rares, i. p. 34, pl. 16, ♀ adult.

Femellè du Calao à bec cizelé, Le Vaillant, *tom. cit.* pl. 17, ♂ adult.

Buceros insculptus, Dumont de St. Croix, Dict. Sc. Nat. vi. p. 209, ex Buff., Sonn., Le Vaill. (1817).

Buceros sulcirostris, Wagler, Syst. Av. p. 201, no. 13, ♂, ♀, ex D'Aubenton (1827).

Hab. Island of Guimaras, March (*Meyer*); Panay (*Sonnerat*).

Sonnerat, during his visit to the island of Panay in the beginning of the year 1772, obtained examples, male and female, of a small Hornbill, which he brought to Paris.

This species he described and figured (*l. c.*). The description and figure of the male (female according to Sonnerat, pl. 83) are correct; but the description of the female (pl. 82) is erroneous in so far that Sonnerat states that the breast and abdomen are coloured alike in both sexes. This error is also to be found represented in the plate (82)[1]; and I am unable to offer a satisfactory explanation. D'Aubenton figured (*l. c.*) both sexes correctly; but, curiously enough, Buffon (*l. c.*), instead of giving an

[1] Le Vaillant (*l. c.*) remarks that the figure of the female (pl. 83) is absolutely nothing but that of the male, counter-drawn line for line and reversed. Even if this be true, it does not account for the erroneous description given in the letterpress. Le Vaillant figures (*l. c.*) and describes both sexes with sufficient accuracy.

original description, copied that of Sonnerat, and, although he quoted D'Aubenton's plates, omitted to notice the discrepancy.

Le Vaillant's figure (*l. c.* pl. 17) and that by D'Aubenton (*l. c.* pl. 781) were drawn from the same example, which was preserved in the Abbé Aubrey's cabinet (*fide* Le Vaill. *l. c.*). At the time Le Vaillant wrote (1810), five examples of this species were known to him. Since that date there is no recorded evidence of any other having been brought to Europe.

At some time previous to the year 1780 Poivre sent to the Royal cabinet in Paris an example of a small Philippine Hornbill, which D'Aubenton figured (*op. cit.* pl. 891) and which Buffon described (*tom. cit.* p. 144) under the title of *Calao de Manille*. This example no longer existed at the Jardin des Plantes in 1810 (*fide* Le Vaill.); but Le Vaillant figured (*tom. cit.* pl. 18) a second example, given to the Abbé Aubrey by Poivre. The origin of Poivre's Hornbill can only be inferred from the title bestowed by Buffon. That it belonged to a new and distinct species, was perfectly recognized by Buffon; yet Le Vaillant identified it (1810) as the young of Sonnerat's Hornbill, and this identification has been quietly acquiesced in by every author, save Meyen, ever since, even by the astute Wagler. The considerable series of individuals obtained by Dr. Meyer in Luzon and in the island of Guimaras, close to that of Panay, completely establishes the fact that the Hornbills brought to France by Poivre and by Sonnerat belonged to two separate species.

The adult male has the head, including a large crest, lower throat, sides of the neck, breast, and abdomen, bright tawny. The upper part of the throat between the rami of the mandibles, a stripe from the gape, bounding the naked space below the eye, the cheeks, where not denuded, and the ear-coverts jet-black. The latter are much elongated, and a few of the uppermost mingle with the lateral crest-plumes. The abdomen is washed with ferruginous, which changes into much deeper ferruginous on the thighs, under tail-coverts, vent, rump, and upper tail-coverts. The back and wings are uniform black, strongly glossed with green. The rectrices for the first seven inches are of a paler ferruginous, some on the outer web narrowly fringed with black. The tail-feathers for the remaining three inches are black, glossed with green, like the back. The shafts are black throughout their lengths. The black of the apical part of the tail runs up the outer webs of the outer pair of rectrices for a short distance. The quills are black, glossed with green, on their outer webs. The chin, cheeks, and space surrounding the eye are devoid of feathers.

A second example only differs in having the ferruginous portion of the rectrices of a paler hue, almost buff, and by the absence of the narrow black exterior fringe.

The adult female differs from the male in being entirely black, with the exception of the rectrices, which are marked and coloured as in the male. In one example the entire outer web of the fifth pair of rectrices is black; in another this is only partially the case.

To the flattened side of the maxilla is attached a plate which extends from the base for two thirds of the length of the maxilla. In the thickness of this plate are six narrow and shallow, almost perpendicular, grooves, coloured yellow in the dried specimen. A similar plate has grown on the sides of the mandible, and is grooved by narrower and more deeply cut diagonal channels. A narrow casque springs from the forehead, which, somewhat swollen posteriorly, is compressed anteriorly into a blunt broken edge. The commissure is much indented and broken. This description of the bill applies to the adults of both sexes; but in the male the bill is longer and deeper than in the female.

	Longitudo rostr.[1]	alæ.	caudæ.	
No. 1. ♂, adult . . .	3·75	10·50	10.	Island of Guimaras.
No. 2. ♂, ,, . . .	3·87	10·25	10.	,, ,,
No. 3. ♀, adult . . .	3	9·75	9.	,, ,,
No. 4. ♀, ,, . . .	3·37	9·75	9.	,, ,,

69. * Penelopides manillæ.

Calao de Manille, D'Aubenton, Pl. Enl. 891, ♂ *juv.*
Le Calao de Manille, Buffon, Hist. Nat. vii. p. 144, ♂ *juv.* p. 140, no. 9.
Buceros manillæ, Bodd. Tabl. Pl. Enl. p. 54, ex D'Aubent. (1783).
Buceros manillensis, Gm. S. N. i. p. 361, no. 10, ex Buffon (1788).
Le Calao à bec cizelé, dans son jeune âge, Le Vaillant, Ois. Rares, i. p. 37, pl. 18, ♂ *jun.*
Buceros sulcirostris (*juv. viril.*), Wagler, Syst. Av. p. 201, ex D'Aubenton.
Buceros manillensis, Buffon, Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. Suppl. prim. p. 91, pl. xiii. ♂ adult.
Buceros manillensis, Linn., v. Kittlitz, Lutké, Voy. (Postels) iii. p. 326, "Manilla."
Buceros panayensis, Scop., Schlegel, Mus. Pays-Bas, *Buceros,* p. 11, nec Scopoli.
Buceros panini, Bodd., v. Martens, J. f. O. 1866, p. 18, nec Bodd.

Hab. Luzon, January and February (*Meyer*).

The adult male (nos. 1, 2) has the back, rump, upper tail-coverts, and wings dull brown, with a bronze-green gloss. The primaries are brown, with a faint ferruginous fringe to the outer webs, the secondaries with a bolder albescent edging. The head, neck, throat, breast, abdomen, vent, thigh-coverts, and under tail-coverts, tawny. The throat, cheeks, and ear-coverts black, and marked as in *P. panini.* The crest is more elongated than in that species. The rectrices for the first five inches are bronzed brown, followed by a ferruginous band about one inch deep, and terminated by a black band glossed with green of about two inches. A narrow ferruginous fringe terminates some of the rectrices. In the outer pair, and sometimes in the two outer pairs, the ferruginous band is pale tawny, and does not run through the outer webs.

The adult female (no. 3) has the wings, back, and tail as in the male, the rest of the

[1] Measured in a straight line from the nostril to the tip.

plumage dull brownish mouse-colour. The quills are not fringed as in the male. The bill in this species is built on the same model as that of *I. panini*; but there do not appear to be as many grooves in the maxilla, five being the greatest number apparent.

In a very old male (no. 6), judging by the bill, several new rectrices have come, which have the central band almost white, the colour above and below this band being black glossed with green, and not brown. The remaining old rectrices are as described above. In a very old female example (no. 7) the same peculiarity is to be found. A young male (no. 5) with the casque partially developed, but without lateral plates or grooves, has the rump ferruginous, and the first-plumage rectrices broadly washed with ferruginous at their apex.

Meyen (*l. c.*) most positively stated that this Luçon chiselled-billed *Buceros* did not belong to that of Panay; and he gave an accurate figure of the old male.

	Longitudo rostri.	Longitudo alæ.	Longitudo caudæ.	
No. 1. ♂, adult . . .	3·25	9·25	9	Luzon.
No. 2. ♂, „ . . .	3·12	8·75	8·25.	„
No. 3. ♀, „ . . .	2·75	8·50	8·25.	„
No. 4. ♀, juv. . . .	2·25	8	7·50.	„
No. 5. ♂, „ . . .	2·62	9·12	8·75.	Manilla.
No. 6. ♂, adult . . .	3·1	9·12	8·87.	„
No. 7. ♀, „ . . .	2·87	8·37	——	„ (tail not fully grown).

Dr. v. Martens (J. f. O. 1866, p. 18) enumerates as an additional species of Philippine Hornbill an individual observed by him in the Military Library at Manilla. He describes it as being without a casque, and as having the tail long, the head crested, the bill and face black, the nape pale yellowish brown, the back and wings spotted and the under surface yellowish. Dr. v. Martens suggests that it may be *B. gingalensis*, Shaw, and bestows no title. The description above given does not agree with the Ceylon species, and was probably made from an immature example of one of the foregoing species.

LANIIDÆ.

Lanius, Linnæus.

70. * Lanius nasutus.

Pie-grièche d'Antigue, Sonn. Voy. Nouv. Guin. p. 114, pl. 70.
Lanius nasutus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 85, no. 13 (1786), ex Sonn.
Lanius antiguanus, Gm. S. N. i. p. 301, no. 29 (1788), ex Sonn.
Lanius cephalomelas, Bp. Rev. et Mag. Zool. 1853, p. 436, "Manilla;" Walden, Ibis, 1868, p. 70.

Hab. Zebu (*Meyer*); Panay (*Sonnerat*).

A single example of a black-headed Shrike, obtained in Zebu by Dr. A. B. Meyer, removes all doubts as to the existence of such a form in the Philippines; and we may further safely assume that it is the same as Sonnerat's species.

In India there appear to be two well-marked species of black-headed Shrikes:—one, the largest, with the whole back in the adult bright rufous, inhabiting Nipaul, Darjeeling and Assam, and named by Mr. Hodgson *L. tricolor* (Ind. Rev. 1837, p. 446, ex Nipaul; Gray & Mitch. Gen. pl. 71); the other, in the adult, with the upper back ashy-grey, and the lower pale ferruginous, inhabiting Goomsoor, Bengal, and said to extend into Arracan (*L. nigriceps*, Frank; Jerd. Ill. Ind. Orn. pl. 17). It is true that Dr. Jerdon, who at one time maintained this view, altered it (*l. c.*) out of deference to Mr. Blyth; but my acquaintance with the two birds bears out Dr. Jerdon's original opinion. Dr. Meyer's Zebu example has the upper back ashy grey, as in *L. nigriceps*, this colour descending much lower than in the Indian form, the uropygium and upper tail-coverts only being ferruginous; nor does the black on the nape extend so low down as in either of the Indian species. The Zebu bird, which is marked a male by Dr. Meyer, does not appear to be fully adult; and without an opportunity of comparing more examples, I am disinclined to assert that it differs specifically from *L. nigriceps*.

	Longitudo alæ.	caudæ.	tarsi.	
L. nasutus . . .	3·50	5	1·25.	♂. Zebu, in April.
L. nigriceps . . .	3·37	4·87	1·20.	Adult. Rognathpoor, Bengal.
L. tricolor . . .	3·75	5·75	1·25.	Adult. Nipaul.
„ . . .	3·75	5·13	1·25.	Adult. Mymensing.
„ . . .	3·75	5·12	1·25.	Immature. Darjeeling.
„ . . .	3·68	4·88	1·25.	♂, not quite adult. Base of Garos.

71. Lanius schach.

Lanius a-scack, Osbeck, Ostind. Resa, p. 227, "vicinity of Canton" (1757).
Lanius schach, J. G. Georgi, Osbeck, Reise Ostind. China (German transl.) p. 296 (1765).
Lanius schach, Linn. S. N. i. p. 136, no. 14 (1766), ex Osbeck; J. R. Forster, Osbeck, Voy. China, East Indies (Eng. tr.) i. p. 367; ii. p. 325 (1771); Bp. Consp. i. p. 364.
Lanius macrourus, Cuv., Mus. Paris Pucheran, Archiv. Mus. vii. p. 324 (1854–55).
Lanius chinensis, J. E. Gray, Zool. Misc. p. 1, "China" (1831).

Prince Bonaparte (*l. c.*) includes the Philippines within the range of this Shrike; and upon his authority (the only one, it is true, I have been able to discover) it is admitted in this list. The Javan and Timor form (*Lanius bentet*, Horsf.,=*Lanius pyrrhonotus*, Vieillot) is considerably smaller, and the black on the forehead recedes more than in the Chinese species. In dimensions it agrees with *Lanius erythronotus*, Vigors, from which species it can only be distinguished by the greater extent of black on the forehead. In fact *L. bentet* is a link between *L. erythronotus* and *L. nigriceps* and the other black-headed forms, *Lanius schach* being a large form of *L. erythronotus*.

In an early phase of plumage, but after the otherwise full plumage has been adopted, *L. nigriceps* closely resembles *L. erythronotus*, the crown of the head changing to black *after* the forehead has become black.

72. Lanius lucionensis. (Pl. XXIX. fig. 1.)

La Pie-griesche de Luçon, Briss. Orn. ii. p. 169, no. 11, "Isle de Luçon."
Lanius lucionensis, Linn. S. N. i. p. 135, no. 10 (1766), ex Briss.; Walden, Ibis, 1867, p. 215; Salvadori, Atti Ac. Sc. Torino, 1868, p. 273; Swinhoe, P. Z. S. 1871, p. 376.
Lanius jeracopis, De Fil. Mus. Mediol. *Aves*, p. 31 (1847), *fide* Salvad. *l. c.*
Lanius phœnicurus, Pall., O. Finsch, Verh. zool.-bot. Gesellsch. Wien, 1872, p. 258, no. 16, partim.

Hab. Negros, Guimaras, and Zebu in March; Luzon in January (*Meyer*).

Were it not that an ornithologist so distinguished as Dr. O. Finsch had quite recently (*l. c.*) called in question the right of this Philippine Shrike to rank as a distinct species, it would have been unnecessary to do more than enumerate it in this list. The latest and most valuable contribution to the history of the rufous-tailed Shrikes we owe to Mr. Swinhoe (*l. c.*). That gentleman had collected an unusually large series of individuals, which, together with the knowledge acquired during a long residence in Eastern Asia, entitles his opinion to the greatest weight. Mr. Swinhoe admits as distinct species *L. cristatus*, *L. superciliosus*, Lath., and *L. lucionensis*, L.; and he has given the probable general lines of their separate annual migrations[1].

These three species, when in adult plumage, are quite unmistakable; but when immature their specific differences are less striking. Yet Dr. O. Finsch (*l. c.*), after a study of the following meagre and insufficient materials—an adult and a young female example from Java (*L. superciliosus*), a young or female individual from Madras (*L. cristatus*), and a young or female bird captured fifty miles out at sea, off the Luzon coast—has arrived at the conclusion that all three belong to one species, which he terms *L. phœnicurus*, Pall.[2] It may therefore not be superfluous to give the characters which distinguish the three species when in full plumage.

L. superciliosus, Lath. (*L. phœnicurus*, Pall. ap. Schrenck; Walden, Ibis, 1867, pl. v. fig. 2), has the entire upper surface very bright *uniform* rufous, a very broad

[1] Although my investigations lead me to generally concur with Mr. Swinhoe's remarks on this branch of the question, in one particular Mr. Swinhoe appears to have been misled by Mr. Blyth's statement that *L. lucionensis* occurs in Ceylon. It appears to be now pretty well ascertained that *L. cristatus* only is found in Ceylon, and that the ashy grey plumage, sometimes observable in that species and in *L. superciliosus*, was the origin of the erroneous identification. The occurrence of *L. lucionensis* in the Andamans has been confirmed since it was asserted by Mr. Blyth) Mouat's, 'Andamans,' 1863, App. Zool. pp. 352, 360) by Mr. Ball (J. A. S. B. 1872, p. 280, no. 21); and I have also lately received Andaman examples of this species.

[2] *L. cristatus*, Linn., is the only species of which I have seen examples from Lake Baikal. More to the eastward in Siberia, *L. superciliosus*, Lath., may perhaps find its northern limit. Mr. Swinhoe (*l. c.*) states that examples from the Amoor, Amoy, and Malacca agree; and I still incline to the belief that *L. phœnicurus*, ap. Schrenk (Reisen Am. i. p. 384), is Latham's bird. The evidence we possess favours the opinion that *L. phœnicurus*, Pall., was described from an example of *L. cristatus*, Linn.

frontal band, a very broad superciliary stripe, and the throat pure white; the inner webs of the basal parts of the primaries white underneath, which shows through on the upper surface of the quills at their insertion, almost forming a white, yet concealed, alar bar; shoulder-edge and under shoulder-coverts pure white.

L. cristatus, L., has the head, nape, rump, upper tail-coverts, and tail rufous, but less bright and browner than in *L. superciliosus*. The back is coloured with the same tint, but paler or less rufous. The chin and upper part of the throat are white; but the tawny hue of the breast extends higher up than in either *L. superciliosus* or in *L. lucionensis*; and all the throat is usually washed with tawny.

The white frontal band is narrow and ill defined; and the white supercilium is much less prominent than in *L. superciliosus*. The quills at their insertions show indications, although slight, of a rudimentary alar bar. The shoulder-edge and under shoulder-coverts are tawny. The female is coloured as the male, but has the subocular stripe brown and not black, and the sides of the breast and flanks more or less striated and freckled with faint brown marks.

L. lucionensis, L., has the forehead and crown delicate pale pearl-grey, no pure white whatever on the forehead. A narrow white supercilium commences above the eye, becoming somewhat broader behind, and shading off into the grey of the head. The occiput, nape, and back are ashy liver-brown. The rump, upper tail-coverts, and tail are washed with rufous, most marked on the upper tail-coverts; the chin and throat pure white, as in *L. superciliosus*; shoulder-edge and under shoulder-coverts pure white; indications of a concealed white alar bar, as in *L. cristatus*; and the female has the sexual distinguishing characters of that species[1]. The almost entire absence of rufous in the plumage of the adult Philippine species suffices to distinguish it at a glance from *L. cristatus* and *L. superciliosus*.

I append the wing- and tail-dimensions of a few examples from different localities, from which it will be seen that no certain characters can be deduced from them.

The changes and phases of plumage these three species pass through before arriving at maturity have yet to be investigated; and many hundreds of individuals will have to be compared before any satisfactory result can be expected. In one place I find that immature examples of *L. superciliosus* and *L. lucionensis* have the entire under surface pure white. Then there is that phase in which the upper surface of *L. cristatus* and of *L. superciliosus* is ashy, dark in the first, light in the other. A Malaccan example of *L. superciliosus* above so closely resembles *L. lucionensis* that there would be great doubt as to its distinctness, were it not that two of the tertiaries were edged with bright rufous; this individual has the whole lower surface pure white.

A Ceylon example, at first sight, seen from above, might easily be mistaken for the Philippine species, were it not for its ruddy rectrices and rufous-tinged forehead and the absence of grey on the head.

[1] I have not met with an authentic example of *L. superciliosus* ♀.

Lanius schwaneri, Bp. (*cf.* Walden, *tom. cit.* p. 223), is reduced to a synonym of *L. lucionensis* by Mr. Swinhoe (*l. c.*); yet that author (*l. c.*) describes a fourth species, entitling it *L. incertus*, which appears to be only distinguishable from *L. lucionensis* by the characters on which Prince Bonaparte founded *L. schwaneri*.

	Longitudo alæ.	caudæ.		
L. superciliosus . . .	3·50	4·00.	♂ adult.	Malacca.
„ . . .	3·37	3·75.	♂ „	„
„ . . .	3·37	3·85.	♂ juv.	„
„ . . .	3·50	4·12.	♂ adult.	Java.
„ . . .	3·62	3·87.	♂ „	Hakodadi, June.
L. lucionensis . . .	3·37	3·87.	♂ „	Zebu, March.
„ . . .	3·37	3·87.	♂ „	Luzon, January.
„ . . .	3·50	3·87.	♂ „	Negros, March.
„ . . .	3·12	3·50.	♀ juv.?	Guimaras, March.
„ . . .	3·25	3·62.	♀ „	„ „
„ . . .	3·60	3·87.	♂ adult.	Amoy, April 28.
„ . . .	3·50	3·50.	♀ „	„ May.
„ . . .	3·37	3·50.	♀ „	„ „
„ . . .	3·50	3·75.	♂ „	South Andaman, December 29.
L. cristatus . . .	3·37	3·75.	♀ „	Lake Baikal.
„ . . .	3·37	3·75.	♀ „	„ „
„ . . .	3·37	3·60.	♀ „	Siberia (Lake Baikal?).
„ . . .	3·37		♂ „	Malabar.
„ . . .	3·37	3·37.	♀ vel ♂ juv.	Coorg.
„ . . .	3·37	3·87.	♀ vel ♂ „	Moulmein, October.
„ . . .	3·37	3·65.	♂ juv. (*fide* Beavan).	Maunbhoom, Dec. 25.
„ . . .	3·25	3·50.	♀ „ (*fide* Beavan).	Moulmein, Sept.
„ . . .	3·37	3·87.	♂ „	Barrackpore, Sept. 28.
„ . . .	3·13	3·62.	♀ „ (*fide* Beavan).	Maunbhoom, Jan.
„ . . .	3·37	3·81.	♀ adult.	Sassowlie.
„ . . .	3·37	3·87.	♂ „	Ceylon, December.
„ . . .	3·37	3·87.	♀ vel ♂ juv.	Ceylon, October.
„ . . .	3·37	3·16.	♂ adult.	Assam.
„ . . .	3·50	3·62.	♂ „	Tongoo.

La Piegrièche rouge de l'isle Panay, Sonnerat, *op. cit.* p. 114, pl. 71;
Lanius ruber, Scopoli, *tom. cit.* no. 14 (1786), ex Sonn.;
Lanius panayensis, Gm.[1] *tom. cit.* p. 307, no. 41 (1788), ex Sonn., and

[1] Gmelin erroneously quotes Sonnerat's 70th plate.

La Piegrièche blanche de l'isle Panay, Sonnerat, *op. cit.* p. 115, pl. 72 ;
Lanius albus, Scopoli, *tom. cit.* p. 85, no. 15 (1786), ex Sonn.;
Lanius albus, Gm., *tom. cit.* p. 307, no. 42 (1788), ex Sonn.,

have never been determined. Bonaparte (Consp. i. p. 364) was unable to suggest an identification; and in the Hand-list Mr. Gray omitted all the titles founded on Sonnerat's two plates. The seventy-first is possibly meant to represent an African or else Madagascar Ploceine form, perhaps a species of *Foudia*; while the species figured in the seventy-second plate, *Lanius albus*, closely corresponds with *Sturnopastor melanopterus* (Daudin).

ARTAMIDÆ.

Artamus, Vieillot.

73. Artamus leucorynus.

Lanius manillensis, Briss. Orn. ii. p. 180, no. 17, "Manilla" (1760).
Lanius leucorynus, Linn., Mantissa Plant. p. 524, "Manilla" (1771), ex Brisson; Walden, Tr. Z. S. viii. p. 67; Kittlitz, Kupfert. pl. 30. fig. 1.
Lanius philippinus, Scop. Fl. Faun. Insubr. ii. p. 85, no. 12 (1786), ex Sonn.

Hab. Negros, March; Guimaras, March; Luzon, January (*Meyer*).

Sexes (*fide* Meyer) do not differ.

Messrs. Hartlaub and Finsch (P. Z. S. 1868, pp. 116, 117, no. 5) assert that the Philippines, and more especially the island of Luzon, are inhabited by two distinct species of the genus *Artamus*:—one, the darker-coloured species, which has hitherto borne the title of *Artamus* (*Loxia*) *melaleucus*, R. Forster (Descr. Anim. p. 272, no. 221, "New Caledonia"); and the other the Javan form, and, as for that, the Indo-Malayan, Papuan, and Australian, *Leptopteryx leucorhynchus* (Linn.), Horsf. (Tr. L. S. xiii. p. 244, "Java"). This assertion is not supplemented by any stated evidence; nor do they profess to have seen Philippine examples of the darker species. The darker bird, *A. melaleucus* (R. Forster), is referred by Messrs. Hartlaub and Finsch to *Lanius manillensis*, Brisson, and Sonnerat's *Piegrièche dominiquaine* and the subsequent titles based on Brisson and Sonnerat's independent, separate, and original descriptions of that Philippine bird; and to it Drs. Hartlaub and Finsch apply the title of *A. leucorhynchus* (Gm.), ex Brisson, but which is really a Linnæan title (*l. c.*).

The oldest title of the paler form they state to be *Artamus leucorhynchus*, Horsf. (nec Gmelin!). The title, not being Horsfield's, cannot be retained, even if Messrs. Hartlaub and Finsch can show that *A. melaleucus* also inhabits the Philippines; and that of *A. leucogaster*, Valenc. Mém. du Mus. vi. p. 27 (1820), would have to be adopted. I have never met with specimens of any other than this latter species from the Philippines; and I have no doubt that from it Brisson and Sonnerat took their descriptions. True *Loxia melaleuca*, R. Forster, ex New Caledonia, only differs from the widely spread *Lanius leucorhynchus*, Linn., in having the entire head almost black instead of ash-grey, by the throat being darker, and also the smoky brown of the back being many shades deeper. The species that is found in the Pelew Islands I have never seen.

CAMPEPHAGIDÆ.

GRAUCALUS, Cuvier.

74. * GRAUCALUS STRIATUS. (Pl. XXX. fig. 1.)

Choucas de la Nouvelle Guinée, D'Aubent. Pl. Enl. 629, ♀ vel ♂ juv.
Le Choucas de la Nouvelle Guinée[1], Montbeillard, Hist. Nat. Ois. iii. p. 80 (1775).
Corvus striatus, Bodd. Tabl. Pl. Enl. p. 38, ex D'Aubent. (1783).
Corvus novæ-Guineæ, Gm. S. N. i. p. 371, no. 28 (1788), ex Montbeillard; Lath. Ind. Orn. i. p. 156, no. 14.
Coracina fasciata, Vieill.[2] Nouv. Dict. viii. p. 8 (1817), ex D'Aubent.
Ceblepyris plumbea, Wagler, Syst. Av. *Corvus,* p. 322 (1827), ex Gm.
Graucalus dussumieri, Lesson[3], Tr. d'Orn. p. 349, ♀ vel ♂ juv., "Manilla"[4] (1831); Jacquin. & Pucheran, Voy. Astrolabe, Zool. iii. p. 65, pl. 8. fig. 1, ♀, *fide* Pucher., "Samboagan, island of Mindanao;" Pucheran, Archives du Mus. vii. p. 363.
Graucalus lagunensis, Bp. Compt. Rend. vol. xxxviii. p. 540, ♂ adult, "Ins. Philipp." (March 20, 1854); Notes Orn. Coll. Delattre, p. 77; Hartl. J. f. O. 1864, p. 445, ♂, ♀, "Philippines."
Graucalus dussumieri, Lesson, Blyth, J. A. S. B. 1861, p. 96; Gray, Hand-list, no. 5070.
Graucalus lagunensis, Bp., Blyth, *l. c.*; Gray, *op. cit.* no. 5080.
Corvus papuensis, apud v. Kittlitz, Lütke, Voy. (Postels) iii. p. 326, nec Gm.

Hab. Luzon, January, April; Negros, March (*Meyer*); Mindanao (*Jacquinot*).

Dr. Meyer obtained six examples of this handsome *Graucalus*, representing three distinct phases of plumage. Two have, with the exception of the upper tail-coverts and lower feathers on the rump, the whole plumage of a dark plumbeous grey, the lores being jet-black. The lower plumage is somewhat paler than the upper, more especially that of the ventral region. A few of the upper tail-coverts and rump-feathers are fringed with pale grey. This is the fully adult male plumage[5] (*G. lagunensis*, Bp.).

A third example has the head, neck, back, and breast dark plumbeous grey; but

[1] Montbeillard leaves it to be inferred that this title (involving, as it does, the origin of the type) was bestowed by D'Aubenton.

[2] This author pretends also to describe the female and the young male; but it is impossible to determine what species he describes from.

[3] This title and the accompanying references are omitted in Dr. Hartlaub's 'Monograph' (J.f.O. 1864, p. 444); nor is it included in his valuable index to Pucheran's papers on the types in the Paris Museum (*op. cit.* 1855). Correctly enough, however, only one species of the true *Graucalus* is enumerated by Dr. Hartlaub from the Philippines.

[4] Dr. Pucheran also states that Lesson's type came from Luzon.

[5] It may also be that of the adult female, it being an unascertained fact whether in both sexes of the large Cuckoo-shrikes the adult plumage is the same. One of the two above described is labelled by Dr. Meyer "a male," and the other "a female;" but I am not quite sure that implicit confidence can be placed in the sexual determinations indicated on Dr. Meyer's labels.

the rest of the under plumage, with the under tail-coverts and the rump and upper tail-coverts, has two or more broad, almost pure white, transverse bands on each feather. The black lores are faintly indicated by a darker shade of plumbeous. This is the phase described by Lesson (*l. c.*), and represented in the eighth plate of the 'Voyage de l'Astrolabe.' It is also the phase figured by D'Aubenton, only that in the 'Planches Enluminées' the lores are exhibited as black. Two other examples differ:—one in the black and white feathers extending higher up on the breast, and being more numerous on the rump; the other in their becoming less distinct—that is, passing into the fully adult phase.

The Negros example (♂ *fide* Meyer) has the whole of the under plumage, from the chin, barred transversely white and black; and the black and white feathers on the uropygium extend to the middle of the back. This individual, I believe, represents the youngest of the three phases of plumage. It has not hitherto been described or figured. The dimensions of all six examples nearly agree.

D'Aubenton's plate, no. 629, first made this species known to science. The individual then figured was brought to Paris by Sonnerat (*teste* Montb. *tom. cit.* p. 82). With it Sonnerat also brought the individual represented by D'Aubenton on plate 630, and on which Gmelin founded his *Corvus papuensis.* Unfortunately Montbeillard did not state the localities where Sonnerat procured either of the two species. The one, however, figured on the 630th plate is undoubtedly an exclusively Papuan form; and being so, we can with much certainty infer that it was obtained by Sonnerat from some part of the Papuan subregion during his only visit to the Papuan Islands, namely in the year 1772. The expedition which Sonnerat accompanied when he visited those islands, and which had left the Isle of France on the 29th of June, 1771, had previously, from the beginning of September 1771 to the beginning of February 1772, explored the Philippine Islands; and Sonnerat seems to have never again travelled in the Philippine archipelago. He returned to France in 1772; and D'Aubenton's plates were published prior to 1775[1]. After this date Sonnerat returned to the East and visited India, Malacca, and China. The subject of Pl. Enl. 629 was therefore procured during Sonnerat's first voyage, either along with that of Pl. Enl. 630 (*C. papuensis*, Gm.) in the Papuan Islands, or else previously in one of the Philippines. No known Papuan *Graucalus* agrees with the bird figured in plate 629; but the female or young male of the common Philippine species does completely agree with it. I therefore without hesitation identify *Le Choucas de la Nouvelle Guinée*, D'Aubent., pl. 629, with the Philippine Cuckoo-shrike. Leaving out *G. swainsonii*, Gould, it being an Australian

[1] I am unable to fix the exact publishing-date of Pl. Enl. 629 & 630; but as these plates are quoted by Montbeillard in the third volume of the first edition of the 'Histoire Naturelle," which is dated 1775, the examples brought to Paris by Sonnerat must have been obtained during his first voyage (that is, his voyage to the Philippines and New Guinea), and not during his second voyage, when he visited Malacca at some period subsequent to 1776, the year when he left Europe for the second time.

member of the genus, the only other species that may have supplied Sonnerat with his example are the Malaccan, Sumatran, and Bornean forms (*G. fasciatus*, Vieill., apud auct. recent.,=*C. sumatrensis*[1], S. Müller, and *Graucalus dobsoni*, Ball, J. A. S. B. xli. p. 281, no. 23, an excellent species, belonging to this group and recently discovered by Mr. Ball in the Andaman Islands. But there is no evidence that Sonnerat obtained any birds from the Malayan peninsula, the Andamans, Sumatra, or Borneo during his voyage from Port St. Louis to Manilla; and on the other hand we have the fact that D'Aubenton's plate 629 represents a *Graucalus* with a black lorum and ocular stripe—a character possessed by the Philippine species in some phases of plumage, and the constant absence of which is said to be (and is, I believe) a principal distinguishing character of the Malayan[2].

Two examples of this Philippine *Graucalus* are contained in the British Museum. Both are in the plumage of *G. dussumieri*; yet they are catalogued under two different numbers and two distinct titles in the Hand-list. One, from Mindanao, through the brothers Verreaux, is named by them *G. lagunensis*; the other, from the Cuming collection, procured at Cataguan, is named *G. dussumieri*.

A species usually associated with the subject of Pl. Enl. 629, is the so-called *Graucalus lineatus*, Lesson, Tr. d'Orn. p. 349. The error has probably arisen in consequence of Lesson (*l. c.*) not quoting the real author of the title, and his giving *Corvus novæ-guineæ*, Gm., as a synonym, and adding Pl. Enl. 629 as a reference. The bird described by Lesson (*l. c.*) under this title is said by him to be from New Holland. It is clearly not the Malayan *G. concretus*, Hartl., nor the Philippine species; and it is difficult to identify; for, among other characters given, is a *white tail*. In the Manuel d'Orn. i. p. 220, Lesson included a *Ceblepyris lineata*, Swainson, and a *Ceblepyris tricolor*[3], Swainson, introducing the two titles with the observation that "Mr. Swainson describes two new *échenilleurs*, which he names," etc. The diagnosis given in the 'Manuel' differs from that given in the 'Traité,' but is evidently a condensed account of the Australian *Graucalus* (*Ceblepyris*) *lineatus*, Swains.[4] Zool. Journal, i. p. 466, New Holland (1825) =*Graucalus swainsonii*, Gould[5], Synop. Birds Austral. pt. iv. pl. —. fig. 2, "east coast of New South Wales."

Mr. Blyth (J. A. S. B. 1861, p. 96) refers to, and partially describes, a species of

[1] *G. concretus*, Hartl. apud nos, Ibis, 1872, p. 371.

[2] The Malayan species is considerably smaller, average length of the wing being 5·50, as against 6·25. It is not of so dark a shade of plumbeous, and the transverse bands are narrower. It is not so well marked and striking as the Philippine species. The Andaman species is larger than the Philippine and possesses a characteristic plumage of its own.

[3] Apparently =*C. humeralis*, Gould, P. Z. S. 1837, p. 143, over which title it takes precedence.

[4] Dr. Rüppell (Mus. Senckenb. iii. p. 30), having failed to find the reference to Swainson, is hard upon Lesson for the meagreness of his diagnosis.

[5] This species must retain its original title of *G. lineatus*, Sw. Mr. Gould (*l. c.*) states that he altered it to *G. swainsonii* because the name *lineatus* had been previously given to another species of this group. But the "other species" was this very bird.

Volvocivora that was among some Philippine birds sent to him by Mr. Swinhoe to examine. I am unable to identify it; and Mr. Blyth bestowed no title.

VOLVOCIVORA, Hodgson.

75. *VOLVOCIVORA (?) CÆRULESCENS. (Pl. XXX. fig. 2.)

Ceblepyris cærulescens, Blyth, J. A. S. B. 1842, p. 463, ♀ vel ♂ juv., "Luçonia;" *op. cit.* 1846, p. 307; Hartlaub, J. f. O. 1865, p. 157, ♂ ad.

Hab. Luzon, January (*Meyer*).

Dr. Meyer procured one example only of this anomalous form. It is in full black plumage and labelled a male. I am uncertain under which *Graucaline* genus to class this species. Mr. Blyth (*l. c.*) has remarked that it "might be regarded as the type of a new division."

That gentleman (Ibis, 1866, p. 368) has stated that his type is the female of *C. aterrima.* I have failed to discover the name of the author of this title and Mr. Blyth is unable to inform me who bestowed it.

LALAGE, Boie.

76. LALAGE DOMINICA.

Le Merle des Indes, Brisson, Orn. ii. p. 248, no. 19, "Indes orientales."
Le Terat-Boulau, Montb. H. Nat. Ois. iii. p. 397, ex Briss.
Merle des Indes orientales, D'Aubenton, Pl. Enl. 273. f. 2.
Turdus dominicus, L. S. Müller, Suppl. p. 145, no. 56 (1776), ex Pl. Enl. 273. f. 2.
Turdus terat, Bodd. Tabl. p. 17 (1783), ex Pl. Enl. 273. f. 2.
Turdus orientalis, Gm. S. N. i. p. 821, no. 71 (1788), ex Brisson.
Lalage terat (Bodd.), O. Finsch, Centr.-Polyn. p. 80.

Hab. Zebu, Guimaras (*Meyer*).

Not distinguishable from Javan, Malaccan, and North-Bornean examples, but with a somewhat larger wing. On L. S. Müller's title *conf.* Cassin, Pr. Ac. Nat. Sc. Philad. 1864, p. 251.

PSEUDOLALAGE, Blyth.

77. *PSEUDOLALAGE MELANOLEUCA. (Pl. XXIX. fig. 2.)

Pseudolalage melanoleuca, Blyth, J. A. S. B. 1861, p. 97, "Philippine Islands;" Hartlaub, J. f. O. 1865, p. 163; v. Martens, J. f. O. 1866, p. 12, no. 44.
Pseudolalage melanictera, Blyth, Sclater (*lapsu calami*), Ibis, 1862, p. 78; Gray, Hand-list, no. 5129.
?*Lalage uropygialis,* Bp. Compt. Rend. xxxviii. p. 541, "*Patr. incert.*" (1854); Coll. Delattre, p. 78.

Hab. Luzon (*v. Martens*).

Feathers of the uropygium spinous; otherwise a true *Lalage.* The diagnosis of *L. uropygialis,* Bp., applies well to this species; but the spinous character of the uropygial feathers is not mentioned. On the stand of the specimen in the British Museum Bonaparte's title is inscribed, although that name is altogether ignored in the 'Hand-list,' where, instead, the misprint in the Ibis (*l. c.*) is adopted, and Mr. Blyth's original title attributed to Hartlaub.

PACHYCEPHALIDÆ.

HYLOTERPE[1], Cabanis.

78. * HYLOTERPE PHILIPPINENSIS. (Pl. XXXI. fig. 2.)

Hyloterpe philippinensis, Walden, Ann. & Mag. Nat. Hist. ser. 4. vol. x. p. 252, "Luzon" (October 1, 1872).

Hab. Luzon (*Meyer*).

Dr. Meyer's researches in the Philippines have added an additional member of a genus hitherto not known to be there represented. The small group of Pachycephaline birds to which the title of *Hyloterpe* is restricted, is now known to contain six species. They are entitled to subgeneric distinction. The sexes are, I believe, alike; and they possess this further peculiarity, that they wear, in adult plumage, a sombre garb recalling the adolescent and the female plumage of the true black-and-yellow *Pachycephalæ*. This Philippine species is a representative form of *H. sulphuriventris*, Walden, ex Celebes. Above, it differs by its plumage being olive-green, and not brown, and underneath by the yellow extending higher, and being much brighter. The bill is likewise more powerful. Seen from above, *H. philippinensis* is difficult to distinguish from *H. fulvotincta*, Wallace, ex Flores; while, in the same way, *H. sulphuriventris* closely resembles *H. griseiceps* ex N. Guinea. Seen from below, however, the affinities are reversed, the Flores *Hyloterpe* showing a great resemblance to that of Timor, *H. orpheus* (Jard.), and the Celebean and Philippine species but differing slightly.

PERICROCOTIDÆ.

PERICROCOTUS, Boie.

79. PERICROCOTUS CINEREUS.

Pericrocotus cinereus, La Fresnaye, Rev. Zool. 1845, p. 94, "Luçon;" Gould, Birds of Asia, pt. ix.; Swinhoe, P. Z. S. 1871, p. 378, no. 315: Schrenck, Amurl. i. p. 381; Radde, Ost-Siberien, ii. p. 273.

Pericrocotus modestus, Strickl. P. Z. S. 1846, p. 102, "Malacca;" Ann. & Mag. Nat. Hist. xix. p. 131.

[1] Wiegm. Archiv f. Naturg. 1847, i. p. 321, type *Hylocharis philomela*, S. Müller. Boie (Isis, 1831, p. 546) gave the title of *Hylocharis* to a section of the *Trochilidæ*. But Mr. G. R. Gray, besides adopting the title (Hand-list, i. p. 148) for a genus of that family, employs it again (*tom. cit.* p. 389) for the Pachycephaline genus named by Dr. Cabanis *Hyloterpe,* and attributes it also to Boie, with the date 1827. Dr. Cabanis (*l. c.*), on the other hand, refers the Pachycephaline genus *Hylocharis* to S. Müller, of which he states *Hylocharis philomela,* S. Müller, to be the type; and he changed the generic title, as that of *Hylocharis* was preoccupied. S. Müller published that title, without giving any characters, in his papers on his zoological discoveries in the Sunda Islands (Tijdschr. Nat. Geschied. en Physiol. ii. p. 331, 1835); but he called the species *Hylocharis luscinia,* and the title *H. philomela* is not given by him. It is probable that the two titles refer to the same species

Ceblepyris luctuosus, De Fil. Cat. Mus. Mediol. p. 31, "Philippines" (March, 1847); Salvad. Atti Acad. Scienze, Torino, 1868, p. 271.

Phœnicornis modesta, Boie Bp., Consp. i. p. 357, "Sumatra" (1850).

Pericrocotus motacilloides, Swinhoe, Ibis, 1860, p. 58, "Amoy, in spring."

Hab. Philippines (*La Fresnaye, Gould*).

Probably only a winter resident.

DICRURIDÆ.

Dicrurus, Vieillot.

80. * Dicrurus balicassius. (Pl. XXXI. fig. 1.)

Monedula philippensis, Brisson, Ornith. ii. p. 31, no. 9, pl. 2 fig. 1, "Philippines."

Corvus balicassius, Linn. S. N. i. p. 157, no. 11 (1776), ex Brisson.

Le Choucas des Philippines, D'Aubent. Pl. Enl. 603.

Le Balicasse des Philippines, Montbeillard, Hist. Nat. iii. p. 83, ex Brisson.

Edolius furcatus, Wagler, Syst. Av. p. 322 (1827), ex Linn.

Edolius viridescens, Gould, P. Z. S. 1836, p. 6, "Manilla;" Blyth, J. A. S. B. xi. pp. 173, 802, figs. 10, 11; Cat. Calc. Mus. no. 1217, pp. 202 & xxii.

Balicassius philippensis, Bp. Compt. Rend. xxxviii. p. 539, "Philippines" (1854); Coll. Delattre, p. 76.

Balicassius furcatus, Bp., ex Gm. *l. c.* nec Gm.

Hab. Luzon, January and February (*Meyer*).

Sexes, as determined by Dr. Meyer, do not differ.

Accurately described in 1760 by Brisson, with its habitat correctly stated, this fine species remained unrecognized until a few years ago. It seems to be confined to the island of Luzon, being represented in Negros by the following species. It is the first species mentioned by Vieillot (Analyse, p. 41, no. 125, 1817) under his genus *Dicrurus*, and therefore may conveniently be regarded as the type, and Bonaparte's generic title *Balicassius*[1] must fall. *E. viridescens*, Gould, was described from a Philippine example now in Mr. Eyton's collection, and which I have examined. Wagler bestowed as a new title that of *furcatus* on *Corvus balicassius*, Linn., as seems to have been his habit when he altered the genus. The fact that true *D. balicassius* is a purely Philippine bird was not fully appreciated by my lamented friend the late Dr. Jerdon; for (Ibis, 1872, p. 119) he alludes to the Himalayan *Dicrurus* as being "distinct from the Malayan species to which the name of *balicassius* was applied." The Malayan species here referred to is *Edolius affinis*, Blyth (J. A. S. B. 1842, p. 174, "Malay peninsula"), and which, after comparison, I am unable to separate from the Himalayan *D. annectens*,

which is the *Tephrodornis grisola*, Blyth, J. A. S. B. 1843, p. 180*, and is described *op. cit.* 1842, p. 799. If Mr. G. R. Gray is right, and it can be shown that *Hylocharis*, Boie, 1825, was founded on the *Hylocharis luscinia* or *philomela* of S. Müller, the generic title *Hyloterpe* will have to fall.

[1] Adopted by Fitzinger (Fam. der Vögel, p. 198).

Hodgs. (Ind. Rev. 1837, p. 326, "Nipaul"), = *D. balicassius* (Linn.), *apud* Jerd., Blyth, Horsf. and Moore, etc., nec Linn.

The following titles have been regarded by some authors as belonging to the Luzon species, although they have nothing to do with it:—

Corvus afer, Lichtenst. M. A. A. H. Lichtenstein, in the Hamburg Catalogue[1], p. 10, no. 99, identified with doubt what can only be the South-African *Dicrurus musicus* with *Corvus afer*, Linn. (*l. c.* no. 12), founded on *Pica senegalensis*, Briss. (*tom. cit.* p. 40, no. 2). Lichtenstein did not create the title. Brisson's bird is doubtless a Senegal *Sturnine* form, and was sent to Réaumur by Adanson.

Corvus adsimilis, Bechstein, Latham's allgemeine Uebersicht der Vögel, ii. p. 562, no. 47 (1791), ex M. A. A. H. Lichtenstein; Kurze Uebersicht, p. 117, no. 44. A title given by Bechstein to *Corvus afer*, Linn. apud Lichtenstein *l. c.*, and which therefore becomes the senior title for *Dicrurus musicus*, Vieillot.

Oriolus furcatus, Gm. S. N. i. p. 395, no. 52. A title given to the *Icterus cauda bifida*, Brisson, Orn. ii. p. 105, no. 16, which in its turn was founded originally on the *Turdus niger mexicanus*, Seba, Thesaurus, i. p. 102, pl. 65. fig. 4. Clearly a *Dicrurus* (*Buchanga*), said by Wagler (Syst. Av. p. 364) to be *Dicrurus cærulescens* (Linn.), but which, from the crissum *only* being described as white, I believe to be *Dicrurus leucopygialis*, Blyth.

81. * DICRURUS MIRABILIS.

Dicrurus mirabilis, Walden & Layard, Ibis, 1872, p. 103, pl. 5, "Negros."

Hab. Negros (*L. C. Layard*, *Meyer*).

Only differs from *D. balicassius* in having the lower breast, abdominal regions, flanks, and under tail-coverts white instead of black. Dr. Meyer procured several examples in Negros.

In the 'Birds of India' (i. p. 438) it is stated, on Mr. Blyth's authority, that *Edolius rangoonensis*, Gould (P. Z. S. 1836, p. 5; and Jard. Illustr. pl. xxxviii.), is a Philippine, and not a Burmese species. It is not impossible that the genus *Dissemurus* is represented in the Philippines; but *E. rangoonensis*, Gould, although apparently unknown in Burma, seems to have been founded on an example of the Malaccan crestless *Dissemurus*.

[1] *Catalogus rerum naturalium rarissimarum Hamburgi*, d. xxi. October, 1793. An auction catalogue of zoological specimens sold at Hamburg on the above date and following days, and drawn up by M. A. A. H. Lichtenstein, Rector of the Johannis School. Many species are described, and new titles bestowed. The work is rare, the only copy known to me being contained in the Library of the University of Kiel.

MUSCICAPIDÆ.

PHILENTOMA, Eyton.

82. * PHILENTOMA CYANICEPS. (Pl. XXXII. fig. 1.)

Muscipeta cyaniceps, Cassin, Pr. Ac. Philad. vii. p. 438, "Philippine Islands" (1855); Un. St. Expl. Exped. Zool. p. 145, pl. ix. fig. 1.

Rhipidura caniceps, Cassin, ap. G. R. Gray (*lapsu calami*), Hand-list, no 4966.

Hab. Luzon, January (*Meyer*).

A small representative form of *Philentoma pyrrhopterum* (Temm.).

LEUCOCERCA, Swainson.

83. * LEUCOCERCA NIGRITORQUIS.

Rhipidura nigritorquis, Vigors, P. Z. S. 1831, p. 97, "neighbourhood of Manilla."

Muscicapa bambusæ, Kittlitz, Kupf. p. 7, pl. 9. f. 2, "Luzon" (1832); Mém. présentés à l'Ac. St. Pétersb. ii. p. 5, pl. 6, "Luzon" (1833).

? *Leucocerca javanica*, ap. Blyth, Ibis, 1865, p. 30.

Hab. Luzon, Zebu; bill, feet, and claws black; sexes alike (*Meyer*).

L. javanica may also inhabit the Philippines; but before including it in their fauna it will be better to wait for further evidence.

CYORNIS, Blyth.

84. CYORNIS BANYUMAS.

Muscicapa banyumas, Horsf. Tr. Linn. Soc. xiii. p. 146, "Java" (1820); Walden, Tr. Zool. Soc. viii. p. 117; v. Martens, J. f. O. 1866, p. 11, no. 32, "Luzon."

Hab. Zebu, April (*Meyer*); Luzon (*Jagor*).

The only individual obtained by Dr. Meyer appears to differ from Javan examples by being of a much darker shade of blue, and by wanting the pale bright blue frontal and superciliary plumes. The bill also is considerably longer and stouter.

HYPOTHYMIS, Boie.

85. HYPOTHYMIS AZUREA.

Gobemouches bleu des Philippines, D'Aubent. Pl. Enl. 666. fig. 1.

Le petit Azur, Montb. Hist. Nat. Ois. iv. p. 534.

Muscicapa azurea, Bodd. Tabl. Pl. Enl. p. 41 (1783), ex D'Aubent.; Walden & Layard, Ibis, 1872, 102, "Negros."

Muscicapa cærulea, Gm. S. N. i. p. 943, no. 64 (1788), ex Montb.; Kittlitz, Kupfert. p. 7, pl. 9. fig. 1; v. Martens, J. f. O. 1866, p. 11, no. 38.

L'Azur à calotte et à collier noir, Le Vaillant, Ois. d'Afr. iv. p. 11, pl. 153. figs. 1, 2.

Muscicapa occipitalis, Vigors, P. Z. S. 1831, p. 97, "neighbourhood of Manilla;" v. Martens, *tom. cit.* no. 31.

Muscicapa cæruleocephala, Sykes, P. Z. S. 1832, p. 85, no. 43, ♀, "Deccan;" J. A. S. B. 1834, p. 423.

? *Myiagra torquata,* Swains.[1] Nat. Libr. Flycatchers, p. 208 (*fide* G. R. Gray, Hand-list, no. 4930).

Muscicapa manadensis, Quoy et Gaim. ap. Bp. Consp. i. p. 321, *nec* Quoy et Gaim.

Hab. Guimaras, March (*Meyer*); Negros (*L. C. Layard*); Luzon (*Vigors*).

The proportion of blue, of bluish grey, and of pure white varies considerably among individuals (males) from the same locality. In some the lower breast and the whole abdominal region is pure white. In the others the entire breast and the abdomen is bluish grey. Again, the presence of the black nuchal patch and black gorget is not constant. In a Malabar male, in apparently otherwise full plumage, the black gorget is absent. A Ceylon male in brilliant azure plumage wants both the black nuchal patch and the gorget. A second specimen from that island also wants these characters. If constant in the Ceylon *Hypothymis*, this form will deserve specific separation. Examples from Maunbhoom, Garoo Hills, Tongoo, Moulmein, Malacca, Java, Flores, Banjarmassing, and the island of Negros perfectly agree with the only individual obtained by Dr. Meyer.

Butalis, Boie.

86. * Butalis manillensis.

Butalis manillensis, Bp. Compt. Rend. xxxviii. p. 652, "Manilla" (1854); Coll. Delattre, p. 80.

Hab. Manilla (*Bonaparte*).

The short notice given of this species makes it difficult to identify. It is stated to be of small size as compared with *B. grisola,* and may prove to be *Butalis latirostris* (Raffles, Tr. Linn. Soc. xiii. p. 312), or else *Butalis griseosticta* (Swinh., Ibis, 1861, p. 330), both these migratory forms occurring in the Malay archipelago during the winter months.

Zeocephus, Bonaparte.

87. * Zeocephus rufus.

Tchitrea rufa, G. R. Gray, Ann. & Mag. Nat. Hist. xi. p. 371, "Philippine Islands" (1843); Gray & Mitch. Genera of Birds, pl. 64.

Zeocephus rufa (G. R. Gray), Bp. Comptes Rend. xxxviii. p. 652 (1854); Coll. Delattre, p. 80; Cassin, Un. St. Expl. Exp. Zool. p. 144.

Hab. Philippines.

The precise localities in the Philippines inhabited by this Flycatcher are not known.

[1] Treated as a distinct species by Bonaparte (Consp. p. 321), and united by Mr. G. R. Gray with the Philippine species. I have failed to find Swainson's description. He merely refers to it (*l. c.*) as a recognized species additional to *H. azurea.*

The following *Muscicapine* forms attributed to the Philippines have not been rediscovered in those islands.

Le Gobe-mouche à tête bleuâtre de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 57, pl. 26. no. 1.

Muscicapa cæruleocephala, Scop. Del. Fl. Faun. Insubr. p. 95, no. 106 (1786), ex Sonn.

Muscicapa cyanocephala, Gm. S. N. i. p. 943, no. 65 (1788), ex Sonn.; v. Martens, J. f. O. 1866, p. 11, no. 35.

Not since recognized.

Le Gobe-mouche à gorge jaune de l'isle de Luçon[1], Sonn. *tom. cit.* p. 57, pl. 26. f. 2.

Muscicapa manillensis, Gm. *tom. cit.* p. 943, no. 66 (1788), ex Sonn.

Judged by the description, a well-marked species; I am, however, quite unable to identify it.

Le Gobe-mouche à tête bleue de l'isle de Luçon[2], Sonnerat, *tom. cit.* p. 58, pl. 27. f. 1.

Muscicapa macroura, Scopoli, *tom. cit.* p. 95, no. 107 (1786), ex Sonn.

Not since recognized.

Gobe-mouche noir de l'isle de Luçon, Sonn. *tom. cit.* p. 59, pl. 27. f. 2.

Muscicapa tessacourbe, Scopoli, *tom. cit.* p. 95, no. 108 (1786), ex Sonn.

Muscicapa luzoniensis, Gm. *tom. cit.* p. 942, no. 62 (1788), ex Sonn.

Stated by Sonnerat to occur in Madagascar, where it is called by the natives *tessacourbé*, as well as in the Philippines. It has not been recognized in the Philippines since Sonnerat wrote, and it is in all probability a purely Madagascar form, namely *Turdus albospecularis*, Eyd. & Gerv. (Guérin, Mag. Zool. Ois. pl. 64, 65, "Madagascar," 1836; Voy. Favorite, Zool. p. 35, pl. 12, 13).

Buffon (Hist. Nat. iv. p. 565), under the title of *Le Moucherolle des Philippines*, described an apparently *Muscicapine* bird, which I am unable to identify. On it Gmelin based his *Muscicapa philippinensis* (S. N. i. p. 943, no. 63); v. Martens, J. für O. 1866, p. 11, no. 34.

HIRUNDINIDÆ.

Hirundo, Linnæus.

88. Hirundo gutturalis.

L'Hirondelle d'Antigue, Sonn. Voy. Nouv. Guin. p. 118, pl. 76.

Hirundo gutturalis, Scopoli, Del. Fl. Faun. Insubr. ii. p. 96, no. 115 (1786), ex Sonn.; Swinhoe, P. Z. S. 1871, p. 346, no. 66; Walden, Tr. Zool. Soc. viii. p. 65, no. 76.

Hirundo panayana, Gm. S. N. i. p. 1018 (1788), ex Sonn.

Hab. Island of Panay (*Sonnerat*).

[1] Omitted by Scopoli.

[2] Omitted by both Gmelin and Latham.

Cecropis, Boie.

89. Cecropis daurica.

Hirundo daurica, Linn. Mantissa Plant. p. 528 (1771), ex Laxman[1]; Brandt, Ann. & Mag. Nat. Hist. xi. p. 114.

Hirundo alpestris, Pallas, Reisen Russischen Reichs, ii. p. 709, no. 19, "Altai and Siberian Alps" (1773); Zoogr. Rosso-Asiatica, i. p. 534, pl. xxx.; Kittlitz, Lütke, Voy. (Postels) iii. p. 327.

Hab. Manilla (*Kittlitz*).

Brandt (*l. c.*) thus identified a Swallow brought from Manilla by Kittlitz. It probably belongs to the race designated *Hirundo striolata*, Temm., ex Java, in the 'Fauna Japonica,' and which is said to frequent the islands of the Malay archipelago (*cf.* Swinh. P. Z. S. 1871, p. 346).

Dr. v. Martens mentions having observed a Swallow with the uropygium of a pale isabelline colour[2], very common about and in the houses of Baños. With doubt he identified it with *H. daurica* (Preus. Exp. O.-Asien, Zool. i. p. 188).

ORIOLIDÆ.

Broderipus, Bonaparte.

90. * Broderipus acrorhynchus.

Oriolus acrorhynchus, Vigors, P. Z. S. 1831, p. 97, "neighbourhood of Manilla;" Gray & Mitch. Gen. Birds, pl. 58; Walden & Layard, Ibis, 1872, p. 101.

Hab. Zebu, Negros, Guimaras, Luzon. Bill pink, rose-coloured; feet and claws blue-grey; Luzon examples (*Meyer*).

A large series of individuals obtained by Dr. Meyer illustrates the varying relative proportion of yellow and black on the head in different examples of this fine Oriole. In a Luzon female, immature, middle rectrices tinged with green; the enclosed yellow frontal space extends back fully for $\frac{7}{8}$ of an inch from the base of the culmen. In a perfectly adult Guimaras male with jet-black middle rectrices and quills, and rich orange-golden dorsal plumage, the forehead only is yellow, that colour occupying a depth of only $\frac{2}{8}$ of an inch. This example, in the distribution and proportions of its black and yellow plumage, is almost absolutely identical with a Sula-Island specimen of *B. frontalis* (Wallace). The Sula example, however, has the middle pair of rectrices entirely black, whereas all the Philippine examples have those feathers more or less tipped with yellow. Moreover the Philippine is a much larger bird, with a longer wing and bill. The extent of yellow at the termination of the middle pair of rectrices varies very considerably. In a Negros male in full golden-orange plumage the tips of the middle pair

[1] I have not been able to consult Laxman (Act. Holm. 1769, xxx. pl. 7. fig. 1); but it may be that he first bestowed the title of *daurica*, which Linnæus adopted.

[2] In the later List (J. f. O. 1866) this colour is described as being isabelline yellow.

are but barely fringed with yellow. In a Luzon male in similar dress the two middle rectrices have a yellow terminal band nearly half an inch in depth.

The tendency in this species seems to be for the entire head to become black as in *O. melanocephalus* and its allies. In an immature Luzon male (*fide* Meyer), with dingy greenish-yellow plumage and streaked breast, the feathers of the nape, occiput, and lores are dingy greenish yellow with greenish black, those of the forehead being dingy golden. Now in the adult these nuchal, occipital, and loral feathers become jet-black at their tips, those on the neck being ashy or greenish ash at their roots, but those on the occiput being bright yellow at their insertions. The direction of variation in this species may therefore be said to be towards *O. melanocephalus*, and from *O. galbula*; or, in other words, *O. galbula* is the older species, *B. acrorhynchus* and its allies being subsequent forms, and *O. melanocephalus* and its allies the most recent[1]. A third species, allied to *B. acrorhynchus* and *B. frontalis*, exists in *Oriolus formosus*, Cabanis, J. f. O. 1872, p. 392, "Island of Siou," the largest of all known Orioles.

Oriolus, Linnæus.

91. * Oriolus philippensis.

Oriolus philippensis, J. E. Gray, Zool. Misc. p. 3, "Philippine Islands" (1831); Bp. Consp. i. p. 346.

Stated by its describer to have been discovered by Captain Hay in the Philippine Islands. It is not represented in the British Museum, and does not appear to have been again obtained. The type specimen was without feet or wings, and was procured from the natives. Its origin might be considered more than doubtful, were it not that it was procured along with an undoubted Philippine species (*Melanopitta sordida*).

MERULIDÆ.

Turdus, Linnæus.

92. Turdus obscurus.

Dark Thrush, Lath. Synop. ii. p. 31, no. 24, "Siberia, woods beyond Lake Baikal."
Turdus obscurus, Gm. S. N. i. p. 816, no. 48 (1788), ex Lath.; Bp. Compt. Rend. xxxviii. p. 4; Coll. Delattre, p. 28.
Turdus rufulus, Drapiez, Dict. Class. d'Hist. Nat. x. p. 443, "Java" (1826).
Turdus pallens, Pallas, Zoographia Rosso-Asiatica, i. p. 457, no. 98, "Dauria" (1831); Temm. & Schlegel, Faun. Japon. *Aves,* p. 63, pl. 27.
Turdus iliacus pallidus, Naumann.
Turdus seyffertitzii, Brehm, Vög. Deutschlands, p. 387, "Herzburg, in Saxony" (1831).

[1] This generalization is not grounded on the phenomena presented by the Orioles alone. It is impossible not to be struck by the numberless proofs the study of birds affords of the tendency of one species to develop into another. On the phases of plumage in *B. sinensis,* conf. Swinh. Ibis, 1863, p. 292.

Turdus modestus, Eyton, P. Z. S. 1839, p. 103, "Malaya."
Turdus verneri, Géné, Mem. Accad. Torino, xxxvii. p. 291, pl. — (1833).
Turdus javanicus,? Horsf., apud Blyth, Cat. Calc. Mus. p. 161, no. 942, "Malacca," nec Horsf.
Turdus davidianus, Milne-Edwards, Nouv. Archives, i. Bulletin, p. 26, "North China" (1865).
Turdus chrysolaus, Temm., apud Godwin-Austen, J. A. S. B. xxxix. p. 102, nec Temm.

Hab. Philippines (Bonaparte).

The occurrence of this species in the Philippines, in itself highly probable, appears to rest on no other good ground than the statement of Bonaparte (*l. c.*).

93. Turdus chrysolaus.

Turdus chrysolaus, Temm. Pl. Col. 537, "Japan" (1831); Fauna Japonica, *Aves*, p. 64, pl. 28; Sclater, Ibis, 1863, p. 197, "Manilla."

Mr. Sclater (*l. c.*) thus identified an example of a Philippine Thrush in Mr. Gould's collection.

Professor Newton (Hist. Brit. Birds, pt. iv. p. 254) mentions that Mr. Gould had received an example of *Turdus varius*, Pallas, from Manilla.

PITTIDÆ.

Erythropitta, Bonaparte.

94. * Erythropitta erythrogastra.

Pitta erythrogastra, Temm. Pl. Col. 212, "Philippines (1823).
Brachyurus erythrogaster (Temm.), Elliot, Monogr. Pittidæ, pl. xvi.; Ibis, 1870, p. 417, no. 17.

Apparently confined to the Philippines; but the exact limits of its range within that archipelago have yet to be ascertained.

Melanopitta, Bonaparte.

95. * Melanopitta sordida.

Merula viridis atricapilla moluccensis, Brisson, Orn. ii. p. 319, no. 57, "Moluccas."
Merle des Philippines, D'Aubent. Pl. Enl. 89.
Brève des Philippines, Montb. Hist. Nat. Ois. iii. p. 412, "Philippines."
Turdus sordidus, L. S. Müller, Suppl. p. 143, no. 51 (1776), ex D'Aubent.
Turdus brevicauda, Bodd. Tabl. Pl. Enl. p. 6 (1783), ex D'Aubent.
Corvus philippensis (*C. brachyurus*, var. β) Gm. S. N. i. p. 375, no. 15 (1788), ex Brisson.
Citta melanocephala, Wagler, Syst. Av. "*Corvus*," no. 14 (1827), ex Gm.; nec Forster.
Pitta atricapilla, Cuv., Lesson, Tr. p. 394, "Manille" (1831); Compl. Buffon, p. 501 (1840), nec Müller & Schlegel.
Pitta macrorhyncha, J. E. Gray, Zool. Misc. p. 3, "Philippine Islands" (1831).
Pitta atricapilla, Temm. Pl. Col. Tabl. Méthod. p. 16 (1832), ex D'Aubent.

? *Pitta leucoptera*, Elliot, Proc. Acad. Nat. Sc. Philad. 1861, p. 153, "Ceylon," av. juv.?
Brachyurus atricapillus, Elliot, Monogr. *Pittidæ*, pl. xxv.
Brachyurus sordidus (L. S. Müller), Elliot, Ibis, 1870, p. 419, in pt.

Hab. Luzon, Negros; iris brown (*Meyer*).

The synonymy of this species is somewhat perplexing, in consequence of Brisson (*l. c.*) having given a description, applying in all its details to the Philippine bird, to an individual said by him to have been sent to l'Abbé Aubrey from the Moluccas. Montbeillard (*l. c.*) some years later described seemingly the same bird (and it was figured by D'Aubenton *l. c.*), but attributed its origin to the Philippines. The difficulty thus caused would probably have remained through all time unsolved had not Le Vaillant, by one of his gratuitous and carping criticisms, unintentionally assisted us. With the view of showing that Buffon was in the habit of describing as good species individuals that had been manufactured by dishonest dealers, Le Vaillant (Ois. de Par. vol. i. p. 106) incidentally alludes to this species. He asserts that the description given by Buffon (Montbeillard) of his "*Breve des Philippines*" was taken from a specimen of the "*Breve de Ceylan*" (=*Corvus brachyurus*, Linn.), in which the head of the common blackbird had been substituted. This example, Le Vaillant says, formed part of the Abbé Aubrey's cabinet; and adds that he purchased it when that collection was sold, and at once discovered the imposition. This story Cuvier (R. A. 1817, p. 356, note 2) repeated on Le Vaillant's authority. Vieillot (Nouv. Dict. p. 358, and Tabl. Méthod. Orn. p. 686) did the same without mentioning his authority. It remained uncontradicted until Wagler (*l. c.*) showed that Le Vaillant was in error. And Cuvier in the second edition of the 'Règne Animal' (p. 373, note) also corrected Le Vaillant. The statement that Montbeillard described from the specimen in Aubrey's cabinet may be accepted; for it is supported by the collateral evidence of Montbeillard (*l. c.*), who, in a footnote, remarks that it is the same bird that Brisson made his 57th "Grive." As no species of *Melanopitta* is known to exist in the Moluccas, we are justified in assuming that Brisson and Montbeillard described from the same, a Philippine example, and in regarding their descriptions as having formed the common basis of all subsequent synonyms applied to this Philippine form of *Pitta*[1].

Six species of black-headed green-bodied *Pittæ* are fully established as meriting specific distinction:—

1. *P. novæ-guineæ*, Müller & Schlegel. New Guinea and the Aru Islands, and most of the Papuan Islands.
2. *P. sanghirana*, Schlegel. Sanghir Islands.
3. *P. rosenbergii*, Schlegel. Soek Island in the Bay of Geelvink.

[1] The title of *Pitta philippensis*, Vieill., is quoted by some authors; but I cannot find that Vieillot ever applied a Latin title to the species, his opinion being that Montbeillard's type was fictitious.

4. *P. forsteni*, Bp. Celebes.
5. *P. muelleri*, Bp. Borneo.
6. *P. sordida* (L. S. Müller). Philippines.

The first three species are representative forms of a Papuan type; the remaining three of an Indo-Malayan.

Dr. Cabanis (Mus. Hein. ii. p. 4, no. 10) identifies an example of *Melanopitta* in the Halberstadt collection, and said to be from Timor, as *Turdus brevicaudus*, Bodd. This is seemingly an error, *P. irena* being the only known Timorese species.

Sumatra is brought within the range of the Philippine *Melanopitta* by Mr. Elliot (*l. c.*); but no authority is quoted.

The examples obtained by Dr. Meyer (♂ ♀) in no way differ.

CRATEROPODIDÆ.

MEGALURUS, Horsfield.

96. MEGALURUS PALUSTRIS.

Megalurus palustris, Horsf. Tr. Linn. Soc. xiii. p. 159, "Java" (1820); Blyth, J. A. S. B. 1844, p. 372; Ibis, 1865, p. 30; *op. cit.* 1867, p. 6.

Malurus marginalis, Reinw., Temm. Pl. Col. 65. fig. 2, "Java" (1823); Kittlitz, Voy. Lütke (Postels) iii. p. 326.

Hab. Luzon (*Kittlitz*); Philippines (*Blyth*).

Kittlitz mentions (*l. c.*) this species among the birds he observed in the island of Luzon. He remarks that it runs on the ground, and moves along and among the branches of low shrubs without jumping. Mr. Blyth (*l. c.*) identified the same species among the Philippine birds contained in the Derby Museum at Liverpool. Javan and Philippine examples have yet to be compared; and it may here be observed that the *Megalurus* of continental India (*Turdus takko*, Buch. Hamilton, M. S. ii. p. 75), does not appear to have been critically compared with the Javan type.

CRATEROPUS, Swainson.

97. CRATEROPUS CAUDATUS.

Gracula caudata[1], Cuvier, in Mus. Paris; Pucheran, Archives du Mus. vii. p. 342; Blyth, Ibis, 1867, p. 6.

Hab. Philippines (*Eydoux & Gervais*).

The above specific title is, by most authors, attributed to Duméril; but no reference is

[1] It is possible that, under the title of *Cossyphus caudatus*, Duméril may have described the Cuvieran type; but I have failed to discover the place. The earliest description of the species I can find is by Drapiez, Dict. Class. vol. x. p. 219 (1826); but he quotes Duméril as the author of the title.

ever cited. Cuvier bestowed the Museum title of *Gracula caudata* on two examples in the Paris Museum—one said to have been obtained in Australia, the other in Bengal. Dr. Pucheran, however (*l. c.*), is of opinion that the second example in reality came from the Philippines, as Manilla is inscribed on its stand, and also because it agrees with an authentic Philippine individual in the Paris Museum, obtained by MM. Eydoux and Souleyet. I can find no other record of a species of this genus having been observed or obtained in the Philippines. Indian authors seem to have been somewhat hasty in identifying the common Indian *Timalia chatarrhœa*, Frankl., with *Gracula caudata*, Cuv. Dr. Pucheran (*l. c.*) does not say that the Bengal bird is equally found in the Philippines, as stated by Mr. Blyth (*l. c.*).

Timalia leucotis, Strickl., is erroneously given from Manilla by Mr. G. R. Gray in the Hand-list, no. 4748.

Homochlamys luscinia, Salvadori, Atti R. Accad. Sc. Torino, v. p. 510, "Filippine o China?"[1] (1870) is, according to its author, a Timaliine form, which was contained in a collection of Chinese and Philippine birds sent to the Turin Museum. As the describer is not certain of its origin, it is not included in this list.

IRENIDÆ.

IRENA, Horsfield.

98. * IRENA CYANOGASTRA.

Irena cyanogastra, Vig. P. Z. S. 1831, p. 67, "neighbourhood of Manilla;" Gray & Mitch. Genera pl. 70; Cassin, United-St. Expl. Exped. p. 143.

Hab. Luzon, iris red (*Meyer*); Panay (*Cassin*).

The sexes (*fide* Meyer) do not differ.

BRACHYPODIDÆ.

IXUS, Temminck.

99. * IXUS GOIAVIER.

Petit goiavier de Manille, Sonnerat, Voy. Nouv. Guin. p. 59, pl. 28.
Muscicapa goiavier, Scop. Del. Fl. Faun. Insubr. ii. p. 96, no. 109 (1786), ex Sonn.
Muscicapa psidii, Gm. S. N. i. p. 941, no. 54 (1788), ex Sonn.

Hab. Manilla, February (*Meyer*).

[1] Erroneously stated in the 'Zoological Record' for 1870, p. 47, to be from the Philippines *and* China, an error repeated in the Hand-list, iii. p. 263, no. 4763*. Count Salvadori has since (Ibis, 1873, April, p. 179) identified it with *Calamoherpe* (*Herbivox*) *canturiens*, Swinhoe, a Chinese and Formosan species, but which may migrate to the Philippines. Count Salvadori's generic title has precedence.

Luzon individuals differ from those inhabiting Java, Malacca, Sumatra, the islands of Madura, Lombock (*P. analis*, Horsf.), and Banjarmassing (*P. gourdini*, G. R. Gray, ex Hombr. & Jacq. Voy. Pôle Sud, pl. 14. fig. 1) in being smaller, with a weaker bill, and in having the ear-coverts and sides of the head dark brown, and not white or albescent brown. The Banjarmassing race is not separable from *Ixos analis.*

100. IXUS SINENSIS.

Le Gobe-mouches verdâtre de la Chine, Sonnerat, Voy. Indes, ii. p. 197.
Muscicapa sinensis, Gm. S. N. i. p. 942, no 56 (1788), ex Sonn.
Turdus occipitalis, Temm., Lesson, Tr. p. 410 (*sine descr.*), "Manilla" (1831); Eydoux et Gervais, Mag. de Zool. 1836, p. 10, pl. 66, "Manille;" Voy. Favorite, v. p. 36, pl. 14, "Manilla."
Turdus palmarum, Temm. *nec* Linn., Mus. Lugd., *fide* Bp., Consp. i. p. 366, no. 17.

Hab. Manilla (*Eydoux & Gervais*).

Lesson (*l. c.*) adopted the title of *occipitalis*, Temm., for an example of this species in the Paris Museum, said to have been brought by Sonnerat from Manilla. Temminck, on being applied to by Eydoux and Gervais, denied having ever named the species. On comparing a bird brought by them from Manilla, Eydoux and Gervais found it to agree with the individual in the Paris Museum, and adopted the title of *occipitalis.* If the Philippine habitat of this well-known Chinese form had rested solely on the locality inscribed on the Paris-Museum label, I should have felt disinclined to trust it; but Eydoux and Gervais's statement that they obtained a similar bird at Manilla seems a sufficient authority for its admission here.

101. * IXUS ? UROSTICTUS. (Pl. XXXII. fig. 2.)

Brachypus urostictus, Salvadori, Atti R. Accad. Sc. Torino, v. p. 509, "Philippines" (March 27, 1870).

Hab. Luzon (*Meyer*).

A well-marked species, combining the crested head and general characters of an *Otocompsa* with the puffy plumage of *Brachypus euptilosus*, J. & S.

Turdus (Criniger) gularis, Horsf., is stated by Mr. Blyth (Ibis, 1865, p. 48) to be found in the Philippines. But Dr. O. Finsch (J. f. O. 1867, p. 15) observes that Java is the only locality it is known, with certainty, to inhabit.

HYPSIPETES, Vigors.

102. * HYPSIPETES PHILIPPINENSIS.

La petite grive des Philippines, Montb. Hist. Nat. Ois. iii. p. 316, "Philippines" (*descr. orig.*).
Turdus philippensis, Gm. S. N. i. p. 814, no. 40 (1788), ex Montb.; Gray, Hand-list, no. 3917; v. Martens, J. f. O. 1866, p. 13, no. 51.

Galgulus philippensis, Kittlitz, *mot. propr.* Kupfert. p. 8, pl. 12. fig. 2, "Philippines" (1832).

Hypsipetes philippensis, Strickl. *mot. propr.* Ann. & Mag. Nat. Hist. xiii. p. 413, "Manilla" (1844); v. Martens, *tom. cit.* no. 55.

Philedon gularis, Cuv. Mus. Paris; Pucheran, Archives du Mus. vii. p. 344, pl. 18, "China?;" Gray, Hand-list, no. 3992.

Hab. Guimaras, Luzon, Zebu (*Meyer*).

The sexes, as determined by Dr. Meyer, do not differ. In the Hand-list, no. 3917, this species is classed along with *Microscelis amaurotis* under the *Pycnonotinæ*, while *Hypsipetes m'clellandii* is included in the *Phyllornithinæ*. It is difficult to discern in what respect *Microscelis* differs from *Hypsipetes*; but anyhow this Philippine species is nothing more than a representative form of *H. m'clellandii*.

Montbeillard's type was obtained in the Philippines by Sonnerat. Cuvier's is said to have been brought from China by Dussumier (October, 1820), *fide* Pucheran, *l. c.* The species is not included in Swinhoe's list of the birds of China (P. Z. S. 1871). It has received the same specific title three times over, each author believing the individual before him to be undescribed.

Pucheran's plate (*l. c.*) represents the top of the head rufous, whereas it is dark cinereous; and the plate on the whole is an indifferent representation of the Philippine bird.

SAXICOLIDÆ.

MONTICOLA, Boie.

103. MONTICOLA SOLITARIUS.

Turdus solitarius, L. S. Müller, N. S. Suppl. p. 142, no. 46 (1776).

Monticola eremita (Gm.), v. Martens, J. f. O. 1866, p. 9, no. 18.

Monticola manillensis (Gm.), v. Martens, *tom. cit.* p. 10, no. 19; conf. Sharpe & Dresser, Birds of Europe, Append.; Walden, Tr. Zool. Soc. viii. p. 63; Walden & Layard, Ibis, 1872, p. 101.

Hab. Luzon, January; Guimaras, March (*Meyer*); Negros, March (*L. C. Layard*).

One Guimaras individual (♂ *fide* Meyer) is in perfect unspotted blue and rufous plumage. Another, also a male by the label, is in blue and rufous plumage, but has the occiput sullied by brown feathers, some of the breast-feathers edged with albescent and some of the rufous abdominal plumage edged with *blue*. The Luzon bird is generally rufous and blue, but with many of the feathers edged with albescent or brown, noted a male on the label. The dimensions of all three agree with examples from Japan.

Pratincola, Koch.

104. Pratincola caprata.

Rubetra lucionensis, Brisson, Orn. iii. p. 442, no. 30, "Isle de Luçon."
Motacilla caprata, Linn. S. N. i. p. 335, no. 33 (1766), ex Brisson; v. Martens, J. f. O. 1866, p. 10, no. 22; Walden, Tr. Zool. Soc. viii. p. 63, no. 72.
Traquet de l'isle de Luçon, D'Aubenton, Pl. Enl. 235. fig. 1 ♂, fig. 2 ♀.
Saxicola fruticola, Horsf. Tr. Linn. Soc. xiii. p. 157, "Java" (1820).
Saxicola bicolor, Sykes, P. Z. S. 1832, p. 92, no. 90, ♂, "Dukhun.
Saxicola erythropygia, Sykes, *l. c.* no. 92, ♀.
Motacilla sylvatica, Tickell, J. A. S. B. 1833, p. 575, "Jungles of Borabhúm and Dolbhúm."
Saxicola melaleuca, Hodgs. Gray's Zool. Misc. p. 83, "Nipaul" (1844) (*descr. nulla*).

Hab. Luzon (*Jagor*).

The type of the following species is stated by Brisson to have been sent from the Philippines to M. Aubrey. It has not been since recorded as inhabiting these islands, and appears to be restricted to Ceylon and peninsular India.

Rubetra philippinensis, Brisson, Orn. iii. p. 444, no. 31, "Philippines."
Motacilla (*Thamnobia*) *fulicata*, Linn. S. N. i. p. 336, no. 39, ex Brisson.
Le Traquet noir des Philippines, D'Aubenton, Pl. Enl. 185. fig. 1.
Autre Traquet des Philippines, Buffon, Hist. Nat. Ois. v. p. 230.

Cittocincla[1], Gould.

105. * Cittocincla luzoniensis.

Turdus luzoniensis, Kittlitz, Kupfert. p. 7, pl. 11. fig. 2, "Luzon" (1832); Mém. présentés à l'Acad. St. Pétersb. vol. ii. pt. 1 & 2, p. 5, pl. 7, "Luzon" (1833).

Hab. Luzon (*Kittlitz*).

[1] Mr. G. R. Gray (Hand-list, i. p. 266) adopts *Cercotrichas*, Boie. The genus *Cercotrichas* was established by Boie (Isis, 1831, p. 542), without characters, in these words. "Under this name I unite *Turdus phœnicopterus*, Temm., *T. erythropterus*, *T. macrourus*, Lath., *T. tricolor*, Vieill., *Sax. leucampter*, Museum Berl." Thus four distinct generic forms are united under one generic title, namely:—

1. *Turdus phœnicopterus*, Temm., = *Ampelis phœnicea*, Lath., a *Campephaga*; type of *Cyrtes*, Reichenbach.
2. *Turdus erythropterus*, Lath., ex Gm. = *Turdus podobe*, L. S. Müller; a Saxicoline form near to *Thamnobia* (conf. Blanford, Observ. Geol. & Zool. Abyssinia, p. 360, no. 127).
3. *Turdus macrourus*, Lath., ex Gm., = *Turdus tricolor*, Vieill., type of *Kittacincla*.
4. *Saxicola leucocampter*, Lichtenst. Mus. Berol. = *Motacilla fulicata*, Linn., type of *Thamnobia*.

Dr. Cabanis (Mus. Hein. i. p. 41), following Rüppell (Syst. Uebers. p. 60), adopted the second species named by Boie as the type of *Cercotrichas*. Messrs. Finsch and Hartlaub, finding it impossible to recognize the incongruous group which Boie had brought together, appropriated (Vög. Ost-Afrik. p. 149) his generic title, re-establishing it as their own, and restricted it to *Turdus erythropterus*, Lath., and *Orgya luctuosa*, Lafr. Mr. G. R. Gray, however, has made the third species the type of *Cercotrichas* and superseded *Kittacincla*, Gould, an arrangement which cannot be upheld.

Copsychus, Wagler.

106. * Copsychus mindanensis. (Pl. XXXIII. fig. 1.)

Le Merle de Mindanao, Montb. Hist. Nat. Ois. iii. p. 387; D'Aubenton, Pl. Enl. 627. f. 1.
Turdus mindanensis, Gm. S. N. i. p. 823, no. 76 (1788), ex Montb.
Copsychus mindanensis (Gm.), Sundevall, Kritisk Framst. p. 36, note (1857); v. Martens, J. f. O. 1866, p. 10, no. 20; Walden & Layard, Ibis, 1872, p. 102, "Negros."

Hab. Zebu, April; Guimaras, March (*Meyer*); Negros (*L. C. Layard*); Mindanao (*v. Martens*).

Professor Sundevall (*l. c.*) was the first author who identified this purely Philippine species, which previously was, and since has continued to be, confounded with the Malayan, *C. musicus* (Raffles).

In a Guimaras male (*fide* Meyer), otherwise in full plumage, the under shoulder-coverts are tipped with white. In Zebu and Negros examples of the male they are entirely black; in a Zebu female (*fide* Meyer) they are ashy; no white on the rectrices of any,—thus agreeing with Montbeillard's account of his type, which was brought to Paris by Sonnerat, presumedly from Mindanao, although its origin is only to be inferred from the title.

Calliope, Gould.

107. Calliope camtschatkensis.

Motacilla calliope, Pallas, Reisen Russischen Reichs, iii. p. 697, no. 17, "Siberia" (1776).
Kamtschatka Thrush, Latham, Synopsis, iii. p. 28, no. 14; Synop. Suppl. p. 140, *tab. in titul.*
Turdus camtschatkensis, Gm. S. N. i. p. 817, no. 58 (1788), ex Latham; Blyth, Ibis, 1865, p. 30, "Philippines."

Mr. Blyth (*l. c.*) includes this bird among the Philippine species he observed in the Derby Museum at Liverpool. It is probably only a winter resident.

SYLVIIDÆ.

Sylvinæ.

Gerygone, Gould.

108. * Gerygone simplex.

Gerygone modesta, Cab. J. f. O. 1866, p. 10, no. 23, "Luzon" (*descr. nulla*), nec v. Pelzeln.
Gerygone simplex, Cab. *op. cit.* 1872, p. 316, no. 4 (*descr. princeps*).

According to its describer, nearly allied to *G. inornata,* Wallace.

109. PHYLLOPNEUSTE MAGNIROSTRIS.

Phylloscopus magnirostris, Blyth, J. A. S. B. 1843, p. 966, "vicinity of Calcutta;" p. 1008, "Arracan;" Ibis, 1870, p. 168.

Mr. Blyth (*l. c.*) states that his Warbler also occurs in the Philippines; it may, however, prove to be the nearly allied *P. borealis*, Blasius.

CALAMODYTINÆ.

ACROCEPHALUS, Naumann.

110. ACROCEPHALUS ORIENTALIS.

Salicaria turdina orientalis, Schlegel, Faun. Jap. *Aves*, p. 50, pl. 21, "Japan."
Calamoherpe orientalis, Bp. Consp. i. p. 285 (1850), ex Schlegel; Walden, Tr. Zool. Soc. viii. p. 64.
Sylvia turdoïdes, ap. Kittlitz, Lütke, Voy. (Postels), iii. p. 327, "Manilla."

Hab. Luzon, February 7; Zebu, March; bill above grey-brown; below reddish; legs and nails pale grey (*Meyer*).

I am unable to separate these Philippine individuals from Amoy examples. Wing 3·25; tail 3·12; tarsus 1·12. It must have been specimens of this species, brought to France by Sonnerat from the Philippines, which were confounded by Montbeillard with *La Rousserole* (Montb. Hist. Nat. iii. p. 294).

DRYMOICINÆ.

CISTICOLA, Kaup.

111. * CISTICOLA SEMIRUFA.

Cisticola semirufa, Cab. J. f. O. 1866, p. 10, no. 25, "Luzon" (*descr. nulla*); *op. cit.* (1872) p. 316, no. 5 (*descr. princeps*).

According to Dr. Cabanis, closely allied to *C. ruficeps*, Gould.

ORTHOTOMUS, Horsfield.

112. * ORTHOTOMUS DERBIANUS.

Orthotomus derbianus, F. Moore, P. Z. S. 1854, p. 309, pl. 76, "Philippines."

Described from an example obtained by Cuming and preserved in the Derby Museum, Liverpool.

113. * ORTHOTOMUS CASTANEICEPS.

Orthotomus castaneiceps, Walden, Ann. N. H. (4) x. p. 252, "Guimaras" (1st October, 1872).

Hab. Guimaras (*Meyer*).

To be readily distinguished from all described species by its dark chestnut head, iron-grey mantle, and bright golden olive-green wings and tail. Its nearest known ally is *O. derbianus*.

MOTACILLIDÆ.

Motacillinæ.

Budytes, Cuvier.

114. Budytes viridis.

Green Wagtail, Brown, Illustr. p. 86, pl. 33, "Ceylon."
Motacilla viridis, Gm. S. N. i. p. 962, no. 81 (1788), ex Brown; v. Martens, J. f. O. 1866, p. 10, no. 28, "Manilla."
? *Motacilla flava,* ap. Kittlitz, Lütke, Voy. (Postels), iii. p. 327, "Manilla" (1836).

Observed by Dr. v. Martens at Manilla, both alive in the open country and preserved in the Military Library.

Calobates, Kaup.

115. Calobates melanope.

Motacilla melanops, Pallas, Reisen Russischen Reichs, iii. p. 696, no. 16, "Dauria" (1776); Zoogr. Rosso-Asiatica, i. p. 500, no. 135.
Motacilla bistrigata, Raffles, Tr. Linn. Soc. xiii. p. 312, "Sumatra" (1821).
Motacilla xanthochistus, Hodgs. Gray's Zool. Misc. p. 83, "Nipaul" (1844).
Pallenura javensis, Bp. Consp. i. p. 250, "Java" (1850).
Calobates sulphurea (Bechstein), Jerd. Birds of India, ii. p. 220, no. 592, "All India and Ceylon."
Calobates melanope (Pallas), Swinh. P. Z. S. 1871, p. 364, no. 202, "China, Formosa, Hainan."

Hab. Luzon, January; Zebu, April (*Meyer*).

Mr. Swinhoe (*l. c.*) has already remarked that the species of *Calobates* found in China, Formosa, and Hainan has a constantly shorter tail than the European bird, and has separated it under the title given by Pallas to the species observed in Dauria. My own observations fully support Mr. Swinhoe's conclusions, which apply to the Philippine bird also, as well as to all those I have examined from continental India. Although a small difference in the length of the tail is, by itself, a character too insignificant whereon to base a species, still it must be recollected that the lines of migration of the two forms are perfectly distinct, the short-tailed birds breeding in Northern Asia and visiting Southern Asia and its islands, those with the long tails breeding in Northern Europe and wintering in Southern Europe, Asia Minor, and Northern Africa[1]. Where the two races osculate remains an interesting point for future investigation; and it is not impossible that the race which winters in Abyssinia will be found to breed in Siberia.

[1] The great body of the migrants is referred to. Many individuals are known to halt and breed at intermediate points.

Calobates melanope.

	Longitudo alæ.	Longitudo caudæ.	
a. Luzon	3·25	3·86.	♂, January. Throat white.
b. Zebu	3·25	3·75.	♂, April. ,, ,,
c. Malacca	3·25	3·86.	♂. ,, ,,
d. ,,	3·00	3·62.	January. ,, ,,
e. Maunbhoom	3·12	3·86.	March. ,, ,,
f. ,,	3·25	4·00.	♀, December 15. Throat yellow.
g. Coorg	3·25	3·62.	,, ,,
h. N. W. India	3·25	3·75.	♂, March. Throat black; nearly full breeding-dress.
i. Simla	3·25	3·86.	♀, December. Throat yellow.
j. Java	3·25	3·86.	=*a.*
k. Lake Baikal	3·25	3·86.	♀, May 26. =*a.*
l. Central Asia	3·25	4·00.	♂, December 18. White throat-feathers fringed with black.

Calobates sulphurea.

m. Hampstead	3·12	4·25.	September 16. Breast buff.
n. ,,	3·25	4·62.	October 24. ,, ,,
o. ,,	3.25	4·36.	November 18. ,, ,,
p. ,,	3·12	4·25.	October 24. ,, ,,
q. Cookham	3·25	4·25.	♂, January 5. ,, ,,
r. ,,	3·25	4·12.	♂, May 10. ,, ,,
s. ,,	3·25	4·25.	♂, September 20. ,, ,,
t. ,,	3·00.	4·00	♂, ,, 26. ,, ,, (A young bird.)
u. ,,	3·25	4·36.	♂, September 26. Breast buff.
v. Highgate	3·25	4·12.	♂, ,, 6. ,, ,,
w. Constantinople	3·25	4·50.	♂, December 1. ,, ,,
x. Ortakeuy	3·12	4·25.	,, ,,
y. Rostanjee	3·25	4·37.	♂, November 19. ,, ,,
z. Arnoutkeuy	3·25	4·12.	♂, September 19. ,, ,,
aa. ,,	3·25	4·25.	♀, December 7. ,, ,,
bb. Abadeh (Persia, 6000 ft.)	3·12	4·20.	♀, July. ,, ,,
cc. Resht (Persia)	3·25	4·25.	♂, November. ,, ,,
dd. Asia Minor	3·25	4·50.	♂, March 22. Throat nearly black (=*C. melanope, h*).
ee. ,, ,,	3·25	4·25.	♂, March 29. Throat nearly black (=*C. melanope, h*).
ff. Ortakeuy	3·35	4·50.	♂, March 16. Throat nearly black (=*C. melanope, h*).

MOTACILLA, Linnæus.

116. MOTACILLA LUZONENSIS.

La Bergeronette à collier de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 61, pl. 29.
Motacilla luzonensis, Scopoli, Del. Fl. Faun. Insubr. ii. p. 94, no. 105 (1786), ex Sonn.
Motacilla alba, var. *β,* Gm. S. N. i. p. 961, no. 11, ex Sonn.
Motacilla alba, var. *γ,* Lath. Ind. Orn. ii. p. 502, no. 1, ex Sonn.

I have never met with authentic Philippine examples of any Pied Wagtail; and I am therefore unable to identify Sonnerat's species (*cf.* Swinhoe, P. Z. S. 1870, p. 120).

ANTHINÆ.

CORYDALLA, Vigors.

117. * CORYDALLA LUGUBRIS, sp. nov.

? *Anthus malayanus,* Eyton? ap. v. Martens, J. f. O. 1866, p. 10, "Luzon."

Hab. Guimaras, March (*Meyer*).

Above, the general ground-colour is olive-grey, each feather broadly centred with brown, most marked on the head and nape. The rump, upper tail-coverts, and shoulder-coverts are almost uniform olive-grey, the brown centres not being very evident. The whole of the wing-feathers are brown edged with albescent. The first primary conspicuously edged with greyish albescent, as in *C. richardi* and *C. rufula.* Between the base of the bill and the eye is a bald patch of albescent feathers, which are continued over the eye rather more narrowly, and then dilate into a broad albescent stripe above the ear-coverts. Lores brown, bordered underneath by an albescent stripe, which extends below the eye and loses itself in the cheek. Ear-coverts dark brown. Under surface of body albescent. Throat almost pure white. A few of the breast-feathers with narrow dark brown centres. Middle pair of rectrices brown, with albescent fringes; outer pair almost pure white; penultimate pair white, with half of the inner web brown; remaining pairs brown. A narrow brown line follows the rami of the mandible. Legs yellow; maxilla brown; mandible yellowish. Neither example exhibits a trace of rufous or ferruginous. The bill is thicker than in *C. rufula* (ex Malacca), of which species this Guimaras bird is a representative.

Wing 3 inches; tail 2·50; bill, from nostril 0·37; tarsus 1·12; hind claw 0·50.

This Pipit is closely allied to *Corydalla hasseltii,* Temm.[1], ex Borneo, of Gray's Hand-list, no. 3655; but, judging from the single example so entitled in the British Museum, the Bornean species differs sufficiently to make a comparison with a greater number of individuals desirable.

Corydalla infuscata, Blyth (J. A. S. B. 1861, p. 96, "Philippines"), was described from a Foochow-hills specimen, a small and dark-plumaged race of *C. richardi,* sent by Mr. Swinhoe to Mr. Blyth (*cf.* Swinhoe, P. Z. S. 1863, p. 272, no. 75).

[1] Apparently a Museum title. No description of the species has hitherto appeared.

PARIDÆ.

PARINÆ.

MACHLOLOPHUS, Cabanis.

118. * MACHLOLOPHUS ELEGANS.

Parus elegans, Lesson, Tr. p. 456, *patr. non indic.* (1831); Pucheran, Rev. et Mag. Zool. 1854, p. 68; Bp. Compt. Rend. xxxviii. p. 63; Coll. Delatre, p. 45; Blyth, Ibis, 1867, p. 34, note.
Parus quadrivittatus, La Fresnaye, R. Z. 1840, p. 129, "Manilla or India."

Hab. Philippines (*Pucheran*).

Lesson's type was brought to Paris from the Philippines by Dussumier in 1820 (*fide* Puch. *l. c.*). Bonaparte (*l. c.*) mentions that numbers of individuals were sent to the Brothers Verreaux about the year 1854; but the exact habitat still remains unrecorded.

MELIPHAGIDÆ.

ZOSTEROPS, Vigors & Horsfield.

119. * ZOSTEROPS MEYENI.

Dicæum flavum, Kittlitz, Kupfert. pt. 2, p. 15, pl. 19. f. 2, "Luzon" (1833); Mém. présentés à l'Acad. St. Pétersb. ii. p. 142, pl. 3. f. 3, "Luzon" (1833), nec Horsf.
Sylvia flava, Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. suppl. p. 79, "Manilla" (1834).
Zosterops meyeni, Bp. Consp. i. p. 398, ex Kittlitz (1850); Hartl. J. f. O. 1865, p. 17.

Hab. Luzon, February (*Meyer*).

Closely resembles *Z. palpebrosa* and *Z. simplex*, but differs from both in having the breast and belly nearly pure white, and in wanting the black lores and dark subocular shading. Above, the shade of green is intermediate between the two. The yellow of the throat and crimson agrees best in shade with *Z. simplex*, but descends lower.

The *Zosterops* mentioned by Mr. Sclater (P. Z. S. 1863, p. 219) is in all probability *Z. parvula*, Hombr. & Jacquin. Voy. Pole Sud, Ois. pl. 19. fig. 4, ex Banjarmassing, and considered by Hartlaub (*tom. cit.* p. 15) to be the same as *Z. melanura*, Temm., ex Pontianak. It is erroneously identified with *Z. flava* (Horsf.) in Gray's Hand-list, no. 2119.

NECTARINIIDÆ.

DICÆINÆ.

DICÆUM, Cuvier.

120. * DICÆUM RETROCINCTUM.

Dicæum retrocinctum, Gould, Ann. N. H. (4) x. p. 114, "Manilla, Mindanao" (Aug. 1872).

Hab. Manilla, Mindanao (*Gould*); Zebu (*Meyer*).

It is to be observed that the single example obtained by Dr. A. B. Meyer is noted a male by that gentleman, although it wears the plumage described by Mr. Gould (*l. c.*) as being that of the female.

Myzanthe, Hodgson.

121. * Myzanthe pygmæa.

Nectarinia pygmaea, Kittlitz, Mém. présentés à l'Acad. de St. Pétersb. vol. ii. pt. 1 & 2, p. 2, pl. 2, "Luzon" (1833).

Hab. Luzon, Guimaras (*Meyer*).

The female (sex as determined by Dr. Meyer) differs from the male in having the entire upper surface and wings greenish olive, and in wanting the ashy breast of the male. When seen from above, it is indistinguishable from *M. ignipectus*, Hodgs., ♀.

Nectariniinæ.

Nectarophila, Reichenbach.

122. * Nectarophila sperata.

Certhia philippensis purpurea, Briss. Orn. iii. p. 655, no. 27, "Ins. Philippensibus" (1760).
Certhia sperata, Linn. S. N. i. p. 186, no. 13 (1766), ex Briss.; Walden, Ibis, 1870, p. 42.

Hab. Luzon, February; ♂, iris yellow-brown (*Meyer*).

Two examples were obtained by Dr. Meyer. One has the head golden green, the uropygium and upper tail-coverts pure brilliant metallic green, and the throat violet. The other has the head coppery green, the uropygium and upper tail-coverts violet-green, and the throat purple.

Arachnechthra, Cabanis.

123. * Arachnechthra jugularis[1].

Certhia philippensis minor, Briss. Orn. iii. p. 616, no. 6, ♂ adolesc. "Ins. Philippensibus" (1760).
Certhia jugularis, Linn. S. N. i. p. 185, no. 7 (1766), ex Briss. no. 6; Walden, Ibis, 1870, p. 27.
Nectarinia eximia (Temm.), v. Kittlitz, Voy. Lütke (Postels), iii. p. 328, "Manilla," nec Temm.

Hab. Negros, March; Guimaras, March; Zebu, April (*Meyer*).

Dr. Meyer obtained numerous examples from the islands named, but none in Luzon. This species most resembles *A. frenata* (S. Müller), but is distinguished by the dingy colouring of the upper plumage (which is brownish olive, and not yellowish olive), by entirely wanting the yellow super- and subocular stripes of *A. frenata*, and by the yellow of the under plumage being pale primrose-yellow, and not deep yellow. The dimensions are about equal. A Zebu and a Negros male display each some bright orange feathers bordering the dark blue plastron. The Philippine female

[1] For the synonymy of this and the preceding species *cf.* Walden, *op. cit.*

examples possess, in common with *A. frenata* ♀, a yellow superciliary stripe, but it is much paler in tint.

A. jugularis differs from *A. flammaxillaris* (Blyth)[1] in wanting the deep maroon pectoral band and the flame-coloured axillaries of the Burmese species; from *A. pectoralis* (Horsf.), from which it is otherwise difficult to be distinguished, in wanting the steel-blue frontal patch.

The examples of the female agree in all respects with Brisson's description of his *Certhia philippensis* (no. 4), excepting that he omits to mention the pale supercilium. The dimensions of the bill, one inch from the gape, given by Brisson are too large for *N. sperata* (L.) (*cf.* Walden, *tom. cit.* p. 28).

Le Somimanga de l'isle de Luçon, Montbeillard, Hist. Nat. Ois. v. p. 496. *Certhia manillensis*, Gm. (S. N. i. p. 471, no. 32, 1788, ex Montbeillard; Walden, Ibis, 1870, p. 45), is probably *Nectarinia insignis*, Jard., from the Malay Islands, and not a Philippine species (*cf.* Walden, *l. c.*).

CERTHIIDÆ.

Rhabdornis, Reichenbach.

124. * Rhabdornis mystacalis.

Meliphaga mystacalis, Temm. Pl. Col. 335. f. 2, "environs de Manille" (1825).
Climacteris striolàta, Kittlitz, Kupft. p. 5, pl. 6. f. 2, "Luzon" (1832).

Hab. Luzon (*Meyer*).

CORVIDÆ.

Corvinæ.

Corvus, Linnæus.

125. * Corvus philippinus.

Corvus philippinus, Bp. Compt. Rend. xxxvii. p. 830, "Philippines" (1853); Notes Orn. Coll. Delattre, p. 8; G. R. Gray, Hand-list, no. 6207.
? *Corvus brevipennis*, Schlegel, Bijdr. Dierk. pt. 8, p. 9, pl. 1. fig. 8, "Philippines" (1859); Mus. Pays-Bas, *Coraces*, p. 22.

Hab. Luzon, April; Negros, March; Cujo, December (*Meyer*).

Dr. Meyer obtained two examples (♂, ♀) of this genus in Negros, one (♀) in Luzon, and one (♀) in the island of Cujo. All the four are in perfect and identical plumage. Head, nape, and under plumage black; primaries black, washed with green; remainder

[1] *A. rhizophoræ*, Swinh., differs from *A. flammaxillaris* in possessing a steel-blue frontal patch and in having a dark band below the maroon. The Penang specimen alluded to (P. Z. S. 1871, p. 349, no. 86) is probably *A. pectoralis*; but I have observed a tendency in some species, in *A. zenobia* and *A. frenata* for instance, to develop a frontal patch.

of the wings, the back, and the rectrices purple-black. In all, the basal portion of the body feathers is white, the gradation of the quills is the same, and the form of the bill scarcely differs. I do not doubt that the Luzon and Cujo individuals belong to Bonaparte's species; and the Negros examples only differ in their dimensions, which are greater. These Philippine Crows, while nearly allied to *C. enca* of Java and Celebes, are distinguishable by the under plumage being shaded with green, and not with purple, and by their larger size.

Professor Schlegel (*l. c.*) founded on a specimen procured by Cuming in the Philippines his *C. brevipennis*. He did not treat *C. philippinus* as a distinct species either in his well-known Monograph or in his list of the *Corvinæ* in the Leyden Museum, but left it to be inferred that *C. philippinus* was the same as *C. validus* (Bijdr. t. d. Dierk. p. 13, *C. enca*). From *C. validus*, ap. nos, ex Malacca, Bonaparte's species differs in being smaller, and in its green coloration. Whether a second species, *C. brevipennis*, occurs in the Philippines, must remain for future collectors to ascertain. Mr. G. R. Gray (*l. c.*) has united the two titles.

	Longitudo				
	alæ.	caudæ.	rostr. a nar.	tarsi.	
♀.	11·50	8·25	1·50	2·25.	Luzon.
♂.	12·25	8·75	1·75	2·35.	Negros.
♀.	12·13	8·75	1·67	2·35.	„
♀.	11·50	8	1·37	2·25.	Cujo.

STURNIDÆ.

Sturninæ.

Acridotheres, Vieillot.

126. Acridotheres cristatellus.

The Chinese Starling or Blackbird, Edwards, Nat. Hist. i. p. 19, pl. 19, "China," (1743).
Sturnus crinibus cinereis, etc., Klein, Hist. Av. p. 64, no. 3 (1750), ex Edwards.
Merula sinensis cristata, Briss. Orn. ii. p. 253, no. 21 (1760), ex Edwards.
Gracula cristatella, Linn. S. N. i. p. 165, no. 5, "China" (1766), ex Edwards.
Le Merle huppé de la Chine, Montb. Hist. Nat. Ois. iii. p. 367, ex Brisson; D'Aubenton, Pl. Enl. 507.
Merula philippensis, Brisson, apud Bp. Consp. i. p. 420, no. 6, nec Brisson; Coll. Delattre, p. 9.
Acridotheres fuliginosus, Blyth, J. A. S. B. xiii. p. 362, *av. juv.*, "Macao" (1844).
Acridotheres philippensis (Temm.), apud Swinhoe, Ibis, 1870, p. 352, "Hainan."
Acridotheres cristatellus (Linn.), Swinhoe, P. Z. S. 1871, p. 384, "S. China to Shanghai, westwards to Szechuen, Hainan, Formosa."

Hab. Luzon, January and April (*Meyer*).

Two examples in adult plumage. The female (*fide* Meyer) has the wing a quarter of an inch shorter than the male. Dr. Meyer has this note on one of the labels, "Said to have been introduced from China"—a tradition already recorded by Mr. Swinhoe (Ibis, 1867, pp. 387, 388). There is no difference to be detected between these Luzon individuals and examples from Hainan and Shanghai.

Dr. Cabanis (Mus. Hein. i. p. 205, no. 968), as in so many other instances, was the author who first cleared up the confusion into which the synonymy of this species had been thrown. His identification of *Pastor cristatellus* (Gm.), Wagler (Syst. Av. *Pastor*, p. 90, no. 14, "China and Java"), with *Pastor griseus*, Horsf. (=*Acridotheres javanicus*[1], Cab. *l. c.*), is undoubtedly correct.

Turdus griseus, Gm., apud Bp. (*l. c.*), nec Gm., agrees with the Javan species. *Gracula cristatella*, L., apud Bp. (*op. cit.*) is probably *Pastor fuscus*, Wagler (*op. cit.*), of India and Burma, and not, as suggested by Mr. Swinhoe (Ibis, 1867, p. 387), *Acridotheres siamensis*, Swinh. P. Z. S. 1863, p. 303, which is a representative form of the Philippine *A. cristatellus*, but to be readily distinguished by its pure white under tail-coverts, broadly white-tipped rectrices, and unicoloured bill.

Merula philippensis, Briss. Orn. ii. p. 278, no. 35, "Philippines," = *Paradisea tristis*, Linn. S. N. i. p. 167, no. 3 (1766), ex Briss., the *Acridotheres tristis* of modern authors, is now well known to be indigenous to India and Ceylon only, although Brisson expressly states that his type specimen was sent to M. Aubrey from the Philippines.

STURNIA, Lesson.

127. STURNIA VIOLACEA.

Rubetra philippensis major, Brisson, Orn. iii. p. 446, no. 32, pl. 22. fig. 3, "Philippines" (*adult*).
Le grand Traquet des Philippines, Buffon, Hist. Nat. Ois. v. p. 230; D'Aubenton, Pl. Enl. 185 fig. 2.
Motacilla violacea, Boddaert, Tabl. Pl. Enl. p. 11 (1783), ex D'Aubent.
Motacilla philippinensis, Gm. S. N. i. p. 968, no. 101 (1788), ex Briss.
Pastor ruficollis, Wagler, Syst. Av., *Pastor*, no. 19, "Manilla" (1829); v. Martens, J. f. O. 1866, p. 15, no. 64.
Lamprotornis pyrrhogenys, Temm. & Schlegel, Faun. Jap. *Aves*, p. 86, "Japan, Borneo" (1842); Walden, Tr. Z. S. viii. p. 78, "Celebes."
Lamprotornis pyrrhopogon, Temm. & Schlegel, *tom. cit.* pl. 46.
? *Calornis albifrons*, Blyth, J. A. S. B. 1861, p. 96, "Philippines," *fide* Swinhoe, P. Z. S. 1863, p. 302, no. 217.

[1] Daudin (Orn. ii. p. 286, 1800) bestowed the specific title of *griseus* on Le Vaillant's *Martin gris de fer* (Ois. d'Afr. pl. 95. f. 2), which is the same species as *Turdus gingianus*, Lath. Ind. Orn. i. p. 362, based on *le petit Martin de Gingi* of Sonnerat (Voy. Indes, ii. p. 194). Horsfield's title of *griseus* for the Javan *Acridotheres* was therefore anticipated, and Dr. Cabanis proposed that of *javanicus*, which stands.

Le Merle dominiquain des Philippines, Montb. Hist. Nat. Ois. iii. p. 396 (*juv.*); D'Aubenton, Pl. Enl. 627. fig. 2.

Turdus dominicanus, Boddaert, *op. cit.* p. 38 (1783), ex D'Aubent.

Turdus dominicanus, Gm. *tom. cit.* p. 836, no. 123 (1788), ex Montb.

There can be no doubt that the Philippine bird described by Brisson (*l. c.*) and figured by D'Aubenton, pl. 185. fig. 2, belongs to the same species as that figured in the 'Fauna Japonica,' pl. 46. That the Japanese species is a winter resident in the Philippines, we are assured by Mr. Swinhoe (P.Z.S. 1863, p. 302, no. 217). And *Pastor ruficollis*, described by Wagler from a Manilla specimen, is also undoubtedly the same as the Japanese species. I have already shown that it ranges as far as Celebes (*l. c.*); and Schlegel (*l. c.*) notes it from Borneo. It has not, however, been observed in China nor in the island of Formosa.

The type of *Turdus dominicanus*, Bodd., was described by Montbeillard (*l. c.*) from an individual said to have been obtained in the Philippines by Sonnerat. It may, however, have been in reality of African origin. This example, so indifferently figured by D'Aubenton (*l. c.*), and insufficiently described by Montbeillard (*l. c.*), was clearly that of an immature bird. Wagler (*l. c.* no. 20) appears to have been the first author who referred *Gracula sturnina*, Pallas,=*Sturnus dauricus*, Pallas, to this species. He states that it inhabits the Philippines and China, and that it nests in Dauria. *G. sturnina*, Pallas, is known to winter in Java, Sumatra, Malacca, and Tenasserim, to occur during its migration in North China, and to breed in Dauria. Does it also occur along with *S. violacea* (=*pyrrhogenys*) in the Philippines during the winter? If so, it may have supplied the type of D'Aubenton's 627th plate. If *S. sturnina* is found not to migrate to the Philippines, then *S. dominicanus* must become a synonym of *S. violacea.* One of the salient differentiating characters of *T. sturnina*, even in the earliest plumage, is the occipital spot formed by the black or purple-black tips of the occipital feathers. In Mr. Blyth's description of *Calornis albifrons*, taken from an undoubted but immature Philippine individual (*cf.* Swinhoe, *l. c.*), this spot is stated to be present. It is true that Mr. Swinhoe identified it with *S. pyrrhogenys*, a species which I believe never exhibits an occipital black spot. Unless *T. dominicanus* prove to be an African form, it is a title that must fall, being junior to both *S. violacea* and *S. sturnina.*

The synonymy of *Gracula sturnina* is as follows:—

Gracula sturnina, Pallas, Reisen Russischen Reichs, iii. p. 695, no. 11, "South Dauria" (1776).

Sturnus dauricus, Pallas, Act. Holmiens. 1778, p. 197, pl. 7; Zoogr. Rosso-Asiatica, i. p. 422, no. 72 (1811–31).

Turdus striga, Raffles, Tr. Linn. Soc. xiii. p. 311, no. 8, "Sumatra" (1821).

Pastor sturninus (Pallas), Wagler, Syst. Av. *Pastor*, no. 20 (1827).

Pastor malayensis, Eyton, P. Z. S. 1839, p. 103, "Malaya;" Blyth, J. A. S. B. 1846, p. 35, "Common at Malacca."

Pastor dominicanus (Gm.), Strickl. J. A. S. B. 1847, p. 470.

Sturnius pyrrhogenys (Temm. & Schlegel), Swinhoe, Ibis, 1861, p. 338, "between Takoo and Peking," nec T. & S.

Calornis dauricus (Pallas), Horsf. & Moore, Cat. Mus. E. I. C. ii. p. 544, no. 814.

Temenuchus dauricus (Pall.), Swinhoe, P. Z. S. 1871, p. 384, no. 365.

CALORNIS, G. R. Gray.

128. * CALORNIS PANAYENSIS.

Le petit Merle ou Musicien de l'isle Panay, Sonn. Voy. Nouv. Guin. p. 115, pl. 73.

Muscicapa panayensis, Scop. Del. Fl. Faun. Insubr. ii. p. 96, no. 110, ex Sonn. (1786); Walden, Tr. Z. S. viii. p. 79.

Turdus cantor, Gm. S. N. i. p. 837, no. 124 (1788), ex Sonn.; v. Martens, J. f. O. 1866, p. 15, no. 66.

Le Merle des colombiers, Montb. Hist. Nat. Ois. iii. p. 381, "Philippines."

Turdus columbinus, Gm. *op. cit.* p. 836, no. 122 (1788), ex Montb.

Turdus cantor, Lath., Kittliz, Kupft. p. 11, pl. 15. f. 1, "Pbilippines."

Lamprotornis panayensis (Scop.), Cab. M. Hein. i. p. 200.

Calornis panayensis, Scop., et *Calornis columbina,* Gm., apud G. R. Gray, Hand-list, nos. 6373, 6384.

Hab. Zebu, April; Luzon, January; Negros, March (*Meyer*).

The Philippine *Calornis*, for long confounded by several authors with the Javan and the Malaccan species, was first recognized as distinct by Dr. Cabanis (*l. c.*). A good series in Dr. Meyer's collection enables me to fully confirm the opinion of Dr. Cabanis.

It is a large species of a dark bronze-green colour, and ranges nearest to *Calornis neglecta*, nob. As labelled by Dr. Meyer, the sexes do not differ; we must therefore assume that examples in streaked plumage are young individuals. The eggs are described in 'The Ibis,' 1872, p. 97.

Lamprotornis magnus, von Rosenb., Schlegel (Ned. Tijdsch. Dierk. iv. p. 18, "Island of Soëk"—1871), is a *Calornis* with the two pairs of middle rectrices exceedingly developed and measuring more than twice the length of the body.

EULABETINÆ.

SARCOPS, Walden.

129. * SARCOPS CALVUS.

Merula calva, Brisson, Orn. ii. p. 280, no. 36, "Philippines."

Gracula calva, Linn. S. N. i. p. 164, no. 2 (1766), ex Brisson; v. Kittlitz, Kupft. p. 9, pl. xiii. f. 2.

Le Goulin, Montb. Hist. Nat. Ois. iii. p. 420.

Le Goulin gris, Cuv. R. A. i. p. 381 (1829).

Gymnops[1] *calvus* (Gm.), Cuv., *l. c.*
Gymnops griseus, Cuv., ap. Meyen, Nov. Acta Acad. C. L. C. Nat. Cur. xvi. suppl. prim. p. 78.
Gymnops tricolor (L. S. Müller), ap. G. R. Gray, Hand-list, no. 6275, nec L. S. Müller.
Gymnops calvus (Linn.), Walden & Layard, Ibis, 1872, p. 103.

Hab. Luzon (*mus. nostr.*); Guimaras, Negros (*Meyer*).
Inhabitants from localities cited identical. Sexes (*fide* Meyer) alike.

The two following species of Icteridæ are described and figured by Sonnerat, who informs us that they are found at Antigua (Panay), and also on the New Continent. Beyond his statement, there is not a tittle of evidence in favour of their Philippine habitat.

(1) *Le Troupiale rouge d'Antigue*, Sonnerat, Voy. Nouv. Guin. p. 113, pl. 68.

Xanthornus holosericeus ♂, Scopoli, Del. Fl. Faun. Insubr. ii. p. 88, no. 36 (1786), ex Sonn.; G. R. Gray, Hand-list, no. 6501; Sclater, Cat. Am. Birds, no. 831; Cab. Mus. Hein. i. p. 190, no. 919.

Oriolus ruber, Gm. S. N. i. p. 388, no. 34 (1788), ex Sonn.; Bp. Consp. i. p. 129.
Amblyramphus bicolor, Leach, Zool. Misc. p. 82, pl. 36, "Cayenne" (1814).
And

(2) *Le Troupiale jaune d'Antigue*, Sonnerat, *l. c.* pl. 59.
Xanthornus holosericeus ♀, Scopoli, *l. c.* (1786), ex Sonn.
Oriolus flavus, Gm. *tom. cit.* p. 389, no. 35 (1788), ex Sonn.
Xanthosomus flavus (Gm.), Sclater, *op. cit.* no. 830; G. R. Gray, *op. cit.* no. 6491.

FRINGILLIDÆ.

Fringillinæ.

Pyrgita, Cuvier.

130. Pyrgita montanus.

Fringilla montana, Linn. S. N. i. p. 324, no. 37, "Europe" (1766); Cab. Mus. Hein. i. p. 156, no. 792.

The occurrence of the Tree-sparrow in the Philippines, in itself not unlikely, rests solely on the authority of Dr. Cabanis (*l. c.*)

Passer jugiferus, Temm., Bp. Consp. i. p. 508, "Philippines" (1850), is stated by Mr. Blyth (Ibis, 1870, p. 172) to be the same as his *Passer flaveolus*, J. A. S. B. xiii. p. 946, "Arracan" (1844); and he regards its Philippine habitat as dubious.

[1] Previously employed by Spix (Av. Brasil. i. p. 11, 1824) for *Falco aterrimus*, Temm. Pl. Col. pl. 37, = *Daptrius ater*, Vieillot (Analyse, p. 69a).

PLOCEIDÆ.

Ploceinæ.

Padda, Reichenbach.

131. Padda oryzivora.

The cock Padda, or Rice-bird, Edwards, Nat. Hist. i. pl. 41, "China."
Loxia oryzivora, Linn. Amœn. Acad. iv. p. 243, no. 16 (1759), ex Edwards; v. Martens, J. f. O. 1866, p. 14, no. 59; Walden, Tr. Zool. Soc. viii. p. 72.

Observed by Dr. v. Martens in the Museum of the Military Library at Manilla, and, in all likelihood, an indigenous species.

Munia, Hodgson.

132. * Munia jagori.

Munia (Dermophrys) jagori, Cab., v. Martens, J. f. O. 1866, p. 14, no. 60, "Luzon."
Dermophrys jagori, Cab. *op. cit.* 1872, p. 316, no. 6.
Munia minuta (Meyen), G. R. Gray, Hand-list, no. 6761.

Hab. Zebu, April (*Meyer*).

Two examples (♂ ♀, *fide* Meyer) of an almost black-headed *Munia* were obtained in Zebu by Dr. B. Meyer. Both have the upper tail-coverts glistening dark chestnut, and the middle pair of rectrices rich glistening ferruginous. In the male the black extends from the breast to the under tail-coverts, forming a broad, mesial, black, continuous band. In the female this black mesial band is interrupted by a chestnut band crossing the breast. In examples of *M. rubro-nigra* from the Deyra Doon, Bengal, Tippera, Mymensing, and Tongoo, as well as of *M. formosana* from Formosa, and *M. brunneiceps* from Celebes and Banjarmassing, the black mesial band is not continuous, nor is it so broadly developed on the abdomen. In *M. rubro-nigra* the whole head is intensely black. In *M. formosana* the occiput and nape are faded brown; and Mr. Swinhoe has established that this is normal in the adult bird (Ibis, 1865, p. 356). The Philippine, Celebean, and South-Bornean forms do not appear to have the head so intensely black as in *M. rubro-nigra*, although darker than in *M. formosana*.

In the Philippine examples the head and nape are not of a true black, but rather of a dark brown. This has also been pointed out by Dr. Cabanis (*l. c.*). In *M. brunneiceps* of Celebes the head is still less black, and the black abdominal band is interrupted.

As the synonymy of *M. atricapilla* and *M. rubro-nigra*, thoroughly disentangled by Mr. Blyth (Cat. Calc. Mus.) and by Mr. Moore (Cat. E. I. C. Mus.), has again been thrown into confusion by Mr. Gray (Hand-list), it may be useful to recapitulate it.

Munia atricapilla.

The Chinese Sparrow, Edwards, Nat. Hist. Birds, i. p. 43, pl. 43, ♂.
Coccothraustes sinensis, Brisson, Orn. iii. p. 235, no. 7, ex Edwards.
Loxia malacca, var. *β*, Linn. S. N. i. p. 302, no. 16, ex Brisson.
Loxia atricapilla, Vieillot, Ois. Chant. p. 84, pl. 53 (1805).

Distinguished by the absence of a black mesial abdominal band; otherwise like *M. rubro-nigra.* The exact range remains to be ascertained. Blyth (*op. cit.* p. 337) mentions having seen it from Pinang. Moore (*op. cit.* ii. p. 508, no. 775) notes a drawing of the species from Sumatra, and an example from Pinang. Under the title of *Munia sinensis* (Brisson), Swinhoe includes the species in his list of the Birds of China (P. Z. S. 1871, p. 384, no. 368). Nothing more has been recorded of its distribution.

Munia rubro-nigra.

Munia rubro-nigra, Hodgs. As. Researches, xix. p. 153, "Nipaul" (1836).
Lonchura melanocephala, M'Clelland, P. Z. S. 1839, p. 163, "Assam."
Spermestes melanocephalus, Hodgs. Gray's Zool. Misc. p. 84 (1844).
Munia atricapilla (Vieill.), G. R. Gray, Hand-list, no. 6759, nec Vieillot.

Said by Mr. Layard to occur in Ceylon[1] (Ann. & Mag. Nat Hist. 1854, vol. xiii. p. 258), this species appears to be rare, if even known, in Southern India. It is common in the British territories to the north-east and south-east of Bengal, such as Assam, Tippera, Arracan, Tenasserim, Burma, also in Bengal, and along the base of the Himalayas.

133. * MUNIA MINUTA.

Fringilla minuta, Meyen, Nov. Act. Acad. C. L. C. Nat. Cur. xvi. suppl. prim. p. 86, pl. 12. fig. 2, "Manilla" (1834); v. Martens, J. f. O. 1866, p. 14, no. 61.

Hab. Sugar-plantations of Luzon (*Meyen*).

As described and depicted by Meyen, this *Munia*, with the exception of the chin and throat, is bright rufous. I have never met with examples agreeing with Meyen's description, although he states that this Finch occurs in numberless troops in the Luzon sugar-plantations. It may be distinct from *M. jagori*, and is so treated by Dr. v. Martens (*l. c.*). The *M. minuta* of Mr. Gray's Hand-list, no. 6761, refers to examples of *M. jagori*.

OXYCERCA, G. R. Gray.

134. * OXYCERCA JAGORI.

Uroloncha jagori, Cab. J. f. O. 1866, p. 14, no. 62, "Luzon" (*descr. nulla*).
Oxycerca jagori, Cab. *op. cit.* 1872, p. 317, no. 7 (*descr. princeps*).

Hab. Luzon, in February, ♂, ♀; bill, feet, and claws bluish grey (*Meyer*).

Of the same type as *Munia topela*, Swinh., but of greater dimensions. The chin and

[1] Its occurrence in Ceylon as an indigenous species has not been confirmed.

throat dark chocolate-brown, without a tinge of ferruginous. Nor does this colour descend so low as its corresponding shade in *M. topela*. The undulations on the under surface, which are of the same character as in *M. topela*, are bolder and larger. Quite distinct from *M. punctularia* (Linn.) and *M. nisoria* (Temm.).

Coccothraustes philippinensis, Brisson, Orn. iii. p. 232, no. 6, pl. xii. fig. 1, ♂, pl. xviii. figs. 1, 2, nest (1760).

Loxia philippina, Linn. S. N. i. p. 305, no. 36 (1766), ex Brisson; v. Martens, J. f. O. 1866, p. 14.

Gros-bec des Philippines, D'Aubenton, Pl. Enl. 135. fig. 2.

Le Toucnam-courvi, Buffon, Hist. Nat. Ois. iii. p. 465.

Loxia maculata, L. S. Müller, Suppl. p. 150, no. 56 (1776), ex D'Aubent.

Originally and minutely described by Brisson from examples in M. Aubrey's cabinet, said to have come from the Philippines. Since that date (1760) there is no evidence of any species of *Ploceus* inhabiting those islands. Camel does not include any members of the genus; and he would certainly have noticed a bird so remarkable for the conspicuous nest it constructs. Dr. Jerdon (Birds of India, ii. p. 348) states that he is convinced that the figure in D'Aubenton's plate (*l. c.*) refers to *P. hypoxanthus* (Daud.[1]).

In this opinion I find it impossible to concur. D'Aubenton's figure fairly depicts the common Indian Weaverbird, *Ploceus baya*, Blyth (J. A. S. B. 1844, p. 945), the belly being represented pure white, while in the so-called *P. hypoxanthus* the belly and under tail-coverts are rich golden. According to Buffon (*l. c.*), D'Aubenton's figure was taken from a male example of Brisson's *Coccothraustes philippinensis*, on which Linnæus founded *Loxia philippina*. Brisson's description completely agrees with *P. baya*, Blyth, and cannot apply to *P. hypoxanthus* of the Indian authors. Moreover Brisson describes and figures the nest of his Weaverbird, and unmistakably represents the pensile nest of *P. baya*, Blyth, and not the non-pensile nests of the other known Asiatic Weavers *P. manyar* (Horsf.), *P. bengalensis* (Linn.), and *P. javanensis* (Less.). It is satisfactory to find that Hermann (Observ. Zool. p. 205, 1804) identified an example of a Weaverbird, sent from Tranquebar along with its *pensile* nest, as *Loxia philippina*, Linn.; for he evidently describes a young male of *P. baya*, Blyth.

"*Toucnam-courvi*," the supposed native name in the Philippines, according to Brisson (*l. c.*), does not sound Tagalish, as already remarked by Dr. v. Martens (*l. c.*); while, on the other hand, it closely resembles the Malay name for the common Weaverbird,

[1] *Loxia hypoxantha*, Sparrman, Mus. Carls. fasc. iii. no. 71, "Sumatra" (1788).

Loxia hypoxantha, Daudin, Traité d'Ornith. ii. p. 429 (1800), ex Sparrm.

Above *uniform* olive-green; forehead and undersurface bright yellow. Evidently not a *Ploceus* (*cf.* Sundevall, Kritisk, p. 12, no. 711). The well-marked species to which the specific title of *hypoxanthus* has been applied by Jerdon, Blyth, and Dr. Pucheran (Rev. Zool. 1854, p. 67), and which is found, in suitable localities, throughout Burma, must take the title of *Ploceus javanensis* (Lesson), Traité, p. 446, "Java" (1831).

P. baya, Blyth, in Ceylon, and which Mr. Layard (Ann. & Mag. Nat. Hist. xiii. 2nd series, p. 257, no. 158) renders *Tokanam cooroovi*, *i. e.* Basket-maker bird.

Therefore, until authentic examples of a Philippine species of *Ploceus* sufficiently agreeing with Brisson's original description are obtained, it will be most in accordance with existing evidence to refer the common Indian and Ceylon Weaverbird, *P. baya*, Blyth, to the Linnæan species *Loxia philippina.*

The *Ploceus philippinus* of Gray's Hand-list, no. 6612, and stated to be from the Philippines only, is *not* represented in the British Museum.

The following species, stated by Sonnerat to inhabit the island of Panay as well as the Cape of Good Hope, is now known to be restricted to the African continent.

La veuve de l'isle de Panay, Sonnerat, Voy. Nouv. Guin. p. 117, pl. 75.
Emberiza signata, Scopoli, Del. Fl. Faun. Insubr. ii. p. 95, no. 103 (1786) ex Sonn.
Emberiza panayensis, Gm. S. N. i. p. 885, no. 69 (1788), ex Sonn.[1]
Veuve à poitrine rouge, D'Aubenton, Pl. Enl. 647.
Fringilla ardens, Boddaert, Tabl. d. Pl. Enl. p. 39 (1783), ex D'Aubent.
Vidua rubritorques, Swainson, Birds West Africa, i. p. 174 (1837).
Pentheria rubritorques (Sw.), Bp. Consp. i. p. 448.
Niobe ardens (Bodd.), G. R. Gray, Hand-list, no. 6669.

COLUMBÆ.

TRERONIDÆ.

Osmotreron, Bonaparte.

135. Osmotreron vernans.

Columba viridis philippensis, Briss. Orn. i. p. 143, pl. 11. f. 2, "Philippines" (1760).
Columba vernans, Linn. Mantissa Plant. p. 526 (1771), ex Briss.; Walden, Tr. Z. S. viii. pp. 81, 113.
Pigeon verd des Philippines, D'Aubenton, Pl. Enl. 138.
Columba viridis, L. S. Müller, Suppl. p. 132 (1776), ex D'Aubent.
Le Pigeon verd de l'isle de Luçon et d'Antigue, Sonn. Voy. N. Guin. p. 110, pl. 64, ♂, 65, ♀ (1776).
Columba viridis, Scopoli (*mot. propr.*), Del. Fl. Faun. Insubr. ii. p. 94, no. 95 (1786), ex Sonn.
The purple Pigeon, Brown, Illustr. p. 42, p. 18, "Java" (1776).
Columba purpurea, Gm. S. N. i. p. 784, no. 61 (1788), ex Brown.

Hab. Luzon, April (*Meyer*).

A single example, a male, but erroneously marked a female by the collector, is contained in Dr. Meyer's collection. It agrees in dimensions and colouring with Malaccan, North-Bornean, Celebean, and Cambodjan (*mus. nostr.*).

[1] Gmelin erroneously quotes Sonnerat's 76th plate.

136. * Osmotreron axillaris.

"*Treron axillaris,* G. R. Gray," Bp. Compt. Rend. xxxix. p. 875 (1854) *patr. incert.*; Conspectus, ii. p. 13 (1857).

Treron aromatica, Gm., ap. G. R. Gray, Cat. Brit. Mus. *Columbæ* (1856), p. 10, "Philippines," nec Gm.

Treron amboinensis (Müller), ap. G. R. Gray, Hand-list, no. 9079, nec Müller.

Treron aromatica (Gm.), ap. Schlegel, Nederl. Tijdschr. Dierk. 1863, p. 64, "Philippines," nec Gm.; Mus. Pays-Bas, *Columbæ,* p. 53 (March 1873); Bp. Icon. Pig. pl. 7.

Hab. Luzon, Guimaras, Negros (*Meyer*).

A large series of the Philippine maroon-backed *Osmotreron* was obtained by Dr. Meyer from the localities cited; and they in no way differ among one another. They belong to the same subsection as *Osmotreron aromatica* (Gm.) of the Moluccas (*cf.* Wallace, P. Z. S. 1863, p. 33, & Ibis, 1863, p. 319), in which the undercoverts of the tail *in both sexes* are white, or yellowish white, without any markings. From the Moluccan species *O. axillaris* it differs in being somewhat larger, by having a large and very powerful bill, by the maroon mantle covering a larger surface of the back and being of a lighter shade, and by the ventral plumage and the thigh-coverts being almost bright yellow mixed with *very* dark green. The middle toe measures one inch, and in *O. aromatica* an eighth less; the corneous part of the maxilla seven-sixteenths against five-sixteenths of an inch in the Moluccan bird.

The title *axillaris* refers to the black edge of the shoulder in this species (*fide* Bp. Icon. Pig.). This part and the lesser shoulder-coverts are nearly black, being very dark slate-colour in fully adult males.

Professor Schlegel (Mus. Pays-Bas, *Columbæ,* p. 53) makes *O. axillaris,* G. R. Gray, apud Bp. Consp. ii. p. 13, equal to *T. griseicauda,* G. R. Gray; but Bonaparte's diagnosis does not agree with either *O. axillaris* or *O. aromatica.*

Wagler states (Syst. Av. *Columba,* no. 8) that he saw a specimen of his *Columba* (*Osmotreron*) *fulvicollis* among a number of Philippine birds sent to Amsterdam. Prince Bonaparte (Consp. ii. p. 14) also cites the Philippines as being within the range of that species. I can find no other evidence of its Philippine habitat; and Wagler does not include the Philippines when writing on the species at a subsequent date (Isis, 1829, p. 738).

Great confusion still prevails in the synonymy of the "maroon-backed" members of the genus *Osmotreron*; and I therefore add a list of the ten species known to me as falling under this definition:—

Under tail-coverts creamy white and immaculate in both sexes.

(1) *Columba amboinensis*, L. S. Müller, Suppl. p. 132, no. 35, ex Pl. Enl. 163[1] (1776).

Columba aromatica, Gm. S. N. i. p. 778, no. 47, "Amboina," ex Brisson, Orn. i. p. 145, no. 39, "Amboyna."

Hab. Bourou and Amboyna (*Wallace*).

(2) *Treron axillaris*, G. R. Gray, *l. c.* "Philippines."

Hab. Luzon, Negros, Guimaras (*Meyer*).

Under tail-coverts creamy immaculate white in male, mottled with greenish in female.

(3) *Columba pompadora*, Gm. S. N. i. p. 775, no. 9, "Zeyloniæ," ex Brisson, Illustr. pl. 19, ♂, 20, ♀, "Ceylon;" Bp. Icon. Pigeons, pl. xi. f. 1, ♀.

Treron flavo-gularis, Blyth, J. A. S. B. xxvi. p. 225, "Ceylon" (1857).

Hab. Ceylon (*mus. nostr.*).

Under tail-coverts green, with cream-coloured tips in both sexes.

(4) *Treron chloroptera*, Blyth, J. A. S. B. 1845, p. 852, "Nicobars."

Hab. Nicobars (*Blyth*); Andamans (*mus. nostr.*).

Under tail-coverts cinnamon in male, yellowish white, mottled with green, in female.

(5) *Vinago affinis*, Jerd. Madr. J. L. & Sc. xii. p. 13, ♀.

Vinago malabarica, Jerd. Illustr. Ornith. letterpress to pl. 21, ♂, "Malabar" (March, 1845); Bp. Icon. Pigeons, pl. xi. fig. 2, ♀, pl. xii. ♂.

Hab. Peninsular India (*Jerdon*).

(6) *Treron pulverulenta*, Wallace, Ibis, 1863, p. 319, "Java."

Treron curvirostra, Vieill., Bp. Icon. Pigeons, pl. vi.

Hab. Java (*Wallace*).

(7) *Treron griseicauda*, G. R. Gray, Mus. Brit. *Columbæ*, p. 10, "*patr. incert.*" (1856).

Hab. Celebes, Sula Islands (*Wallace*).

A large ochreous pectoral patch; under tail-coverts in male dark cinnamon, in female creamy white dashed with pale cinnamon.

(8) *Columba olax*, Temm. Pl. Col. 241, ♂, "Sumatra" (1823).

Hab. Sumatra, Malacca (*mus. nostr.*); Java (*Schlegel*).

(9) *Osmotreron phayrei*, Blyth, J. A. S. B. 1862, p. 344.

Hab. Assam, Sylhet, Arakan, Pegu, Martaban, rare in Lower Bengal (*Blyth*); Tongoo (*mus. nostr.*).

[1] Buffon (H. N. Ois. ii. p. 528) expressly states that this figure was taken from Brisson's *Pigeon vert d'Amboine*.

Under tail-coverts cinnamon in the male, green edged with white and tinged with cinnamon in the female; head and neck ferruginous chestnut.

(10) *Columba fulvicollis*, Wagler, Syst. Av. *Columba*, no. 8 (1827), ex Temm.; Wallace, Ibis, 1865, p. 375.

Columba aromatica, var., Temm. & Knip, Pig. p. 30, pl. 6, "Batavia;" Pig. et Gallin. i. pp. 53, 442.
"*Columba ferruginea*, Reinhardt, MS." Wagler, Isis, 1829, p. 738.
Columba cinnamomea, Temm. Recueil d'Ois. livr. 93, "Pontianak" (1835).
Treron tenuirostre, Eyton, Ann. Nat. Hist. xvi. p. 230, "Malacca" (1845).

Hab. Borneo (*Temm.*); Malacca (*Eyton*); Sumatra (*Wallace*).

LEUCOTRERON, Bonaparte.

137. * LEUCOTRERON GIRONIERI. (Pl. XXXIV. fig. 1.)

Leucotreron gironieri, J. Verr. et Des Murs, Ibis, 1862, p. 342, pl. 12, "Tallawan (Philippines)" (*juv.*).
Ptilopus geversi, Schlegel, Ibis, 1863, p. 120.
Ptilopus hugoniana, Schlegel, Nederl. Tijdschr. Dierk. 1863, p. 60, pl. 3. f. 2, "Luçon" (*juv.*); Wallace, Ibis, 1865, p. 378.
Ptilopus hugonianus, Schlegel, Mus. Pays-Bas, *Columbæ*, p. 36 (March, 1873).

Hab. Luzon, Guimaras (*Meyer*).

In the adult plumage this species has the entire head, neck, and upper breast pale ashy white, the occiput and nape being faintly washed with light green. Bordering the grey of the breast and intervening between it and the ashy green of the lower parts is a broad dark purple band, rather deeper in the middle than at the sides. The under tail-coverts are cinnamon-colour. The under surface of the rectrices is slate-colour, with a broad terminal almost white band, which above appears yellow; the chin and throat and the space before the eye black; remainder of the upper plumage bright rich green, with a golden gloss in certain lights. From a Guimaras example, noted as a male by Dr. Meyer.

Another male example from Luzon has the abdominal region of a still more ashy green, some of the ventral plumage being tawny. An individual from Guimaras, and noted a female, has the abdominal region deep green, and the dark purple pectoral band is represented by a large triangular patch of the same colour, a few purple feathers on each side only indicating the position of the band. The pale ashy white of the nape is more deeply tinged with green. Another Guimaras female (*fide* Meyer) has the head, nape, and breast green, the forehead alone being bluish grey; the abdomen is mixed tawny ashy green; on the breast is a limited purple triangular patch. This individual resembles very nearly the figure in 'The Ibis' (*l. s. c.*), only that in the plate by Jennens the purple patch is represented much too low down, and the under tail-coverts are not dark enough. It also agrees well with the description given by Professor Schlegel (*l. c.*).

A fourth Guimaras individual (female, *fide* Meyer) has the plumage still more intensely green than the last; the bluish grey of the forehead is less distinct, and the uniform deep green of the breast is only broken by a faint indication of dark purple at the tips of two or three feathers. The under tail-coverts are mostly pale cinnamon. In all five examples the mandible is carmine at its base, the remainder of the bill yellow, the feet carmine.

It is probable that in the young birds the head and breast are green, and that the dark purple pectoral patches are rudimentary indications of the broad pectoral band of the adult. As in *Leucotreron gularis*, of which this Philippine species is a beautiful representative form, the first primary is abruptly attenuated near the end.

RAMPHICULUS, Bonaparte.

138. * RAMPHICULUS OCCIPITALIS.

Ptilonopus occipitalis, G. R. Gray, List Birds Brit. Mus. *Gallinæ*, iii. p. 1, "Philippines" (1844), *descr. nulla*; Gray & Mitch. Genera, ii. p. 467, pl. 118; List Birds Brit. Mus. *Columbæ*, p. 7, no. 17 (1856); Wallace, Ibis, 1865, p. 378; v. Martens, J. f. O. 1866, p. 22, no. 124.

Ramphiculus occipitalis (G. R. Gray), Bp. Compt. Rend. xxxix. p. 878 (1854); Consp. ii. p. 17; Iconogr. Pig. pl. 14.

Osmotreron batilda, Bp. Compt. Rend. *l. c. juv.* "Philippines" (1854); Consp. ii. p. 27; Wallace, *tom. cit.* p. 382; v. Martens, *l. c.* no. 125.

Columba occipitalis (G. R. Gray), Schlegel, Handleiding, i. p. 411 (1857).

Hab. Luzon (*Meyer*).

No difference between the sexes as determined by Dr. Meyer. The young bird was described as distinct by Prince Bonaparte, and the adult and young severally made the type of separate genera.

A Luzon example of *Ptilopus jambu* (Gm.) is stated by Professor Schlegel to be contained in the Leyden Museum (Mus. Pays-Bas, *Columbæ* p. 36). The correctness of the attributed habitat requires confirmation.

PHABOTRERON, Bonaparte.

139. * PHABOTRERON AMETHYSTINA. (Pl. XXXIV. fig. 2.)

Phapitreron amethystina, Bp. Compt. Rend. xl. p. 214, "Philippines" (1855); Consp. ii. p. 28 (1857).

Chlorœnas amethystina (Bp.), Schlegel, Mus. Pays-Bas, *Columbæ*, p. 80.

140. * PHABOTRERON LEUCOTIS.

Columba leucotis, Temm. Pl. Col. 189, "environs de Manille" (1823); Walden & Layard, Ibis, 1872, p. 104, "Isl. of Negros."

Phapitreron leucotis (Temm.), Bp. Compt. Rend. xxxix. p. 879 (1854); Consp. ii. p. 28.

Chlorœnas leucotis (Temm.), Schlegel, Mus. Pays-Bas, *Columbæ*, p. 78, "Luzon."

Hab. Luzon and Guimaras (*Meyer*); Negros (*L. C. Layard*).

The sexes do not differ. Examples from all three localities are undistinguishable.

CARPOPHAGA, Selby.

141. CARPOPHAGA ÆNEA.

Palumbus moluccensis, Briss. Orn. i. p. 148, no. 41, "ex Moluccis insulis" (1760).
Columba ænea, Linn. S. N. i. p. 283, no. 22 (1776), ex Briss.
Pigeon Ramier des Moluques, D'Aubent. Pl. Enl. 164.
Columba moluccensis, L. S. Müller, Suppl. p. 133, no. 35 *d* (1776), ex D'Aubent.
Columba sylvatica, Tickell, J. A. S. B. 1833, p. 581, "Jungles of Borabhúm & Dholbhúm."
Carpophaga pusilla, Blyth, J. A. S. B. 1849, p. 816, "Nilgiris" *errore.*
Carpophaga chalybura, Bp. Compt. Rend. xxxix. p. 1074, "Philippines" (1854); Consp. ii. p. 32; Iconogr. pl. 42.
Carpophaga sylvatica "(Tickell)," Blyth, J. A. S. B. 1861, p. 97, "Philippines."

Hab. Luzon, January, April; Negros, March (*Meyer*).

Examples from Ceylon, India, Burma, the Andamans, and Java cannot be specifically separated from this Philippine species. Mr. Blyth has already remarked (*l. c.*) that a young Philippine example before him did not differ from the Indian and Burmese species. The Sumatran, Bangkan, Sumbawan, and Flores forms are also considered to belong to *C. ænea* by Professor Schlegel (Mus. Pays-Bas, *Columbæ*, p. 85), although he keeps *C. sylvatica* apart as being a smaller race. And Mr. Wallace (Ibis, 1865, p. 383) includes Lombok and the Malay peninsula within the range of *C. ænea.*

Bonaparte (*l. c.*) relied on the Philippine bird having the head and neck whiter, and on the under surface of the tail being paler and of a steel-grey, and not brown-black. The under surface of the rectrices is certainly somewhat paler; but the difference between the colouring of the head and neck, as described by Bonaparte, is not apparent in Dr. Meyer's examples, which are in perfect plumage. The chief difference they exhibit is in the colouring of the breast, which appears to be more tinged with vinous; and thus the entire under surface is more or less vinous, and not the abdomen only as in *C. ænea.* On the head, nape, and back of the neck also the rather deep vinous shading of *C. ænea* is absent. Bonaparte's plate (*l. c.*) so little resembles these Philippine examples that it cannot be relied on.

Carpophaga pickeringi, Cassin, Pr. Ac. Philad. vii. p. 228 (1854), and U.S. Expl. Exped. pl. 27, 2nd ed., obtained on Mangsi Island, one of the Sooloo archipelago, seems to be a distinct species, with light-cinereous under tail-coverts, and consequently related to *C. perspicillata.*

Carpophaga paulina (Temm.), ex Celebes, is always readily to be distinguished by its intensely vinous breast, and by its bright rufous nape. Yet an intermediate form is said to also occur in Luzon (*cf.* Schlegel, Nederl. Tijdschr. Dierk. 1866, p. 201; Mus. Pays-Bas, *Columbæ*, p. 85)—the Philippine habitat, however, only resting on a single example, said to have been obtained in Luzon by M. H. Gevers.

The following measurements are taken (the Luzon male excepted) from examples in full plumage.

Carpophaga insularis, Blyth, apparently peculiar to the Nicobars, is a perfectly distinct species, allied to *C. perspicillata*.

	Longitudo rostr.	alæ.	caudæ.	
C. ænea	0·64	9·00	6·00.	Java.
,, ...	0·64	9·12	6·62.	Sarawak.
,, ♀	0·64	9·25	6·50.	Busan, N. Borneo.
,, ...	0·64	9·25	6·37.	Tongoo, Burma.
,, ...	0·64	9·12	6·25.	Maunbhoom.
,, ♀	0·64	9·25	6·25.	Kyodan, Salween river.
,, ...	0·60	8·25	5·62.	Malabar.
,, ♂	0·60	8·25	5·62.	Dambool, Ceylon.
,, ...	0·60	8·25	5·75.	Cocarry, Ceylon.
,, ...	0·55	8·00	5·62.	Ceylon.
C. chalybura ♂	0·64	9·50	6·25.	Luzon.
,, ♀	0·64	9·25	6·12.	,,
,, ♀	0·60	9·12	6·00.	,,
,, ♂	0·64	9·64	6·75.	Negros.

Carpophaga perspicillata, (Temm.) Pl. Col. 246, was described from the Philippines and the Moluccas. Professor Schlegel (Nederd. Tijdschr. Dierk. 1866, p. 195) doubts the correctness of the Philippine habitat, and confines the range to the Halmaheira group of islands and the island of Bouru. The allied form, *Carpophaga neglecta*, Schl., *l. c.*, occurs only in Ceram, Amboyna, and the island of Boano.

PTILOCOLPA, Bonaparte.

142. * PTILOCOLPA GRISEOPECTUS.

Carpophaga pectoralis, G. R. Gray, List Birds Brit. Mus. iii. *Gallinæ*, p. 7, adult, "Philippines" (1844), *descr. nulla*; nec Wagler, Isis, 1829, p. 740.

Carpophaga griseopectus, G. R. Gray, in Mus. Brit. (1854); List Birds Brit. Mus. *Columbæ*, p. 22, no. 24, "Philippines" (1856); v. Martens, J. f. O. 1866, p. 24, no. 129.

Ptilocolpa griseopectus (G. R. Gray), Bp. Compt. Rend. xxxix. p. 1075, "ins. Philipp." (1854), *descr. princeps*; Consp. ii. p. 34 (1857); Iconogr. Pig. pl. 51; G. R. Gray, Hand-list, no. 9226; Wallace, Ibis, 1865, p. 385.

Carpophaga pectoralis, G. R. Gray, Hartl. J. f. O. 1855, p. 98, "Philippines."

Ptilocolpa carola, Bp. Compt. Rend. *l. c.* (*juv.*), "ins. Philipp." (1854).

Carpophaga carola (Bp.), G. R. Gray, *l. c.* no. 25; Hand-list, no. 9227; Wallace, *l. c.*; v. Martens, *l. c.* no. 130.

Hab. Philippines (*Cuming*); Luzon (*Gevers*).

The range of this Pigeon within the Philippines, to which archipelago it appears restricted, has yet to be ascertained.

MYRISTICIVORA, Reichenbach.

143. MYRISTICIVORA BICOLOR.

Le Pigeon blanc mangeur de Muscade de la Nouvelle Guinée, Sonnerat, Voy. Nouv. Guin. p. 169, pl. 103.

Columba bicolor, Scopoli[1], Del. Fl. Faun. Insubr. ii. p. 94, no. 97 (1786), ex Sonn.; Cassin, Un. St. Expl. Exped. 2nd ed. p. 265, pl. 28, ♂ adult.

Columba alba, Gm. S. N. i. p. 780, no. 53 (1788), ex Sonn.

Columba littoralis, Temm. Knip. i. pt. 2, p. 15, pl. 7, "Java, New Guinea" (1811); Pig. et Gallin. i. pp. 99, 448 (1813).

Carpophaga casta, Peale, Un. St. Expl. Exped. 1st ed. Zool. p. 204, "Sooloo Islands" (1848); Hartlaub, Archiv f. Naturgesch. xiii. Jahrgang, i. p. 116.

Hab. Negros, March (*Meyer*).

The example above referred to, a male (*fide* Meyer), in no way differs from an authentic New-Guinea individual. It possesses fourteen rectrices. Several examples collected near Malacca by Mr. Maingay[2] are also not to be distinguished, and all possess fourteen rectrices. A large series of this species, as well as of *M. luctuosa*, was sent from Celebes by Dr. Meyer; but unfortunately no exact localities were given. This Pigeon appears to extend from the Andamans and Java to New Guinea, timing its migrations according to the ripening of the various fruits it feeds on[3].

HEMIPHAGA, Bonaparte.

144. * HEMIPHAGA POLIOCEPHALA.

Carpophaga poliocephala, G. R. Gray, List Birds Brit. Mus. *Gallinæ*, iii. p. 6, "Philippines" (1844), *descr. nulla*; Gray & Mitch. Genera, ii. p. 469, pl. 119; List Birds Brit. Mus. *Columbæ*, p. 22, no. 22 (1856); Hand-list, no. 9223; Hartl. J. f. O. 1855, p. 91 (*descr. princeps*); Schlegel, Mus. Pays-Bas, *Columbæ*, p. 92.

Hemiphaga poliocephala (G. R. Gray), Bp. Compt. Rend. xxxix. p. 1077 (1854); Consp. ii. p. 39 (1857).

Hab. Philippines (*Cuming*); Luzon (*Hartlaub*, *Gevers*).

This Pigeon is a representative form of *H. forsteni*, ex Celebes.

[1] *Conf.* Cassin (*l. c.*) on Scopoli's title.

[2] Mr. Maingay, in his MS. notes on this species, states that it is never found on the mainland of the Malaccan peninsula. It arrives at the Water Islands, nine miles from Malacca, about the beginning or middle of July, is abundant towards the latter end of August, and departs towards the end of September. Captain Pinwill observed a flock pass over Pinang in July, but adds that they are not found on that island.

[3] On the range of *M. bicolor*, cf. Schlegel, Neder. Tijdschr. iii. p. 205.

COLUMBIDÆ.

Ianthœnas, Reichenbach.

145. * Ianthœnas griseogularis.

Ianthœnas griseogularis, Walden & Layard, Ibis, 1872, p. 104, pl. 6, "Guimaras" (April, 1872).
Carpophaga metallica, var., Schlegel, Nederl. Tijdschr. Dierk. 1866, p. 202, "Luzon."
Janthœnas luzoniensis, Schlegel, Mus. Pays-Bas, *Columbæ*, p. 75, "Luzon" (March, 1873).

Hab. Guimaras (*Meyer*); Luzon (*Gevers*).

Discriminated, described, figured, and named for the first time in 1872 by the two English authors above cited, from an individual obtained in the island of Guimaras. Professor Schlegel in 1873 (*l. c.*) again named it, and quoted its original title as a synonym. As the species is not confined to the island of Luzon the last title is also misleading.

Macropygia, Swainson.

146. * Macropygia tenuirostris.

Macropygia tenuirostris, G. R. Gray, List Birds Brit. Mus. *Columbæ*, p. 39, "Philippines," *descr. nulla* (1856); Bp. Consp. ii. p. 57, "Philippines" (1857).
Columba phasianella, Temm. Pl. Col. 100, "Manilla," nec Temm. Tr. Linn. Soc. xiii. p. 129.

Hab. Luzon, Negros (*Meyer*).

This species belongs to the same section as *M. phasianella* (Temm.), and *M. emiliana*, Bp.

In Negros Dr. Meyer obtained a single example of a *Macropygia* which differs from the Luzon species in having the back and uropygium dark brown without a trace of rufous, in the shoulder-coverts being uniform brown, not edged with rufous, in the upper surface of the middle pair of rectrices being brown like the back, and in having a black band traversing the whole breadth of the second and third outer pair of rectrices (the first pair are wanting). This individual is stated on the label to be a male, while the Luzon example with which the above comparison is made is marked a female. The differences observable may therefore be sexual.

M. tenuirostris is stated by Professor Schlegel (Mus. Pays-Bas, *Columbæ*, p. 109) to belong to the Javan and Lombock species, *M. emiliana*, Bp.,—an opinion in which I regret I cannot concur. Besides being considerably smaller, *M. emiliana* has the upper plumage of a much lighter and clearer rufous, and the upper surface of the rectrices are pure light rufous, and not brown.

Turtur, Selby

147. * Turtur dussumieri.

Columba dussumieri, Temm. Pl. Col. 188, "Luçon" (1823).

Hab. Luzon and Negros (*Meyer*).

Otherwise closely allied to *T. bitorquata* (Temm.), this Luzon Dove differs in having not merely the crown, but the whole of the head, nape, cheeks, and sides of the throat ash-grey, in the nuchal band being formed of pale grey feathers margined with iron grey, in wanting the pure white collar, in the bill being much weaker and shorter, and in the white terminal bands on the lateral rectrices being much narrower.

Two Luzon examples are respectively marked male and female by Dr. Meyer, and do not differ. A third Luzon individual, marked a female by Dr. Meyer, has the head the same colour as the back, the feathers of the nuchal band smaller and almost entirely iron grey or black, bordered below by a bright ferruginous zone. It is probably an immature bird. The example from Negros is identical with those from Luzon.

Professor Schlegel (Mus. Pays-Bas, *Columbæ*, p. 120) says that *T. dussumieri* has been wrongly indicated as inhabiting the Indian continent and Malacca, and further observes that Mr. G. R. Gray gives its habitat as Luzon, while it in reality probably inhabits the Mariannes. The species certainly does not occur either on the Asiatic continent or in the Sunda Islands, but does inhabit the Philippines, whence the type described by Temminck originated. *T. gaimardi*, Bp. Consp. ii. p. 66, with which Professor Schlegel associates *T. dussumieri*, was described from Marianne specimens obtained by Quoy and Gaimard, and placed by them in the Paris Museum in 1811. The Prince, in his diagnosis, distinguished this Marianne Dove from *T. dussumieri*, the habitat of which, however, he erroneously gave as being Malasia, Java, Sumatra, and Borneo.

148. Turtur humilis.

Columba humilis, Temm. Pl. Col. pl. 259, ♂ nec ♀, 258, ♀ nec ♂, "Bengale, île de Luçon" (1824); Bp. Consp. ii. p. 66, ♀, "Philippines;" Swinhoe, P. Z. S. 1871, p. 397, no. 473.

Hab. Luzon (*Meyer*); S. China to Shanghai, Formosa, Hainan (*Swinhoe*).

The red Turtledove of Luzon differs from that of India (*T. humilis*, ap. Jerd., no. 797) in being of a much darker red, and in having the under wing-coverts dark ash instead of pale ash inclining to white, and the head, uropygium, and upper tail-coverts much darker ash. The form which inhabits China and Cambodia belongs to the Luzon, and not to the Indian race.

The Indian bird will have to take the title of *Turtur tranquebarica*, Herm. Obs. Zool. p. 200, "ex Tranquebaria" (1804), while for that of Luzon it will perhaps be best to retain Temminck's title, although he does not make it quite clear whether he described and figured a Bengal or a Philippine individual. In 1855 Prince Bonaparte (Compt. Rend. xl. p. 18) maintained that individuals from Coromandel and the Philippines were absolutely identical. But later, 1856, after his visit to the British Museum, the same author observed (*op. cit.* xli. p. 659), "*Turtur muroensis*, Hodgs., de l'Inde" [*T. humilis* of Indian authors], "pouvait fort bien différer spécifiquement de *Streptopelia humilis* des Philippines."

Dr. Meyer notes the colour of the feet and nails as being grey, and of the bill as slate-colour.

La Tourterelle cendrée de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 52, pl. 22.

Columba cinerea, Scop. Del. Fl. Faun. Insubr. ii. p. 94, no. 93 (1786), ex Sonn.; nec Scop. ap. Bp. Consp. ii. p. 61.

Turtur luzoniensis, Gm. S. N. i. p. 786, no. 32 *Turtur*, var. δ (1788), ex Sonn.

Columba phœnicorhyncha, Wagler, Isis, 1829, p. 745, ex Sonn.

Under the title above cited Sonnerat described a species of Turtledove which, he stated, inhabits the island of Luzon, and mentions no other locality. I can find no evidence of any species agreeing with Sonnerat's description having been found in the Philippines since Sonnerat wrote. The diagnosis agrees fairly with *Columba picturata*, Temm., from which bird Sonnerat probably took his description.

Bonaparte (*l. c.*) confounded two, if not three, distinct species of the genus *Turtur* described by Sonnerat, under Scopoli's title of *Columba cinerea*. The description given by Bonaparte (*l. c.*) is of *Columba miniata*, Temm. Pig. & Gall. i. pp. 369, 460, founded on Sonnerat's *Grande Tourterelle de la Chine*, Voy. aux Indes, ii. p. 178. In his reference to Sonnerat the Prince commits three mistakes. He quotes page 176, where Sonnerat describes his *Tourterelle grise de la Chine*, on which Scopoli founded his *Columba chinensis*; and he adds plate 22—the number of Sonnerat's plate (in the 'Voyage à la Nouvelle Guinée') which represents *Columba cinerea*, Scopoli[1]. There is no plate numbered 22 in the second volume of the 'Voyage aux Indes.' Having thus confounded the two species, the Prince adds China as a habitat of *Columba cinerea*. Previously the Prince had stated (Compt. Rend. xl. p. 16) that he considered *C. miniata*, Temm., = *C. cinerea*, Scop. It is difficult to decide from what species Sonnerat described his *Grande Tourterelle de la Chine*. On reading Temminck's diagnosis (*l. c.*) of *Columba miniata* it is obvious that he copied from Sonnerat. Together with its size (Sonnerat says that it is as large as a Wood-pigeon), the colouring described is inconsistent with any known Chinese species of Dove.

La Tourterelle brune de la Chine, Sonn. Voy. aux Indes, ii. p. 177, on which Latham founded his *Columba orientalis* (Ind. Orn. ii. p. 606), is *Turtur gelastes*, Temm. & Schlegel.

Mr. Blyth (Ibis, 1870, p. 173) mentions having observed in the Leyden Museum a Dove labelled *Columba turtur*, from the Philippines, "like *T. auritus*, but darker, the black predominating on the upper parts; lower tail-coverts white." Can this be *Columba cinerea*?

[1] Prince Bonaparte (*l. c.*) also misquotes Vieillot; for he refers to N. Dict. xxvi. p. 312; whereas *C. miniata*, Temm., occurs at p. 368, and *Columba cinerea* is treated by Vieillot as a separate species at p. 381, although partly misquoting Sonnerat's French title.

GOURIDÆ.

Phlogœnas, Reichenbach.

149. * Phlogœnas luzonica.

La Tourterelle grise ensanglantée de l'isle de Luçon, Sonnerat, Voy. N. Guin. p. 52, pl. 21, "Luçon," (1776).

Columba luzonica, Scop. Del. Fl. Faun. Insubr. ii. p. 94, no. 92 (1786), ex Sonn.

Columba cruenta, Gm. S. N. i. p. 785, no. 66 (1788), ex Sonn.; Knip, Colomb. et Gall. p. 16, pl. 8; Gould, B. of As. pl —.

Var. *albina.*

La Tourterelle blanche ensanglantée de l'isle de Luçon, Sonn. *op. cit.* p. 51, pl. 20, "Luçon."

Columba nivea, Scop. *op. cit.* p. 94, no. 91 (1786), ex Sonn.

Columba sanguinea, Gm. *op. cit.* p. 785, no. 65, ex Sonn.; Knip, *op. cit.* p. 17, pl. 9.

Hab. Luzon (*Meyer*); Calamine Island (*Buzeta*).

Chalcophaps, Gould.

150. Chalcophaps indica.

The Green-winged Dove, Edwards, Nat. Hist. i. pl. 14, "East Indies."

Columba indica, Linn. S. N. i. p. 284 (1766), ex Edwards; Schlegel, Nederd. Tijdschr. Dierk. 1866, p. 265.

Tourterelle de Java, D'Aubent. Pl. Enl. 177[1].

Le Turvert, no. 3, Buffon, Hist. Nat. ii. p. 556, "Java."

Columba javanensis, L. S. Müller, Suppl. p. 133 (1776), ex D'Aubenton.

Columba javanica, Gm. S. N. i. p. 781, no. 55 (1788), ex Buffon.

? *Palumbus amboinensis,* Brisson, Orn. i. p. 150, no. 42, "ex Amboinensi Ins." *descr. orig.*

? *Columba cyaneopileata,* Bonnaterre, Tabl. Enc. Méthod. i. p. 238 (1823), ex Brisson.

? *Chalcophaps moluccensis,* G. R. Gray, P. Z. S. 1860, p. 361, ♀, "Amboyna and Batchian."

Le Pigeon vert à tête grise d'Antigue, Sonnerat, Voy. Nouv. Guin. p. 112, pl. 66, "Panay."

Columba pileata, Scop. Del. Fl. Faun. Insubr. ii. p. 94, no. 96 (1786), ex Sonn.

Columba albicapilla, Gm. S. N. i. p. 775, no. 8 (1788), ex Sonn.

Columba griseocapillata, Bonnat. *tom. cit.* p. 238 (1823), ex Sonn.

Columba superciliaris, Wagler, Syst. Av. p. 256 (1827), ex Edwards.

Monornis perpulchra, Hodgs., Gray, Zool. Misc. 1844, p. 85, "Nipaul."

Calcophaps bornensis, Müller, Bp. Compt. Rend. xi. p. 208 (1855); *op. cit.* lxiii. p. 947 (1856).

Calcophaps formosana, Swinhoe, Ibis, 1865, p. 357, ♂, p. 540, ♀, "Formosa."

Hab. Luzon, Negros (*Meyer*).

Examples obtained in the above-mentioned Philippine Islands in no essential respect, either of dimensions or plumage, differ from Ceylonese, Indian, Burman, Andaman, Malaccan, Javan, Bornean, Celebean, and Formosan individuals. I have therefore

[1] Buffon (*l. c.*), through a misprint, quotes Pl. Enl. 117.

united all the titles founded on examples from those localities under the Linnæan designation.

In deference to the opinion of Mr. Wallace (Ibis, 1865, p. 393), I have excluded *C. moluccensis*, G. R. Gray, although Professor Schlegel (*l. c.*) does not admit its distinctness. A Ceram example of a female in my collection certainly does differ from all others within the range of *C. indica*, as stated above, in having the rump earthy brown, with the cross bars dark brown, without a trace of grey. If, however, the Moluccan species prove to be distinct it will have to take the title of *C. cyaneopileata*, Bonn. *l. s. c.*

C. timorensis, Bp. (*javanicoides*, Temm. Mus. Lugd.) *op. cit.* lxiii. p. 948, is an excellent species, wing 6·25, but is doubtfully separable from *C. chrysochlora*, Wagl. *l. c.*, ex Australia.

C. augusta, Bp. *op. cit.* 1855, p. 209, described from an example of unknown origin, has not as yet been identified. Professor Schlegel (*l. c.*) states that it is based on *C. indica* in transition-plumage; but the diagnosis is undoubtedly that of an adult male. The Prince suggests that *C. augusta* may be the same as the Nicobar form of *C. indica* described by Mr. Blyth (J. A. S. B. 1846, p. 371), and treated by him as a variety of *C. indica* (Cat. Calc. Mus. p. 238, no. 440)[1].

The titles *Columba cyanocephala*, Gm. *tom. cit.* p. 781, no. 56, nec no. 20, and *C. cæruleocephala*, Lath. Ind. Orn. ii. p. 610, no. 61, both founded on Latham's *Blue-crowned Turtle*, Synop. iv. p. 655, no. 52, cannot be allotted, Latham's description being too vague, and no species of *Chalcophaps* having been discovered in China north of the island of Hainan.

Le Pigeon violet à tête rouge d'Antique, Sonn. Voy. Nouv. Guin. p. 112, pl. 67.
Columba pulcherrima, Scop. Del. Fl. Faun. Insubr. ii. p. 94, no. 98 (1786), ex Sonn.
Columba rubricapilla, Gm. S. N. i. p. 784, no. 62 (1788), ex Sonn.
This bird is now known to be confined to the Seychelles.

Calœnas, G. R. Gray.

151. Calœnas nicobarica.

The Nincombar Pigeon, Albin, Nat. Hist. Birds, iii. p. 44, pls. 47, 48, "Islands of Nincombar near Pegu" (1740).

Columba nicobarica, Linn. S. N. i. p. 283, no. 27 (1766), ex Albin; Cassin, Un. St. Expl. Exped. p. 276.

Hab. Philippine Islands (*Peale*).

Seen by Peale in the Philippine Islands, but afterwards in greater abundance at the island of Mangsi. The same author states that the habits of this Pigeon, as observed on that island, were *decidedly arboreal.*

[1] *Conf.* Blyth, Ibis, 1868, p. 133. The Nicobar race appears to me undistinguishable.

152. Geopelia striata.

Columba striata, Linn. S. N. i. p. 282 (1766); v. Martens, J. f. O. 1866, p. 24, no. 136.

Observed by Dr. v. Martens in the collection of the Military Library at Manilla.

GALLINÆ

PHASIANIDÆ.

Gallus, Linnæus.

153. Gallus bankiva.

Gallus bankiva, Temm. Pig. et Gallin. ii. p. 87, "Java" (1813).

Hab. Luzon, Guimaras (*Meyer*).

These Philippine examples agree with Malaccan.

TETRAONIDÆ.

Perdicinæ.

Arborophila, Hodgson.

154. * Arborophila —— sp.?

? *Le perdrix de Gingi,* Sonn. Voy. aux Indes, ii. p. 167.

? *Tetrao gingicus,* Gm. S. N. i. p. 760, no. 41 (1788), ex Sonn.; Temminck, Pig. et Gallin. iii. pp. 410, 733, "India, Coromandelia;" Blyth, Ibis, 1870, p. 174, "Philippines?"

Arboricola, sp., v. Martens, J. f. O. 1866, p. 25, no. 142, "Philippines."

A Philippine species of *Arborophila* is described by Dr. v. Martens (*l. c.*) from an example he observed in the Military Library at Manilla. Temminck (*l. c.*) described, from an example in his cabinet, the male of what he identified as the *Perdix gingica*, Lath. This specific title, which Latham only copied from Gmelin, was founded by the latter author on Sonnerat's species (*l. c.*). Sonnerat having named the bird *Perdrix de Gingi*, it was inferred by Temminck that the species inhabited the Coromandel coast. But it is pretty well ascertained that no such species is known in India, or, indeed, in any part of continental Asia, nor has it been discovered in Ceylon, or in any of the Malay Islands. Hence it may be presumed (also the surmise of Mr. Blyth, *l. c.*) that Sonnerat's Partridge was obtained in the Philippines and not in Coromandel. The description given by Dr. v. Martens (*l. c.*) is too short to enable us to identify the examples he saw with the species fully described both by Sonnerat and Temminck. In one particular his description materially differs; for Dr. v. Martens describes the head as being green-black, whereas Sonnerat says that in his bird the top of the head is dark brown, and Temminck calls it maroon-brown. The example similar to his own, which Temminck (*l. c.*) mentions as being preserved in the British Museum, seems to be no longer extant. Dr. v. Martens thus describes the example alluded to by him:—"Head green-black; breast wine-red, streaked with black; sides pale red, spotted with black." For full description of the example in the Leyden Museum, *cf.* Blyth, *l. c.*

Excalfactoria, Bonaparte.

155. Excalfactoria chinensis.

Chinese Quail, Edwards, Illustr. v. p. 77, pl. 247, ♂, "China."
Tetrao chinensis, Linn. S. N. i. p. 277, no. 19 (1766), ex Edwards; v. Martens, J. f. O. 1866, p. 25, no. 143.
La Caille des Philippines, Brisson, Orn. i. p. 254, no. 17, pl. 25. f. 1, "Philippines."
La petite Caille de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 54, pl. 24, ♀, "Luçon."
Oriolus lineatus, Scop. Del. Fl. Faun. Insubr. ii. p. 87, no. 34 (1786), ex Sonn.
Tetrao manillensis, Gm. S. N. i. p. 764, no. 57 (1788), ex Sonn.
Coturnix excalfactoria, Temm. Pig. & Gallin. iii. pp. 516, 742 (1815).
Coturnix flavipes, Blyth, J. A. S. B. 1842, p. 808, ♀, "Bengal."

Hab. Philippines (*Jagor*).

Brisson described from a Philippine example sent to M. Aubrey. He states that the Philippine form is smaller than the one which inhabits China, and that Chinese examples have the breast spotted with black. It is not improbable that the Philippine species may prove to belong to the Celebean form, *E. minima*, Gould, in which case both will have to assume the title of *lineata*, Scop.

TURNICIDÆ.

Turnix, Bonnaterre.

156. * Turnix ocellata.

Caille de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 54, pl. 23.
Oriolus ocellatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 88, no. 35 (1786), ex Sonn.; Blyth, J. A. S. B. 1861, p. 97.
Tetrao luzoniensis, Gm. S. N. i. p. 767, no. 61 (1788), ex Sonn.
Hemipodius thoracicus, Temm. Pig. et Gall. iii. pp. 622, 755, "Luzonia" (1815).
Ortygis ocellata, Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. xvi. suppl. prim. p. 101, pl. 17, "South Peru, from 10–12000 feet above the sea"! *errore* (1834); v. Martens, J. f. O. 1866, p. 26, no. 144; G. R. Gray, Hand-list, no. 9912.

Hab. Philippines (*Blyth*, *l. c.*).

Hemipodius fasciatus, Temm. Pig. & Gallin. iii. pp. 634, 757, "Philippines" (1815), was described from a single example, stated on its label to be from the Philippines. Later Temminck (Receuil d'Ois. 10[e] livr. 1823) in his monographic sketch of the genus *Hemipodius*, omitted this title altogether, but added to the Javan habitat of his *H. pugnax*, as first described (Pig. et Gall.), that of the Philippines as well as Sumatra. Beyond this there seems to be no evidence of a second species of *Turnix* inhabiting the Philippines; and it may be taken that *H. fasciatus* is the same species as *H. pugnax*.

ROLLULIDÆ.

ROLLULUS, Bonnaterre.

157. * ROLLULUS —— sp.

Cryptonyx, sp. v. Martens, J. f. O. 1866, p. 25, no. 141.

"Above red-brown; underneath black. No crest, nor nail on the hallux." Dr. v. Martens thus describes a bird of this genus he observed in the collection of the Military Library at Manilla.

MEGAPODIIDÆ.

MEGAPODIUS, Quoy et Gaimard.

158. MEGAPODIUS CUMINGI.

Megapodius rufipes, Temm., G. R. Gray (*lapsu cal.*), List of Birds, Brit. Mus. *Gallinæ*, p. 21, "Manilla" (1844), nec Temm.

Megapodius cumingii, Dillwyn, P. Z. S. 1851, p. 118, pl. 39, "Labuan, Philippines;" G. R. Gray, P. Z. S. 1861, p. 290, no. 11; v. Martens, J. f. O. 1866, p. 26.

Described from Labuan individuals, and identified by Mr. Dillwyn as identical with the species obtained in the Philippines by Mr. Cuming. A recomparison is, however, desirable.

A species of Bustard, described and figured by Sonnerat under the title of *le Paon sauvage de l'isle de Luçon* (Voy. Nouv. Guin. p. 85, pl. 49), and said by him to occur also at the Cape of Good Hope, is clearly not a Philippine species. It, however, is a well-known South-African Bustard, of which the following is the synonymy:—

Charadrius cristatus, Scop. Del. Fl. Faun. Insub. ii. p. 93, no. 82 (1788), ex Sonn.; Schlegel, Mus. Pays-Bas, *Cursores*, p. 8; G. R. Gray, Hand-list, no. 9919.

Otis kori, Burchell, Tr. S. Africa, i. p. 393, (vignette) p. 402 (1822); Rüppell, Mus. Senckenb. ii. p. 213, pl. 13; Tem. Recueil d'Ois. 102[e] livr., add. genre *Outarde*.

Otis luçoniensis, Vieillot, Tabl. Enc. Méthod. Ornith. i. p. 332 (1823), ex Sonn.

Otis arabs, Linn., var. A, Latham, Gen. Hist. viii. p. 355 (1823), ex Sonn.

? *Vanellus*, sp., v. Martens, J. f. O. 1866, p. 26.

Gmelin appears to have overlooked Sonnerat's description and plate. Latham (Ind. Orn. ii. p. 659, no. 4) identified Sonnerat's species with *Otis arabs*, Linn., but subsequently (Gen. Hist. *l. c.*) treated it as a separate variety of that species. Vieillot (N. Dict. xxiv. p. 294) adopted Latham's original view, but later (*l. c.*) regarded Sonnerat's Bustard as a distinct Philippine species, and gave it the title above cited. Temminck was the first to point out (Recueil d'Ois. 90e livr.) that Sonnerat's *Paon sauvage* belonged to a species distinct from *Otis arabs*; and on the subsequent discovery of *Otis kori* by Burchell, Temminck at once (*l. c.*) identified it with Sonnerat's species, Rüppell (*tom. cit.* p. 218) having in the mean time united Sonnerat's Bustard to the Indian *Otis nigriceps*. Professor Schlegel and the majority of recent authors have adopted Temminck's view. Dr. v. Martens, however (*l. c.*), classes Sonnerat's bird as a Plover, and remarks, "Diesen Kibitz finde ich nirgends citirt."

GRALLÆ.

CHARADRIIDÆ.

CHARADRIINÆ.

CHARADRIUS, Linnæus.

159. CHARADRIUS FULVUS.

Fulvous Plover, Lath. Gen. Synop. iii. p. 211, no. 17, "Otaheite."
Charadrius fulvus, Gm. S. N. i. p. 687, no. 18 (1788), ex Latham; Finsch & Hartl. Orn. Centr.-Polyn. p. 188; Sharpe & Dresser, Birds of Europe, pt. ix. pl. —; Walden & Layard, Ibis, 1872, p. 105.
Charadrius pluvialis, Linn., ap. v. Kittlitz, Lütke, Voy. (Postel), iii. p. 327, "Manilla."
Charadrius longipes, Temm., v. Martens, J. f. O. 1866, p. 27, no. 147, "Luzon."

Hab. Luzon, February; ♀, bill black, legs bluish grey (*Meyer*); Negros (*L. C. Layard*).

In winter plumage.

SQUATAROLA, Cuvier.

160. SQUATAROLA HELVETICA.

Vanellus helveticus, Briss. Orn. v. p. 106, no. 4, "Helvetia."
Tringa subtridactyla, Hasselquist, Iter Palæstinum, p. 397, no. 28 (1757); Reise nach Palästina (Gadebusch, German tr.), p. 307, no. 28 (1762).
Charadrius helveticus, Linn. S. N. i. p. 250, no. 12 (1766), ex Brisson; Walden & Layard, Ibis, 1872, p. 105.

Hab. Cujo, December (*Meyer*); Negros, March (*L. C. Layard*).

In winter plumage.

Ægialitis, Boie.

161. Ægialitis geoffroyi.

Charadrius geoffroyi, Wagler, Syst. Av. p. 61, no. 19, "Pondicherry, Java" (1827); Harting, Ibis, 1870, p. 378, pl. 11.

Stated by Mr. Harting (*l. c.*), on Cuming's authority, to inhabit the Philippines.

162. Ægialitis dubia.

Le petit Pluvier à collier de Luçon, Sonn. Voy. Nouv. Guin. p. 84, pl. 46, "Luçon."
Charadrius dubius, Scopoli, Del. Fl. Faun. Insubr. ii. p. 93, no. 81 (1786), ex Sonn.; Walden, Tr. Zool. Soc. viii. p. 89.
Charadrius alexandrinus, Hasselq., var. δ, Gm. S. N. i. p. 684, no. 2, ex Sonn.
Charadrius philippinus, Latham, Ind. Orn. ii. p. 745, no. 11 (1790), ex Sonn.
Charadrius curonicus, Beseke, =*minor*, Meyer, v. Martens, J. f. O. 1866, p. 26, no. 146.

Philippine examples have still to be compared with the *Æ. minutus* (Pall.), ap. Jerdon, of India.

Von Heuglin, in his great work (Ornithologie Nordostafrikas, p. 1029, no. 753), identifies Sonnerat's *petit Pluvier de l'isle de Luçon* with *C. curonicus*, but with doubt adopts as synonyms *C. dubius*, Scop., and *C. philippinus*, Lath., titles founded on Sonnerat's description and plate.

163. Ægialitis mongolica.

Charadrius mongolus, Pallas, Reisen Russischen Reichs, iii. p. 700, no. 29, "Mongolia," (1776); Harting, Ibis, 1870, p. 384; Schlegel, Mus. Pays-Bas, *Cursores*, p. 41.

Hab. Philippines (*Cuming*).

Œdicneninæ.

Esacus, Lesson.

164. Esacus magnirostris.

Œdicnemus magnirostris, Geoffroy St.-Hilaire, Vieill. N. Dict. xxiii. p. 231 (1818), nec Latham; Cassin, Un. St. Expl. Exped. p. 329; Walden, Tr. Zool. Soc. viii. p. 91.

Hab. Common in the Philippine and Sooloo Islands (*Peale*).

Himantopodinæ.

Himantopus, Brisson.

165. Himantopus autumnalis.

Charadrius autumnalis[1], Hasselq., Iter Palestinum, p. 253, no. 29 (1757); Reise nach Palästina (Gadebusch, Germ. Trans.), 308, no. 29, "Egypt, in October" (1762).

Himantopus rufipes, Bechst., v. Martens, J. f. O. 1866, p. 28, no. 160.

Hab. Luzon (*Jagor*).

A Luzon example is thus identified by Dr. v. Martens (*l. c.*).

166. Himantopus leucocephalus.

Himantopus leucocephalus, Gould, P. Z. S. 1837, "Australia, Java, Sumatra;" Walden, Tr. Zool. Soc. viii. p. 91; v. Martens, J. f. O. 1866, p. 28, no. 161.

Hab. Mindanao (*Cuming*).

GLAREOLIDÆ.

Glareolinæ.

Glareola, Brisson.

167. Glareola orientalis.

Glareola orientalis, Leach, Tr. Linn. Soc. xiii. p. 132, pl. xiii. fig. 1, 2, "Java" (1820); Walden & Layard, Ibis, 1872, p. 105, "Negros."

Hab. Negros (*L. C. Layard*).

GALLINULIDÆ.

Porphyrioninæ.

Porphyrio, Brisson.

168. * Porphyrio pulverulentus.

Porphyrio pulverulentus, Temm. Pl. Col. 405, "Africa" *errore* (1826); v. Martens, J. f. O. 1866, p. 29, no. 176.

Porphyrio poliocephalus, Lath., apud Schlegel, Mus. Pays-Bas, *Ralli*, p. 54, "Philippines," nec Lath.; *conf.* Walden, Tr. Z. S. viii. p. 92.

Hab. Philippines (type, *fide* Schlegel, *l. c.*).

[1] I adopt Hasselquist's title for this species because I believe it was republished in the English translation (Voy. Travels in the Levant, 1766), and in the French translation by Eidous (Voyage dans le Levant, 1769), as well as having been published by Linnæus as a synonym in his twelfth edition of the 'Systema.'

Dr. v. Martens (*l. c.*) notes this species as being among the Philippine birds preserved in the Military Library at Manilla.

Gallinulinæ.

Gallinula, Brisson.

169. Gallinula chloropus.

Fulica chloropus, Linn. S. N. i. p. 258, no. 4 (1766).

Hab. Luzon, 7th of February, ♂ ♀; bill red, yellow at the tip; legs yellow-green; nails grey (*Meyer*).

These examples agree with European specimens.

Gallicrex, Blyth.

170. Gallicrex cinerea.

Crested Gallinule, Lath. Gen. Synopsis, v. p. 267, no. 22, "China?" *descr. orig.*

Fulica cinerea, Gm. S. N. i. p. 702, no. 20 (1788), ex Lath.; v. Martens, J. f. O. 1866, p. 29, no. 174.

Gallinula cristata, Lath. Ind. Orn. ii. p. 773, no. 23 (1790), ex Lath., nec *Fulica cristata,* Lath. *tom. cit.* p. 779, no. 3; G. R. Gray, List Br. Mus. *Grallæ,* p. 123, "Isl. of Manilla."

Gallinula plumbea, Vieill. Nouv. Dict. d'Hist. Nat. xii. p. 404, ♂, "Java" (1817).

Gallinula lugubris, Horsf. Tr. Linn. Soc. xiii. p. 195, ♂, "Java" (1820).

Gallinula gularis, Horsf. *l. c.* ♀, "Java."

Gallinula nævia, Gm., apud Lesson, Tr. p. 534, ♀, "Manilla" (1831), *nec* Gm.; Pucheran, Rev. et Mag. Zool. 1851, p. 569.

Gallinula porphyrioides, Less. *l. c.,* ♂, "*Patr. incog.*;" Pucheran, *l. c.*

Rallus rufescens, Vieill., Jerdon, Madras J. L. & Sc. xii. p. 205, no. 331, ♀, "near Cochin" (1840).

Gallicrex cristatus (Lath.), Blyth, Cat. Calc. Mus. p. 283, no. 1660 (1849).

Hab. Manilla (*Dussumier, Cuming*).

Observed by Dr. v. Martens in the Military Library of Manilla.

Erythra, Reichenbach.

171. Erythra phœnicura.

Rallus phœnicurus, Forster, Zool. Ind. p. 19, pl. 9, "Ceylon" (1781); v. Martens, J. f. O. 1866, p. 29, no. 171; Walden, Tr. Z. S. viii. p. 94.

Hab. Zamboanga (*v. Martens*).

RALLIDÆ.

ORTYGOMETRA, Linnæus.

172. ORTYGOMETRA CINEREA.

Porphyrio cinereus, Vieill. Nouv. Dict. d'Hist. Nat. xxviii. p. 29, "Java" (1819); Schlegel, Mus. Pays-Bas, *Ralli,* p. 32; Walden, Tr. Z. S. viii. p. 94.

Hab. Philippines (*Cuming*).

PORZANA, Vieillot.

173. PORZANA PYGMÆA.

Crex pygmæa, Naumann, Schlegel, Mus. Pays-Bas, *Ralli,* p. 30.

Hab. Philippines (*Verreaux*).

The Philippine habitat of this Water-crake rests solely on a single individual thus identified by Professor Schlegel in the Leyden Museum, and acquired from M. Verreaux.

174. PORZANA FUSCA.

Rallus philippensis fuscus, Brisson, Orn. v. p. 173, no. 2, "Philippines."
Rallus fuscus, Linn. S. N. i. p. 262, no. 4 (1766), ex Brisson; Schlegel, Mus. Pays-Bas, *Ralli,* p. 20.
Râle brun des Philippines, D'Aubenton, Pl. Enl. 773.
Gallinula rubiginosa, Temm. Pl. Col. 357, "Java" (1825).

Hab. Philippines (*Cuming*).

An adult Philippine example, obtained by Cuming, is preserved in the Leyden Museum; and with it Professor Schlegel (*l. c.*) identifies individuals from Borneo, Java, and Sumatra. From Javan examples I am unable to distinguish Ceylon specimens. *Gallinula erythrothorax,* Schlegel, Faun. Japon. *Aves,* p. 121, pl. 78, "Japan," only differs in being considerably larger. It is still a question whether the race which occurs in Nipaul, *Zapornia flammiceps,* Hodgs., Gray (Zool. Misc. 1844, p. 86, *sine descr.*), belongs to the Japanese or the Southern-Asiatic race. Radde (Reisen im Süden von Ost-Sib. ii. p. 309) obtained, in June and July, on the middle Amoor, examples of greater size than even those from Japan. Mr. Swinhoe (P. Z. S. 1871, p. 414, no. 605) states that the "pectoral red does not extend so low down as in *P. fusca,*" this character being a sign of immaturity in the South-Asiatic form.

In the Hand-list, *P. fusca* and *P. rubiginosa* are kept separate. To the last, Pl. Col. 357 is correctly referred; to the first, Pl. Col. 387 (which represents *Esacus magnirostris*) is added as a reference[1].

[1] This error seems to have arisen from the misprint in Blyth's Cat. of the Calc. Mus. p. 285, no. 1666, having been copied.

RALLINA, Reichenbach.

175. RALLINA FASCIATA.

Rallus fasciatus, Raffles, Tr. Linn. Soc. xiii. p. 328, "Sumatra" (1821).
Gallinula eurizona, Temm. Pl. Col. 417, "Java" (1826).
Rallus ruficeps, Cuv. Mus. Par.; Lesson, Tr. p. 537, no. 24, "Java, Manilla" (1831).
Ortygometra ocularis, G. R. Gray, List Br. Mus. *Grallæ*, p. 119, "Philippine Isl." (1844).
Ortygometra eurizona (Temm.), G. R. Gray, op. cit. p. 117, "Manilla" (1844).

Hab. Philippines, Manilla (*Cuming*, *Dussumier*).

AMAURORNIS, Reichenbach.

176. * AMAURORNIS OLIVACEA. (Pl. XXXIII. fig. 2.)

Gallinula olivacea, Meyen, Nov. Act. Ac. C. L.C. Nat. Cur. xvi. suppl. prim. p. 109, pl. 20, "Manilla" (1834).
Amaurornis olivacea (Meyen), Reichenbach, Natürl. Syst.

Hab. Manilla, near the sea-coast (*Meyen*); Luzon (*mus. nostr.*).

Said also to occur in Ternate and in Halmaheira (Schlegel, M. Pays-Bas, *Ralli*, p. 43); but examples from these localities have yet to be compared with Philippine specimens.

HYPOTÆNIDIA, Reichenbach.

177. * HYPOTÆNIDIA TORQUATA.

Rallus philippensis torquatus, Briss. Orn. v. p. 170, no. 6, "Philippines" (1760).
Rallus torquatus, Linn. S. N. ed. 12, i. p. 262 (1766), ex Brisson.
Rallus lineatus, Cuv. Mus. Paris, *fide* Pucher. Rev. et Mag. Zool. 1851, p. 276, "Manilla;" Lesson, Tr. p. 536, no. 11 (1831).
Rallus torquatus, Briss., Meyen, Nov. Act. Ac. C. L. C. Nat. Cur. suppl. prim. p. 108, pl. 19; Lesson, *l. c.* no. 12.

Hab. Luzon, January (*Meyer*).

Two examples, both marked female, were obtained by Dr. Meyer. One is in full plumage, with all its colours fresh and bright, the maroon collar well developed; this I believe to be a male. The other has its markings less sharply defined, the black of the throat mixed with grey, and the pectoral band of the same colour as the back; in its dimensions it considerably exceeds the first.

178. HYPOTÆNIDIA PHILIPPENSIS.

Rallus philippensis, Brisson, Orn. v. p. 163, no. 4, "Philippines."
Rallus philippensis, Linn. S. N. i. p. 263, no. 7 (1766), ex Brisson; Schlegel, Mus. Pays-Bas, *Ralli*, p. 23; Walden, Tr. Z. S. viii. p. 95; Buller, Birds N. Zealand, part iii. pl. 6. fig. —.

Râle rayé des Philippines, D'Aubenton, Pl. Enl. 774.

Hab. Philippines (*Cuming*).

179. Hypotænidia striata.

Rallus philippensis striatus, Brisson, Orn. v. p. 167, no. 5, "Philippines."

Rallus striatus, Linn. S. N. i. p. 262, no. 5 (1766), ex Brisson; Schlegel, Mus. Pays-Bas, *Ralli,* p. 24; Walden, Tr. Zool. Soc. viii. p. 95.

Hab. Luzon (*Gevers*).

Lesson (Tr. p. 538, no. 30) introduces, without description, a species of Rail said to be from the Philippines, under the titles of "*Râle écaudé,* Cuv., Gal. de Paris; *Gallinula circoleps,* Temm." Bonaparte (Compt. Rend. xliii. p. 599, no. 382) classified the same bird under *Corethrura,* and transformed Cuvier's French museum title into *Rallus ecaudatus,* Cuv. This, in its turn, becomes *caudatus,* Cuv., in Mr. Gray's Hand-list, no. 10474. Dr. Pucheran does not not notice this type; and I am unable to identify it.

PARRIDÆ.

Hydrophasianus, Wagler.

180. Hydrophasianus chirurgus.

Le Chirurgien de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 81, pl. 45.

Tringa chirurgus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 80 (1786), ex Sonn.

Parra luzoniensis, Gm. S. N. i. p. 709, no. 13 (1788) ex Sonn.

Chinese Jacana, Latham, Gen. Synop. v. p. 246, no. 8, "China."

Parra sinensis, Gm. *l. c.* no. 15, ex Lath.; Schlegel, Mus. Pays-Bas, *Ralli,* p. 71; v. Martens, J. f. O. 1866, p. 29, no. 177.

Hydrophasianus sinensis (Gm.), Wagler, Isis, 1832, p. 279.

Hab. Luzon (*mus. Lugd.*; *v. Martens*).

SCOLOPACIDÆ.

Limosinæ.

Numenius, Linnæus.

181. Numenius phæopus.

Scolopax phæopus, Linn. S. N. i. p. 243, no. 4 (1766).

Hab. Cujo Island, December (*Meyer*).

Example referred to by Mr. Dresser (Birds of Eur. pt. xvii.), where, however, the name of the locality is misprinted.

Le Courly tacheté de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 85, pl. 48, "Luçon."

Tantalus variegatus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 78 (1786), ex Sonn.

Scolopax luzoniensis, Gm. S. N. i. p. 656, no. 21 (1788), ex Sonn.; G. R. Gray, Hand-list, no. 10252.

Numenius atricapillus, Vieill. Nouv. Dict. d'Hist. Nat. viii. p. 303 (1817), ex Sonn.

Numenius luzoniensis (Gm.), v. Martens, J. f. O. 1866, p. 28, pl. 159.

Professor Schlegel (Mus. Pays-Bas, *Scolopaces*, p. 93) identifies this species with *Numenius phæopus.* Sonnerat's plate and description do not perfectly agree with that species, more especially as he describes and figures the crown of the head as being black. Mr. Swinhoe, who considers *N. uropygialis*, Gould, distinct from *N. phæopus*, has identified Mr. Gould's species with that described by Sonnerat (P. Z. S. 1871, p. 410, no. 572). Mr. Dresser (Birds of Eur. pt. 17) has united *N. phæopus* with *N. uropygialis*, and regards Sonnerat's plate as having been drawn from a Philippine example of the common Whimbrel.

Courly brun de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 85, pl. 47.

Tantalus rufus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 77 (1786), ex Sonn.

Tantalus manillensis, Gm. S. N. i. p. 649, no. 12 (1788), ex Sonn.

Ibis fuscata, Vieill. Nouv. Dict. d'Hist. Nat. xvi. p. 16 (1817), ex Sonn.; Wagler, Syst. Av. p. 372.

I am unable to determine this species; nor has it been recognized since Sonnerat published its description. No author appears to have suggested its identity with any known species. But, curiously enough, Mr. G. R. Gray, in the index (Hand-list, iii. pp. 235, 268), refers Vieillot's title *fuscata*, and Gmelin's title *manillensis*, both being founded on Sonnerat's plate (*l. c.*), to no. 10234 of his Hand-list. This is the number pertaining to *Tantalus albicollis*, Gm., the young of *Tantalus melanopis*, Gm.; but the two titles above given are not added as synonyms, nor do they appear, although indexed, in any part of the work. From this it may be inferred that Mr. Gray at one time identified Sonnerat's *Courly brun* with the South-American species. The elements of Sonnerat's short description are manifestly taken from some form of the genus *Ibis*, and not of *Numenius*.

TOTANINÆ.

RHYACOPHILUS, Kaup.

182. RHYACOPHILUS GLAREOLA.

Tringa glareola, Gm. S. N. i. p. 677, no. 21 (1788); Kittlitz, Lütke, Voy. (Postels) iii. p. 327; v. Martens, J. f. O. 1866, p. 28, no. 164.

Actitis[1] *glareola* (Gm.), Walden, Tr. Zool. Soc. viii. p. 96, no. 160.

[1] *Actitis,* Kaup, Prodromus, p. 262 (1811), is Kaup's title for an incongruous group consisting of *Scolopax limosa*, *S. totanus*, *Tringa pugnax*, and *T. hypoleucos*.

Hab. Luzon, 9th of February; bill brownish black; legs yellowish green; nails grey (*Meyer*); Manilla (*Kittlitz, Jagor*).

A female (*fide* Meyer) in winter dress.

TRINGOIDES, Bonaparte.

183. TRINGOIDES HYPOLEUCOS.

Tringa hypoleucos, Linn. S. N. i. p. 250, no. 14 (1766); Schlegel, Mus. Pays-Bas, *Scolopaces*, p. 80; v. Martens, J. f. O. 1866, p. 28, no. 166; Finsch & Hartl. Vög. Ost-Afrikas, p. 752.

Hab. Philippines (*Cuming*); Luzon (*Jagor*).

For complete synonymy and range *cf.* O. Finsch & Hartl. *l. c.*

TOTANUS, Bechstein.

184. TOTANUS CALIDRIS.

Scolopax calidris, Linn. S. N. i. p. 245, no. 11 (1766); Schlegel, Mus. Pays-Bas, *Scolopaces*, p. 65.

Hab. Philippines (*Cuming*).

A Philippine example from Cuming's collection is preserved in the Leyden Museum.

185. TOTANUS GLOTTIS.

Scolopax glottis, Linn. S. N. i. p. 245, no. 10 (1766); Schlegel, Mus. Pays-Bas, *Scolopaces*, p. 61; v. Martens, J. f. O. 1866, p. 28, no. 165.

Hab. Philippines (*Cuming*); Luzon (*Jagor*).

TRINGINÆ.

TRINGA, Linnæus.

186. TRINGA RUFICOLLIS.

Tringa ruficollis, Pallas, Reisen Russisch. Reichs, iii. p. 700, no. 31, "Dauria" (1776), *descr. orig.*

Tringa salina, Pallas, Zoogr. Rosso-Asiatica, ii. p. 199, no. 309, pl. 61 (1811–31), ex Pallas; Swinhoe, P. Z. S. 1871, p. 409, no. 566; Sharpe & Dresser, Birds of Europe, pt. vii. "*Tringa minuta*," p. 5.

Totanus damacensis, Horsf. Tr. Linn. Soc. xiii. p. 192, "Java" (1820); Walden, Tr. Zool. Soc. viii. p. 97.

Hab. Luzon, 7th of February; bill black; feet yellowish grey; claws black (*Meyer*).

A single example of a very long-toed *Tringa*, in winter plumage, was obtained in Luzon, which I do not doubt belongs to this species. The outer rectrices are brownish grey, and not pure white, and the shaft of the first primary only is white. In dimensions it agrees with a Lake-Baikal example in red summer plumage. The general ground-colour of the upper plumage is greyish brown, most of the feathers being largely centred with dark brown; from the base of the bill to the eye an unspotted bald albescent stripe, which passes over the eye and loses itself above the ear-coverts. Under plumage white, the sides of the breast clothed by cinereous feathers with small brown centres. My Lake-Baikal example also has the sides of the breast similarly marked, only that the rufous is mixed with the cinereous. The middle toe, including the nail, nearly measures a full inch.

Pallas altered his first title, *ruficollis* (which Gmelin and Latham adopted), to *salina*.

Scolopacinæ.

Gallinago, Leach.

187. Gallinago scolopacina.

Scolopax gallinago, Linn. S. N. i. p. 244, no. 7 (1766).
Gallinago scolopacina, Bonap. Compt. Rend. xliii. p. 579 (1856).

Hab. Luzon; feet yellowish; nails grey (*Meyer*).

Two examples of this species of Snipe (♂ *fide* Meyer) were procured by Dr. A. B. Meyer on the 7th of February at Laguna de Bai.

188. Gallinago megala.

Gallinago megala, Swinhoe, Ibis, 1861, p. 343, no. 118, "Amoy."
Scolopax (*Spilura*) *stenura*, Temm., apud Radde, Reisen im Süden von Ost-Sibir. ii. p. 334, no. 208, pl. xiii. f. 1, 2, 3 (1863).
Scolopax heterura, Cab. J. f. O. 1866, p. 28, no. 163, " Luzon " (*minime* Hodgson), *descr. nulla*.
Gallinago heterocerca, Cab. *op. cit.* 1870, p. 235, *descr. princeps*; id. *op. cit.* 1872, p. 317.
Scolopax heterocerca (Cab.), Taczanowski, J. f. O. 1870, p. 311, no. 17.
"*Gallinago megala*, Swinhoe," O. Finsch, Verh. zool.-bot. Ges. Wien, 1872, p. 267 (sub *G. stenura*).

Hab. Luzon (*Jagor*).

Rhynchæa, Cuvier.

189. Rhynchæa capensis.

Gallinago capitis bonæ spei, Brisson, Orn. vi. suppl. p. 141.
Scolopax capensis, Linn. S. N. i. p. 246, no. 14 (1766), ex Brisson; O. Finsch & Hartl. Vög. Ost-Afrikas, p. 774.
Rhynchæa variegata, Vieill., Schlegel, Mus. Pays-Bas, *Scolopaces*, p. 16.
Rhynchæa, sp.? v. Martens, J. f. O. 1866, p. 28, no. 162.

Hab. Philippines (*Cuming*).

Several examples obtained by Cuming in the Philippines are contained in the Leyden Museum.

Grus, sp., v. Martens, J. f. O. 1866, p. 27, no. 148.

If we may rely on Camel, and also on Buzeta, the Philippines are inhabited by members of both the Ciconiidæ and the Gruidæ. No other author has confirmed the statement (*cf.* v. Martens, *l. c.*).

ARDEIDÆ.

Ardeinæ.

Ardea, Linnæus.

190. Ardea purpurea.

Ardea purpurea, Linn. S. N. i. p. 236, no. 10 (1766).

Ardea purpurea, var. *manillensis,* Meyen, Nov. Act. Ac. C. L.C. Nat. Cur. xvi. suppl. prim. p. 102, "Manilla" (1834).

Hab. Manilla (*Meyen*).

Separated from the European species by Meyen, chiefly on account of its greater size.

Ardea longicollis, Meyen, Nov. Act. Ac. C. L.C. Nat. Cur. xvi. suppl. prim. p. 104, "Philippines" (1834), has never been identified. If not a distinct species, it probably belongs to one of the races of *Ardea alba,* not to *H. garzetta,* as assigned by Mr. G. R. Gray in the Hand-list, no. 1013.

Ardetta, G. R. Gray.

191. Ardetta flavicollis.

Yellow-necked Heron, Latham, Synop. Suppl. p. 239, no. 82, "India, Oude."

Ardea flavicollis, Lath. Ind. Orn. ii. p. 701, no. 87 (1790), ex Lath.; Gray & Hardw. Ill. Ind. Zool. i. pl. 66. fig. 2; Jerd. Ill. Ind. Orn. pl. 16; Wagler, Syst. Av. p. 180, no. 16; Horsf. Tr. Linn. Soc. xiii. p. 189, "Java;" Bp. Consp. ii. p. 131, "Ind. continent;" Gould, Birds Austral., 8vo, ii. p. 315, "Australia."

Ardea nigra, Vieill. N. Dict. xiv. p. 417, "Bengal" (1817).

Ardea bilineata, Cuv. Mus. Paris.; Pucher. Rev. et Mag. Zool. 1851, p. 374, "Java;" Bp. *tom. cit.* p. 132, "Malasia, Java, Sumatra;" v. Martens, J. f. O. 1866, p. 28, "Philippines."

Ardea picta, Raffles, Tr. Linn. Soc. xiii. p. 326, "Sumatra" (1821).

Ardea australis, Cuv. Mus. Paris.; Pucher. *tom. cit.* p. 375 (juv.), "Australia."

Ardetta gouldi, Bp. *tom. cit.* p. 132, "Australia" (1857).

Ardea flavicollis australis, Schlegel, Mus. Pays-Bas, *Ardeæ,* p. 46, "Australie."

Dr. von Martens (*l. c.*) identified a species of Heron, contained in the Military library at Manilla, with *Ardea bilineata,* Cuv. This title Pucheran has shown (*l. c.*) to have been bestowed on Javan examples of a species identical with the Indian Yellow-necked Heron.

192. Ardetta cinnamomea.

Cinnamon Heron, Lath. Gen. Synop. iii. pt. 1, p. 77, no. 43, "China."
Ardea cinnamomea, Gm. S. N. i. p. 643, no. 73 (1788), ex Lath.; Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 40; v. Martens, J. f. O. 1866, p. 28, no. 154.

Hab. Philippines (*Schlegel*, *v. Martens*).

193. Ardetta sinensis.

Chinese Heron, Latham, Gen. Synop. iii. pt. 1, p. 99, no. 73, "China."
Ardea sinensis, Gm. S. N. i. p. 643 (1788), ex Lath.; Walden, Tr. Zool. Soc. viii. p. 99; Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 40, "Philippines."

Hab. Philippines (*Schlegel*).

Bubulcus, Pucheran.

194. Bubulcus coromanda.

Le Crabier de Coromandel, Buffon, Hist. Nat. vii. p. 393; D'Aubenton, Pl. Enl. 910.
Cancroma coromanda, Bodd. Tabl. Pl. Enl. p. 54 (1783), ex D'Aubent.; v. Martens, J. f. O. 1866, p. 27, "Luzon;" Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 30.

Hab. *Luzon* (*Jagor*).

Herodias, Boie.

195. Herodias garzetta.

Ardea garzetta, Linn. S. N. i. p. 237, no. 13 (1766); v. Martens, J. f. O. 1866, p. 27, no. 151, "Luzon;" Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 15, "Philippines."
Ardea nigripes, Temm. Man. d'Orn. 2nd ed. pt. iv. p. 376, "l'Archipel des Indes" (1840).
Ardea candidissima, Gm., Kittlitz, Lütke, Voy. (Postels) iii. p. 327, "Manilla," *nec* Gm.

Hab. Luzon (*Jagor*).

196. Herodias intermedia.

Ardea intermedia, Wagler, Isis, 1829, p. 659, "Java;" Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 20.

A Philippine example in the Leyden Museum is thus identified by Professor Schlegel.

Butorides, Blyth.

197. Butorides javanica.

Ardea javanica, Horsf. Tr. Linn. Soc. xiii. p. 190, "Java" (1820); Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 43; v. Martens, J. f. O. 1866, p. 27; Walden, Tr. Zool. Soc. viii. p. 100; Finsch & Hartl. Faun. Central-Polynes. p. 207; Walden & Layard, Ibis, 1872, p. 105, "Negros."

Hab. Philippines (*Schlegel*); Luzon (*Jagor*); Negros (*L. C. Layard*).

BOTAURINÆ.

NYCTICORAX, Stephens.

198. * NYCTICORAX MANILLENSIS.

Nycticorax manillensis, Vigors, P. Z. S. 1831, p. 98, "neighbourhood of Manilla;" Fraser, Zool. Typica, pl. 66; Bp. Consp. ii. p. 140, "Philippines;" v. Martens, J. f. O. 1866, p. 28, "Isl. of Samar;" Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 60, "Luçon;" G. R. Gray, Hand-List, no. 10173, "Philippines."

"*Ardea caledonica*, Forster," Meyen, Nov. Ac. C. L.C. Nat. Cur. xvi. suppl. prim. p. 103, "Manilla," *nec* Forster; v. Martens, *tom. cit.* no. 158.

Hab. Manilla (*Lindsay*).

Professor Schlegel (*l. c.*) unites *Nycticorax crassirostris*, Vigors (Voy. Blossom, Zool. p. 27, "Bonin isl." 1839), with *N. manillensis*. According to Vigors, it only differs from *N. caledonicus* in the shape of the bill and its colour, and in the wing being an inch shorter. With *N. manillensis* he makes no comparison. This last does appear to differ from *N. caledonicus*; but as the type of *N. crassirostris* is no longer contained in the British Museum, although enumerated in the Hand-list as being extant, I am unable to confirm Professor Schlegel's opinion.

199. NYCTICORAX GRISEUS.

Ardea grisea, Linn. S. N. i. p. 239, av. juv. (1766).
—— *nycticorax*, Linn. *tom. cit.* p. 235; Meyen, Nov. Act. Ac. C. L.C. Nat. Cur. xvi. suppl. prim. p. 104, "Manilla;" v. Martens, J. f. O. 1866, p. 28, "Taalsee."

Hab. Manilla (*Meyen*).

GORSACHIUS, Bonaparte.

200. GORSACHIUS MELANOLOPHUS.

Ardea melanolopha, Raffles, Tr. Linn. Soc. xiii. p. 326, *adult*, "Sumatra" (1821); Layard, Ann. & Mag. Nat. Hist. 1854, 2nd ser. vol. xiv. p. 114, "Ceylon;" Blyth, Ibis, 1865, p. 38; *op. cit.* 1867, pp. 173, 309; Swinhoe, P. Z. S. 1871, p. 413; Holdsworth, P. Z. S. 1872, p. 478, "Ceylon."

Nycticorax limnophilax, Temm. Pl. Col. 581, *juv.*, "Java" (1835); Bp. Consp. ii. p. 156; Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 55, "Philippines, Bangka, Java."

Gorsachius goisagi, Temm., Bp. Consp. ii. p. 138, no. 122 (*adult*, Mus. Paris); Swinhoe, Ibis, 1865, p. 358; *op. cit.* 1866, pp. 123, 403.

Tigrisoma limnicola, Reichenb. Syst. Av. p. 16 (1852).
—— *typus*, Pucheran, Bp. *l. c.*

Ardea (*Botaurus*) *philippensis*, Gm., apud v. Martens, J. f. O. 1866, p. 28, no. 155 (*nec* Gm.).

? *Nycticorax goisagi*, Temm. Pl. Col. 582, *adult*, "Japan" (1835); Faun. Japon. p. 116, pl. 70: Bp. Consp. ii. p. 138, no. 122, *juv.* ex Japan; Schlegel, Mus. Pays-Bas, *Ardeæ*, p. 54.
? *Gorsachius melanolophus* (Raffles), G. R. Gray, Hand-list, no. 10177, "Japan."

It is still a matter of some doubt whether the species of the genus *Gorsachius* which occurs in Ceylon, Tenasserim, the Sunda islands, the Malayan peninsula, and the Philippines (*Ardea melanolopha*, Raffles) is the same as that which inhabits Japan (*Nycticorax goisagi*, Temm.). Professor Schlegel (*l. c.*) keeps them distinct, whereas Mr. Swinhoe, in his last list of the Birds of China (*l. c.*), unites them. Professor Schlegel's materials for comparison consisted of four Japanese individuals, two from Java, one from Bangka, and one from the Philippines, while Mr. Swinhoe appears to have obtained his in Formosa only. The most marked differential character possessed by *G. melanolophus* is its black crown and long black crest, each plume in the immature bird (*Nycticorax limnophilax*, Temm.) having a bold subterminal white irregular mark. In no authentic Japanese individuals do the crown and crest seem to be black; in the adult they are of a rich purple chestnut. Prince Bonaparte (*l. c.*) described two individuals: one, contained in the Paris Museum, having a black crest, he noted as the adult; the other, with the head and nape bright chestnut, as the young. They are both stated to be "ex Japan, nec inss. Philippensibus." They are certainly examples of adult birds; for the immature plumage of the Archepelagic, the Formosan, and the Japanese races have been fully described. The type of *Ardea melanolopha* is described by Sir Stamford Raffles (*l. c.*) as possessing a black crest[1]. Mr. Blyth (Ibis, 1865, p. 38) mentions that he has seen *A. melanolopha* from Malacca, Arakan, Ceylon, and the Philippines, that the adult is similar to *G. goisagi*, but has a long black-crested pileus at all ages, while *G. goisagi* from Japan has no black on the crest at any age. This opinion Mr. Blyth subsequently modified (*op. cit.* 1867, p. 173), in consequence of some observations of Mr. Swinhoe (*op. cit.* 1866, p. 403) on the seasonal changes of the crest-feathers, based on two adult specimens sent from Formosa. Mr. Swinhoe speaks positively of the black crest being present in the summer dress, and adds:—"In winter the crest *seems* to fall, leaving the head smooth and plain chestnut, instead of being capped and crested with cinereous-black plumes." A valuable and detailed account given by Mr. Swinhoe (*tom. cit.* p. 123) of the Formosan species when young (nearly full-grown) agrees with the Archipelagic bird at a similar age. This state of plumage is not found, or at least has not been described as occurring, in the Japan species (*cf.* Faun. Jap. pl. 70, immat., and Mus. Pays-Bas, *l. c.*). The facts known, bearing on the phases of plumage peculiar to the Japanese and the South-Asiatic races, induce me to hesitate before adopting Mr. Swinhoe's views. As a fact, the Malayan species (*G. melanolophus*)

[1] Mr. Blyth (*l. c.*) considers that *A. melanolopha*, Raffles, is the young; but Sir Stamford's description agrees best with the adult plumage.

wears the full chestnut plumage and the long black crest *in winter*; for I possess specimens, obtained by the late Mr. Maingay at Malacca in December, in that dress. Again, the Japanese, although said not to possess a black crest, does wear a long purple-chestnut crest; for so it is described by Temminck (*l. c.*); and a Nagasaki example (*mus. nostr.*) has a full chestnut-coloured crest. The only Japanese example in the British Museum wears the same plumage.

The bill in all the Malaccan examples I have examined is longer and straighter than in that of the Nagasaki individual above referred to.

The British Museum contains a Philippine example in chestnut plumage, with a black crown and flowing black crest. It is not enumerated in the Hand-list. In the same work, on the other hand, *N. limnophilax*, Temm., is entered as a separate species (No. 10164), from the Philippines, but not as being represented in the Museum.

Dr. v. Martens (*l. c.*) described a species of *Botaurus* which he had observed in the Military Library at Manilla, and identified it with *Ardea philippensis*, Gm. His short account agrees best with *G. goisagi*; for he says nothing about a black crest; and this negative evidence favours the hypothesis that *G. melanolophus* = *G. goisagi*.

Ardea philippensis, Gm., is generally considered to be the same as *A. undulata*, Gm. S. N. i. p. 637, no. 54. Brisson first described the individual (Orn. v. p. 474, no. 38) on which Gmelin bestowed the title of *A. philippensis*. The type, according to Brisson, was sent from the Philippines to M. Aubrey. The description of the plumage, given in great detail, does not tally as well with *G. melanolophus*, or *G. goisagi*, as with the American species, while the dimensions are much too small. Buffon, also, who (Hist. Nat. Ois. vii. p. 395) entitled it "le petit Crabier," mentions that it is even smaller than "le Blongios" (*Ardetta minuta*). Prince Bonaparte's identification of *A. philippensis*, Gm., with *A. undulata*, Gm. (Consp. ii. p. 138), in which he is confirmed by Professor Schlegel (Mus. Pays-Bas, *Ardeæ*, p. 56), appears therefore, on the whole, to be well founded. In Mr. Gray's Hand-list, no. 10154, it is treated as a distinct Philippine species, under the title of *Zebrilus pumilus* (Bodd.).

Two species of Spoonbills were described by Sonnerat as inhabiting the island of Luzon, namely:—

La Spatule blanche de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 89, pl. 51.
Platalea alba, Scop. Del. Fl. Faun. Insubr. ii. p. 92, no. 75 (1786), ex Sonn.
Platalea leucorodia, var. β, Gm. S. N. i. p. 614, ex Sonn.,

and

La Spatule huppée de l'isle de Luçon, Sonn. *tom. cit.* p. 90, pl. 52.
Platalea cristata, Scop. *tom. cit.* p. 92, no. 76, ex Sonn.
Platalea leucorodia, var. γ, Gm. *l. c.*, ex Sonn.

Platalea tenuirostris, Temm. Man. d'Orn., 2nd edit. p. ciii (1820)[1], ex Sonn. pls. 51, 52; Handboek der Eur. Vog. (Dutch tr.) p. cxxxiv (1824), ex Sonn.

Platalea luzoniensis, Bp. Consp.[2] ii. p. 148, no. 6 (1857), ex Sonn. pls. 51, 52; v. Martens, J. f. O. 1866, p. 27, no. 149.

The first is evidently the young of the second species; and if the Philippine habitat assigned to them by Sonnerat is incorrect, the types were in all probability obtained by him either at Madagascar, at the Mauritius (*Pl. telfairi*, Vigors, P. Z. S. 1830–31, p. 41), or in Southern Africa (*Pl. chlororhyncha*, Drapiez, Dict. Cl. d'Hist. Nat. xv. p. 531, 1829; *Pl. nudifrons*, Cuv. Mus. Paris.; Pucher. Rev. et Mag. Zool. 1851, p. 376,—titles founded on individuals generally admitted to belong to one and the same species). Sonnerat's description of his two species is very meagre; but the bill of the first is described as reddish brown, and the feet as being yellow inclining to red. The bill of the second (the adult, crested bird) is stated to be of a ruddy grey (*gris roux*), the edges being red, and the legs of a light but dull red (*rouge claire et terne*). These characters being only found in *Pl. chlororhyncha*, and as no species of Spoonbill has, since Sonnerat wrote, been recorded as inhabiting the Philippines or, indeed, any of the islands of the Malay archipelago, we may with much certainty adopt Professor Schlegel's decided opinion that Sonnerat described from individuals belonging to the African species (*cf.* Schlegel, Mus. Pays-Bas, *Ciconidæ*, *Pl. chlororhyncha*, p. 22).

Buffon (Hist. Nat. vii. p. 456) considered Sonnerat's two birds to represent one species not differing from *Pl. leucorodia*. But if it be conceded that Sonnerat described from either Mauritius, Madagascar, or African individuals, Scopoli's specific title *alba* must be adopted for the red-legged Spoonbill. This title Prince Bonaparte (*tom. cit.* p. 147) referred to *Pl. leucorodia*, quoting Annus I. Hist. Nat. page 115. No such title occurs at *page* 115; but under *number* 115 Scopoli enumerates *Pl. leucorodia*, Linn., and, as its chief character, uses the word *alba*. In the synonymy of *Pl. leucorodia* by Finsch and Hartlaub (Vög. Ost-Afrikas, p. 715) this reference of Bonaparte's has been accepted without examination and the number misquoted. The same error reappears in Heuglin (Orn. Nordost-Afrikas, p. 1122).

[1] Not 1816, as quoted by Bonaparte, *tom. cit.* p. 148, no. 5, a misprint copied by Dr. O. Finsch, Vög. Ost-Afrikas, p. 718, and by von Heuglin, Orn. Nordost-Afrikas, p. 1126, who adds "première édition."

[2] A title established by the Prince, although attributed by him to Scopoli.

ANSERES.

ANATIDÆ.

Anatinæ.

Querquedula, Stephens.

201. *Querquedula multicolor.

La petite Sarcelle de l'isle de Luçon, Sonn. Voy. Nouv. Guin. p. 91, pl. 55.
Sterna multicolor, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 74 (1786), ex Sonn.
Anas manillensis, Gm. S. N. i. p. 523, no. 91 (1788), ex Sonn.; Eyton, Monogr. Anatidæ, p. 125.

Mr. Eyton (*l. c*), without hesitation, identifies Manilla (?) examples in Lord Derby's collection and his own with Sonnerat's Luzon Teal, adding that it is allied to *Q. formosa.* Professor Schlegel (Mus. Pays-Bas, *Anseres,* p. 77) identifies, with doubt, Sonnerat's species with the Australian *Nettapus pulchellus,* Gould.

Anas, Linnæus.

202. *Anas luzonica.

Anas luzonica, Fraser, P. Z. S. 1839, p. 113, "Luzon;" Zool. Typica, pl. 67; v. Martèns, J. f. O. 1866, p. 30, no. 189.

Hab. Luzon (*Cuming, Jagor*).

Anas boschas is stated by Dr. Pickering (Cassin, Un. St. Expl. Exped. p. 340) to be raised in immense numbers at the Philippine Islands, but to be undoubtedly of Malay introduction. I do not, therefore, enumerate it as an indigenous species; but there is no good reason to doubt the probability of its being also a wild winter Duck in the Archipelago.

Dendrocygna, Swainson.

203. Dendrocygna vagans.

Dendrocygna vagans, Eyton, MS.; Fraser, Zool. Typica, pl. 68, "Manilla" (1849); Walden, Tr. Zool. Soc. viii. p. 102; v. Martens, J. f. O. 1866, p. 30, no. 190; v. Pelzeln, Reise 'Novara,' Vög. p. 137.

Hab. Manilla (*Cuming*); island of Samar (*Jagor*).

Anserinæ.

Nettapus, Brandt.

204. Nettapus coromandelianus.

La Sarcelle de Coromandel, Buffon, Hist. Nat. Ois. ix. p. 274, "Côte de Coromandel;" D'Aubent. Pl. Enl. 549, 550.

Anas coromandeliana, Gm. S. N. i. p. 522, no. 90 (1788), ex Buffon; v. Pelzeln, Reise 'Novara,' Vögel, p. 136.

Hab. Luzon (Laguna de Bai), June 20th (*Zelebor*).

PROCELLARIIDÆ.

Procellariinæ.

Puffinus, Brisson.

205. Puffinus leucomelas.

Procellaria leucomelas, Temm. Pl. Col. 587, "Japan" (1836); Temm. & Schlegel, Faun. Japonica, *Aves,* p. 131, pl. 85; G. R. Gray, List. Br. Mus. *Anseres,* p. 160, "Cataguan" (1844).

Hab. Cataguan (*Cuming*).

LARIDÆ.

Larinæ.

Larus, Linnæus.

206. Larus, sp.

"*Larus ridibundus,* Linn.," v. Martens, J. f. O. 1866, p. 30, no. 184.

Dr. v. Martens (*l. c.*) mentions having observed the Laughing Gull, during the month of May, common on the Passig river; and one or more examples, obtained at Manilla by Jagor, are stated to be preserved in the Berlin Museum. The species occurs rarely as a winter visitant in South China (Swinhoe, P. Z. S. 1871, p. 421); and the above identification requires confirmation.

A species of *Lestris* (*L. hardyi*, Bp. Compt. Rend. xlii. p. 770, 1856) has the Philippines among other localities assigned to it in the Hand-list, no. 10939. Its right to rank as a distinct species is denied by Professor Schlegel (*cf.* Bp. *op. cit.* xliii. p. 644); and its sole claim to be included within the Philippine range rests on the fact of an example, contained in the Berlin Museum, having been captured in mid ocean between the Sandwich and Philippine Islands. In the Leyden Museum, at the time

Bonaparte wrote, it was labelled *Lestris parasiticus*? ex Malasia, Boie; and in the Berlin Museum (example above referred to) *Lestris crepidata,* Cabanis.

STERNINÆ.

HYDROCHELIDON, Boie.

207. HYDROCHELIDON LEUCOPAREIA.

Sterna leucopareia, Natterer, Temm. Man. d'Orn. 2nd ed. ii. p. 746 (1820); Walden, Tr. Zool. Soc. vii. p. 103.

Hab. Luzon, February. Bill grey-black; feet coral-red; nails black (*Meyer*).

The example thus labelled has the bill and feet dark carmine in the dried skin.

208. HYDROCHELIDON, sp.

Sterna (*Hydrochelidon*) *fluviatilis,* Gould?, v. Martens, J. f. O. 1866, p. 30, no. 186.

Dr. v. Martens (*l. c.*) mentions having seen a Tern very abundant on the Passig river and in the Bay of Manilla, which he identifies, with doubt, as above. Examples are noted by him as being preserved in the Berlin Museum.

Sterna brachyura, v. Kittlitz, Voy. Lütke (Postels), iii. p. 327, *sine descr.*, "Manilla," has not since been recognized.

ONYCHOPRION, Wagler.

209. ONYCHOPRION ANÆSTHETUS.

L'Hirondelle de mer de l'isle de Panay, Sonn. Voy. Nouv. Guin. p. 125, pl. 84.
Sterna anæsthetus, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 72 (1786), ex Sonn.
Panayan Tern, Lath. Synop. iii. pt. 2, p. 363, no. 15, ex Sonn.
Sterna panayensis, Gm. S. N. i. p. 607, no. 16 (1788), ex Lath.
Sterna panaya, Lath. Ind. Orn. ii. p. 808, no. 16 (1790), ex Gm.; Finsch & Hartl. Orn. Centralpolyn. p. 228; Vögl. Ost-Afrik. p. 833.

Hab. Panay (*Sonnerat*).

ANOUS, Leach.

210. ANOUS STOLIDUS?

Sterna stolida, Linn. S. N. i. p. 227, no. 1 (1766).
Le petit Fouquet des Philippines, Sonn. Voy. Nouv. Guin. p. 125, pl. 85.
Sterna pileata, Scopoli, Del. Fl. Faun. Insubr. ii. p. 92, no. 73 (1786), ex Sonn.
Sterna philippina, Lath. Ind. Orn. ii. p. 805, no. 7 (1790), ex Sonn.

Sonnerat's description differs somewhat from *A. stolidus*; and until Philippine examples can be compared, the question of identity must remain in doubt.

PODICIPIDÆ.

Podiceps, Latham.

211. *Podiceps philippensis.

Le Castagneux des Philippines, Buffon, Hist. Nat. Ois. viii. p. 246; D'Aubenton, Pl. Enl. 945; Temm. Man. d'Orn. ii. p. 729.

Colymbus minor, var. β, Gm. S. N. i. p. 591, no. 20, ex Buffon.

Colymbus philippensis, Bonnaterre, Encycl. i. p. 58, pl. 46. f. 3 (1823), ex Buffon; v. Martens, J. f. O. 1866, p. 31, no. 192.

Hab. Luzon (*Jagor*).

Messrs. Finsch and Hartlaub (Ost-Afrik. iv. 812) unite the Asiatic species of Little Grebe with European *P. minor*. Buffon (*l. c.*) states that the Philippine species is distinct. Temminck (*l. c.*) is of the same opinion; and Dr. v. Martens, who has had opportunities of comparing Jagor's Philippine example in the Berlin Museum, enumerates the Philippine Dabchick under Bonnaterre's title.

PELECANIDÆ.

Pelecaninæ.

Pelecanus, Linnæus.

212. Pelecanus roseus.

Le Pelican rose de l'isle de Luçon, Sonnerat, Voy. Nouv. Guin. p. 91, pl. 54, adult.

Pelecanus roseus, Gm. S. N. i. p. 570, no. 9 (1788), ex Sonn.; Donndorff, Zool. Beytr. vol. ii. pt. 1, p. 848, no. 9 (1794), ex Gm.

Le Pelican brun de l'isle de Luçon, Sonn. *loc. cit.* pl. 53, *juv.*[1]

Pelecanus manillensis, Gm. *op. cit.* p. 571, no. 11 (1788), ex Sonn.

? *Pelecanus javanicus,* Horsf. Tr. Linn. Soc. xiii. p. 197, "Java" (1820).

P. manillensis, Gm., and *P. roseus*, Gm., have been regarded by most authors, and latterly by Mr. Elliot in his useful Monograph of the genus (P. Z. S. 1869, p. 583), as belonging to *P. philippensis*, Gm. A reference to Sonnerat's plate 54, and his description of the Pelican there figured, however, leaves it almost certain that he intended to represent a different species. This was also the view maintained by Dr. Jerdon (Birds Ind. iii. pp. 858, 859), who identified the Lesser White Pelican of India with *P. roseus*, Gm. Until Luzon examples can be examined, the question must remain in doubt. Sonnerat's 53rd plate appears to represent the immature plumage.

[1] Scopoli omitted to bestow a Latin title on either of the two Pelicans figured by Sonnerat.

213. PELECANUS PHILIPPINENSIS.

Onocrotalus philippinensis, Brisson, Orn. vi. p. 527, no. 3, "Luçon."
Pelecanus philippinensis, Gm. S. N. i. p. 571, no. 12 (1788), ex Brisson; Bp. Compt. Rend. xliii. p. 574; Sclater, P. Z. S. 1868, p. 268; *op. cit.* 1871, p. 633.
Pelecanus rufescens, Gm. (partim); Lichtenst. Abhandl. Akad. Wissensch. Berl. 1838, p. 439 (partim); Elliot, P. Z. S. 1869, p. 583 (partim); G. R. Gray, Hand-list, no. 11155 (partim).

Originally described from an example obtained in Luzon and sent to M. Aubrey at Paris.

Although Lichtenstein, Schlegel, Elliot, and G. R. Gray unite this Pelican with *P. rufescens*, the view adopted by Bonaparte, Sclater, Barboza du Bocage, and Finsch & Hartlaub, that the African bird belongs to a distinct species, is most in accordance with the known facts.

SULARINÆ.

DYSPORUS, Illiger.

214. DYSPORUS SULA.

Pelecanus sula, Linn. S. N. i. p. 218, no. 7 (1766); Walden, Tr. Zool. Soc. viii. p. 106, no. 191.
Sula fiber (Linn.), G. R. Gray, List Br. Mus. *Anseres*, p. 183, "Mindanao" (1844).

Hab. Mindanao (*Cuming*).

215. DYSPORUS PISCATOR.

Pelecanus piscator, Linn. Amoen. Acad. iv. p. 239, no. 8 (1759); S. N. i. p. 217, no. 6 (1766); Cassin, Un. St. Expl. Exped. 2nd edit. Ornith. p. 365; Finsch & Hartl. Faun. Centralpolyn. p. 255.

Hab. Philippines (*Pickering*).

GRACULINÆ.

PHALACROCORAX, Brisson.

216. PHALACROCORAX, sp.

Carbo sinensis, Shaw, v. Martens, J. f. O. 1866, p. 29, no. 180.

A species of Cormorant, "einfarbig schwarz," observed by Dr. v. Martens in the Military Library at Manilla, is identified by him with *Pelecanus sinensis*, Shaw and Nodder (Nat. Misc. vol. xiii., pl. 529, *juv.*, "China").

217. PHALACROCORAX, sp.

Carbo lucidus, Lichtenstein, v. Martens, J. f. O. 1866, p. 30, no. 181.

An example from Manilla, preserved in the Berlin Museum, is identified by Dr. v. Martens (*l. c.*) with the well-known African *Ph. lucidus*, a species unknown in Asia and its islands.

PLOTIDÆ.

Plotus, Linnæus.

218. Plotus melanogaster.

Anhinga melanogaster, Forster, Zool. Ind. p. 22, pl. xii., "Java, Ceylon" (1781); Walden, Tr. Zool. Soc. viii. p. 106; v. Martens, J. f. O. 1866, p. 30, no. 182; Walden & Layard, Ibis, 1872, p. 96, "Negros."

Plotus novæ-hollandiæ, Gould, v. Pelzeln, Reise der 'Novara,' *Vögel*, p. 156.

Hab. Luzon, April (*Meyer*); Negros (*L. C. Layard*).

DESCRIPTION OF THE PLATES.

PLATE XXIII.

Map of the Philippine Archipelago.

PLATE XXIV.

Limnaëtus philippensis, p. 141. From a specimen in the Norwich Museum.

PLATE XXV.

Fig. 1. *Ninox philippensis*, p. 144. From a specimen in Lord Walden's collection.
Fig. 2. *Pseudoptynx philippensis*, p. 144. From a specimen in the British Museum.
Fig. 3. *Lempijius megalotis*, p. 145. From a specimen in the British Museum.

PLATE XXVI.

Fig. 1. *Merops bicolor*, p. 150.
Fig. 2. *Merops sumatranus*, p. 151.
From specimens in Lord Walden's Collection.

PLATE XXVII.

Cranorrhinus leucocephalus, p. 165.

Fig. 1, young male; fig. 2, female, not quite adult. Specimens in the British Museum.

PLATE XXVIII.

Penelopides panini, p. 166, Fig. 1 ♂, 2 ♀. From specimens in Lord Walden's collection.

PLATE XXIX.

Fig. 1. *Lanius lucionensis*, p. 171. From a specimen in Lord Walden's collection.
Fig. 2. *Pseudolalage melanoleuca*, p.178. From a specimen in the British Museum.

PLATE XXX.

Fig. 1. *Graucalus striatus*, p. 175.
Fig. 2. *Volvocivora cærulescens*, p. 178.
From specimens in Lord Walden's collection.

PLATE XXXI.

Fig. 1. *Dicrurus balicassius*, p. 180.
Fig. 2. *Hyloterpe philippinensis*, p. 179.
From specimens in Lord Walden's collection.

PLATE XXXII.

Fig. 1. *Philentoma cyaniceps*, p. 182.
Fig. 2. *Ixus urostictus*[1], p. 191.
From specimens in Lord Walden's collection.

PLATE XXXIII.

Fig 1. *Copsychus mindanensis*, p. 194.
Fig. 2. *Amaurornis olivacea*, p. 231.
From specimens in Lord Walden's collection.

PLATE XXXIV.

Fig. 1. *Leucotreron gironieri*, p. 213.
Fig. 2. *Phabotreron amethystina*, p. 214.
From specimens in Lord Walden's collection.

[1] Written *Pycnonotus urostictus* on the Plate.

APPENDIX.

Containing Index of Philippine species and a Table showing their Geographical distribution[1].

Species.		Philippines.								Celebes.	Borneo.	Java.	Sumatra.	Malay peninsula.	Timor.	India.	Australian Region.	Polynesian Region.	Papuan Subregion.	
		Luzon.	Panay.	Guimaras.	Negros.	Zebu.	Mindanao.	Cujo	Cataguan.											
1. Cacatua hæmaturopygia, p. 132		*		*	*															
2. Prioniturus discurus, p. 132		*		*			*													
3. Tanygnathus luconensis, p. 133		*		*	*															
4. Cyclopsitta lunulata, p. 133		*					*													
5. Loriculus philippensis, p. 135		*																		
6. " regulus, p. 135					*															
6a. " occipitalis, p. 135							*													
7. " hartlaubi, p. 136							*													
8. " chrysonotus, p. 137						*														
9. Hypotriorchis severus, p. 139					*					*		*				*			*	
10. Hierax erythrogenys, p. 139		*																		
11. Lophospiza trivirgata, p. 140	*										*	*	*			*				Formosa, Ceylon.
12. Teraspiza virgata, p. 141		*		*							*	*	*	*	*	*				China, Japan, Formosa.
13. Tachyspiza soloënsis, p. 141	*									*	*	*	*	*					*	China.
14. Limnaëtus philippensis, p. 141		*																		
15. Cuncuma leucogaster, p. 142	*									*		*	*	*	*	*	*	*	*	Ceylon.
16. Spilornis holospilus, p. 142		*					*		*											
17. Haliastur intermedius, p. 142		*		*								*								Siam.
18. Elanus hypoleucus, p. 142		*								*	*	*								
19. Baza magnirostris, p. 143	*																			
20. Butastur indicus, p. 143		*		*				*		*		*		*					*	Tenasserim, Japan, China.
21. Circus melanoleucos, p. 143	*													*		*				China, Siberia, Ceylon.
22. " spilonotus, p. 143	*													*						China, Formosa, Dauria.
23. " æruginosus, p. 144	*														*	*				China, Formosa, Ceylon.
24. Ninox philippensis, p. 144		*																		
25. Pseudoptynx philippensis, p. 144	*																			
26. Lempijius? megalotis, p. 145		*																		
27. Scelostrix candida, p. 145		*														*	*			Formosa.
28. Thriponax javensis, p. 146		*					*				*	*		*						
29. Mulleripicus funebris, p. 146		*																		
30. Chrysocolaptes hæmatribon, p. 147		*																		
31. " xanthocephalus, p. 147					*															
32. " lucidus, p. 147		*																		
33. Yungipicus maculatus, p. 148		*	*				*													
34. Harpactes ardens, p. 149		*					*													[lon.
35. Merops philippinus, p. 149		*			*					*	*	*	*	*		*				China, Flores, Lombock, Cey-
36. " bicolor, p. 150		*			*															[Flores, Ceylon.
37. Eurystomus orientalis, p. 152		*		*	*			*		*	*	*	*	*	*	*				China, Siberia, Lombock,
38. Alcedo bengalensis, p. 152		*									*	*	*	*	*	*				Central Asia, Siberia, China,
39. Alcyone cyanopectus, p. 153	*																			[Japan, Flores, Gilolo, Ceylon.
40. Pelargopsis gouldi, p. 153		*																		
41. Ceyx melanura, p. 153		*																		
42. " tridactyla, p. 153	*											*	*	*		*				Ceylon.
43. " philippinensis, p. 153		*																		
44. Entomobia gularis, p. 154		*			*	*														
45. " pileata, p. 154	*										*		*	*		*				China, Ceylon.
46. Callialcyon coromanda, p. 155	*										*	*	*	*		*				
47. Sauropatis chloris, p. 155		*		*	*	*				*	*	*	*	*		*			*	
48. Actenoides hombroni, p. 155							*													
49. " lindsayi, p. 156		*																		
50. Xantholæma hæmacephala, p. 156		*					*						*	*		*				
51. " rosea, p. 157					*							*								
52. Macropteryx comatus, p. 158		*									*		*	*						Siam.
53. Collocalia troglodytes, p. 158		*																		
54. Lyncornis macrotis, p. 159		*																		
55. Caprimulgus manillensis, p. 159		*								*										

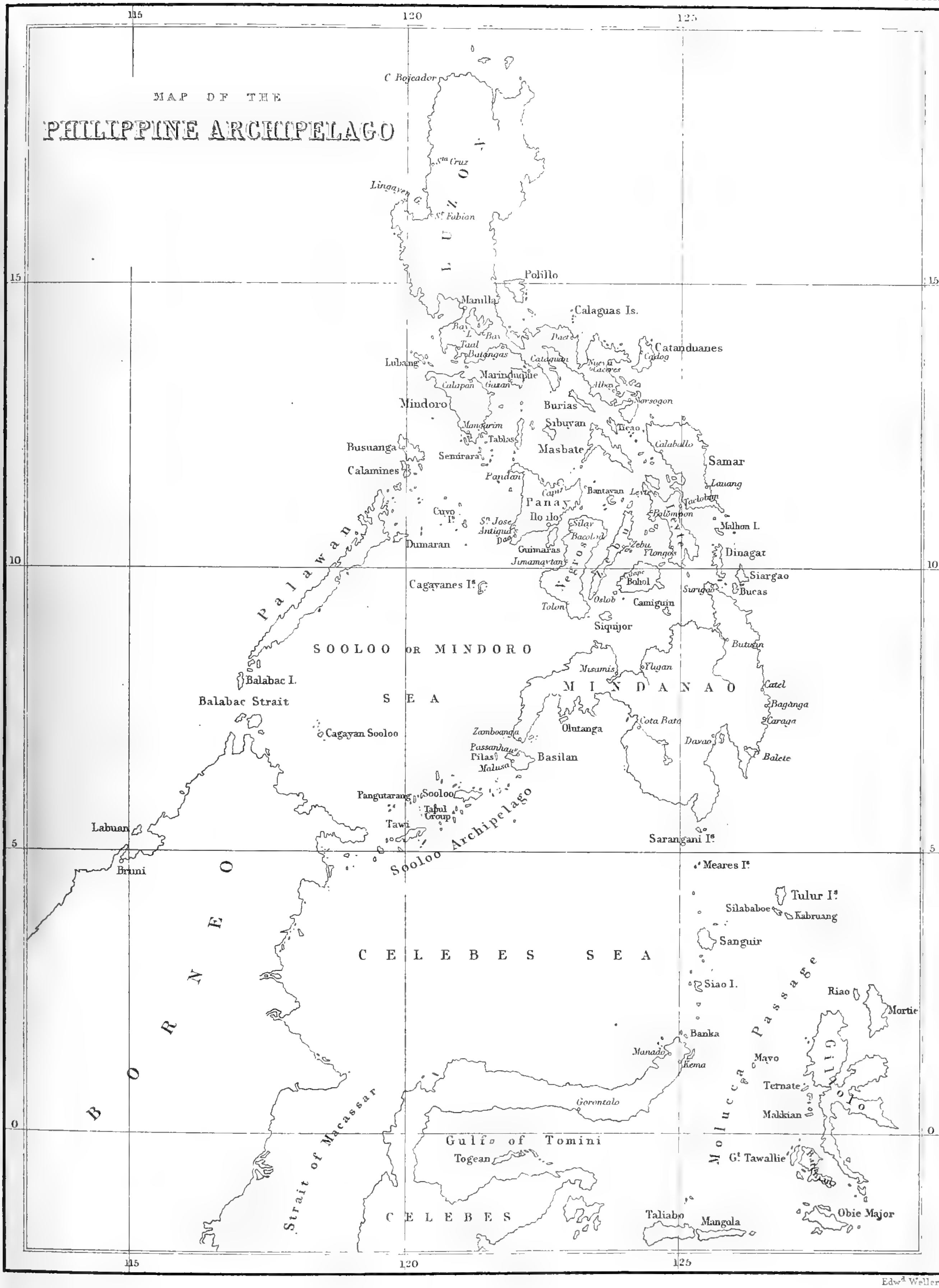
[1] The first column gives the species whose exact habitat within the Archipelago is not known. European and African ranges are excluded.

Species.		Philippines.																		
		Luzon.	Panay.	Guimaras.	Negros.	Zebu.	Mindanao.	Cujo.	Cataguan.	Celebes.	Borneo.	Java.	Sumatra.	Malay peninsula.	Timor.	India.	Australian Region.	Polynesian Region.	Papuan Subregion.	
56. Caprimulgus griseatus, p. 160	*																			
57. Cacomantis merulinus, p. 160		*	*																	
58. Chalcococcyx amethystinus, p. 160		*																		
59. Hierococcyx strenuus, p. 161		*																		
60. „ pectoralis, p. 161	*																			
61. Eudynamis mindanensis, p. 162			*	*			*													
62. Dasylophus superciliosus, p. 162		*																		
63. Lepidogrammus cumingi, p. 163		*																		
64. Centrococcyx viridis, p. 163		*		*	*	*														
65. Pyrrhocentor melanops, p. 164							*													
66. Buceros hydrocorax, p. 164		*																		
67. Craniorrhinus leucocephalus, p. 165							*													
68. Penelopides panini, p. 166			*	*																
69. „ manillæ, p. 168		*																		
70. Lanius nasutus, p. 169			*			*														
71. „ schach, p. 170	*																			China, Formosa.
72. „ lucionensis, p. 171		*		*	*	*														China, Formosa, Andamans.
73. Artamus leucorhynus, p. 174		*		*	*					*	*	*	*		*		*		*	Andamans.
74. Graucalus striatus, p. 175		*			*		*													
75. Volvocivora ? cærulescens, p. 178		*																		
76. Lalage dominica, p. 178				*		*					*	*	*	*				*		
77. Pseudolalage melanoleuca, p. 178		*																		
78. Hyloterpe philippensis, p. 179		*																		
79. Pericrocotus cinereus, p. 179	*												*	*						China, Siberia.
80. Dicrurus balicassius, p. 180		*																		
81. „ mirabilis, p. 181					*															
82. Philentoma cyaniceps, p. 182		*																		
83. Leucocerca nigritorquis, p. 182		*				*														
84. Cyornis banyumas, p. 182		*				*				*	*	*	*							[Ceylon.
85. Hypothymis azurea, p. 182		*		*	*						*	*	*	*		*				Andamans, Flores, China,
86. Butalis manillensis, p. 183		*																		Species undetermined.
87. Zeocephus rufus, p. 183	*																			
88. Hirundo gutturalis, p. 184			*							*	*	*	*	*		*			*	China, Japan, Formosa, Ceylon.
89. Cecropis daurica ?, p. 185		*																		Species not determined.
90. Broderipus acrorhynchus, p. 185		*		*	*	*														
91. Oriolus philippensis, p. 186	*																			
92. Turdus obscurus, p. 186	*										*	*		*		*				China, Japan, Formosa, Siberia.
93. „ chrysolaus, p. 187	*																			China, Formosa, Japan.
94. Erythropitta erythrogastra, p. 187	*																			
95. Melanopitta sordida, p. 187		*			*															
96. Megalurus palustris, p. 189		*										*				*				
97. Crateropus caudatus, p. 189	*															*				
98. Irena cyanogastra, p. 190		*	*																	
99. Ixus goiavier, p. 190		*																		
100. „ sinensis, p. 191		*																		China, Formosa.
101. „ urostictus, p. 191		*																		
102. Hypsipetes philippinensis, p. 191		*		*		*														
103. Monticola solitarius, p. 192		*		*	*					*				*		*			*	Gilolo, China, Formosa, Japan.
104. Pratincola caprata, p. 193		*								*		*			*	*				Lombock, Formosa, Flores.
105. Cittocincla luzoniensis, p. 193		*																		
106. Copsychus mindanensis, p. 194				*	*	*	*													
107. Calliope camtschatkensis, p. 194	*															*				Siberia, China.
108. Gerygone simplex, p. 194		*																		
109. Phyllopneuste magnirostris, p. 195	*										*	*		*		*				China, Siberia.
110. Acrocephalus orientalis, p. 195		*				*				*	*		*	*					*	China, Japan, Lombock.
111. Cisticola semirufa, p. 195		*																		
112. Orthotomus derbianus, p. 195	*																			
113. „ castaneiceps, p. 195				*																
114. Budytes viridis, p. 196		*								*		*		*		*				China, Moluccas, Ceylon.
115. Calobates melanope, p. 196		*				*					*	*	*	*		*				China, Formosa, Siberia, Cey-
116. Motacilla luzonensis, p. 198	*																			Unidentified. [lon.
117. Corydalla lugubris, p. 198				*																

Species.		Philippines.																		
		Luzon.	Panay.	Guimaras.	Negros.	Zebu.	Mindanao.	Cujo.	Cataguan.	Celebes.	Borneo.	Java.	Sumatra.	Malay peninsula.	Timor.	India.	Australian Region.	Polynesian Region.	Papuan Subregion.	
118. Machlolophus elegans, p. 199	*																			
119. Zosterops meyeni, p. 199		*																		
120. Dicæum retrocinctum, p. 199		*				*														
121. Myzanthe pygmæa, p. 200		*		*																
122. Nectarophila sperata, p. 200		*																		
123. Arachnechthra jugularis, p. 200				*	*	*														
124. Rhabdornis mystacalis, p. 201		*																		
125. Corvus philippinus, p. 201		*			*			*												
126. Acridotheres cristatellus, p. 202		*																		China, Formosa.
127. Sturnia violacea, p. 203	*									*	*									Japan.
128. Calornis panayensis, p. 205		*	*		*	*														
129. Sarcops calvus, p. 205		*		*	*															
130. Pyrgita montanus, p. 206	*											*		*		*				China, Formosa.
131. Padda oryzivora, p. 207	*									*	*	*	*	*						S. China, Lombock.
132. Munia jagori, p. 207		*				*														
133. ,, minuta, p. 208		*																		
134. Oxycerca jagori, p. 208		*																		
135. Osmotreron vernans, p. 210		*								*	*	*	*	*						Cambodia.
136. ,, axillaris, p. 211		*		*	*															
137. Leucotreron gironieri, p. 213		*		*																
138. Ramphiculus occipitalis, p. 214		*																		
139. Phapitreron amethystina, p. 214		*																		
140. ,, leucotis, p. 214		*			*															
141. Carpophaga ænea, p. 215		*			*						*	*	*	*		*				Ceylon, Lombock.
142. Ptilocolpa griseopectus, p. 216		*																		
143. Myristicivora bicolor, p. 217					*					*	*	*		*					*	Nicobars.
144. Hemiphaga poliocephala, p. 217		*																		
145. Ianthœnas griseogularis, p. 218		*			*															
146. Macropygia tenuirostris, p. 218		*			*															
147. Turtur dussumieri, p. 218		*			*															
148. ,, humilis, p. 219		*																		S. China, Formosa,Cambodia.
149. Phlogœnas luzonica, p. 221		*																		
150. Chalcophaps indica, p. 221		*			*					*	*	*	*	*		*				Hainan, Formosa.
151. Calœnas nicobarica, p. 222	*									*				*					*	Nicobars.
152. Geopelia striata, p. 223	*									*	*	*	*	*						Lombock, Bangka, Sumbawa.
153. Gallus bankiva, p. 223		*		*						*		*		*						
154. Arborophila, sp., p. 223	*																			
155. Excalfactoria chinensis, p. 224	*										*	*	*	*		*				S. China, Formosa, Ceylon.
156. Turnix ocellata, p. 224	*																			
157. Rollulus, sp., p. 225	*																			
158. Megapodius cumingi, p. 225	*										*									
159. Charadrius fulvus, p. 226		*			*					*	*	*	*	*	*	*	*	*	*	China,Formosa,Japan,Siberia.
160. Squatarola helvetica, p. 226					*			*			*	*		*	*	*	*		*	Almost cosmopolitan.
161. Ægialitis geoffroyi, p. 227	*										*	*	*		*	*	*		*	China,Japan, Formosa, Flores
162. ,, dubia, p. 227	*																			Species undetermined.
163. ,, mongolica, p. 227	*										*	*				*	*		*	N. Asia, China.
164. Esacus magnirostris, p. 227	*									*		*	*						*	
165. Himantopus autumnalis, p. 228		*														*				China.
166. ,, leucocephalus, p. 228							*			*	*	*	*		*	*	*		*	
167. Glareola orientalis, p. 228					*						*	*			*	*	*		*	China, Formosa, Bangka.
168. Porphyrio pulverulentus, p. 228	*																			
169. Gallinula chloropus, p. 229		*														*				China, Formosa.
170. Gallicrex cinerea, p. 229		*									*	*				*				S. China, Formosa, Ceylon.
171. Erythra phænicura, p. 229							*			*	*	*	*	*		*				S. China, Formosa, Ceylon.
172. Ortygometra cinerea, p. 230	*									*	*	*		*	*	*	*	*	*	
173. Porzana pygmæa, p. 230	*															*				China, Japan, Ceylon.
174. ,, fusca, p. 230	*										*	*	*			*				Ceylon.
175. Rallina fasciata, p. 231		*									*	*	*	*						
176. Amaurornis olivacea, p. 231		*																		
177. Hypotænidia torquata, p. 231		*																		
178. ,, philippensis, p. 231	*									*							*	*		
179. ,, striata, p. 232		*								*	*	*	*	*		*				China, Formosa, Ceylon.

Species.		Philippines.																		
		Luzon.	Panay.	Guimaras.	Negros.	Zebu.	Mindanao.	Cujo.	Cataguan.	Celebes.	Borneo.	Java.	Sumatra.	Malay peninsula.	Timor.	India.	Australian Region.	Polynesian Region.	Papuan Subregion.	
180. Hydrophasianus chirurgus, p. 232		*										*				*				China, Formosa, Ceylon.
181. Numenius phæopus, p. 232								*		*	*	*	*			*	*	*	*	China,Formosa,Japan,Ceylon.
182. Rhyacophilus glareola, p. 233		*								*	*	*	*	*		*				Japan, Ceylon, China.
183. Tringoides hypoleucos, p. 234		*								*	*	*	*	*		*	*		*	China,Formosa,Japan,Ceylon.
184. Totanus calidris, p. 234	*	*								*	*	*		*		*				China, Ceylon.
185. " glottis, p. 234		*								*	*	*				*	*		*	Asia. [lon.
186. Tringa ruficollis, p. 234		*								*	*	*				*				China, Formosa, Siberia, Cey-
187. Gallinago scolopacina, p. 235		*														*				China, Formosa, Japan.
188. " megala, p. 235		*								*									*	China, Formosa, Siberia.
189. Rhynchæa capensis, p. 235	*										*	*	*	*		*				China,Formosa,Japan,Ceylon.
190. Ardea purpurea, p. 236		*									*	*	*			*				China, Japan.
191. Ardetta flavicollis, p. 236	*										*	*	*		*	*	*		*	China, Asia.
192. " cinnamomea, p. 237	*										*	*	*			*				China, Formosa, Ceylon.
193. " sinensis, p. 237	*									*	*	*				*				China, Formosa, Ceylon.
194. Bubulcus coromanda, p. 237		*									*	*			*	*			*	S. China, Formosa, Japan,
195. Herodias garzetta, p. 237		*								*	*	*				*	*		*	Ceylon. [Ceylon.
196. " intermedia, p. 237	*										*	*				*	*			China, Japan, Ceylon.
197. Butorides javanica, p. 237		*			*					*	*	*			*	*	*	*	*	S. China, Formosa, Japan,
198. Nycticorax manillensis, p. 238		*																		[Ceylon.
199. " griseus, p. 238		*								*	*	*				*				Asia.
200. Gorsachius melanolophus, p. 238	*											*	*	*						Ceylon, Tenasserim.
201. Querquedula multicolor, p. 242		*																		
202. Anas luzonica, p. 242		*																		
203. Dendrocygna vagans, p. 242		*								*		*					*	*	*	
204. Nettapus coromandelianus, p. 243		*										*				*				Ceylon.
205. Puffinus leucomelas, p. 243									*											Japan.
206. Larus, sp., p. 243		*																		Species undetermined.
207. Hydrochelidon leucopareia, p. 244		*								*	*	*				*	*			Formosa, Asia.
208. " sp., p. 244		*																		Species undetermined.
209. Onychoprion anæsthetus, p. 244			*							*	*	*	*	*		*	*	*	*	China, Ceylon.
210. Anous stolidus ?, p. 244	*																			Species undetermined.
211. Podiceps philippensis, p. 245	*																			Species undetermined.
212. Pelecanus roseus, p. 245		*																		Species undetermined.
213. " philippinensis, p. 246		*										*		*		*				China.
214. Dysporus sula, p. 246							*			*	*	*	*	*		*	*	*	*	China, Formosa.
215. " piscator, p. 246	*											*				*	*	*	*	S. China.
216. Phalacrocorax, sp., p. 246	*																			Species undetermined.
217. " " " p. 246		*																		Species undetermined.
218. Plotus melanogaster, p. 247		*			*					*	*	*	*			*				Ceylon.
Total	57	133	9	27	38	18	19	5	2	47	62	75	46	50	16	69	24	11	31	

Trans Zool Soc Vol 9 Pl XVIII



Edwd Weller

$\frac{1}{2}$

J. Smit lith. M & N Hanhart imp.

LIMNAETUS PHILIPPENSIS.

$\frac{1}{2}$

J Smit lith

M & N Hanhart imp

1. MINOX PHILIPPENSIS [illegible] EMPIDING MEGALOTIS

J Smit lith.

M & N Hanhart imp.

1. MEROPS B[illegible] 2. [illegible] M[illegible]LRAV[illegible]

$\frac{1}{2}$

J. Smit lith.

M. & N. Hanhart imp.

J. Smit lith.

M & N Hanhart imp.

J Smit lith. M & N Hanhart imp.

1 LANIUS [illegible] 2 [illegible]LALAGE MELANOLEUCA

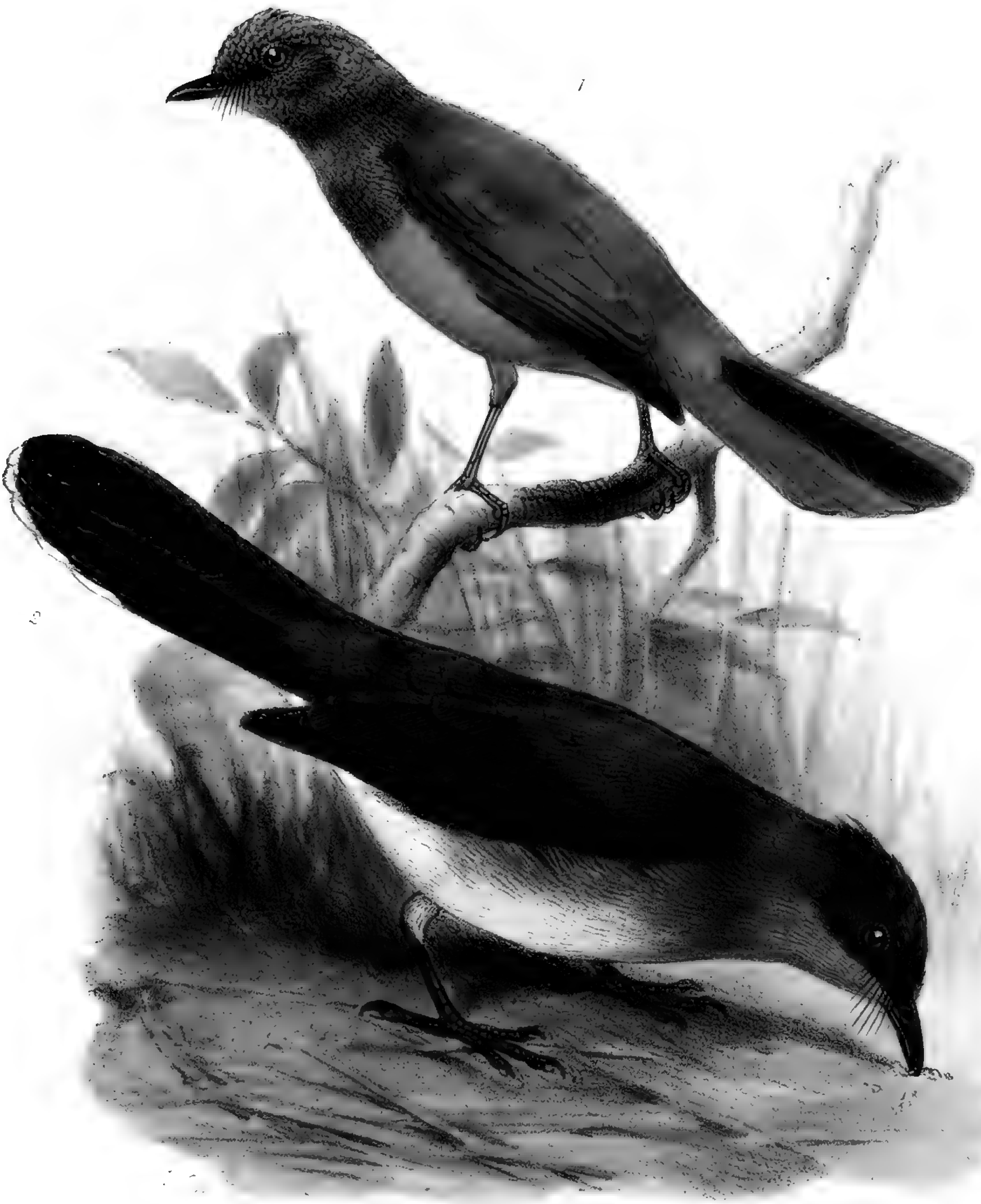
J Smit lith

M & N Hanhart imp

1. GRAUCALUS [illegible] 2. [illegible]

J. Smit lith. M. & N. Hanhart imp.

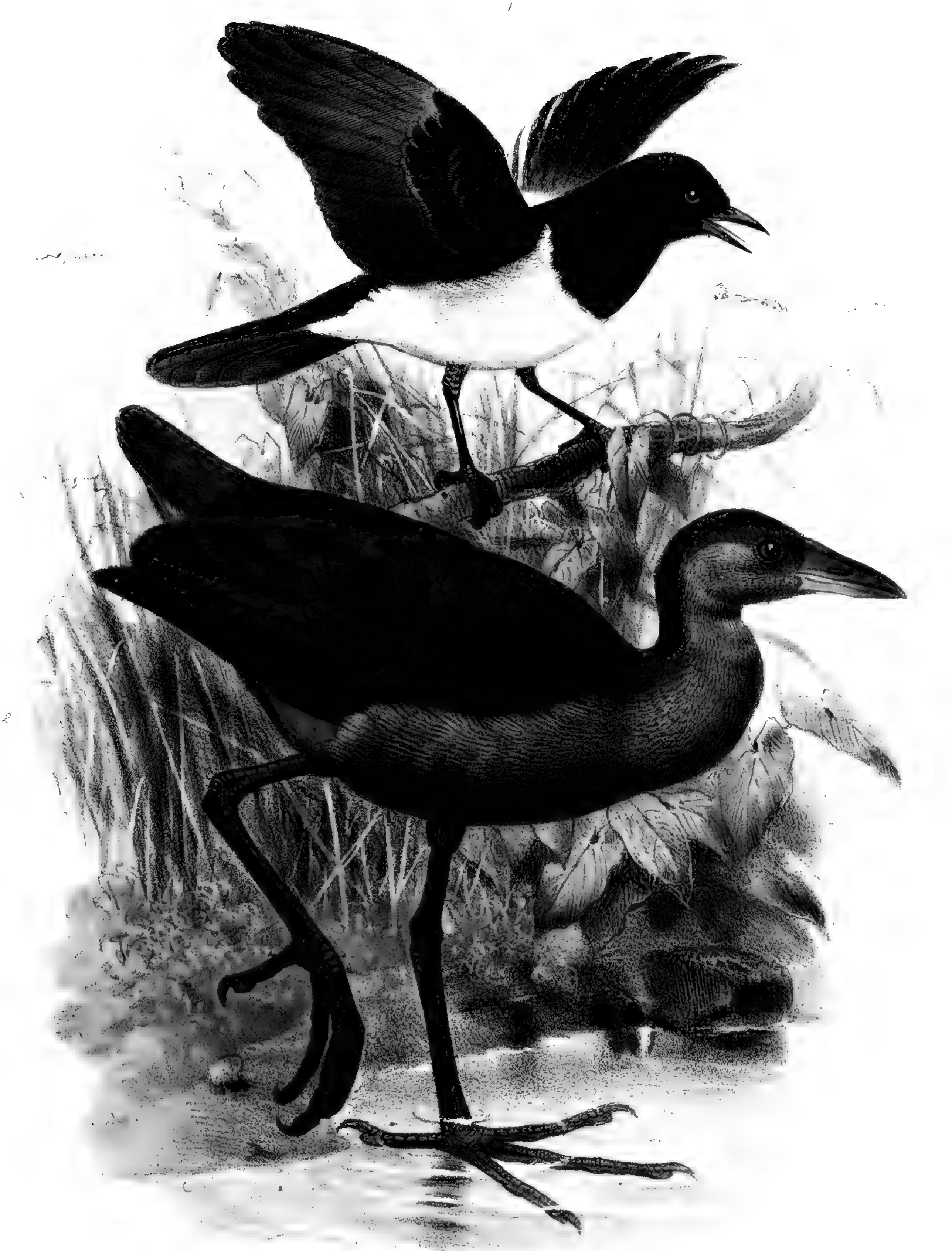
1. DICRURUS BALICASSIUS 2. HYLOTERPE PHILIPPENSIS



J Smit lith

M & N Hanhart imp

1. PHILENTOMA CYANICEPS 2. PYCNONOTUS UROSTICTUS

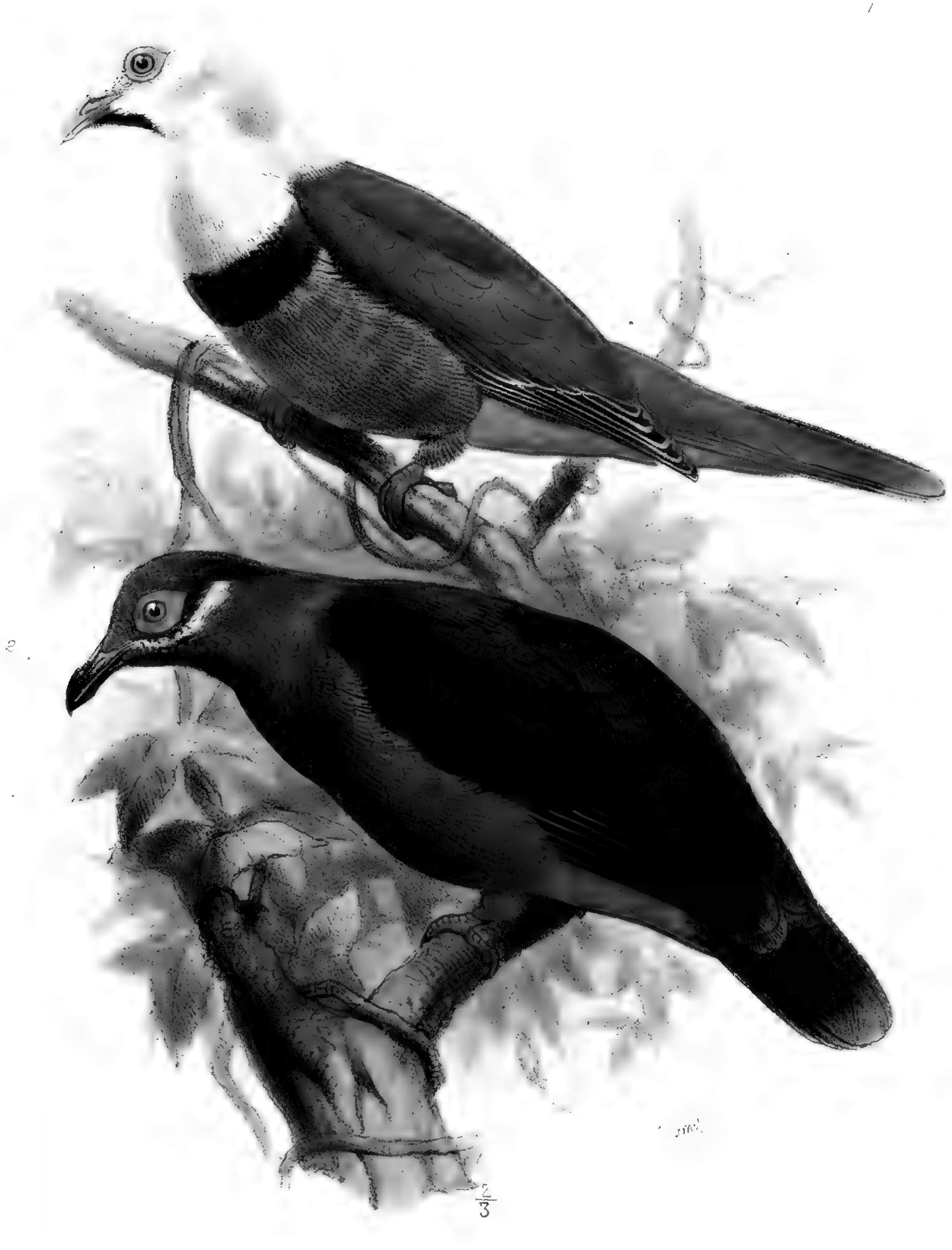


2/3

J Smit lith

M & N Hanhart imp

[illegible]



J Smit lith

M & N Hanhart imp

1. LEUCOTRERON GIRONIERI 2 PHAPITRERON AMETHYSTINA

III. *On* DINORNIS (Part XX.): *containing a Restoration of the Skeleton of* Cnemiornis calcitrans, *Ow., with remarks on its affinities in the Lamellirostral group. By* Professor OWEN, *F.R.S., F.Z.S., &c.*

Read December 2nd, 1873.

[PLATES XXXV. to XXXIX.]

§ 1. *Introduction.*

IN a preceding Memoir[1] this genus of the extinct flightless birds of New Zealand was founded upon portions of the skeleton, including some vertebræ of the neck[2], the pelvis[3], portions of the sternum[4] indicative of the rudimental state of the keel and consequent incapacity of the bird for flight, a femur[5], a tibia[6], a metatarsus[7], and a humerus[8] described as belonging "to some such flightless bird," and provisionally referred to the species represented by the first-named bones[9].

The resemblance of the tibia in certain characters to that of a natatorial bird (*Colymbus*) was pointed out; but there were other features of the bone which checked the choice of the family. The minor degree of inward extension of the inner distal condyle (*tom. cit.* pl. 66. fig. 1, *a*), as compared with that characteristic of *Anatidæ*—still more the out-springing of the innear trochlear joint at the distal end of the metatarsus (*tom. cit.* pl. 67. fig. 1, ii, and fig. 3, iv) below the level of the interval between the other two trochleæ, instead of the inner trochlea rising from a higher level than the origin of the other two trochleæ, together with the absence of any backward production of the innear trochlea beyond the plane reached by the other two trochleæ, were characters which, in the then (1865) inability to extend my comparisons of these bones with their homologues in the Anatidæ, so as to include the rare Australian form *Cereopsis*, counselled reticence as to positive statement of the Anserine affinities of *Cnemiornis*, the cranial grounds for determining the family affinities of the genus being wanting.

These grounds have now been supplied by an esteemed and accomplished correspondent, James Hector, M.D., F.R.S., Government Geologist of the province of Wellington, New Zealand, from whom, in September last, I received outline figures and brief notes of *Cnemiornis* in addition to those given in my first Memoir (*tom. cit.*), or

[1] "On *Dinornis*" (Part X.) &c., Trans. Zool. Soc. vol. v. p. 395.

[2] Ib. pl. 63. figs. 1–4, pl. 64. figs. 1 & 2.

[3] Pl. 64. figs. 5, 6, 7.

[4] Pl. 63. figs. 5, 6, 7, 8.

[5] Ib. pl. 65. figs. 1 & 2.

[6] Ib. pl. 66. figs. 1–5.

[7] Ib. pl. 67. figs. 1–4.

[8] Ib. pl. 66. figs. 7–10.

[9] Ib. p. 396.

in a more perfect state than were some of those bones—as, *e. g.*, the sternum and pelvis therein described and represented. The most instructive additional bones of this second series were an almost entire skull and a humerus, the latter showing that the bone referred to *Cnemiornis* in the description of pl. lxiv. (*tom. cit.*) must have belonged to some other, apparently similar-sized, flightless bird, which I deem to have been probably an *Aptornis*, inasmuch as a few bones referable to that genus were included in the collection sent to me in 1864 from Timaru. For this instructive accession to the evidences of *Cnemiornis* (*tom. cit.* p. 395) ornithology is indebted to the Hon. Captain Fraser, F.R.G.S., who has consigned an account of the cave in which the bones were discovered to the 'Transactions of the New-Zealand Institute,' vol. v. (1872)[1].

The 'Notes' by Dr. Hector on these remains, now in the Museum of the Wellington Philosophical Society, have been published in the 'Proceedings of the Zoological Society of London,' Part I. 1874.

Having since had the opportunity of examining portions of two crania, certain ribs, humeri, and a metacarpus of other individuals of *Cnemiornis*, I can testify to the accuracy of the figures of those bones given by Dr. Hector; and to his 'Notes' my later acquisitions enable me to add descriptions and figures of an ulna and an almost entire coracoid of *Cnemiornis*. The more perfect of my two skulls includes also the roof and fore (lacrymal) part of the orbits, wanting in Dr. Hector's figure: and I believe, therefore, that a description of these specimens confirming Dr. Hector's demonstration of the former existence of a very large, not to say gigantic, Anserine bird in New Zealand will not be unacceptable, inasmuch as in their description comparisons will be made with the skulls of other Lamellirostrals, more especially of the flightless Duck (*Tachyeres*[2] *brachypterus*, Latham) of Magellan's Strait, and of the *Cereopsis cinereus* of Australia. The latter bird is notable among Anserines for the length of its legs and shortness of its bill; and it appears to me more terrestrial in its habits than most of its living congeners.

§ 2. *Skull.*

The occipital surface of the skull of *Cnemiornis* is remarkable, in the present comparative series, for its breadth, especially at its base, here due to the outward expansion of the paroccipitals (Pl. XXXV. fig. 2, 4, 4), in which feature the skull of *Tachyeres* is

[1] 'A description of the Earnsclough Moa-Cave,' p. 102. (This cave is in the interior of the province of Otago.)

[2] The generic name *Micropterus*, applied by Lesson in 1831 to the *Anas brachyptera* of Latham, was bespoken by Lacépède, in 1802, for a genus of Fishes. *Microptera* was applied by Gravenhorst, in the same year, to a family of pentamerous Coleoptera, and by Robin, in 1830, to a genus of Diptera. *Micropteryx* was given by Hübner, in 1816, to a genus of Lepidoptera, and by Agassiz, in 1829, to a genus of Fishes. The name above proposed for a subgeneric type of Anatidæ, as well-marked as any of those to which terms indicative of such distinction have been applied, is derived from ταχυνήρης, swift rower, and relates to the characteristic movements of Latham's species in water, which has obtained for it, from navigators, the name of "Steamer Duck."

more like it than is that of *Cereopsis* (ib. fig. 7). It resembles more the latter Anserine in its complex ossification. *Cnemiornis* differs from both those genera and most other Anserines in the greater breadth of the cerebellar prominence (ib. 3) along the middle of the superoccipital tract, and in its greater slope forward as it rises from the foramen magnum (compare fig. 1, 3, with fig. 6, 3, Pl. XXXV.). A narrow mesial tract slightly projects from the convex prominence in *Cnemiornis*; it answers to the sharper ridge (3) in *Cereopsis* (ib. fig. 7, 3). The foramen magnum has a relatively longer vertical diameter in *Cnemiornis* than in *Cereopsis* or *Tachyeres*. In the vertical extent of the basioccipital[1], beneath the condyle (ib. fig. 7), *Cereopsis* comes nearer to *Cnemiornis* than does *Tachyeres*. A greater proportion of the parieto-frontal expansion of the cranium appears in the direct back view of the skull in *Cereopsis* than in *Cnemiornis*—the brain being smaller relatively, and the muscular impressions more extensive, in the larger extinct Anserine.

The extent of the insertion of the portion of the "longus colli posticus" (Zool. Trans. iii. p. 283, pl. 32. *o***), impressing the sides of the cerebellar protuberance, and leaving a convex ridge on each side the mid tract, dividing the occipital from the parietal surface, gives greater breadth to the upper part of the occiput, so defined, in *Cnemiornis* than in *Cereopsis*; the insertions of the "complexus" (*tom. cit.* ib. *y*) leave the deeper impressions (Pl. XXXV. fig. 2, *y y*) bounded by the lateral ridges; and these are more distinct from the "biventer" impressions than in *Cereopsis*.

The basioccipital protuberances (ib. figs. 2, 4, 1′) are more developed than in any known Anserine, though they are well marked in *Cereopsis* (ib. fig. 7, 1′) and indicate great size and power of the "recti capitis laterales" muscles (Zool. Trans. iii. p. 286, pl. 32. *d*). In the deep chink-like fossa between the protuberances and the paroccipitals open the canals giving passage to the hypoglossal and vagal (fig. 2, *v*) nerves and the paroccipital foramen (ib. *p*) (perforating the base of the paroccipital and opening into the tympanic cavity). The paroccipitals (figs. 1–4, 4), giving insertion to the "trachelo-paroccipitales" (Trans. Zool. Soc. iii. pl. 34, fig. 1, *z*), are subcompressed, and do not descend below the basioccipital protuberances.

The basisphenoidal fossa (Pl. XXXV. figs. 4 & 9, 5), the floor of which is formed by a short triangular lamelliform process, receives on each side a (vascular?) canal from the tympanic cavity. On each side of the fore part of this fossa the entocarotid canals (ib. ib. *e c*) are exposed in *Cnemiornis*, which converge to terminate at the back part of the deep "sella." Of these canals there is only a minute indication in *Cereopsis*. In advance of them the basisphenoid contracts and develops the pair of pterapophyses (ib. ib. 5′), here, as in other Anserines, well marked, but sessile; they are a long ellipse in shape.

The base of the alisphenoid swells out, external to the entocarotid opening, to

[1] The "fontanelles" "due to original arrest of ossification between the exoccipital and mastoid" (Anat. of Vertebrates, tom. ii. p. 49), are obliterated in both *Cnemiornis* and *Cereopsis*.

augment the tympanic cavity, with which such "bulla" communicates by an aperture (Pl. XXXV. fig. 1, *t a*) below the inner articular facet for the tympanic. The tympanic cavity opens upon the basis cranii by a wider aperture (ib. fig. 4, *t b*), directed outward and forward as well as downward, of a transversely elliptical form, which seems to be bisected at a higher level by the process of bone (from the alisphenoid), forming the inner articular cavity for the inner division or condyle of the head of the tympanic. A vacuity divides this from the outer articular cavity, which looks inward and a little downward.

The prebasal aperture of the tympanic cavity (Pl. XXXV. fig. 4, *t b*) is bounded behind by the bar of bone extending, as in *Cereopsis* and *Aptornis*[1], from the side of the basisphenoid (ib. figs. 1 & 4, 5*) to the mastoid process (ib. fig. 1, 8′). This bar bounds the fore part of the lateral opening of the tympanic cavity (ib. figs. 1 & 4, *t l*). The inner wall of this cavity is perforated by two openings leading to the pneumatic cancellous structure of the cranial walls. The paroccipital forms the hinder wall of the tympanic cavity, and is continuous by the thin plate forming the lower part of the inner wall of the cavity with the basisphenoidal pier of the vertical "sphenomastoid" bar or arch (fig. 1, 5′–8′).

The sphenoidal tympanic bulla is homologous with that in the Marsupial genus *Peragalea*[2]. Anterior to it opens the foramen ovale (figs. 1 & 4, 6), divided, on one or both sides, by a slender bar between the issue of the motory and larger sensory parts of the third division of the trigeminal nerve. Five lines in advance and mesiad of this is the "foramen rotundum;" and two lines in advance of this is the larger elliptic foramen for the optic nerve (ib. fig. 1, 10) and first division of the trigeminal.

On the inner surface of the cranium the petrosal is impressed above the cribriform depression, representing the "foramen auditorium internum" by a very deep vertically elliptical fossa, answering to the "appendicular fossa" in that part of the epencephalic chamber of certain Marsupialia[3]. The side walls of the epencephalic compartment are from 9 lines to 5 lines in thickness, and are occupied by air-cells; the walls of the prosencephalic compartment are thinner, but still with a pneumatic diploë.

[1] In the description of the sphenomastoid part of the skull of *Aptornis defossor* it is stated:—

"The articulation is close and deep, whereby, with a peculiar suspensory structure, the tympanic is retained on the right side of the present skull, where the surrounding parts of the cavity are entire." The structure is described as follows:—"This process" (the mesomastoid) "has contracted a filamentary bony union with the expanded base of the alisphenoid, the filament passing behind the neck of the tympanic, helping to suspend and maintain it *in situ*."—Trans. Zool. Soc. v. (1870) p. 356, pl. 40. fig. 1, 8′.

[2] *Perameles lagotis*, Art. Marsupialia, Cycl. of Anatomy, vol. iii. p. 274, fig. 96.

[3] "The petrous bone in the Kangaroo, Koala, and Phalanger, is impressed above the 'meatus auditorius internus' by a deep, smooth, round pit, which lodges the lateral appendage of the cerebellum."—Art. Marsupialia, *ut supra*. p. 274. This is the "appendicular fossa;" the "floccus" of Reil is a different part of the cerebellum.

The greatest breadth of the cranial cavity is at the lateral depressions for the optic lobes, where it is $1\frac{1}{2}$ inch across; the greatest vertical diameter is $1\frac{1}{4}$ inch; the length of the cavity is 1 inch 9 lines; it is short, therefore, in proportion to its breadth and height. In the proportion of the mandibular to the cranial part of the skull, *Cnemiornis*, as is shown in Pl. XXXV. fig. 1, most nearly resembles *Cereopsis* (ib. fig. 6) among Lamellirostrals.

There are no sutural indications of the limits of the parietals. The occipital surface, which, from its upper slope, appears in the view of the skull given in Pl. XXXV. fig. 3, through its more vertical position in *Cereopsis* does not there appear (ib. fig. 8); but a parietal tract (ib. ib. 7) is indicated in *Cereopsis* by the more marked and definite rise of the "frontal" covering (ib. ib. 11, 11) of the cerebral hemispheres. This difference is shown also in the profile views (fig. 1, 3–7, *Cnemiornis*; and fig. 6, 3–7, *Cereopsis*), in Pl. XXXV.

The "crotaphyte surface" (ib. fig. 6, *t*) is small and feebly indicated in *Cereopsis*; the postcrotaphite surface (ib. *p c*) is better marked. In *Cnemiornis* both crotaphite (ib. fig. 1, *t*) and postcrotaphite (ib. *p c*) surfaces are better defined by intermuscular ridges.

The "processes" of the mastoid are limited to that (8′) which passes behind the joint for the tympanic to coalesce with the basisphenoidal extension (5′) in *Cnemiornis*, as in *Cereopsis* and *Aptornis*; but in *Aptornis* there is a second, longer and stronger process of the mastoid, which descends external and anterior to the tympanic articulation [1].

The postfrontal is a long and strong trihedral process, terminating obtusely in *Cnemiornis* (Pl. XXXV. fig. 1, 12), but extending forward to coalesce with the backwardly produced lacrymal in *Cereopsis*, in which anserine the bony rim of the orbit is thus completed (ib. fig. 6, 73–12).

The lacrymal is long, and directed backward as well as downward, in *Cnemiornis* (ib. fig. 1, 73), but terminates half an inch from the end of the postfrontal, leaving the lower part of the rim of the orbit incomplete to that extent. The hind part of the base of the postfrontal is deeply impressed by an oblong fossa (ib. fig. 4, 1) in *Cnemiornis*; and this fossa is well defined, though less deep, in *Cereopsis*.

The upper part of the orbital rim, or frame, is more complete, better defined, in *Cnemiornis*, and is separated by a smooth upper tract of about 2 lines from the depressions for the superorbital mucous glands (ib. fig. 3, *m m*), which depressions are absolutely as well as relatively larger in *Cereopsis*, and cause by their pressure, combined with that of the eyeball from below, absorption of parts of the upper orbital border. The interspace between the glandular fossæ is gently concave across, but undulated by a feeble mesial rising of the frontal.

[1] It is referred to in Dr. Hector's Paper as the "premastoid arch;" but the process effects no junction with any outstanding part of the basis cranii.

The prefrontals (Pl. XXXV. fig. 12, 14), perforated in Birds, as in all other vertebrates, by the olfactory nerves, expand from their coalescence with the presphenoid (ib. fig. 4, 9) to articulate above with the fore part of the frontals and to give support to the lacrymals. They form the fore part of the rhinencephalic cavity, and contribute to the hind part of the walls of the olfactory cavity, of which they there commence the "septum," by their mutual coalescence.

Each olfactory nerve passes from the rhinencephalic to the olfactory chamber by a single canal (fig. 12, *ol*), the right and left nerve forming a pair separated by the base of the "septum," and indicating the primitive quality of the neurapophyses of the third cranial vertebra (ib. 14).

The frontals are truncate anteriorly (ib. fig. 3, 11, 11') and present two transversely elongate convexities or condyles (fig. 11, *h*, *h*) for articulating with the nasals; external to which junction the nasals (fig. 3, 15) expand slightly to form a convexity (fig. 12, *k*) articulating with a concavity at the fore part of the base of each lacrymal. A pair of short fine fissures (fig. 3, 22) indicate the proportion which the premaxillary contributes to the naso-frontal joint.

A similar indication in *Cereopsis* (ib. fig. 8) bespeaks a relatively broader nasal process of the premaxillary. The bifurcation of the nasal at *a*, *b* (figs. 1, 3, 6, 8) to form the hind border of the external nostril has the angle rounded at the apex in *Cnemiornis* (fig. 1, *n*); it is notched and irregular in *Cereopsis* (fig. 6, *n*); the nostril is large and ovate in both, but with the anterior end larger and more definitely marked and rounded in *Cnemiornis*.

The internarial tract of the upper mandible is almost flat in *Cnemiornis* (fig. 3, *c*), but is convex, raised into an arch, in *Cereopsis* (fig. 8, *c*). The definition of the broad, short, rostral part (figs. 1, 3, 6, 8 *d*) of the premaxillary is well defined in both; but the defining channels at the sides of the base of such rostral part are deeper, and are bounded by a ridge behind, in *Cnemiornis*. The "rostrum" is pitted by the usual vascular impressions and foramina relating to renewal of the horny beak-sheath in both Anserines.

On the bony palate a median "prepalatal" vacuity exposes the anterior extremity of the vomer (fig. 4, 13) at a higher level. At a lower one, behind the vacuity, is the orifice of a longitudinal "palato-vomerine" canal (figs. 4, 11, *e*), running backward between the bony palate and the vomer. The prepalatal vacuity is represented in *Cereopsis* by a depression (fig. 9, 13), into the back and deep part of which the palato-vomerine canal (ib. *e*) opens. The extent of median coalescence of the palatal plates of the maxillaries (? if this be not due to the vomer), behind the palato-vomerine foramen, is relatively the same in *Cnemiornis* and *Cereopsis*.

The palatal vacuity is present in *Tachyeres brachypterus* and most Lamellirostrals, is largest (so far as I have seen) in *Carina moschata*, is reduced to a fissure in some skulls of the Common Goose, and is exceptionally obliterated in *Plectopterus gambianus*, as it is in *Cereopsis*.

The hind part of the bony palate is emarginate in *Cnemiornis* (Pl. XXXV. fig. 4), but less deeply than in *Cereopsis* (ib. fig. 9); its outer angles extend backward and upward, internal to the palatines, and are continued into the swollen pneumatic or "antral" ends of the maxillaries, the outer wall of which is cribriform, or reticulate, in *Cnemiornis* (ib. fig. 10, 21*). The anterior, horizontally lamellate, ends of the palatines (fig. 4, 20) coalesce with the maxillaries (ib. ib. 21) between the "antero-palatal" plates and the angle to which the expanded end of the jugal style (ib. fig. 7, 26) is attached.

From these attachments the palatines (20), retrograding, lose transverse and gain vertical extent, and this suddenly at their hind ends, from the upper and inner side of which a "nasal lamella" extends inward and forward to meet its fellow, and circumscribe there the palato-naris (ib. figs. 4 & 9, *f*). A ridge along the inner side of the free part of the palatine (ib. ib. 20′) seems to mark the inner boundary of the palatal surface; below this the "nasal" plate extends, with a concave surface next the meatus, to the terminal expansion; the outer surface is smooth and convex.

The bony palate anterior to the vacuity (fig. 4, 13) is divided into three longitudinal channels, of which the median one is deepest; but all gradually shallow to the common palatal level close to the broad terminal alveolar or rostral border.

From the conformity with *Cereopsis* of the articular cups for the bicondylar head of the tympanic, we may infer a similarity of that bone in *Cnemiornis*; and a like conformity of the pterapophyses (ib. figs. 4 & 9, 5′) supports the same inference in regard to the pterygoids, and strengthens that in regard to the tympanic. Both these skull-bones are wanting in my specimens of *Cnemiornis*, as in that of Dr. Hector.

The mandible of *Cnemiornis* shows the lamellirostral character of the ectocoronoid articular process (ib. figs. 1, 5, *g*). The ordinary coronoid (ib. *q*) is higher than in *Cereopsis* (ib. fig. 6, *q*), and has an angular form. The alveolar border of the dentary between the coronoid and the punctate symphysial end is smooth, rather swollen, and, as it were, bent over to the outer side of the mandible, where it overhangs the more depressed lower part of that surface. This is relatively deeper than in *Cereopsis*, the whole mandible being deeper and broader in proportion to its length, and with the fore end more squarely terminated.

The articular channels (fig. 5, *w*, *x*) for the tympanic are divided or defined by a longitudinal ridge, as in *Cereopsis*. The outer groove (*w*) is partly supported by an ectarticular process; the inner one (*x*) by a longer entarticular process, which bends upwards and terminates in a swollen apex. The angular process (30) is relatively shorter and deeper in *Cnemiornis* than in *Cereopsis* and Anserines generally. The oblique suture between the subangular (29) and dentary (32) is traceable in *Cnemiornis* as in most other Lamellirostrals. In the transverse joint between the nasal base of the upper mandible and the fronto-lacrymal apex of the cranium, and in the spheno-mastoid bridge crossing the tympanic cavity, *Cereopsis* agrees with *Cnemiornis.*

§ 3. *Vertebræ.*

Of the cervical vertebræ of *Cnemiornis* I have now as many as exemplify the usual modifications of their size, shape, and processes in this part of the spinal column of birds, also the general characteristics of such part in Lamellirostrals by a number of vertebræ above the average in the feathered class; but the precise sum of cervicals waits a better opportunity of obtaining the skeleton of the same individual than has hitherto offered, and one knowingly availed of[1].

The main modification of the cervicals of *Cnemiornis*, as compared with those of other Natatores, is the greater extent of ossification of the neural arch. The parial hypapophyses also converge in the eleventh cervical to contact at their free ends; and those in the twelfth cervical have coalesced to form a complete inferior bony arch or ring. This structure I have not observed in any other Anserine or Lamellirostral species[2].

Both characteristics of *Cnemiornis* are shown in the figures of the cervical vertebræ in my first Monograph on the genus. The views chosen for this purpose gave, accordingly, the upper[3], the under[4], with the fore[5] and hind[6], surfaces of the vertebræ. In the present paper I therefore give a side view (Pl. XXXVI. fig. 6), and, for comparison with fig. 4, pl. 63, Trans. Zool. Soc. vol. v., a corresponding view of the homologous cervical in *Cereopsis* (ib. fig. 7) and *Tachyeres* (fig. 8).

The cervical vertebræ in Anserines, which have a single hypapophysis at the hind part of the centrum, beneath the hind articular surface, are the two or three which follow the axis. After a certain number without lower processes a pair of præhypapophyses (Pl. XXXVI. figs. 7 & 8, *ph*) begin to project from beneath the costal arch, approach each other in succeeding vertebræ without coalescing, and gain the under surface of the centrum as they lengthen. They then usually abruptly cease, and are replaced by a single hypapophysis at the middle of the fore half of the centrum; and this is continued, usually with decreasing length or suppression, to the dorsal series, where, after the first, the hypapophysis reappears with increased length.

The cervical vertebra of *Cnemiornis* the subject of figs. 1–4, pl. 63 (*tom. cit.*), answers by the position of its hypapophysis to the third or fourth cervical in *Cereopsis* and *Tachyeres*. My present series shows it to be the fourth, and also includes the third cervical, of which I give a side view in Pl. XXXVI. fig. 1, with a similar view of the homologous vertebra in *Cereopsis* (ib. fig. 2) and *Tachyeres* (ib. fig. 4).

[1] Twelve cervical vertebræ were collected by the Hon. Capt. Frazer in the Earnscleugh Cave, and are attributed to the same individual bird by Dr. Hector.

[2] It occurs in other groups of Aves; the illustration in my 'Anatomy of Vertebrates,' vol. ii. p. 40, fig. 25, is from a Pelican.

[3] Trans. Zool. Soc. vol. v. pl. 63. fig. 3. [4] Ib. ib. fig. 4. [5] Ib. ib. fig. 1. [6] Ib. ib. fig. 2.

Besides size, the chief difference is in the greater relative breadth of the entire vertebra, and more especially of the neural arch (as shown in fig. 3, pl. 63. *tom. cit.*). This breadth is due in the anterior fourth of the cervical region to a diapophysial ridge extending from the side of the præ- to that of the postzygapophysis, near which the ridge (ib. fig. 1, *a*) stands out furthest, and has its margin thickened and roughened for tendinous attachment. In the middle third of the cervical region the diapophysis loses in antero-posterior extent of origin, but gains in length, or outstanding, and in greater thickness of its free border for muscular attachment. The eighth cervical, for example, is here $2\frac{1}{2}$ inches in breadth. The outer surface of the base of the anchylosed cervical rib is strongly sculptured by irregular longitudinal ridges and furrows.

No Anserine comes near to *Cnemiornis* in this respect. Its cervical vertebræ recall the proportions of those in *Megaceros*, and have a like relation to the muscular powers brought to bear upon the head. In the extinct Anserine this probably related to the gripe and tug exercised by the broad, short, but strong beak upon the vegetable growths torn up for food.

The third cervical (ib. fig. 1), like the fourth, is broader than it is long. The hypapophysis is represented by a sharp ridge, 8 lines in length, at the hinder half of the centrum, terminating in a short tuberosity (ib. *hy*) projecting beyond the hinder articular facet. The parapophysial plate extends from the lower angle of the anterior articular surface of the centrum to the hinder half of that element, ascending upon its side, and forming the floor (ib. *p*) of a vertebrarterial canal, 10 lines in length, and 8 lines in diameter at the hinder outlet (*v*). The end of the rib-element (ib. *pl*) forming the outer wall of the canal is broken off. In the fourth cervical the neural spine is entire; it is also short and rounded, as in the third (fig. 1, *n s*); and more of the pleurapophysis is preserved. The hypapophysis has its base shortened to an extent of 5 lines; but its apex extends downwards, 3 lines below the hinder articular facet (*h*, fig. 2, pl. 63, *tom. cit.*).

The side view of the twelfth cervical vertebra (ib. fig. 6) shows the division of the hinder part of the vertebrarterial canal into two foramina (ib. *v*, *v'*) by the bony bar passing from the pleurapophysial plate backward and downward to the lower part of the side of the centrum. In *Cereopsis* (ib. fig. 9) and *Tachyeres* (ib. fig. 10) the vertebrarterial canal of the answerable vertebra has also two hinder outlets (*v* & *v'*); but the dividing bar passes from the hind border of the rib-plate upward to coalesce with the neural arch, and the upper outlet (*v'*) is much less than the lower one (*v*). The diapophysis (ib. fig. 6, *d*) projects freely, in *Cnemiornis*, above the longitudinal ridges: these alone mark the rib-prominence below the præzygapophysis in *Cereopsis* (ib. fig. 9) and *Tachyeres* (ib. fig. 10).

The vertebræ bearing freely-movable ribs are nine in number in *Cnemiornis*, of which the last three are anchylosed with the sacral mass. The rib of the first dorsal is free at the distal end; the centrum has a hypapophysial tuberosity at its fore part, the size of which is not definable by reason of fracture. The breadth of the anterior articular surface of the centrum is 1 inch 7 lines; its height at the middle is but 5 lines; this bilobed character is more strongly shown in the next.

The second dorsal presents a structure which seems not to have hitherto been noted in birds. Besides the median process (hypapophysis) (Pl. XXXVI. fig. 11, *hy*) from the fore part of the under surface of the centrum, there is a pair of processes (ib. ib. *hl*, *hl*) from the sides of that part of the centrum, which part extends vertically below the anterior articular surface (ib. fig. 11, *c*, *c*) for an extent of from 2 to 5 lines, and is festooned below by the emarginations between the origins of the median (*hy*) and lateral (*hl*) inferior processes. This character is rudimentally indicated in the first dorsal vertebra of *Cereopsis* (ib. fig. 13, *hy*, *hl*); the processes (*hl*) are broader and more transversely extended in *Tachyeres* (ib. fig. 14). The articular surface for the tubercle of the rib is supported in *Cnemiornis* by a distinct process (ib. figs. 11 & 12, *dt*) from the under part of the base of the diapophysis (*d*). The process is feebly indicated in *Cereopsis* and *Tachyeres* (ib. fig. 14, *dt*). The length of the second dorsal vertebra in *Cnemiornis* from the postzygapophysis (z') to the broken end of the mid hypapophysis (*hy*) is 2 inches 4 lines. The length between the same points of the corresponding vertebra in *Cereopsis* is 1 inch. The rib has a short, straight sternal portion tied by ligament to the anterior small tubercle of the costal border of the sternum.

In the third dorsal (Pl. XXXVI. figs. 15, 16) the hypapophysis (*hy*) extends its base the whole length of the centrum, and curves forward as it narrows to a trituberculate end, the mid tubercle projecting beyond the lateral pair (ib. fig. 16, *hl*, *hl*), and also beyond the vertical parallel of the joint between the third and second dorsal centrums. The upper spine (ib. fig. 15, *ns*) also curves forward, its anterior apex reaching the same vertical parallel as that below (*hy*). One or two longitudinal ridges strengthen the neural spine near its summit. The hypapophysis of the fourth dorsal (ib. fig. 17, *hy*) has a less extensive base, but equal length; it is also curved forward, as is the neural spine; but this is longer, and gains more antero-posterior breadth toward its truncate summit.

The fifth and sixth free dorsals cease to develop hypapophyses; their neural spines continue to gain in antero-posterior breadth. The principal pneumatic aperture in the dorsal vertebræ of *Cnemiornis* is at the base of the diapophysis (ib. figs. 15, 17, *d*), between the articular surfaces (ib. *pl* and *dt*) for the bifurcate head of the rib; in the cervical vertebræ it is at the base of the neural arch.

The ribs, both vertebral and sternal, increase in length; and epipleural appendages are attached to the former from the second to the seventh pair.

The chief things notable in the dorsal vertebræ of *Cnemiornis*, as compared with *Cereopsis* and existing Anserines, are the great breadth of the centrum in proportion to the length, the minor fore-and-aft extent of the neural spines in proportion to their height, the forward curvature of both upper and lower spines, and, above all, the absence of the osseous splints which connect together the summits of the neural spines and the diapophyses of a greater or less proportion of the dorsal series in all living and volant Lamellirostrals. The vigorous actions of flight need corresponding fixedness in the complex congeries of bones forming the centre whence the muscular forces converge to work the wings.

In Lamellirostrals, as in most other birds[1], the vertical convexity and transverse concavity of the anterior articular end of the centrum (Pl. XXXVI. fig. 11, *c*, *c*) closely clasps the posterior surface with reverse curvatures of the next centrum before it; and this double interlocking runs throughout the series of movable dorsals. The zygapophysial surfaces (ib. *z*, *z'*) are large, and strongly connect together the neural arches of the dorsals. The pleurapophyses have two cup-and-ball joints with their vertebra, widely separate upon the bifurcate ends of the ribs. The bony hæmapophyses, or sternal ribs, have, for the most part, bilobed articular ends for a double joint with the costal border of the sternum (Pl. XXXVII. fig. 3).

Cnemiornis retains all these modifications, but has not the superadded strength gained by the bony beams passing from parts of one dorsal vertebra to the next; to which, in birds of strongest and swiftest flight, is superadded continuous anchylosis of certain neural spines of the segments of the thorax. *Cereopsis* shows the splint-like ossifications of the tendons of muscles inserted into the diapophyses and neural spines of the free dorsals; and this retardation of the ordinary Lamellirostral structure coexists with a development of wing, endowing the Australian Goose with the power of flight.

§ 4. *Sternum.*

The sternum of *Cnemiornis* (Pl. XXXVII. figs. 1, 2, 3) is of an oblong-quadrate form, 7 inches long by 4 inches broad at the middle of the bone, expanding to 4 inches 9 lines in the present specimen across the anterior border.

This border shows three wide and shallow emarginations, the median one between the advanced angles (*a*, *a*) of the inner wall of the coracoid groove (*b*), the lateral ones between these and the costal processes (*d*, *d*), near which the emargination deepens.

From the median end of the outer wall of each coracoid groove the anterior ridged origins (*c*, *c*) of the keel converge backward to form the low, rather broad and flat beginning (*s*) of this instructive process. Its extreme depth or projection from the plane of the sternum does not exceed 3 lines; the breadth of its free border is 4 lines; and this is flat and roughened by transverse striæ for aponeurotic attachments. It loses breadth and depth as it retrogrades, and subsides (at *s'*) about 3 inches from the origins. Beyond the keel the body of the sternum retains somewhat of the convexity, transversely and lengthwise, which characterizes in a greater degree the carinate part of the sternum; but the terminal third of the bone becomes almost flat. It is truncate posteriorly, with

[1] The exception, in *Aptenodytes*, is figured in 'Phil. Trans.' 1851.

rounded angles, retaining a breadth of 3 inches 3 lines at this end, which is devoid of the pair of notches characterizing, as a rule, the Anserine sternum [1].

Cnemiornis follows the rule of keelless, or rudimentally keeled, breast-bones of flightless fowl in the integrity of the bony shield. The length of each coracoid groove is 1 inch 6 lines, the greatest depth $1\frac{1}{2}$ line. From near the lateral end of the outer wall the pectoral ridges extend backward, slightly converging, but cease to be traceable after a course of 2 inches. The costal process (*d*) is quadrate, relatively thicker and more produced than in *Cereopsis* or *Tachyeres*. The outer surface, defined by a low curved ridge, is so smooth as to have suggested the remark at p. 399, Trans. Zool. Soc. vol. v. The inner surface of the base of both right and left of these processes shows a large reticulate pneumatic vacuity.

The costal border indicates the same degree of longitudinal curve, convex outward, of the coextensive part of the breast-bone as in *Cereopsis*; but is relatively more extensive, and is traversed obliquely from within outward and backward by seven articular prominences for the sternal ribs. The five anterior of these are ridges expanded at the ends into articular tubercles; the sixth and seventh are represented by the inner tubercle only. A smaller tubercle (ib. fig. 3, *h* 1), in advance of the broad ridges, may afford attachment to the hæmapophysis of the second free rib. The breadth of this surface is shown in fig. 3. *Cereopsis* has but five articular prominences on each costal border. *Tachyeres* has seven, as in *Cnemiornis*. The outer surface of the sternum near the costal border is feebly concave transversely, before swelling into the convexity producing the hollow cavity of the anterior half of that bone next the thoracic abdominal cavity.

It would seem that a comparison with the view of tracing affinity within the limits of the Lamellirostaal group could not profitably be made between the almost keelless breast-bone of *Cnemiornis* and the deeply keeled ones in all existing members of such group; for even the sternum of the flightless Steamer-Duck has "the great development of the keel" which the experienced ornithologist Eyton adds to his osteological characters of the family Anatidæ [2]. However, there is a greater convex curve of the free border of the sternum in *Cereopsis* [3] than in *Anser cygnoïdes* [4] or in *Tachyeres*; and, in a small degree, this approximates *Tachyeres* and *Cereopsis* to *Ciconia*.

§ 5. *Limb-Bones.*

The coracoid (Pl. XXXVII. figs. 4–7) accompanying the collection of *Cnemiornis* bones now described, is of the left side, and wants only the terminal expansion fitting to the

[1] Eyton, 'Monograph on the Anatidæ,' 4to, 1838, pl. 1. figs. 7–11. *Clangula* (fig. 4) and *Fuligula* (fig. 5) agree with the Goosander (*Mergus serrator*) in the conversion of these notches into foramina. *Cereopsis* and *Tachyeres* adhere to the anserine type.

[2] Eyton, in his classical Monograph (4to, 1838, p. 5), follows Vigors in making "Anatidæ" (which suggests rather the tribe or subfamily of Ducks) the equivalent of Cuvier's well-conceived term "Lamellirostres."

[3] Id. Supplement to 'Osteologia Avium' (4to, 1869), pl. ii. *Cereopsis*. [4] Ib. pl. 3.

sternal groove. The length of the bone which includes the beginning of this expansion is 3 inches 6 lines; the entire bone would be about 4 inches 6 lines in length. The extreme breadth at the middle of the shaft is $4\frac{1}{2}$ lines. It is thus weaker and more slender than in *Cereopsis*, and longer in proportion to its sternal breadth than in *Tachyeres*. It also differs from the coracoid in these and other Lamellirostrals in the very slight production of the tuberosity *c* in advance of that (*b*) supporting the the articular surface (*a*) for the humerus. The tuberosity *c* is divided from *b* by a shallow groove (*d*) of less than half the width of the homologous one in *Cereopsis*; and the tuberosity *b* is not present in *Cereopsis*, or is represented (as in fig. 8, *b*) only by the produced margin of the relatively larger and deeper facet for the humerus. The process (*e*) joining the median facet of the scapular articular expansion is more produced, more terminally expanded, both lengthwise and transversely; the latter expansion inclines, as a curved lamella, toward the inner or anterior division of the tuberosity *c*, in advance of the humeral joint.

From the low scapular process in *Cereopsis* (Pl. XXXVII. fig. 8, *e*) a ridge of bone (ib. *f*) extends down to the middle of the coracoid, where it blends with the mesial border, leaving a narrow oblong interspace, 4 lines in length, near that border. This character is not present in the coracoid of *Tachyeres*. Such a vacuity (ib. fig. 5, *f*) exists in the coracoid of *Cnemiornis*; but its filamentary boundary is not continued from the scapular process (*e*, *e'*); it forms part, or is a continuation, of the sharp mesial border of the shaft of the bone; and the vacuity is a perforation of such border.

An intermuscular ridge (ib. fig. 5, *g*) is continued in *Cnemiornis* more directly from the tuberosity (*c*), but sooner subsides upon the shaft than in *Cereopsis*; it is resumed at the lower third of the shaft, but nearer the lateral border, and bounds the fore part of a flat, roughish, elongate tract, which has a continuation of the lateral border (ib. fig. 7, *j*) for its hinder boundary. Above this tract, the shaft of the coracoid is thicker in *Cnemiornis* than in *Cereopsis* and other Anserines. The hind surface of the sternal half of the coracoid is feebly concave; the sternal articular expanded end has been broken away in my specimen.

Although this coracoid is more slender, in proportion to its length, than in *Cereopsis*, it is thicker, and less flattened from before backward toward the sternal expansion. This proportion is still more characteristic of the coracoid of *Cnemiornis*, in comparison with that of *Tachyeres*, in which the whole shaft is more flattened than in *Cereopsis*.

The strength of the bone in *Cnemiornis* relates to its office in depressing the sternum in the respiratory movements of the bird.

In describing the humerus[1] forming part of the collection of bones including a skull of *Dinornis robustus* and part of one of *Aptornis*, together with the tibia and other bones on which was founded the genus *Cnemiornis*, I stated that, "from the feeble development of its proximal processes," such humerus "had evidently belonged to some such

[1] Zool. Trans. vol. v. pp. 396–399.

flightless bird," and that "it bore nearly the same proportion to the sternum as does the humerus of *Notornis*."

As the humerus associated with a nearly entire skeleton of *Cnemiornis*, discovered by the Hon. Capt. Frazer in the interior of the province of Otago, New Zealand, presents clearly distinctive characters from the one figured in Zool. Trans. vol. v. pl. 66. figs. 7–10, I am now disposed to believe that it may prove to be the humerus of an *Aptornis*, probably *Aptornis defossor*.

Dr. Hector remarks that, in the humerus of *Cnemiornis*, "the tuberosity (XI *b*) representing the pectoral ridge is not so wide" as in that above described and figured by me. I am in some doubt as to the dimension referred to, whether, viz., the "width" of the pectoral process is meant for its basal extent, or the degree in which it projects from such origin. The marked and unequivocal distinction is that, in the humerus of *Cnemiornis*, of which I have had under inspection a right and left (Pl. XXXVIII. figs. 1–6) since the reception of Dr. Hector's Memoir, the pectoral ridge (*d*) is continued directly from the ecto-tuberosity (outer or radial tuberosity), whereas in *Aptornis* (Zool. Trans. vol. v. pl. 66. fig. 7, *b'*) it is divided from that tuberosity (ib. ib.) by a shallow concavity nearly 1 inch in length.

The ento-tuberosity (inner or ulnar one) in *Cnemiornis* (Pl. XXXVIII. figs. 1 & 2, *c*), instead of rising above the convex articular head (*a*) of the humerus as in *Aptornis* (?), does not attain its level; its expansion below such tuberosity for a pneumatic fossa (fig. 3, *p*), with its cribriform plate, is a more conspicuous distinction, as Dr. Hector has shown.

Notwithstanding, however, the several approximations which these characteristics of the humerus of *Cnemiornis* make to that bone in birds of flight, the almost keelless condition of the sternum, together with the dwarfed proportions of the humerus in comparison with those of the bones of the leg, the pelvis, vertebræ, and skull, confirm the conclusion, in which Dr. Hector accords with myself, that *Cnemiornis* was unable to fly.

The existence of the Flightless Duck (*Tachyeres brachypterus*; *Anas brachyptera*, Latham) has long been known; but the humerus in that species is as long as the tibia, and the power of flight is enjoyed by the young bird, and only lost when the bulk and weight of the adult frame is acquired[1]. It can hardly be supposed that flight was enjoyed at any age in a lamellirostral palmiped with a humerus of only half the length and less than half the thickness of the tibia.

It is half an inch less in absolute length than the humerus of *Cereopsis*; but the circumference of the shaft is one fourth greater in *Cnemiornis* (it is 1 inch 6 lines in *Cereopsis*, 2 inches in *Cnemiornis*); and the muscular impressions are throughout stronger.

The groove between the head (Pl. XXXVIII. figs. 1–3, *a*) and the entotuberosity (*b*) is less deep in *Cnemiornis*: the pectoral ridge (*d*) is rather less produced, and is not so

[1] As observed by Dr. Cunningham (Zool. Trans. vii. p. 493, pl. 60. fig. 43, humerus; pl. 62. fig. 62, tibia).

much bent forward. The ectocondyle (Pl. XXXVIII. fig. 6, *e*) is broader in proportion to its length, the entotuberosity (ib. fig. 5, *c*) is more produced backward, and the pneumatic ridge (fig. 1, *o*) is more produced inward, in the humerus of *Tachyeres* than in that of *Cereopsis* and *Cnemiornis*. In these characters of the bone, the extinct flightless Anserine of New Zealand more resembles the Australian than the Magellan genus.

The ulna in my present illustrations of *Cnemiornis* belongs, like the coracoid, to the left side. It is entire (ib. figs. 7 & 8), is relatively shorter, but much thicker, than the ulna of *Tachyeres*, and is absolutely shorter, and relatively much shorter and thicker, than is the ulna of *Cereopsis*. It exceeds these bones in both species, as well as in any other existing Lamellirostral, in the definition and prominence of the parts of the exterior and convex surface of the shaft for the attachment of "secondary" quill-feathers and the "tectrices primæ." These marks are of two kinds, cavities and prominences. The cavities (fig. 7, *h*), fourteen in number, extend in a single series along the entire shaft: they are elliptical in shape, about 3 lines by 2 lines in dimension, more feebly impressed along the middle and distal end of the shaft, some touching each other, others with intervals of half a line or a line. The prominences (ib. *i*, *i*) are developed from a ridge, external to the cavities, beginning one fourth of the bone's length from its humeral end, and terminating opposite the penultimate cavity. The prominences, nine in number, are from 2 to 3 lines apart. The ridge (fig. 8, *c*) extending the articular cavity for the ulnar condyle of the humerus, and overhanging the surface of attachment of the "brachialis internus" is more produced and extensive than in *Cereopsis*. The olecranon (*e*) is relatively rather more produced; the rest of the proximal surface (fig. 9) closely accords with the anserine type. The surface (*f*) for the attachment of the lateral ligament, and the larger one below (*g*) for the insertion of the "brachialis anticus," are well defined; but the latter is less deep than in *Cereopsis*. Both articular terminal ends are less expanded in proportion to the shaft, and especially so the distal end, than in *Cereopsis*. The radial prominence is less produced.

My specimen of the composite bone called "metacarpus" (ib. fig. 10) is rather larger than the one figured by Dr. Hector, agreeing in this respect with the associated humerus. Like that wing-bone also, it is characterized by its breadth and thickness, which, in proportion to the length of the metacarpus, are much greater than in *Cereopsis* or *Tachyeres*.

The number and nature, or homologies, of the constituents of this bone were determined by its analysis in a young Ostrich, in my work 'On the Nature of Limbs' (1849), and in the description of the specimen No. 1367 in the 'Catalogue of the Osteological Specimens in the Museum of the Royal College of Surgeons' (4to, p. 265). The metacarpus in the Bird consists, like the metatarsus, of three metacarpal bones coalesced with each other and with part of the carpus. As the latter element is mainly and more directly in articular relation of support to the "medius" metacarpal (Pl. XXXVIII. fig. 10, III), and at the same time presents a convex articular surface to the two non-confluent carpals of the proximal row, it answers to the "os magnum" (ib. fig. 10, *m*). The base of the metacarpal coalesced therewith is indicated, on the palmar side, by the prominence (III). The stunted "index" metacarpal (II) has coalesced by its entire length with the contiguous base of the "medius" metacarpal (III), and its supporting carpal (*m*). The head of the "annularis" metacarpal is likewise indicated by the prominence (IV) on the sternal side, where it has coalesced with the contiguous part of the base of the "medius" (III). From this attachment the shaft of IV bends slightly ulnad, and then runs parallel with an interspace about $1\frac{1}{2}$ line in breadth to near the distal end, which again coalesces with that of the "medius." This coalescence is chiefly along the thenal side of the bones; on the opposite, anconal, or dorsal side the primitive separation is shown by a groove.

The head of the index metacarpal (fig. 10, II) is more tumid, but less extended radiad, in *Cnemiornis* than in *Cereopsis*; and the distal articulation (II′) for the proximal phalanx of the index digit is less definite: such rudiment of that finger (commonly called the "thumb" by ornithologists) was probably tied by ligament to its metacarpal.

The tendinal groove impressing lengthwise the anconal surface of the shaft of the mid metacarpal is less marked in *Cnemiornis* than in *Cereopsis*. The distal articulation (fig. 11) is similar in both: it is quadrate, flattened on the radial half, and swelling into a condyle on the ulnar half. The distal articular surface of the "annularis" metacarpal (IV′) shows more of the typical form, viz. two narrow condylar convexities, with a trochlear depression between them.

I have not recognized phalanges in either series of *Cnemiornis* remains which have reached me, and have restored them in the figure of the entire skeleton (Pl. XXXIX. fig. 1) according to the analogy of *Cereopsis*—the radial digit or index (II) being represented by a proximal phalanx, the median digit (III) by three phalanges, and the annular digit (IV), again, by the proximal phalanx only.

To the characters of the pelvis described and figured in my former monograph I am able to add, through Dr. Hector's description, the configuration of the entire part, as shown in the restoration of the skeleton (Pl. XXXIX. fig. 1). The ischium, of which the slender continuation from the acetabulum was shown in fig. 7, 63, of pl. 64 (*tom. cit.*), loses thickness and gains vertical breadth as it recedes, and, coalescing with the hind end of the ilium, circumscribes a great ischiadic foramen, of an oval figure, nearly 3 inches long by 1 inch deep. The pubis unites with the end of the ischium, a "foramen ovale" intervening nearly 5 inches in length and 10 lines at the broadest part, with the canal for the passage of the "obturator internus" tendon[1], indicated, as usual, by a low process rising from the upper border of the pubis, and a corresponding one descending from the opposite part of the beginning of the ischium. Both processes are present in *Cereopsis*, as in *Cnemiornis*; but only the upper or ischiadic one marks out the "obturator" notch

[1] "Myology of Apteryx," Trans. Zool. Soc. iii. 292.

in *Tachyeres*[1]. A second small vacuity weakens the ilium above the hind part of the ischiadic foramen in *Tachyeres*, as in the White-eyed Pochard (*Anas leucophthalmus*)[2]; but this character is not present in *Cnemiornis* or in *Cereopsis*. The proportion in length of the preacetabular to the postacetabular parts of the pelvis is greater in the two last-named genera than in *Tachyeres*.

I have nothing to add to the characters of the femur, tibia, and fibula illustrated in my former memoir. The excessive development of the combined pro- and epicnemial processes, which suggested the affinity or resemblance to *Colymbus*, we now know to have been possessed by a species of another family of web-footed birds. The great extinct Anserine of New Zealand may have kicked its way through the dense element with a vigour and speed that would have arrested the attention of navigators more strongly, perhaps, than such action in the smaller non-volant Lamellirostral which has thereby got the name of "Steamer Duck."

The three digits whose metatarsal bones coalesce to form the "metatarsus" in birds are homotypes of the three metacarpals similarly fused together in the wing, viz. the second, third, and fourth. The first, sometimes wanting, but more commonly present, keeps its rudimental metatarsal element free in all species with the back toe. The rough slightly depressed surface above the entotrochlea shows the usual anserine position of attachment of the back toe in *Cnemiornis*.

The metatarsus of *Cnemiornis* (Plate XXXVIII. fig. 12) yields well-marked evidence of its closer affinity to *Cereopsis* than to *Tachyeres* or other Lamellirostral genera. In these the entotrochlea, or that distal condyle which supports the second or innermost[3] of the three anterior toes, is given off from the composite bone at a higher or more proximal level than the other two trochlear condyles (ib. fig. 14, II): it also projects much more backward than the other condyles. In *Cereopsis* the entotrochlea (ib. fig. 13, II) comes off at a lower level, nearly that of the ectotrochlea, and projects but a short way behind the line attained by the hind part of the mesotrochlea, this terminating a little behind that reached by the ectotrochlea. Thus, in *Cereopsis*, the three trochleæ are more in accordance with the ordinary pattern in non-natatorial birds; and this is precisely the character by which *Cnemiornis* departs from the web-footed order in the

[1] According to Mr. Smit's figure of the pelvis of the Steamer Duck in Trans. Zool. Soc. vol. vii. pl. 62. fig. 59: the originals, collected at the cost of the nation in a Government expedition, have not found their way to the National Museum of Natural History. On special application to the naturalist of the expedition of H.M.S. to the Magellan's Strait, some bones of an immature *Tachyeres* have been sent by him to the British Museum since the penning of the present paper.

[2] *Nyroca*, Flem.; see Eyton, 'Monograph on the Anatidæ,' 4to, 1838, p. 63, and plate.

[3] M. Alphonse Milne-Edwards, describing the metatarse of *Cereopsis* in his 'Recherches pour servir à l'histoire naturelle des Oiseaux Fossiles,' 4to, 1867, writes of the "trochlées digitales:"—"l'externe, au lieu d'être fortement rejetée en arrière, comme dans les autres Anatides; se trouve presque sur le même plan que la médiane" (p. 80). I find the "ectotrochlea" (supporting the outer five-jointed toe) to have its hind border a little anterior to the plane of that of the mesotrochlea, while the entotrochlea projects as much behind that plane, but in a markedly less degree than does the internal trochlea in *Tachyeres* and other Anatidæ.

structure of its metatarse. The entotrochlea comes off at the same transverse line with the ectotrochlea (Trans. Zool. Soc. v. pl. 67. figs. 1 & 3), and shows but a feeble trace of the anserine backward production of the internal trochlea, as shown in the side view of the bone given in the present paper (Pl. XXXVIII. fig. 12). The metatarse in *Tachyeres* conforms to the rule in Anatidæ, the innermost digital trochlea not only diverging from the confluent shafts at a higher level (as shown in Trans. Zool. Soc. vol. vii. pl. 62. fig. 63), but being produced more backward ("fortement rejetée en arrière") than the other two trochleæ (as shown in the side view given in fig. 14, Pl. XXXVIII.).

§ 6. *Conclusion.*

The sum of the comparisons instituted in the foregoing descriptions of parts of the skeleton of *Cnemiornis* with corresponding parts in *Cereopsis* and in *Tachyeres* weighs strongly in favour of the nearer affinity of the non-volant Anserine of New Zealand with the feebly flying Goose of Australia than with the non-volant Duck of Magellan's Strait. This is more especially exemplified in the pelvis, the metatarsus, and the skull. The characters of shortness, breadth, and obtuseness of the beak which generically distinguish *Cereopsis novæ hollandiæ* were exaggerated in *Cnemiornis*, and lead me to infer a similarity of diet and terrestrial habits[1] in the gigantic goose of New Zealand.

In the 'American Journal of Science and Arts,' vol. xlix. no. 146, March 1870, Professor O. C. Marsh reports the acquisition, from "the greensand of New Jersey," of "a portion of the shaft and distal extremity of a left tibia which indicates a species, apparently, of a swimming bird nearly as large as the common wild Swan (*Cygnus americanus*, Sharpless)" (p. 206). "The condyles of the distal end are broader anteriorly than deep, the inner condyle being more prominent in front, and the outer one projecting somewhat further behind. The intercondyloid space is wider than either condyle." "The supratendinal bridge is well ossified;" "it is submedian in position, straight, transverse, of moderate width, and spans a deep and well-defined canal, which was traversed by the extensor tendon of the toes." "The under trochlear surface is but slightly concave transversely, and has a faint median elevation, as in the tibia of the Swan." But this elevation is present in birds of other genera, families, and orders: it is shown in many of my illustrations of the bone; and I may refer to the latest (Trans. Zool. Soc. vol. viii. pl. 59. fig. 2), where it is indicated in the tibia of *Dinornis gravis* by the letter *u*. With regard to another alleged anserine character, I may remark that in every bird with the "supratendinal bridge well ossified," I have found it spanning a canal that might be called "deep and well-defined," and "which was traversed by a tendon;" but this I have found to be, in Anserines as in other birds, the tendon of the

[1] Mr. Yarrell has recorded his observation that the *Cereopsis*, like the semipalmated Goose, "passes much of its time on land," 'Proceedings of the Committee of Science and Correspondence of the Zoological Society of London,' 8vo, p. 25 (January 1831).

"tibialis anticus" (Trans. Zool. Soc. vol. iii. 1842, p. 297, pl. 35. 8)[1], not "the extensor tendon of the toes." Professor Marsh admits that the lower part of his fossil tibia "has little of the marked inward curvature characteristic of swimming birds, but is so straight that its median plane, if continued, would divide the trochlear surface nearly equally" (ib. p. 207). He further states that "the outer margin of the canal is low and obtuse, as in most of the Gallinaceous birds" (ib. p. 206), that "on the lower surface of the inner condylar ridge there is a shallow notch, resembling in shape and position that in the tibia of some Gulls" (ib.), and that "the shaft curves forward slightly just where it begins to expand above the lower condyles, closely resembling in this respect the tibia of the Turkey" (ib. p. 207).

Nevertheless on this portion of bone is founded the genus *Laornis*, of the order Natatores, bearing "a strong resemblance in many respects to the Lamellirostres and also to the Longipennes, but differing essentially from the typical forms of both these groups."

With all respect to the learned Professor of Paleontology in Yale College, I would express the strong wish felt, with myself, by many of my fellow labourers in that science, that he would accompany his descriptions, notices, and names of new genera and species of extinct animals with figures, of the natural size, of the fossils on which such are founded. Casts would be still more acceptable for European comparisons. In relation to the subject of the present memoir it is plain that if the fossil tibia, "nearly as large" as that of a Wild Swan, prove to be really anserine, it cannot be referred to the genus *Cnemiornis* of 1865.

The species representing this anserine genus was about the same size as, or, rather, exceeded, its contemporary, also now extinct, the ralline *Aptornis defossor*. Both equalled in bulk the smaller species of Cassowary. The height of the back of *Cnemiornis* above the ground probably exceeded 2 feet; and the length of its body from beak to tail must have been at least 3 feet.

DESCRIPTION OF THE PLATES.

PLATE XXXV.

Fig. 1. Side view of skull of *Cnemiornis*.
Fig. 2. Back view of ditto.
Fig. 3. Upper view of ditto.
Fig. 4. Under view of ditto.
Fig. 5. Upper view of mandible.
Fig. 6. Side view of skull of *Cereopsis*.
Fig. 7. Back view of ditto.
Fig. 8. Upper view of ditto.
Fig. 9. Under view of ditto.
Fig. 10. Upper view of mandible.
Fig. 11. Back view of base of maxilla of *Cnemiornis*.
Fig. 12. Prefrontal portion of cranium of ditto.

[1] See also 'Anat. of Vertebrates,' ii. (1866) p. 108, and Alphonse Milne-Edwards, 'Oiseaux Fossiles de la France,' 1867, 4to, pl. 7. figs. 1 & 2, 13, 13' (tibial antérieur).

PLATE XXXVI.

Fig. 1. Side view of third cervical vertebra, *Cnemiornis calcitrans.*
Fig. 2. Idem of ditto, *Cereopsis.*
Fig. 3. Under view of ditto, ditto.
Fig. 4. Side view of ditto, *Tachyeres brachypterus.*
Fig. 5. Under view of ditto, ditto.
Fig. 6. Side view of twelfth cervical vertebra, *Cnemiornis calcitrans.*
Fig. 7. Front view of twelfth cervical vertebra, *Cereopsis.*
Fig. 8. Idem of ditto, *Tachyeres brachypterus.*
Fig. 9. Side view of ditto, *Cereopsis.*
Fig. 10. Idem of ditto, *Tachyeres.*
Fig. 11. Front view of second dorsal vertebra, *Cnemiornis calcitrans.*
Fig. 12. Under view of ditto, ditto.
Fig. 13. Front view of ditto, *Cereopsis.*
Fig. 14. Under view of ditto, *Tachyeres.*
Fig. 15. Side view of third dorsal vertebra, *Cnemiornis.*
Fig. 16. Front view of ditto, ditto.
Fig. 17. Side view of fourth dorsal vertebra, ditto.

PLATE XXXVII.

Fig. 1. Under view of sternum, *Cnemiornis.*
Fig. 2. Front border of ditto.
Fig. 3. Costal border of ditto.
Fig. 4. Inner view of coracoid.
Fig. 5. Outer view of coracoid.
Fig. 6. Scapular end of ditto.
Fig. 7. Side view of ditto.
Fig. 8. Outer view of coracoid, *Cereopsis.*

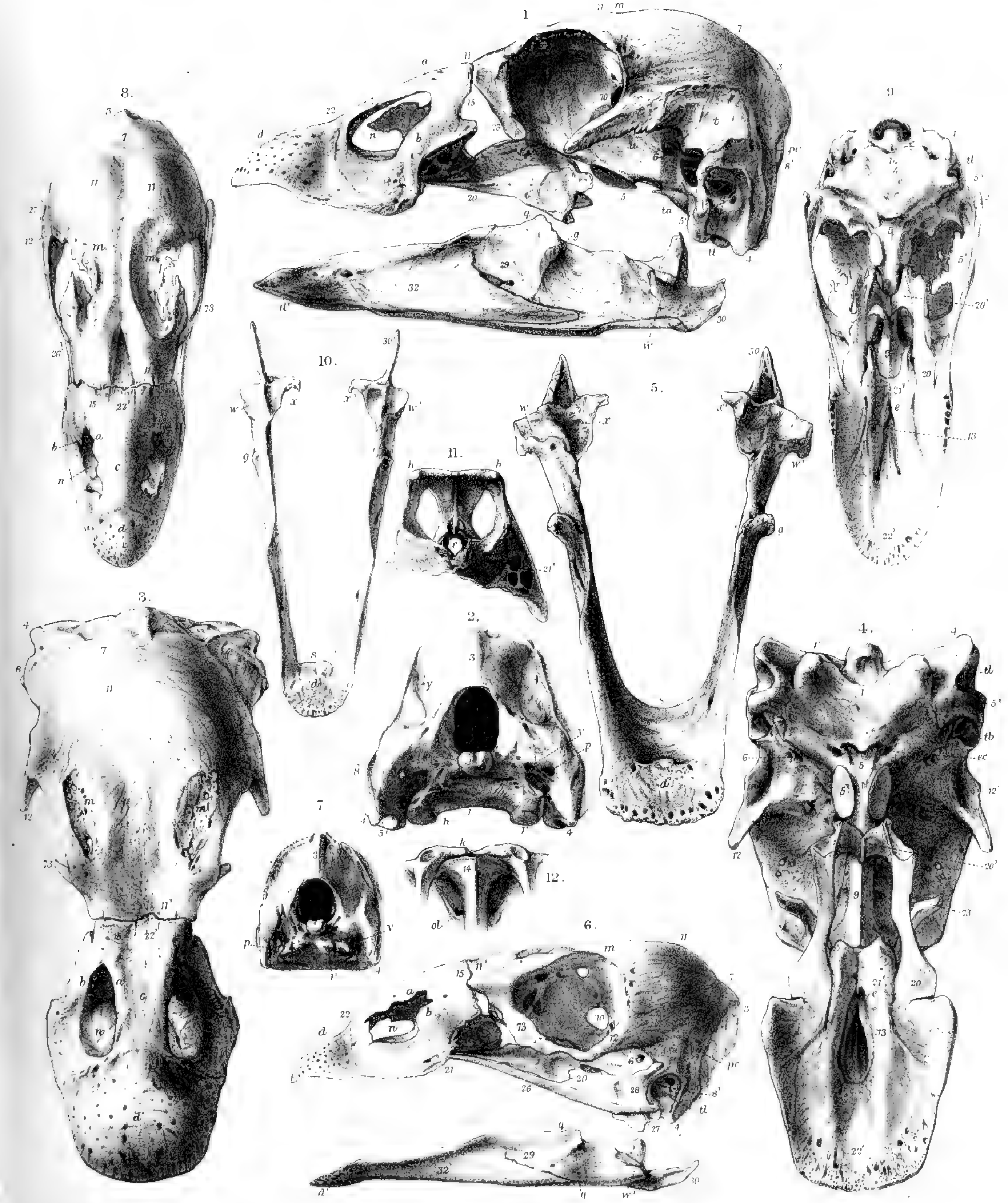
PLATE XXXVIII.

Fig. 1. Anconal view of humerus, *Cnemiornis.*
Figs. 2 & 3. Views of proximal half of ditto.
Fig. 4. View of distal half of ditto.
Fig. 5. Proximal articular end of ditto.
Fig. 6. Distal articular end of ditto.
Figs. 7 & 8. Views of left ulna, ditto.
Fig. 9. Proximal articular end of ulna.
Fig. 10. View of metacarpus.
Fig. 11. Distal articular end of ditto.
Fig. 12. Side view of metatarsus.
Fig. 13. Idem, *Cereopsis.*
Fig. 14. Idem, *Tachyeres brachypterus.*

N.B. All the figures of the preceding Plates are of the natural size.

PLATE XXXIX.

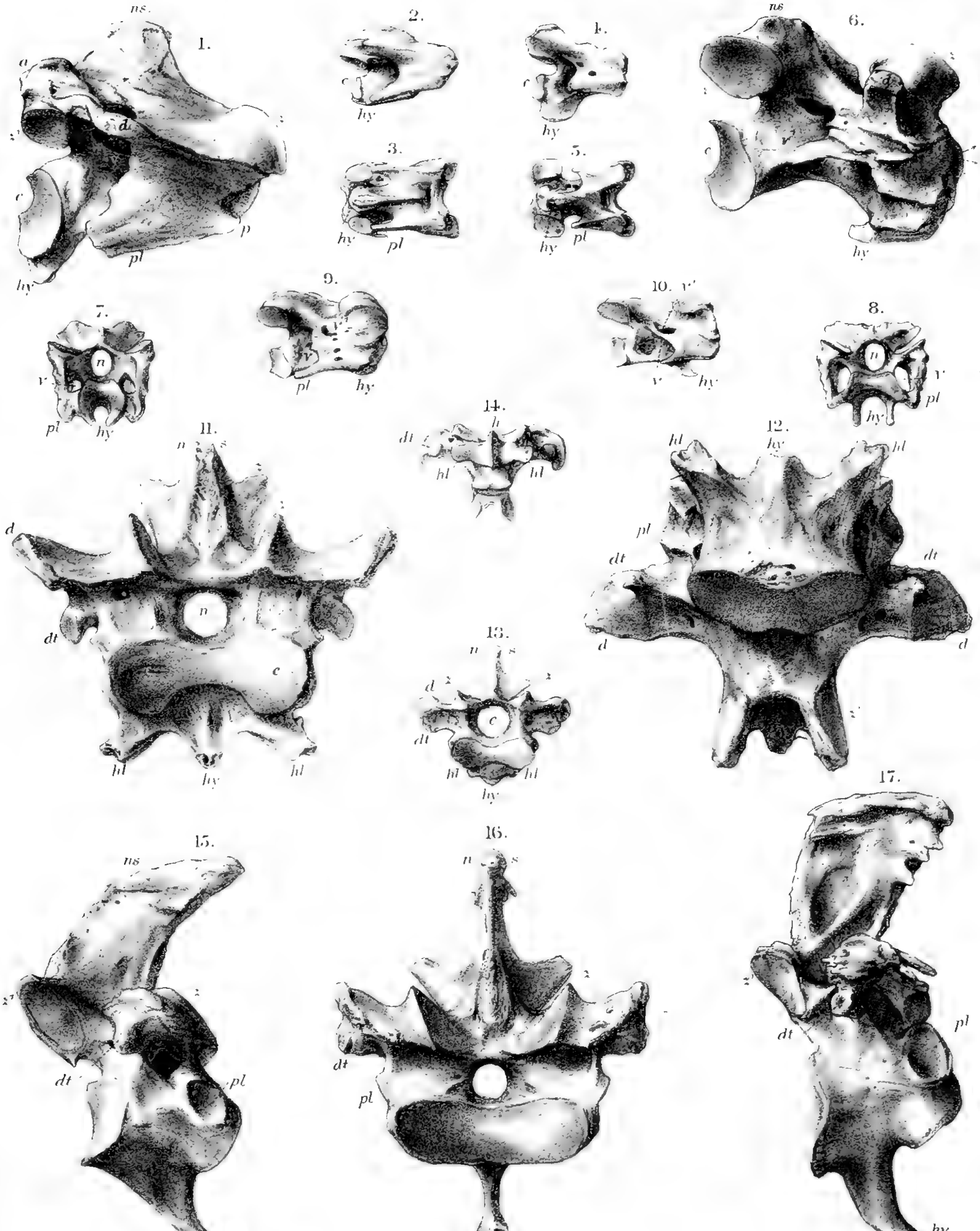
Fig. 1. Restored skeleton of *Cnemiornis calcitrans.*
Fig. 2. Skeleton of *Cereopsis,* reduced to the same scale.



R.O. del. Griesbach lith

Mintern Bros imp

SKULL OF CNEMIORNIS



R.O. del Griesbach lith

Mintern Bros imp

VERTEBRÆ OF CNEMIORNIS.

R.O. del. Griesbach lith.

Mintern Bros. imp.

STERNUM OF CNEMIORNIS.

R.O. del. Griesbach lith.

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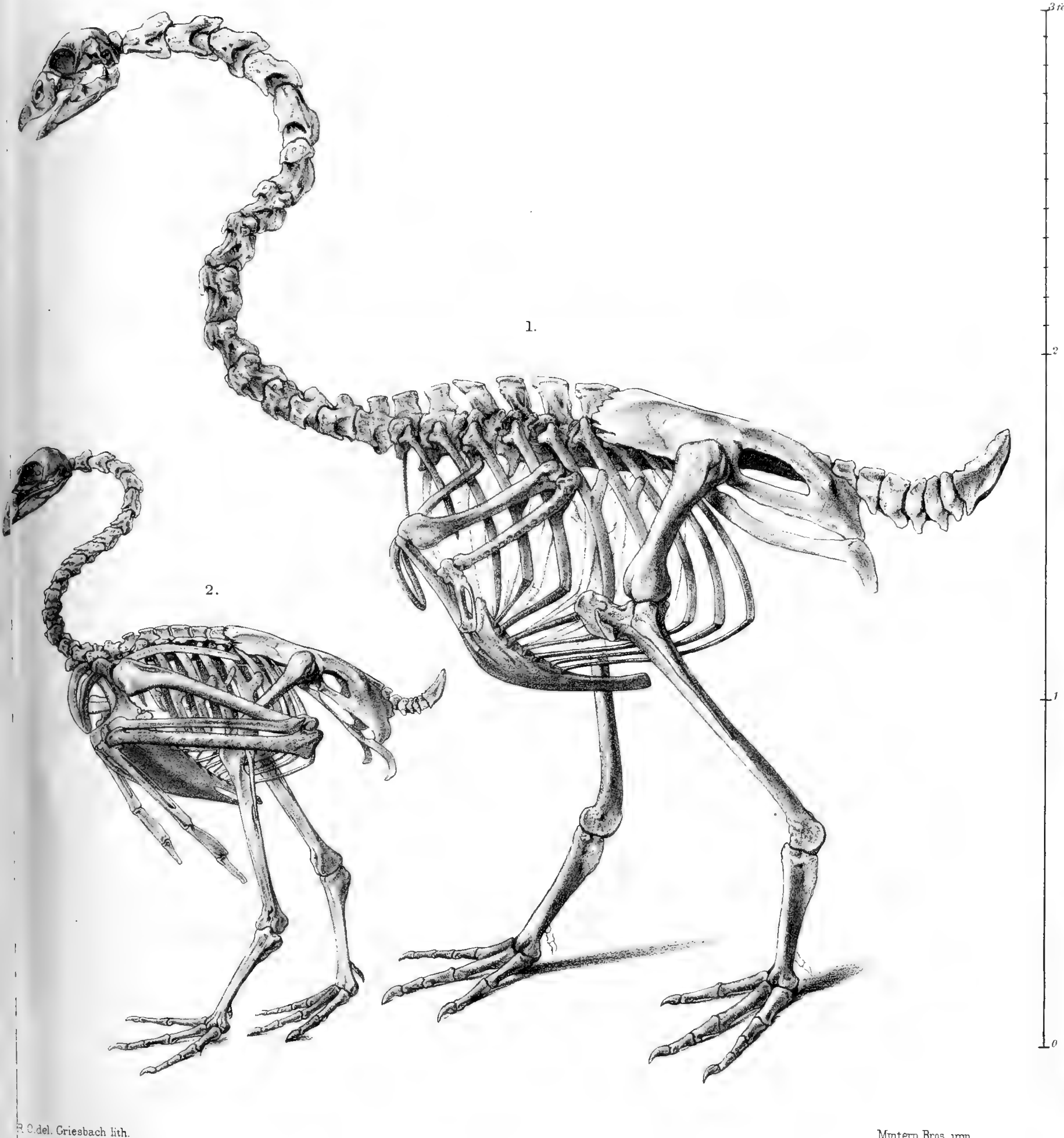
HUMERUS & ULNA OF CNEMIORNIS.



R. O. del. Griesbach lith.

Mintern Bros. imp.

1. RESTORED SKELETON OF CNEMIORNIS.
2 .... „ .... „ .... „ CEREOPSIS

IV. *On the Curassows now or lately living in the Society's Gardens.* *By* P. L. Sclater, *M.A., Ph.D., F.R.S., Secretary to the Society.*

Read June 17th, 1873.

[Plates XL.–LIII.]

In the 'Proceedings' of the Society for 1870 (p. 504 *et seqq.*) Mr. Salvin and I gave a synopsis of the species of the Gallinaceous family Cracidæ, so far as they were then known to us.

The various species of Curassows (*Crax* of Linnæus), which constitute the first subfamily *Cracinæ* according to the arrangement there adopted, are many of them very common birds in captivity. Specimens are to be seen in every collection of living birds; and this Society has from time to time possessed examples of nearly all the known species. In spite of their being so common, however, the Curassows are by no means well understood, and there has been great confusion among the different species. This has arisen, not only from the general similarity of some of the nearly allied species, but even more from the fact that in some of the species the two sexes are nearly alike in colour, whereas in other species nearly allied they are quite different. It has thus come to pass that it is rare to find these fine birds correctly determined, either in living collections or in museums, and that it is by no means uncommon to see the sexes of two different species associated together as male and female.

With the view of diminishing this confusion as far as possible, and of rendering the determination of the species of *Crax* and their sexes more easy, I have had from time to time, during the last three years, figures taken of the specimens living in the Society's gardens. With the addition of a few other figures from examples in the British Museum and in other collections, there has thus been formed a complete series of illustrations of all the certainly known species of the subfamily, together with one still imperfectly known, the publication of which will, I trust, make the somewhat obscure subject much better understood than heretofore.

The following synonymy of the species, and remarks upon their history, distribution, and other points, are mainly taken from the article by myself and Mr. Salvin above spoken of, such changes only having been introduced and such additions made as various opportunities of examining living and dead specimens of Curassows during the past three years have afforded me.

Genus I. Crax.

1. Crax globicera. (Plate XL. ♂ et ♀.)

Crax globicera, Linn. S. N. i. p. 270 (*partim*); Taylor, Ibis, 1860, p. 311; Salvin, Ibis, 1861, p. 143; Sclater, P. Z. S. 1860, p. 253; Lawr. Ann. Lyc. N. Y. viii. p. 12, ix. p. 139; v. Frantz. J. f. O. 1869, p. 373; Scl. et Salv. P. Z. S. 1870, pp. 513 et 838, et Nomencl. p. 135.
Crax temminckii, Tsch. F. P. Aves, p. 287.
Crax alberti ♀, Fraser, P. Z. S. 1850, p. 250, tab. xxviii. (♀).
Crax blumenbachii, G. R. Gray, List of Gall. p. 15, et Hand-l. ii. p. 253.
Crax alector, Scl. & Salv. Ibis, 1859, p. 223; Moore, P. Z. S. 1859, p. 61.
Crax rubra, Linn. S. N. i. p. 270 (♀); Temm. Pig. et Gall. iii. pp. 21 et 687 (♀); Lawr. Ann. L. N. Y. vii. p. 301 (♀); Bennett, Gard. & Men. Z. S. ii. p. 225.
Curasso bird, Edward's Gleanings, pl. 295, *undè*, .
Crax edwardsi, Reich. Tauben, p. 134.
Crax pseudalector, Reichenb. Tauben, p. 131, tab. 273. f. 1516 (?).
Crax albini, Lesson, Traité d'Orn. p. 484, et Reichenb. Tauben, p. 135 (?).

Nitenti-nigra: ventre imo crissoque albis: cristæ elongatæ plumis nigris, apicem versus recurvis: loris parcè plumulosis: cera tuberculata et rostro toto luteis; pedibus corneis: long. tota 34, alæ 18·5, caudæ 15·5, tarsi 4·7. *Fem.* castanea, ventre imo cinnamomeo: dorso superiore plus minusve nigro induto: capite cristato et cervice undique nigris, albo maculatis: alis extus caudaque nigro et ochraceo plus minusve variegatis et transfasciatis.

Hab. Western Mexico (*Deppe*); Tehuantepec (*Sumichrast*); prov. Vera Cruz (*Sallé* and *Sumichrast*); Guatemala, Vera Paz and Pacific coast (*Salvin*); Belize (*Leyland*); Honduras (*Taylor* and *G. Whitely*); Costa Rica (*v. Frantz.*); Veragua (*Arcé*); Panama (*M'Cleannan*).

Linnæus's *Crax globicera* is founded mainly upon the *Crax curassous* of Brisson (Orn. i. p. 300), which is more likely to be intended for this species than any other. Brisson mentions the *tubercula ad basin rostri, rotunda, lutea*—which excludes everything except the present bird and *C. daubentoni.* And as he says nothing whatever of the tail being tipped with white, the balance of evidence is in favour of his having intended to describe the present species. *Crax rubra* of Linnæus, founded upon *Crax peruvianus* of Brisson (*op. cit.* p. 305), is, there can be little doubt, intended for the female of the present bird.

The first author who appears to have correctly identified these birds as male and female is Tschudi, who, in his 'Fauna Peruana,' accurately describes both sexes under the name *Crax temminckii*, from specimens obtained by Deppe in Western Mexico; but he is no doubt in error in supposing that this was the species that he himself saw in the wood-region of Eastern Peru, where it is represented by *Crax globulosa.*

In the first paper on the Ornithology of Guatemala, written by Mr. Salvin and myself, we erroneously called the Guatemalan bird *Crax alector.* This mistake was subsequently rectified, and the bird referred to *Crax globicera*, which name has generally been adopted by more recent writers for the Central-American species.

In Mr. G. R. Gray's 'List of Gallinæ' this Curassow is called *Crax blumenbachii*, after Spix's figure (Av. Bras. ii. t. 64). It is possible Mr. Gray may be correct in this reference, as we have seen Central-American specimens of the female nearly as dark as is represented in Spix's figure; but if this be so, it can hardly be true, as Spix states, that his specimen was obtained at Rio.

This Curassow is the only species of the genus and subfamily met with in America north of Panama. I have examined a large number of specimens from different localities between the isthmus and Southern Mexico. The male is quite constant in colour, except that in one Panama specimen in Salvin and Godman's collection the tail shows a very narrow margin of white. The female, on the contrary, is very variable, as has been already pointed out in the diagnosis. In some specimens the wings are wholly red, in others much banded with black and cinnamomeous: in some specimens also the tail-bands are very slight, and almost evanescent; in others they are broad and conspicuous. The upper portion of the back varies from black to chestnut.

The Globose Curassow, as it is usually called, is one of the commonest species met with in living collections. Within these last ten years, as will be seen by the subjoined list, at least twenty specimens have been received by the Society; so that we have had ample opportunity of becoming acquainted with it.

List of Living Specimens of *Crax globicera* exhibited since 1860.

a, *b*. Females	Presented by R. W. Keate, Esq., F.Z.S.	August 9, 1862.
c. Male *d*. Female	Presented by R. S. Newall, Esq.	August 12, 1864.
e.	Presented by Capt. Abbott.	August 31, 1864.
f. Male *g*. Female	Purchased.	November 16, 1865.
h.	Presented by Commander Glynn, R.N.	August 20, 1866.
i. Male *j*. Female	Deposited.	October 20, 1866.
k, *l*.	Received in exchange.	February 4, 1869.
m. Female	Purchased.	December, 13, 1869.
n. Female	Purchased.	May 25, 1870.
o. Male *p*. Female	Purchased.	July 28, 1870.
q. Female	Purchased.	July 16, 1872.
r. Female	Presented by Capt. Butler	October 15, 1872.
s. Male	Purchased.	May 15, 1873.

In the female specimen *r* (which died Feb. 26, 1873), Mr. Garrod informs me, the trachea was simple and without convolutions.

2. CRAX DAUBENTONI. (Plates XLI. ♂, XLII. ♀.)

Hocco, Faisan de la Guiane, Buff. Pl. Enl. 86.

Crax daubentoni, G. R. Gray, List of Gall. p. 15 (1867), et Hand-l. ii. p. 253; Scl. et Salv. P. Z. S. 1870, p. 516, et Nomencl. p. 135; Sclat. P. Z. S. 1870, p. 671.

Crax aldrovandi, Reichenb. Tauben, p. 134, tab. 272*b*. f. 5038 (♂) et tab. 273. f. 1518 (♀).

Crax globicera, Temm. Hist. Nat. des Gall. iii. pp. 12 et 686; Reichenb. Taub. p. 133, tab. 273. f. 1517.

Crax mikani ♂, Pelzeln, Orn. Bras. p. 343 (♀).

Nitenti-nigra: ventre imo et caudæ apice albis: cristæ elongatæ plumis nigris recurvis: loris plumosis: cera tuberculata et mandibula utrinque ad basin carunculata flavis: pedibus nigricantibus: long. tota 32, alæ 15·5, caudæ 14, tarsi 4·5. *Fem.* mari similis, sed crista ad basin albo obsolete fasciata: ventre et tibiis albo transfasciolatis: cera et rostro nigris.

Hab. Venezuela, near Caracas (*Levraud*); Tucacas (*Wright* and *Warmington*).

This Curassow was confounded by the older authors with *C. globicera*; and it must always, perhaps, remain somewhat of an open question to which bird that name should in strict propriety be applied. Mr. Gray first correctly associated the two sexes of the present bird, and in his 'List of Gallinæ' gave the name *daubentoni* to it, in consequence of the male being figured by Daubenton as the *Hocco, Faisan de la Guiane*, in the 'Planches Enluminées.' This species and its northern representative are certainly close allies, the chief difference between the two males consisting in the present bird having broad white tips to the rectrices. But the females, it will be observed, are very different.

The forest-region of Venezuela is the only locality which I know of for this Curassow. M. Levraud transmitted specimens of it in his extensive collection from Caracas, which I have examined at Paris. In 1870 we received our first living pair of this species, from Mr. James Wright, who obtained them from near Tucacas in Venezuela. In the following year Mr. A. Warmington was kind enough to bring us a male and two females from the same port, and to furnish me with the following notes on the subject.

"The three Curassows (one male and two females) were captured at 'Maron' near Tucacas, N. Venezuela, and at the present time are nearly two years old, having been taken from the nest when scarcely larger than a chick of two months old. They soon became perfectly tame, and would follow me about. When able to fly they made short flights, always quickly returning, and seldom alighting. At night they invariably roosted on the highest spot they could find in the home corral. They are called by the natives 'Porũ.' Their cry is a sort of mournful prolonged whistle, and in the forest, when eight or ten are together, has a very singular effect. It is not common to see these birds on the ground. When they alight in a tree they almost invariably utter their cry, and at the same time raise the tail-feathers fan-like, thus exposing the white plumage beneath, and offering a conspicuous and tempting mark for the sportsman. They are excellent eating. I have never heard of these birds breeding in confinement, though I cannot say they do not. The young ones are exceedingly beautiful delicate little creatures, marked very much like and having a very similar appearance to young Partridges or Quails. They become much attached to individuals who treat them kindly. These birds are common in all parts of Venezuela where there is a forest."

Herr v. Pelzeln has kindly supplied me with accurate coloured figures of his *Crax mikani*, from which it seems evident that the supposed *male* of that species is the female of *Crax daubentoni*, and the supposed *female* the female of *Crax alberti*.

List of Living specimens of Crax daubentoni *exhibited since* 1860.

a. Male, *b.* Female	Presented by J. Wright, Esq.	September 29, 1870.
c. Male, *d, e.* Females	Presented by A. Warmington, Esq.	July 11, 1871.
f. Male	Presented by George Hall, Esq.	September 5, 1871.
g. Female	Deposited.	October 24, 1871.

3. Crax alector. (Plate XLIII. ♂ et ♀.)

Crax alector, Linn. S. N. i. p. 269; Temm. Pig. et Gall. iii. pp. 27 et 689; Vieill. Gal. d. Ois. ii. p. 6, t. 199; Cab. in Schomb. Guian. iii. p. 746; Reichenb. Tauben, p. 130; Bennett, Gardens & Men. ii. p. 9; Pelzeln, Orn. Bras. p. 286; Gray, Gen. of B. iii. p. 486, et Hand-l. ii. p. 253; Scl. et Salv. P. Z. S. 1870, p. 514, et Nomencl. p. 135.

Gallus indicus, Sloane, Jamaica, ii. p. 362 et t. 26, undè

Crax sloanei, Reichenb. Tauben, p. 131 (?).

Purpurascenti-nigra: ventre imo crissoque albis: cristæ brevis plumis nigris, versus apicem recurvis: loris nudis: cera et rostro ad basin flavis, hujus apice cærulescente: pedibus corneis: long. tota 35, alæ 14·5, caudæ 13·5, tarsi 4·5. *Fem.* mari similis, sed crista intus albo parce transfasciata.

Hab. British Guiana (*Schomb.*); Rio Negro, Rio Vaupé, and Rio Brancho (*Natt.*).

The species most liable to be confounded with the present Curassow are *Crax globicera* and *Crax sclateri*. From both of these it is distinguishable by the purple tinge of its plumage, which is very noticeable in living specimens, and is also plainly seen in skins. From *C. globicera* it is likewise distinguishable by the naked lores and by the want of the protuberance on the cere; from *C. sclateri* by the absence of the white tips to the tail-feathers and the black thighs. It differs not only from these, but from almost all other members of the genus in the sexes being nearly alike.

The patria of *C. alector* is Guiana, Cayenne, and the adjoining districts of Amazonia up to the Rio Negro. In Upper Amazonia it is replaced by *C. globulosa*.

List of living specimens of Crax alector *exhibited since* 1860.

a.	Presented by W. Duncan Stewart, Esq.	June 26, 1861.
b, c.	Presented by R. W. Keate, Gov. of Trinidad.	August 9, 1862.
d.	Purchased.	May 3, 1865.
e.	Presented by Mr. Beaumont.	April 10, 1866.
f–i.	Deposited.	July 25, 1867.
j, k.	Presented by Col. May	August 14, 1869.
l.	Presented by Mr. J. Stanton.	June 6, 1871.
m, n.	Presented by G. Browne, Esq.	September 7, 1871.
o, p.	Presented by Quintin Hogg, Esq.	July 16, 1872.
q, r.	Purchased.	September, 13, 1872.
s.	Presented by George Bruce, Esq.	May 14, 1874.

The specimen *r*, purchased September 13, 1872, was found by Mr. Garrod to be a male on dissection, and to have a small superficial tracheal loop.

4. CRAX SCLATERI. (Plate XLIV. ♂ et ♀, et Plate XLV. ♀.)

Mitu, Azara, Apunt. iii. p. 83. no. 338.

Crax alector, Hartl. Ind. Az. p. 22.

Crax sclateri, Gray, List of Gall. p. 14, et Hand-l. ii. p. 253; Pelzeln, Orn. Bras. p. 287; Scl. et Salv. P. Z. S. 1870, p. 515, et Nomencl. p. 135.

Crax circinatus, Licht. MS. in Mus. Berol. (*teste* Pelzelno).

Crax discors, Natt. MS. in Mus. Berol. (*teste* Pelzelno).

Crax azaræ, Natt. MS. in Mus. Vindob. (*teste* Pelzelno).

Nitenti-nigra: ventre imo, crisso et caudæ apice albis: cristæ mediocris plumis nigris versus apicem recurvis: loris nudis: cera et rostro toto flavis: pedibus carneis: long. tota 32, alæ 14, caudæ 14, tarsi 4. *Fem.* supra nigra, ochracescenti-albo, nisi in cervice, transfasciata: crista alba, basi et apice nigris: subtus gula et cervice nigris: abdomine cinnamomeo, pectore nigro transfasciato: cauda nigra, hujus fasciis transversis et apice fulvis; rostri basi obscura, apice cum pedibus flavis.

Hab. Paraguay (*Azara* and *Page*); Brazil, prov. Mato Grosso (*Natterer*).

Azara clearly describes both sexes of this Curassow, which appears to be the sole representative of the group in Paraguay and in the adjacent portion of the Brazilian province of Mato Grosso. It was, however, confounded with other species, or provided only with MS. names, until Mr. Gray described it in his List of Gallinæ in 1867.

As already remarked, the male of this species closely resembles the corresponding sex of *C. alector*; it is singular, therefore, that the females of the two species should be so very different.

We have received four or five living specimens in the Society's collection which have been determined as "*Crax sclateri* ♀;" but I am a little doubtful whether they really belong to this species or to the dubious *Crax pinima.* One of these, spec. *b*, received in 1863, is figured Plate XLV. It differs from the Nattererian specimen (figured Pl. XLIV. fig. 2) in being rather larger, in having rather narrower bands above, and in having the tail-feathers distinctly terminated with white instead of fulvous.

List of living specimens of Crax sclateri *exhibited since* 1860.

a.	Received in exchange.	March 12, 1861.
b.	Presented by the Prince de Joinville	October 13, 1863.
c.	Received in exchange.	February 21, 1872.
d, e.	Purchased.	January 20, 1874.

Specimen *b*, which died February 9, 1874, was determined by Mr. Garrod to be a female. The trachea was simple, without any loop.

5. Crax globulosa. (Plate XLVI. ♂ et ♀.)

Crax globulosa, Spix, Av. Bras. ii. p. 50, t. 65 (♂), 66 (♀); Gray, Gen. of B. iii. p. 486, et Hand-l. ii. p. 253; Reichenb. Taub. p. 135; Scl. et Salv. P. Z. S. 1870, p. 515, et 1873, p. 307, et Nomencl. p. 135.

Crax globicera, Bates, Naturalist on the river Amazons, ii. p. 112.

Nitenti-nigra: ventre imo crissoque albis: crista nigra recurva: loris plumosis: cera tuberculata et mandibula utrinque ad basin carunculata flavis: rostri apice nigro: pedibus rubris: long. tota 36, alæ 16, caudæ 14·5, tarsi 4·4. *Fem.* mari similis, sed tuberculo et carunculis rostri nullis et ventre fulvo diversa.

Hab. Upper Amazons (*Spix*); Pebas (*Castelneau* and *Deville*); Rio Napo (*mus. G. N. L.*).

The well-developed yellow caruncles at the base of the mandible distinguish this species from all its allies except *C. daubentoni*, in which the tail is broadly tipped with white. I have only seen one female of this species; it agrees with Spix's figure and description. The variation of the sexes in this bird corresponds to that which obtains in *Crax carunculata*, which has likewise conspicuous caruncles on the base of the bill. In the latter case, however, the caruncles are red instead of yellow.

I have not yet met with living specimens of this bird. The figures are taken from skins in the collection of Mr. G. N. Lawrence of New York, whom I have to thank most sincerely for the loan of them. They were obtained on the Rio Napo.

6. Crax carunculata. (Plate XLVII. ♂ et ♀.)

Crax carunculata, Temm. Pig. et Gall. iii. pp. 44, 690 (1815); Sw. An. in Men. p. 183; Gray, Gen. of B. iii. p. 486, et Hand-l. ii. p. 254; Scl. et Salv. P. Z. S. 1870, p. 517, et Nomencl. p. 135.

Crax rubrirostris, Spix, Av. Bras. ii. p. 51, t. 67; Max. Beitr. iv. p. 528.

Crax blumenbachi, Burm. Syst. Ueb. iii. p. 345.

Crax yarrelli, Bennett, Gard. & Men. ii. p. 227; Yarrell, P. Z. S. 1830–1, p. 33; Sw. An. in Men. p. 188; Jard. et Selby, Ill. Orn. iv. pl. vi.

Nitenti-nigra: ventre imo crissoque albis: crista nigra versus apicem recurva: loris nudis: ceræ tuberculo parvo et caruncula utrinque ad basin mandibulæ rubris: pedibus corneis: long. tota 34, alæ 15·5, caudæ 13·5, tarsi 4. *Fem.* mari similis, sed crista albo fasciolata et ventre imo crissoque rufis.

Hab. Wood-region of S.E. Brazil from Rio to Bahia (*Max.* and *Burm.*).

This Curassow is easily distinguishable by its red bill, and has therefore been less often confounded with other species than most of its congeners. Burmeister, however, has united it to *Crax blumenbachi* of Spix, supposing that Spix's figure may represent the female of the present bird. This can hardly be so. Spix's plate obviously represents the female of *C. globicera*, or of some allied species of which we do not yet know the male. If his locality (Rio) be correct, the latter is probably the case.

List of living specimens of Crax caruncullata *exhibited since* 1860.

a. Male	Purchased.	April 5, 1859.
b. Female	Purchased.	March 12, 1861.
c, d.	Purchased.	May 3, 1865.
e. Male *f.* Female	Received in exchange.	February 26, 1867.
g, h.	Presented by Edward Thornton, Esq.	May 4, 1867.
i, j.	Deposited.	December 2, 1867.
k.	Deposited.	October 29, 1868.
l. Female	Purchased.	May 25, 1870.
m. Male	Purchased.	December 23, 1873.

7. Crax alberti. (Plate XLVIII. ♂ et ♀.)

Crax alberti, Fraser, P. Z. S. 1850, p. 246, t. 27; Gray, List of Gallinæ, p. 15, et Hand-l. ii. p. 253; Reichenb. Tauben, p. 136; Scl. et Salv. 1870, p. 517, et Nomencl. p. 135.

Crax mikani ♀, Pelzeln, Orn. Bras. p. 343.

Nitenti-nigra: ventre imo, crisso et caudæ apice albis: crista brevi, recurva, nigra: loris dense plumosis: ceræ tuberculo et mandibulæ carunculis cæruleis: rostri apice corneo: pedibus plumbeis: long. tota 30·0, alæ 15·5, caudæ 14. *Fem.* nigra: crista albo fasciolata: dorso, alis extus et cauda supra albo anguste transfasciatis: cauda albo terminata: remigibus externis et abdomine toto castaneis: ventre medio crissoque pallidioribus.

Hab. Columbia.

Mr. Fraser first described this Curassow (which may be readily known by its densely feathered lores and blue wattles), from a specimen living in the aviaries at Knowsley in 1850. It is, however, obvious that the bird described and figured by him (*l. c.* pl. xxviii.) as the female of *C. alberti* is not the true female of this species, but that of *Crax globicera.*

Crax alberti is now not unfrequently brought alive to this country. There have been of late years specimens of both sexes in the Society's Gardens, as will be seen by the subjoined list. Its true patria, which was long unknown, is certainly the wood-region of Columbia. A female in the collection of Salvin and Godman was transmitted direct from Bogotá by Mr. G. Crowther. There is a male in the Paris Museum, sent from the same locality by Dr. Lindig, and a female in the same collection obtained near Sta. Marta by M. Bonnecourt.

The bird described by Herr v. Pelzeln as the female of his *Crax mikani*, seems to be the female of this species, judging from the figure of the specimen, with which he has kindly supplied me, as also from his accurate description.

List of living specimens of Crax alberti *exhibited since* 1860.

a, b.	Purchased.	April 2, 1868.
c. Female	Purchased.	May 25, 1870.
d. Female	Purchased.	July 28, 1870.
e. Male	Deposited.	October 26, 1870.
f. Female	Purchased.	March 1, 1873.
g. Male	Purchased.	January 21, 1874.

As regards the preceding seven species of *Crax*, we are now acquainted with both sexes of each of them, and know the localities in which they occur in a state of nature. There remain some other dubious species, namely:—

1. Crax pinima.

Crax pinima, Pelzeln, Orn. Bras. pp. 287 et 341; Gray, Hand-l. ii. p. 253; Scl. et Salv. P. Z. S. 1870, p. 518, et Nomencl. p. 135.
Crax fasciolata, Spix, Av. Bras. ii. p. 48, t. 62 *a* (?).

Natterer obtained a single specimen of the bird described by Pelzeln as *Crax pinima* in the neighbourhood of Pará, and, as stated by v. Pelzeln, had at first doubts as to its being a valid species. He remarks in his MS. that the *Mutum pinima* of Pará, as it is called there, does not differ from the Curassow of Cujabá and Paraguay (i. e. *C. sclateri*). Afterwards he appears to have changed his opinion, and to have designated the bird of Pará *C. pinima*. On the whole I am inclined to believe that *Crax pinima* is founded on a female *Crax sclateri*. But I should be glad to be able to examine examples of both sexes of the Curassow of Pará, in order to compare it with that of Mato Grosso and Paraguay, the range being rather extensive for one species of the genus.

2. Crax incommoda. (Plate XLIX.)

Crax incommoda, Sclater, P. Z. S. 1872, p. 690, et Rev. Cat. Vert. p. 295.

In 1872 I proposed to give the temporary designation of *Crax incommoda* to the bird living in the Society's Gardens, of which I now give a figure. As will be seen, it comes nearest to the female of *Crax daubentoni*, but is at once distinguishable by the narrow transverse white bars across the upper plumage, and the pale flesh-coloured legs. From the female of *Crax sclateri* (Pl. XLV.), which it likewise somewhat resembles, it is distinguishable by its larger size, white belly, barred thighs, black bill, and differently coloured legs.

This specimen, which was purchased of the Jardin d'Acclimatation of Paris in 1870, died in July 1873. It was examined by Mr. Garrod and ascertained to be a female. It is of large size, measuring in the skin (now in Messrs. Salvin and Godman's collection), total length 32 inches, wing 15, tail 13, tarsus 4; the lores are rather sparingly feathered. Mr. Garrod tells me the trachea in this bird was quite simple.

[On October 30, 1873, we purchased (also from the Jardin d'Acclimatation) what is apparently a second specimen of the same species. It differs, however, in having much more white below, the feathers of the throat and breast being white, with transverse bars of black. There is also more white at the base of the crest. The iris is bright reddish brown; the feet and legs pale greyish horn-colour. This specimen is still living in the Society's Gardens.—P. L. S. March 11, 1875.]

[3. CRAX VIRIDIROSTRIS, sp. nov.

Under this designation I have been somewhat unwillingly constrained to place on our register a Curassow which I met with in the Gardens of the Zoological Society of Amsterdam, during a recent visit, and which, having been most kindly lent to me by Mr. Westerman, is now in the Society's Gardens. It is perhaps most nearly allied to *Crax alberti*, having a large caruncle on the lower mandible as in that species. But this and the swollen cere are of a pale green colour instead of blue. It may be characterized as follows:—

Nitenti-nigra: ventre imo crissoque et caudæ apice albis: cristæ plumis brevibus exstantibus retroflexis: rostri cera tumida et carunculis mandibulæ inferioris pallide viridescenti-flavis: pedibus plumbeis: crassitie insignis: major quam *Crax globicera.*—P. L. S. June 3, 1875.]

Genus II. NOTHOCRAX.

NOTHOCRAX URUMUTUM. (Plate L.)

Crax urumutum, Spix, Av. Bras. ii. p. 49, t. 62; Gray, Gen. of B. iii. p. 486, et Hand-l. ii. p. 254; Cab. in Schomb. Guian. iii. p. 746; Reichenb. Tauben, p. 132; Pelzeln, Orn. Bras. p. 288.
Urax urumutum, Burm. Syst. Ueb. iii. p. 347.
Nothocrax urumutum, Scl. et Salv. P. Z. S. 1870, p. 519, et 1873, p. 307, et Nomencl. p. 135.

Rufescens, nigro vermiculata: pilei cristati plumis elongatis pendentibus nigris: cervice undique et corpore subtus castaneis, ventre imo in cinnamomeum trahente: cauda nigricante, rectricum pogoniis externis rufescentibus nigro vermiculatis: spatio oculari late nudo, in ave viva cærulescente: rostro rubro: pedibus rubellis: long. tota 24, alæ 12, caudæ 10, tarsi 2·6.

Hab. British Guiana (*Schomb.*); Rio Negro (*Spix* and *Natt.*); Rio Pastaza, Upper Amazons (*E. Bartlett*).

We have not yet succeeded in obtaining living specimens of this rare and singular species. Mr. E. Bartlett's notes on its habits (P. Z. S. 1873, p. 307) are as follows:—

"I first saw this beautiful species of Curassow in a Peruvian's house, at Santa Maria on the Huallaga, where it was running about along with the common fowls. The bird appeared to be lively and active, and would fight the dogs and fowls, driving them out of the house. A very curious circumstance is that when one of the hens commenced sitting, the bird would drive her off the nest and take her place; this I witnessed myself: the attempt at incubation, however, was not of long duration; for the Curassow destroyed the eggs, as I was informed afterwards by the owner.

"I ascertained that the bird came from the Rio Pastaza; and I believe it is not uncommon on that river and throughout the dense forests on the north-west bank of the Amazons. I have often heard this bird in the middle of the night near Nauta.

"The Peruvians call it the *Monte Píyu.*

"The habits of this bird render it most difficult to obtain, from its living in holes or burrows in the ground. The Indians remain in the forest all night at the place where it is first heard. I was informed by many of the Peruvians, whose word I could rely upon, that these birds come out at night, and ascend to the top branches of the lofty trees in search of food. The Indians are on the look-out, and shoot them just before sunrise as they are descending to return to their places of concealment, where they pass the day."—E. B.

Natterer (Pelzeln, Orn. Bras. p. 288) gives the same account of this bird's nocturnal habits, but says nothing of its living underground.

Genus III. Mitua.

1. Mitua tuberosa. (Plate LI.)

Crax mitu, Linn. S. N. i. p. 270.
Pauxi mitu, Temm. Pig. et Gall. iii. pp. 8, et 685; Gray, Gen. of B. iii. p. 487, et Hand-l. ii. p. 254.
Mitu braziliensis, Reichenb. Tauben, p. 137.
Ourax mitu, Cuv. Règ. An. 1817, i. p. 441; Temm. Pl. Col. 153; Bennett, Gard. & Men. ii. p. 129; Pelz. Orn. Bras. p. 288.
Urax mitu, Burm. Syst. Ueb. iii. p. 349.
Crax tuberosa, Spix, Av. Bras. ii. p. 51, t. 67 *a.*
Mitua tuberosa, Bates, Nat. on the Amazons, ii. p. 112, et ed. 2, p. 262; Scl. et Salv. P. Z. S. 1870, p. 520, et 1873, p. 307, et Nomencl. p. 135.
Urax tuberosa, Burm. Syst. Ueb. iii. p. 348.
Ourax erythrorhynchus, Swains. Classif. of B. ii. p. 352, et An. in Men. p. 187.
Urax erythrorhynchus, Cab. in Schomb. Guian. iii. p. 747.

Nigra purpurascente perfusa: ventre imo castaneo: caudæ apice albo: loris dense plumosis: pilei plumis elongatis: rostri culmine valde elevato, antice cultrato, postice incrassato, rubro: pedibus rubris: long. tota 33, alæ 14, caudæ 12, tarsi 4. *Fem.* mari similis.

Hab. Rio Madeira and Mato Grosso (*Natterer*); Rio Tapajos (*Bates*); Eastern Peru, Chamicurros, and Loreto (*E. Bartlett*).

The occurrence of this Curassow in British Guiana, though asserted by Schomburgk, appears to be very doubtful. It is a more southern species, and is probably only met with on the south side of the Amazons. Natterer obtained specimens of it near the city of Mato Grosso, and at various other points as he descended the Madeira. Bates met with it on the Rio Tapajos, and Bartlett on the Upper Amazons in Eastern Peru.

Two males of this species (*b* and *h* of list), examined by Mr. Garrod, both presented a fair-sized tracheal loop.

List of specimens of Mitua tuberosa *exhibited since* 1860.

a.	Purchased.	August 6, 1860.
b, c.	Presented by the Prince de Joinville.	October 13, 1863.
d, e.	Presented by Sir William Clay, Bart.	December 17, 1863.
f.	Presented by E. Thornton, Esq.	May 4, 1867.
g.	Purchased.	May 25, 1870.
h, i.	Presented by Mrs. A. E. Nash.	January 2, 1875.

2. Mitua tomentosa. (Plate LII.)

Crax tomentosa, Spix, Av. Bras. ii. p. 49, t. 63.
Pauxi tomentosa, G. R. Gray, Gen. of B. iii. p. 487, et Hand-l. ii. p. 254.
Urax tomentosa, Cab. in Schomb. Guian. iii. p. 746; Burm. Syst. Ueb. iii. p. 349.
Ourax tomentosa, Pelz. Orn. Bras. p. 288.
Mitua tomentosa, Scl. et Salv. P. Z. S. 1870, p. 520, et Nomencl. p. 135.

Nigra, purpureo nitens: ventre imo castaneo: caudæ apice rufo: pilei plumis subelongatis, paulum exstantibus: loris dense plumosis: rostri culmine elevato, subcompresso, rotundato, rubro, apice flavicante: pedibus rubris: long. tota 33, alæ 15, caudæ 13·5, tarsi 4·5. *Fem.* mari similis.

Hab. British Guiana (*Schomb.*); Rio Negro (*Spix* and *Natt.*); Rio Brancho (*Natt.*).

Spix, the discoverer of this species, met with it on the Rio Negro, where Natterer also obtained many examples, as likewise on its northern affluent, the Rio Brancho. Schomburgk tells us that it is found on the wooded river-banks of the Savanna-rivers of British Guiana.

List of specimens of Mitua tomentosa *exhibited since* 1860.

a, b.	Purchased.	January 14, 1862.

Genus IV. Pauxis[1].

Pauxis galeata. (Plate LIII.)

Crax pauxi, Linn. S. N. i. p. 270.

Pierre de Cayenne, Buff. Pl. Enl. 78.

Crax galeata, Lath. Ind. Orn. ii. p. 624.

Pauxi galeata, Temm. Pig. et Gall. iii. pp. 1 et 683; Gray, Gen. of B. iii. p. 487, et Hand-l. ii. p. 354; Reichenb. Tauben, p. 137; Scl. et Salv. P. Z. S. 1870, p. 519, et Nomencl. p. 135; Scl. P. Z. S. 1870, p. 669.

Ourax pauxi, Cuv. Règn. Anim. 1817, i. p. 441; Bennett, Gard. & Men. ii. p. 65.

Lophocerus galeatus, Swains. Classif. of B. ii. p. 353 et An. in Men. p. 184.

Ourax galeata, Tsch. F. P. p. 289.

Nigra æneo nitens: ventre imo et caudæ apice albis: pilei plumis brevibus, erectis: tuberculo frontali maximo, oviformi, cæruleo: rostro rubro: pedibus carneis: loris dense plumosis: long. tota 34, alæ 16, caudæ 13, tarsi 4. *Fem.* mari similis, sed statura paulo minore.

Hab. Venezuela: Rio Cassiquiari, and Upper Orinoco (*Natt.*); near Caracas (*Levraud* in *Mus. Paris*); near Tucacas (*Warmington*).

Natterer heard of this bird's existence when on the Upper Rio Negro, and has recorded that, according to information received from the natives, it occurs on the Rio Cassiquiari and adjoining parts of the Orinoco, and is called by the natives "*Pauxi de piedra,*" or Stone Curassow—a name also sometimes applied to it in English, from the pebble-like projection on the front of the bill.

In Gray and Mitchell's 'Genera of Birds' (pl. cxxii.), a figure is given of a brown bird (taken from a specimen in the gallery of the British Museum) which is named "*Pauxi galeata.*" At the time Mr. Salvin and I prepared our Synopsis of the Cracidæ, we were of opinion that this form (which is also represented here, Pl. LIII. fig. 2) was the normal female of the present species. But this appears not to be the case. Mr. Vekemans informs me that in a pair of these birds in the Antwerp Gardens, the female of which laid eggs in 1874, the only difference consists in the smaller size of the female.

Mr. G. Dawson Rowley, F.Z.S., writes to me upon the same subject as follows:—

"In Gray's Genera, vol. iii., I find the plate of a brown bird named *Pauxi galeata,* of which I have shown to you an example living in my aviary. This example has been with me in perfect health for more than five years. It only differs from Gray's figure in that the edges of the feathers of the back and tail are nearly white, while he makes them light brown; but this I suppose to be the consequence of age, as my bird is old, and the plumage is very perfect, fine and glossy. This bird is an undoubted hen.

[1] Emended from "*Pauxi,*" in the same way as "*Mitua*" from "*Mitu.*" *Cf.* Strickland, Ann. N. H. vii. p. 36 (1841).

"When I had the pleasure of consulting several high authorities respecting this bird, they all agreed that it was the female of *Pauxi galeata*, which for some time satisfied me. But one of the *supposed black males* of *Pauxi galeata* in my aviary, small in size, has been seen to lay an egg, and has paired with the other black male, thus proving that the female in this species is exactly like the male, and not as described by you, P. Z. S. 1870, p. 519."

Under these circumstances, I think there can be no question that the *normal* female of the present species resembles the male in plumage, and that the red bird either is of a distinct species or presents the exceptional case of a dimorphic female. I rather incline to the latter view, because Mr. Rowley's specimen was, I believe, received from the same port as his pair of the ordinary *Pauxi galeata*, and because Temminck[1] says of this species, "Le plumage des femelles ne diffère point: les jeunes ont des teintes brunes et rousses." It may be, therefore, that in some cases the females remain throughout life in the immature plumage, as, I have reason to suspect, is sometimes the case in other species where the adult male and female are clad alike and the young has a different dress.

List of specimens of Pauxis galeata *exhibited since* 1860.

a, b. Males (?)	Purchased.	July 28, 1870.

DESCRIPTION OF THE PLATES.

PLATE XL.

Crax globicera, male and female, from specimens living in the Society's Gardens in September 1870.

PLATE XLI.

Crax daubentoni, male, from a specimen received from Tucacas, Venezuela, and presented to the Society by Mr. J. Wright, September 29, 1870. See Rev. Cat. of Vert. (1872) p. 295.

PLATE XLII.

Crax daubentoni, female, from the specimen received on the same occasion.

[1] Pig. et Gall. iii. p. 4.

PLATE XLIII.

Crax alector, male and female. Male, from a specimen living in the Society's Gardens in September 1870. Female, from a skin collected by Natterer at Barra do Rio Negro in September 1832, now in the collection of Messrs. Salvin and Godman.

PLATE XLIV.

Crax sclateri, male and female, from skins obtained by Natterer on the Rio de Cabaçal in 1825, now in Messrs. Salvin and Godman's collection.

PLATE XLV.

Crax sclateri, female, from a specimen living in the Society's Gardens in 1870, originally presented by the Prince de Joinville, October 13, 1863. See Rev. Cat. Vert. p. 294.

PLATE XLVI.

Crax globulosa, male and female, from skins in the collection of Mr. G. N. Lawrence, of New York, C.M.Z.S.

PLATE XLVII.

Crax carunculata, male and female. Male, from a mounted specimen in the British Museum. Female, from a specimen living in the Society's Gardens.

PLATE XLVIII.

Crax alberti, male and female. Male, from a bird living in the Gardens of the Zoological Society of Amsterdam. Female, from a specimen living in the Society's Gardens.

PLATE XLIX.

Crax incommoda, from the typical specimen living in the Society's Gardens, drawn in October 1871.

PLATE L.

Nothocrax urumutum, from a specimen in the British Museum.

PLATE LI.

Mitua tuberosa, from a specimen living in the Society's Gardens, September 1870.

PLATE LII.

Mitua tomentosa, from a skin collected by Natterer at Marabitanas in April 1831, now in the collection of Messrs. Salvin and Godman.

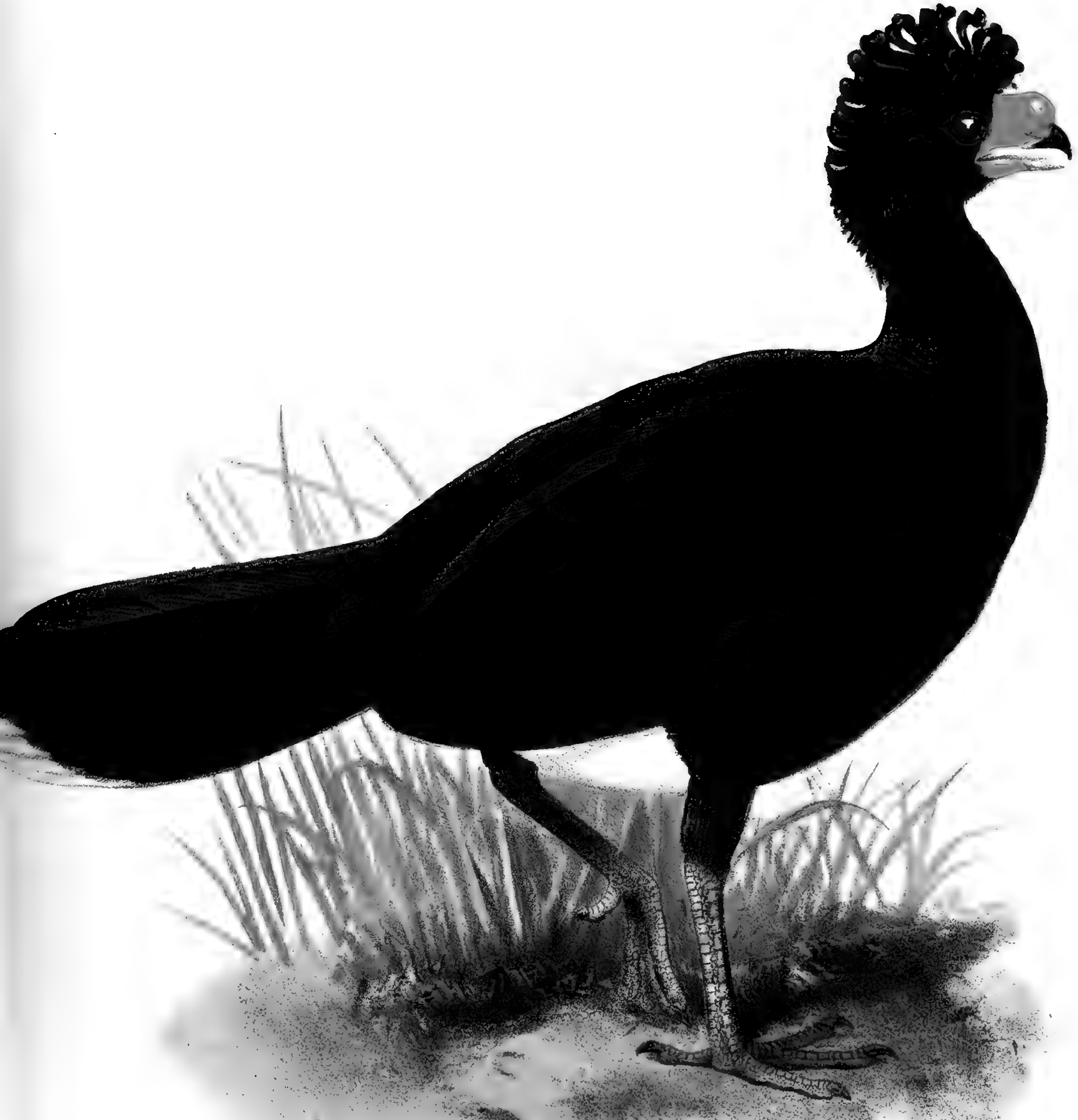
PLATE LIII.

Fig. 1. *Pauxis galeata*, from a specimen living in the Society's Gardens in 1874, being one of two specimens purchased July 23, 1870. See P. Z. S. 1870, p. 669.

Fig. 2. *Pauxis galeata*, var. *rubra*, from the specimen in the British Museum.

J. Smit lith. M & N Hanhart imp.

CRAX GLOBICERA ♂ et ♀



J. Smit lith

3

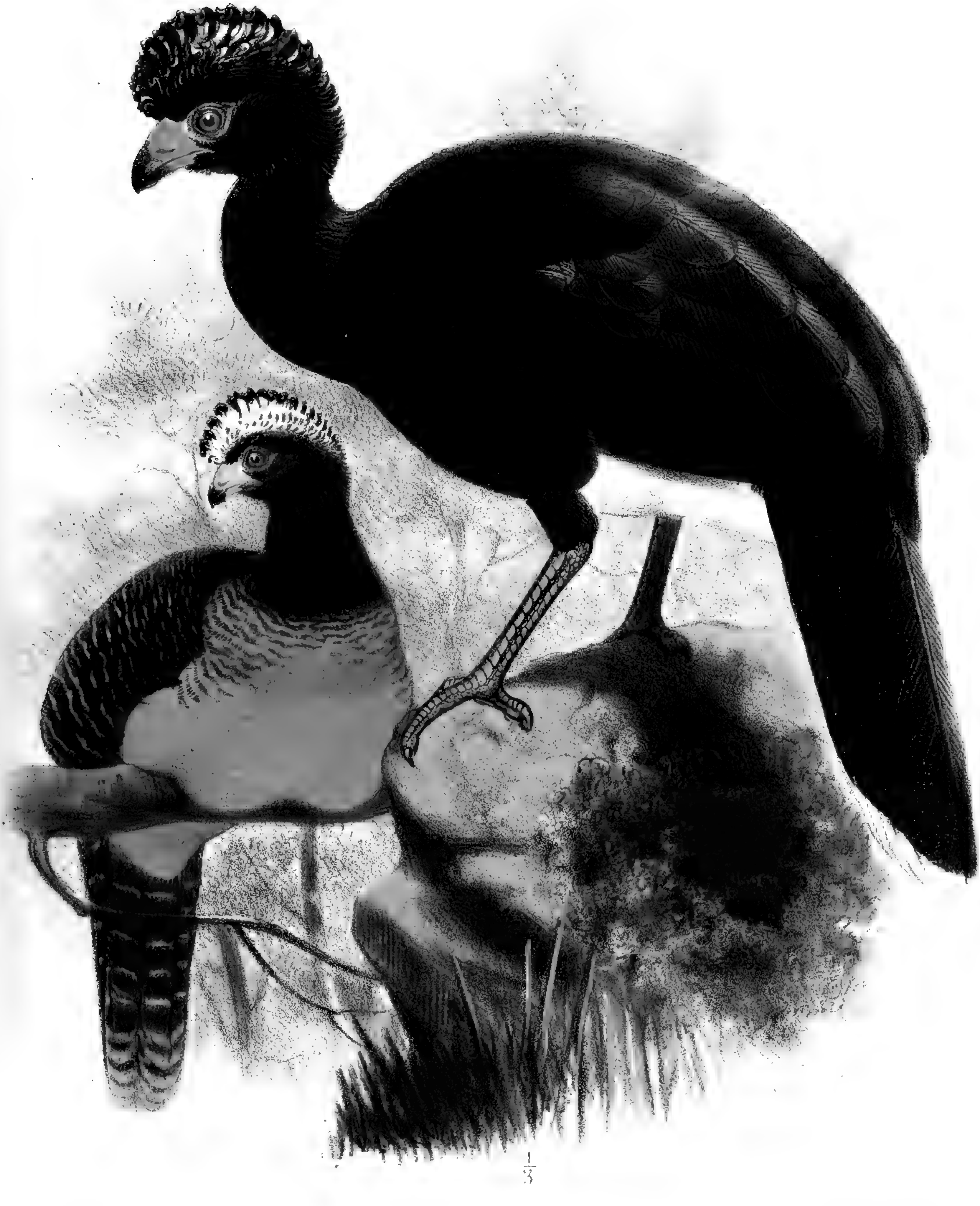
M & N Hanhart imp.

CRAX DAUBENTONI ♂

$\frac{1}{3}$

J. Smit lith. M & N Hanhart imp.

CRAX DAUBENTONI ♀



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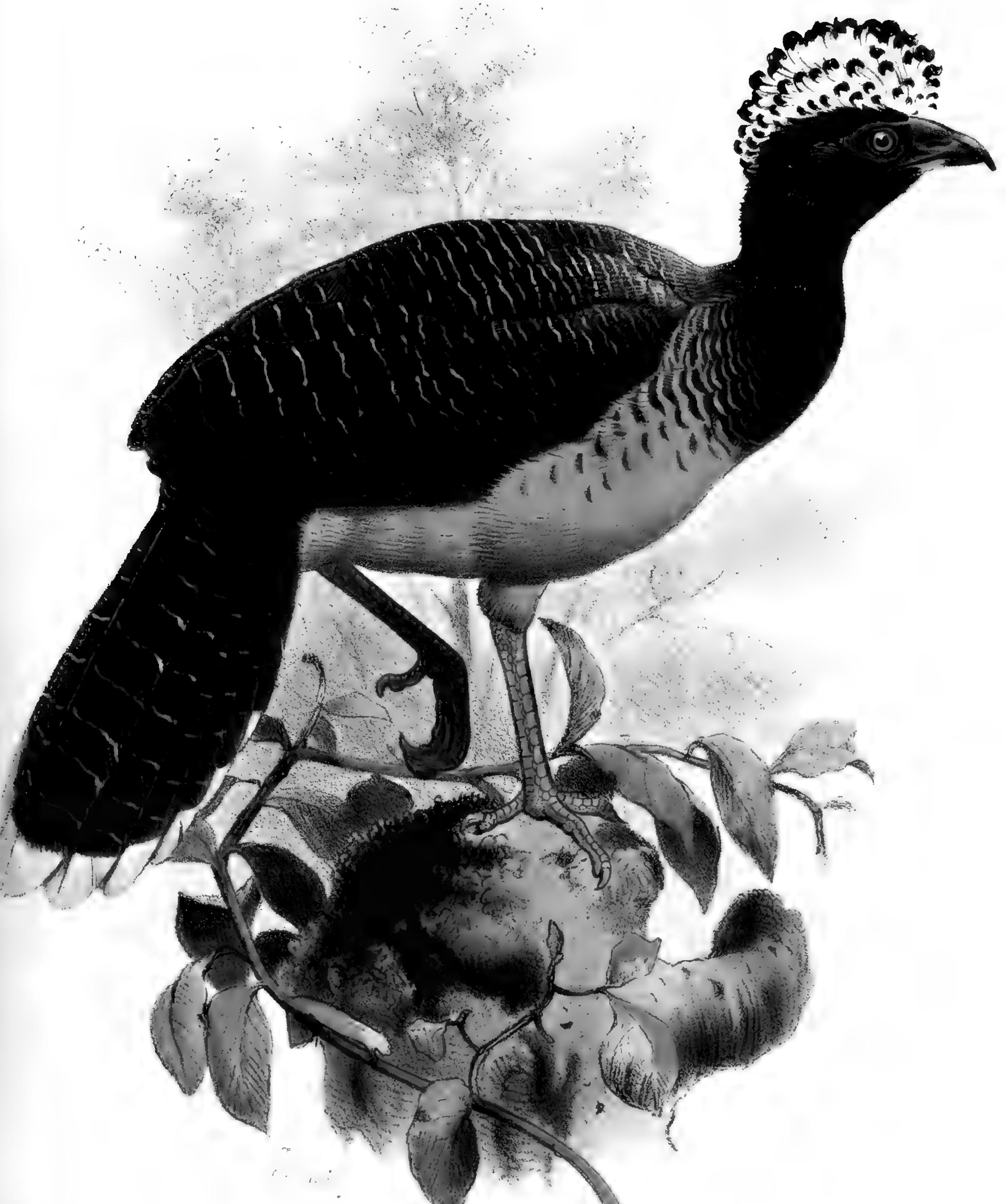
J. Smit lith.

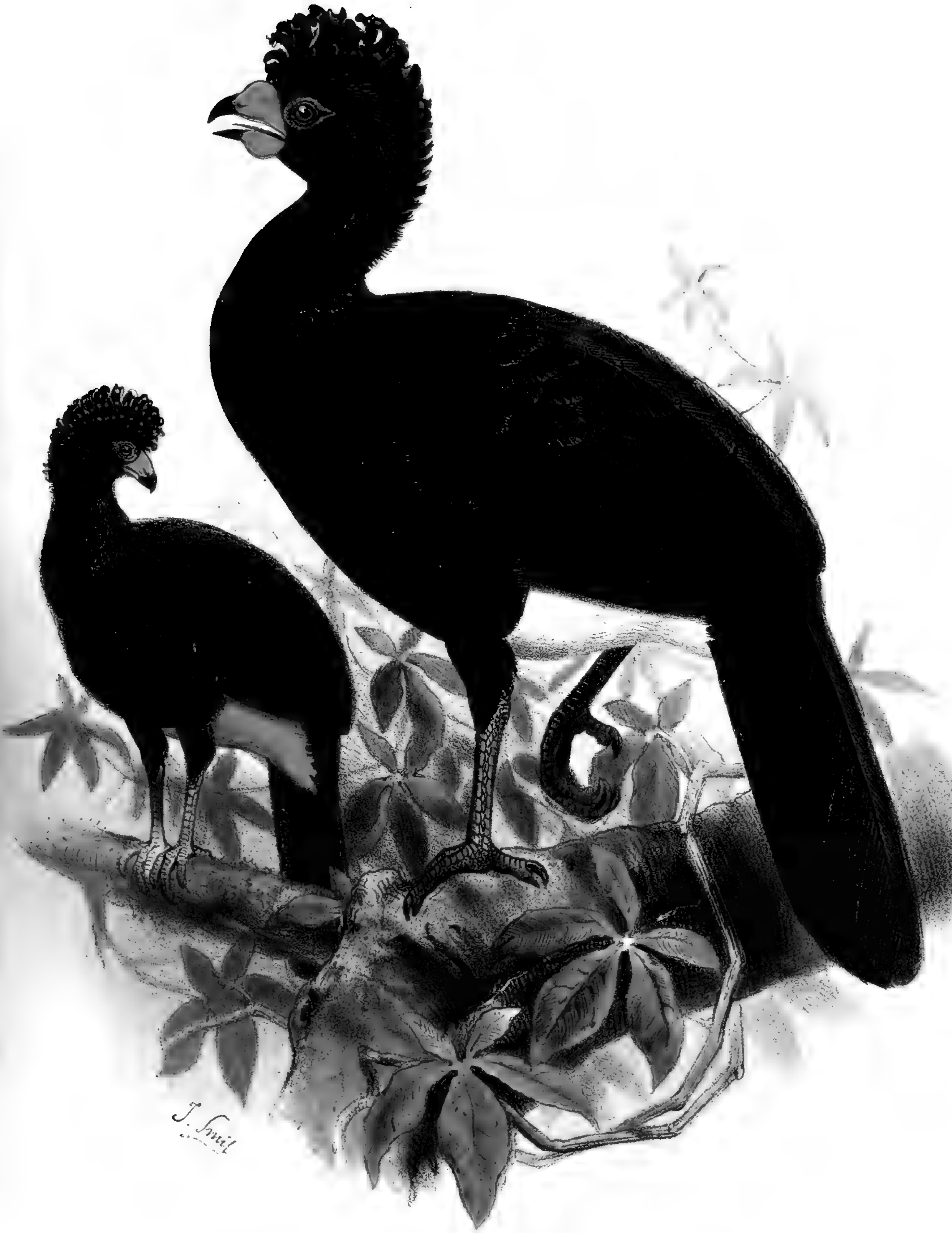
M & N Hanhart imp.

CRAX SCLATERI ♂ & ♀



J. Smit del. M. & N. Hanhart imp.

CRAX SCLATERI ♀



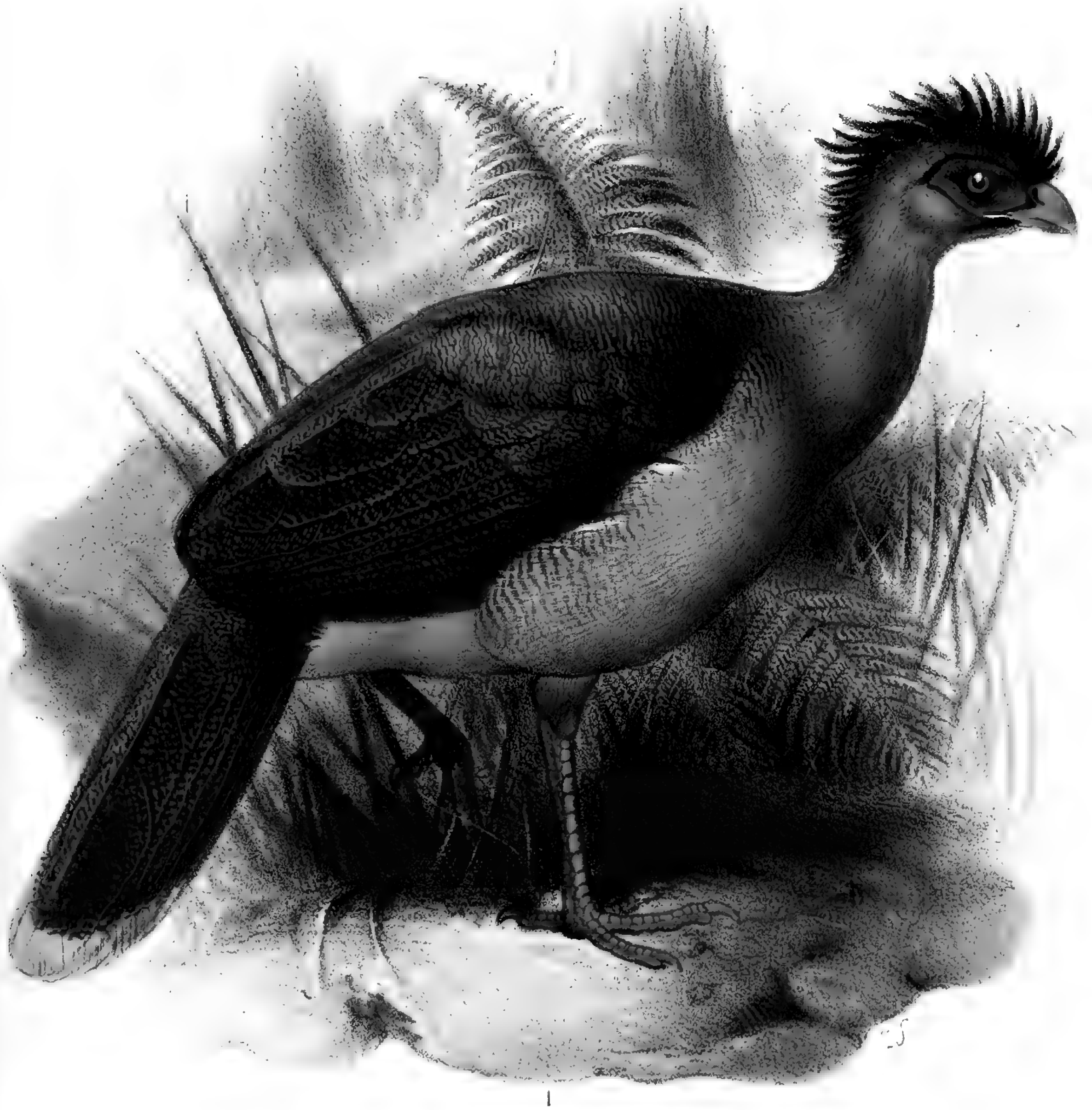
J. Smit lith.

CRAX GLOBULOSA, ♂ et ♀

1/3

♂ & ♀

CRAX ALBERTI ♂ et ♀.



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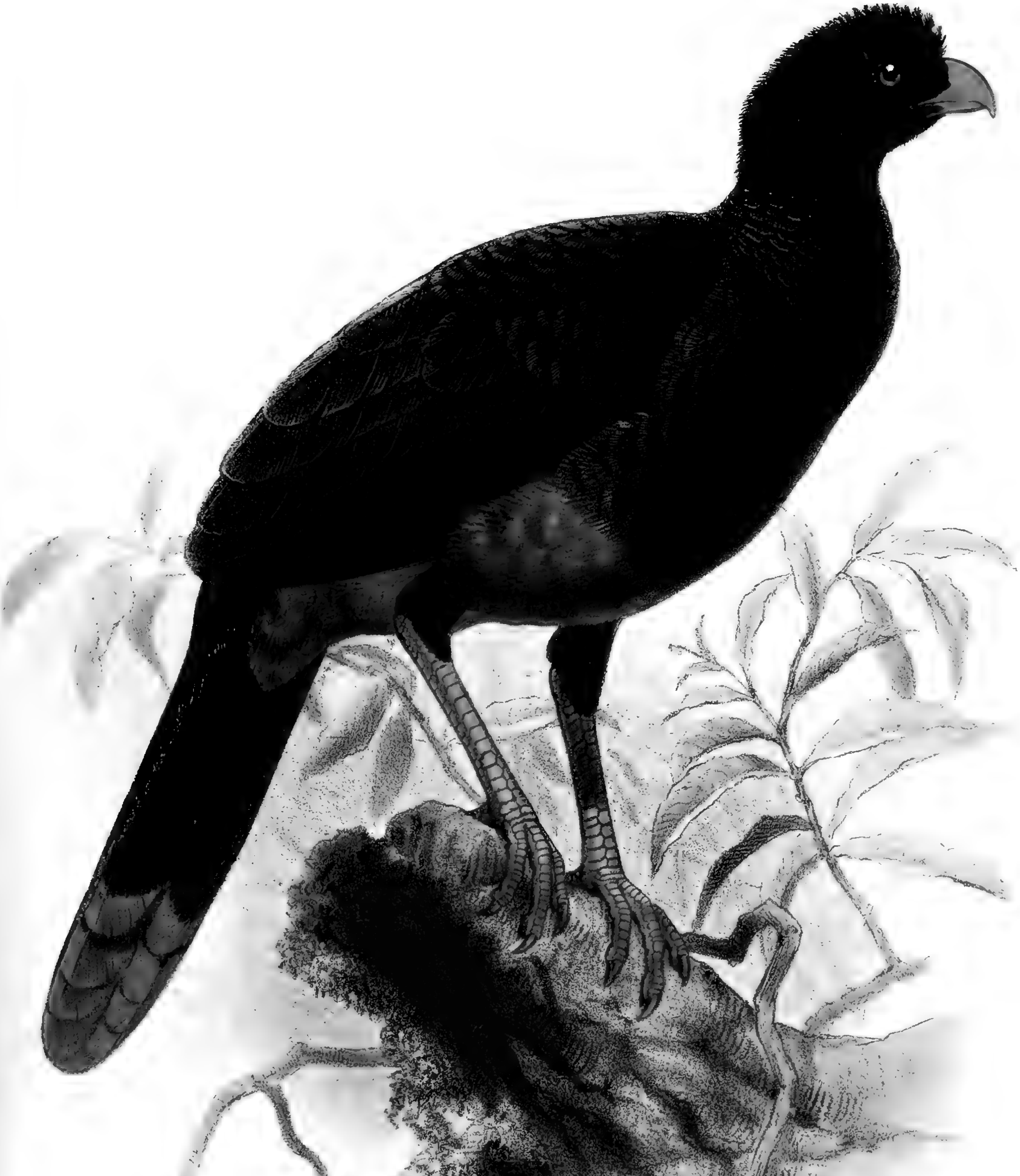
J. Smit lith.

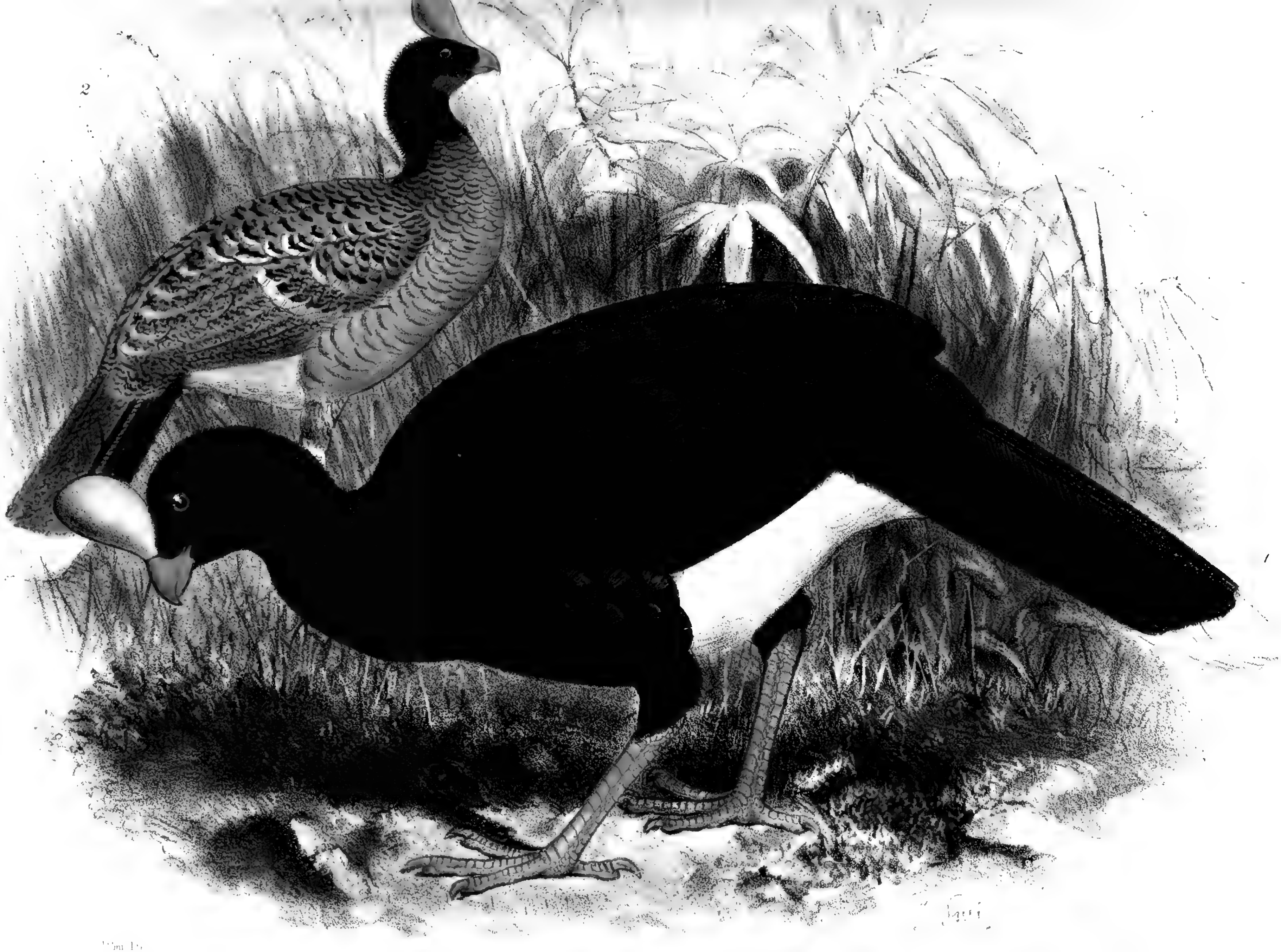
Hanhart imp.

NOTHOCRAX URUMUTUM

J. Smit lith.



MITUA TOMENTOSA



PAUXI GALEATA. — P. VAR RUBRA.

V. *On Ægithognathous Birds* (Part I.). *By* W. K. Parker, *F.R.S.*, *F.Z.S.*

Read February 18th, 1873.

[Plates LIV. to LXII.]

Introductory Remarks.

THOSE who take pleasure in ornithology know well that systematists, working for the most part from external characters, are continually at a loss when some new and mixed type, which will not fit into their plan, is brought before them. The present race of ornithologists is a vast improvement upon the past, and, with greater catholicity of mind, are not unwilling to receive help from workers who, not devoted to birds alone, nor in any group to outward characters merely, are wont to dig deeper for diagnostics.

If any one shall say that taxonomic ornithology is full-blown and perfect, I would ask, Why then do no two systematists agree together? A hundred classifiers, a hundred so-called *systems.* I suppose that the most violent raid ever made upon a people quiet and secure was when Professor Huxley read his invaluable paper before this Society (April 11, 1867) "on the Classification of Birds; and on the Taxonomic Value of the modifications of certain of the cranial bones observable in that class."[1]

I am proud in the consciousness of having been of some service to the author of that paper, which is at once a model to work by and a platform to work upon. If such a production were perfect, it would cease to grow; but its large, sinewy, and rather awkward limbs give promise of something better than those full-grown but feeble "systems" the skeletons of which have filled this valley of vision with their bones.

I know it will be said—it has been said, that to take the palate merely as a means for diagnosis is to be extremely partial, and that such characters will be misleading. Such objections are natural enough to those whose minds are most richly stored with a knowledge of the exquisite modifications of the outward structure of a bird, but whose studies have not been based upon accurate morphological knowledge.

Even the outward form of the *face* gives the key-note to the whole bird; the human face looking out from above the neck of a Giraffè would scarcely be more absurd than a Hornbill's face mounted on the neck of a Swan. The head and face rule all things else. Every modification in the organs of progression must be in correlation with that deeper change which has taken place in the storied and labyrinthic walls of the head So also, with regard to the other organs, *chylopoietic*, *generative*, and the like; all these

[1] See P. Z. S. 1867, p. 415.

are ruled by, all these follow, those subtle early modifications of the primordial structure of the head.

But those who, with the new lights of morphological science, seek to help the *classifiers*, to whom they are so much indebted, do not look upon a bird as if it were a special creation, a new thing in the earth, standing alone, a plumy wonder. The bird is, as it were, but a metamorphosed hot-blooded reptile; and the reptile itself a step and stage upwards from a series of creatures still a little lower in the scale of life. And here lies the charm of the morphological study of birds, namely in the amazing metamorphosis which the simple facial arches and nasal sacs undergo. It is the condition of these parts especially that has engaged my attention of late. The postoral arches have, indeed, been studied by me less than those in front of and above the mouth; but the latter once determined and thoroughly made out, the others offer no difficulty.

In working out the trabecular and palatine arches and nasal capsules, however, every refinement of histological method has to be used, and light fetched in from the morphology of the same parts in the other Vertebrata.

In the present communication I have not been benefited alone by Professor Huxley's paper just referred to, but also by another with which he favoured us on the 14th of May, 1868—"On the Classification and Distribution of the 'Alectoromorphæ' and 'Heteromorphæ'" (see P. Z. S. 1868, p. 294). A careful study of this latter paper has opened my eyes to what seems to me a most vital part of these studies. I refer to the light they may throw upon the variation and distribution of types. This idea has been incubating in my own slower mind ever since Mr. Sclater put it into my power to dissect the Southern type of Crow, namely *Gymnorhina tibicen*. That was eight or nine years since; and the Crows have always, with that light, been to me divided into those of the "Notogæa" and those of the "Arctogæa."

Moreover the terrestrial habits and earth-born physiognomy of several of the larger and middle-sized Southern Passerines have attracted my attention for many years past; for I strongly suspected that these have had a much more direct and immediate struthious parentage than those highest results of metamorphic change, the songsters and Crows of our own hemisphere. This rooted belief has grown into something like certainty to me of late; for within the present year my friend Mr. Osbert Salvin has put his rich collection of southern specimens of skeletons into my hands: my own rather extensive series consisted principally of northern types.

These new treasures did not comprise many from Australia; but our excellent Senior Clerk (Mr. W. J. Williams) has given me several spirit-specimens from that part of the Notogæa, and these have turned out to be of the utmost value. Working lately at the face of embryo birds to supplement morphological deficiencies in my paper on the Fowl's skull (Phil. Trans. 1869), I stumbled upon the remarkable modifications of the embryonic passerine face which give to the adult the character denominated by Professor Huxley, "Ægithognathous." This type is characterized by him in his usually terse and lucid manner; but he does not give any very definite explanation of the meaning of the parts. Speaking of the region to which I have recently given most attention, he says (p. 451), "The anterior part of the nasal septum (in front of the vomer) is frequently ossified in Ægithognathous birds, and the interval between it and the præmaxilla filled up with spongy bone; but no union takes place between this ossification and the vomer." So far, true; but this is a very meagre account of the matter; and whether the "spongy bones," mostly cartilaginous, belong to the same category as our own "inferior turbinals," or are the large ornithic "alinasal turbinals," is not stated; neither is it noticed what kind of union takes place between the vomer and these turbinals.

It is evident that nothing but the embryology of their parts, and their comparison through a huge series, can test the value of the group to which the term Ægithognathous is applied.

Neither does our author fairly superimpose his "Coracomorphæ" upon his "Ægithognathæ," although they come far nearer to fitting than any other of the groups characterized on the one hand by their general form, and on the other by their facial modifications. I have only found three families of the "Ægithognathæ" that cannot logically be placed amongst the "Coracomorphæ"—namely, the "Cypselidæ" in the crown, and the "Turnicidæ" and "Thinocoridæ" amongst the roots, of the great ornithic life-tree. But other facial groups, "Desmognathæ," "Schizognathæ," &c. turn up anywhere and everywhere; so that the ornithologist mindful of great groups of one especial form, the *Crow-form* for instance, and yet desirous of seeing all things in the light of facial morphology, must work with both hands earnestly, now surveying the thousands of types in conformity with that one pattern, and then using his knowledge of their anatomical analysis.

With regard to the *form-groups*, I have to complain that they are not of *equal worth*, but far from it; these self-same "Coracomorphæ" are, zoologically, worth four or five of other groups that might be pointed out, which yet have a like terminology: this must be remedied. Yet it is a fact that the Passerine birds are most potent of all in families, genera, and species, and that these, forming half the known birds, are, on the whole, wonderfully uniform. The limits of the ægithognathous group given here will not accord with those given by my friend. I reject his Goatsuckers and Humming-birds, retain his Swifts, and bring in from the lower kinds of Carinatæ the Hemipods[1] and *Thinocorus*. These low types, especially, make the harmony of the two *maps*, the facial and the physiognomical, impossible. But they do this: they make the investigation of the

[1] Professor Huxley did not, I believe, suspect that a family classed by him with the Fowls (Alectoromorphæ) was possessed of an ægithognathous face; yet this the "Turnicidæ" have, as I find, both by examination of the skull of the young and adult *Hemipodius varius*, and the skull of the young of *Turnix rostratus*.

Mr. Robert Swinhoe, F.Z.S., sent me the latter; my friend Mr. Osbert Salvin, F.R.S., has lent me the Hemipod and many others, vital to my work; and Mr. W. J. Williams, of the Zoological Society, presented me with six invaluable passerine forms from Australia.

whole matter very bewitching, suggesting that we are somewhat near the stock (phylum) from which the multitudinous Passerines have sprung.

Moreover every patient fellow worker will see eye to eye with me, that in the *south* we find the most struthious types, and in the *north* the highest, and that our bird-groups are as important for study in their geographical distribution as in their taxonomy or their morphology.

The "Trochilidæ" and "Caprimulgidæ" have to be treated of separately; and the "Celeomorphæ" (Woodpeckers and Wrynecks, classed together) may be designated, *facially*, as the "Saurognathæ." These latter are peculiarly *lacertian* in their face; the Humming-birds and Goatsuckers are schizognathous, not ægithognathous, as Professor Huxley supposed (*op. cit.* p. 454).

I find upon close examination that the "Ægithognathæ" admit of three morphological subdivisions, and the "Desmognathæ" of four; and as the remainder of this research may have to rest awhile, these subdivisions may be given here.

The "Ægithognathæ" present the three following modifications in their structure:— *a*, incomplete; *b*, complete; *c*, compound.

a. Incomplete.—Ægithognathism occurs in the "Turnicomorphæ" (*Hemipodius, Turnix*). Here the vomerine cartilages (cartilages to which the symmetrical vomers are attached)[1] are very large, and incompletely ossified, and the broad *double* vomer has a "septo-maxillary" at each angle; but these bones are only strongly *tied* to the "alinasal" cartilage, and do not graft themselves upon it: their union is with the vomerine cartilage.

b. Complete: Var. 1.—This occurs in some of the lowest harsh-voiced "Coracomorphæ." The vomers are developed in large vomerine cartilages, which they often only partially ossify; but these osseous tracts are distinct from those of the often bony alinasal walls and turbinals. A small "septo-maxillary," one each side, generally appears limpet-like, on the inturned angle of the alinasal cartilage, but does not run into it; this is well seen in *Pachyrhamphus*, *Pipra*, and *Thamnophilus*.

Var. 2.—This occurs in an immense group comprising the higher "Coracomorphæ" and also the *Swifts* (Cypselidæ). Here all the vomerine bones are grafted upon the nasal wall, and thus the bird loses its primary "schizognathism."

c. Compound.—This form of face occurs when, superadded to the perfectly ægithognathous face, desmognathism is produced by ankylosis of the inner edge of the maxillaries, with a highly ossified "alinasal" wall and nasalseptum. Examples *Gymnorhina tibicen*, *Paradisea papuana*, *Artamus leucorhinus*. Of this type a feebler form is produced when the maxillaries only coalesce with the ossified alinasal wall, as in *Dendrocolaptes albicollis*, *Thamnophilus doliatus*, and *Phytotoma rara*.

It may be as well to mention here the varieties of the "desmognathous" palate.

[1] These belong to the labial category, and can be identified with similar elements in the face of the Snake, Frog, and Shark.

a. Direct, as in the Falcons and Geese, when the maxillaries meet below at the mid line, as in the mammal: two subvarieties of this form occur, as in the Falcon, where the nasal septum is ankylosed to this hard palate; and in the Goose, where it remains free.

b. Indirect.—This is very common and is best seen in Eagles, Vultures, and Owls; the maxillo-palatines are ankylosed to the nasal septum by their inner margin, but are separated from each other by a chink; this is well seen also in the fledgeling of the Falcon, which is indirectly desmognathous at that early stage.

c. Imperfectly direct.—This is when the maxillo-palatine plates are united by harmony-suture, and not by coalescence. Example *Dicholophus cristatus.*

d. Imperfectly indirect.—Here the maxillo-palatine plates are closely articulated with and separated by the "median septo-maxillary" bone, but these are not ankylosed. Example *Megalæma asiatica.*

A fifth variety might have been added, in such a case as *Podargus*, where the palatines as well as the maxillaries largely coalesce *below*; to a less extent this is seen in the gigantic species of Hornbills, e. g. *Buceros birostris* (see Huxley, *tom. cit.* p. 446. fig. 28).

Podargus carries this desmognathism to the greatest extent of any bird; in the Crocodile, and in the Anteater, a still more extended hard palate occurs, where the internal pterygoid plates form a lower bridge.

The unpublished materials from which I have made these extracts illustrate several forms of desmognathism, besides the early conditions of the ægithognathous palate and such schizognathous forms as *Trochilus* and *Caprimulgus.*

I have already given several figures of the schizognathous palate in my former paper, "On the Gallinaceous Birds and Tinamous" (Trans. Zool. Soc. vol. v. pl. 40). Here pl. 37 illustrates *Syrrhaptes* and *Lagopus*, and pl. 38 *Vanellus* and *Columba*; pl. 40 gives the *struthious* or dromæognathous face of *Tinamus.* But the most familiar and simple illustration of the schizognathous face is seen in the *Fowl* (Phil. Trans. 1869, pls. 81–87).

These details of morphology have to be mastered before the taxonomic value of these facial characters can be known, or in any way appreciated; and they are matters that lie somewhat deeper than the length or thickness of a primary quill, or the direction of the outer toe.

The materials out of which the ægithognathous face has been formed, exist, *in a raw state*, in the reptiles (Lacertilia, Ophidia) and, still nearer home, in the *Rhea.*

The counterparts of the cartilages in which the first osseous centre for each "vomer" is found in the "Ægithognathæ," were long since figured by me in the *Rhea* (Phil. Trans. 1866, pl. 10. fig. 14, *alate sections on each side of r.b.s* and *v*), and also were found in the common Snake (*Natrix torquata*) and in the embryo of *Eunectus murinus*; these studies of the Ophidian face have not, however, been published.

Besides these "vomerine" or labial cartilages, there is what I shall freely illustrate here as the "recurrent trabecular lamina;" this is formed by the apices of the recurrent trabecular cornua, which have coalesced.

The first group I now take up will make these matters clear to the reader, and will also give us the most rudimentary and reptilian condition of the nasal labyrinth—one very important part of the present subject.

On the Morphology of the Face in the "Turnicomorphæ."

I have had rare opportunities lately for studying this peculiar group of birds, and can correct some things in which I was misled in my former paper ("On the Gallinaceous Birds," Trans. Zool. Soc. vol. v. p. 172).

A few years since my friend Mr. Swinhoe, Consul at Amoy, sent me some young specimens of *Turnix rostrata*, from Formosa, in spirits; Mr. Salvin has put into my hands a very perfect skeleton of *Hemipodius varius*, in which the nasal cartilages are preserved in a dry state; and I have also the separate parts of the skull of a young *Hemipodius varius*, the gift of Dr. Murie.

If the palate of the young *Turnix* (Pl. LIV. fig. 1) be compared with that of the *Syrrhaptes*, Grouse, Plover, and Pigeon, already referred to as figured in my former paper, it will be seen at a glance that these birds have much in common; they belong, evidently, to one morphological stratum, or nearly so. But the *Turnix* is the lowest of these types; and it would seem as if he and his compeers were the waifs and strays of a large and widely distributed group of birds only a little higher in the scale than the Tinamous.

From such a group, largely extinct, the Sand-Grouse may have arisen; from such a stock the Plovers; and these old types may also be looked upon as zoologically paternal to several other modern families, the greatest of these being the Passerines. As to the relation of the Hemipods to existing types, I cannot do better than refer the reader to Professor Huxley's paper on the "Alectoromorphæ" (Zool. Proc. 1868, pp. 302–304).

There, however, no suspicion has been given as to the meaning of the broad "vomer" in relation to the Passerines; it is merely compared to that of the Grouse—not of *Lagopus*, but of *Tetrao urogallus* (see "On the Classification of Birds" Proc. Zool. Soc. 1867, p. 432, fig. 140). But even that vomer is a poor representative of that of the Hemipod, and for some years it has been a mystery to me because of its passerine form.

The flat-faced stump of the bone which in *Hemipodius* binds on each side the trabecular to the palatine arch—"basi-pterygoid process" (Pl. LIV. figs. 1 & 9 *b.pg*)—accords exactly in place and size with that of the Pigeon and Plover, and is less struthious than that of *Syrrhaptes*.

The parasphenoidal bar (fig. 1, *pa.s*) is rather massive in the young; but in the old

Hemipod (fig. 9) it is much more like that of the Ostrich family; and this trabecular underbearer of the ethmoid (fig. 11, *p.e*) is swollen and spongy as in the "Ratitæ."

The cranio-facial "hinge," however, is as perfect as in the Fowl; and the rest of the coalesced trabecular bar is unossified and forms the lower edge of a feeble septum nasi (*s.n*). As in the Crow and many of the "Coracomorphæ," the trabecular base of the septum is alate in its middle region (fig. 4, *s. n*, *tr*). The præmaxilla (figs. 1, 2, 9, 10, 11, *px*), even in the old bird, remains but little different from what is seen in the ripe chick of the Fowl ("Fowl's Skull," pl. 84), having a form common to Pigeons, Sandgrouse, and Hemipods.

The body of the bone is of small extent, the dentary processes thin and splintery (*d.px*), the palatine processes (fig. 1, *p.px*) very slender styles, such as we everywhere see in the feebler Coracomorphæ; and the early ankylosed nasal processes (fig. 2, *n.px*) are flat, splintery, and struthious. These processes retain their outline in the adult (fig. 10) after they have coalesced with their surroundings. But the greatest marvel in this bird's face is the peculiarities of its vomer, both in form and development. Very strange *in form* is the one figured by me in my earlier paper ("On the Gallinaceous Birds," &c. pl. 34. fig. 1, *v*), where it is described as the "little broad vomer," which is convex anteriorly, with a short horn at each angle, and ending behind in a slight style on each side for attachment to the palatine[1].

This species was not determined; but it had the most coracomorphic vomer of the three worked out by me; compare that figure with those of the young Crow (Monthly Micr. Journ. Nov. & Dec. pls. 36–39, *v*).

But *dry, adult* specimens give no idea of the true meaning of this vomer, which is composed of four osseous and two cartilaginous elements, as in the huge "family," or rather "order," of the Coracomorphæ. Amongst the birds that have uprisen from the Turnicine "stratum," the Plovers have a symmetrical vomer, formed of two sickle-shaped pieces, in indifferent tissue. The Sandgrouse and Pigeons, as far as I have seen, have no vomer ("Gallin. Birds," pls. 36 & 37); but the true Grouse, and all the "Alectoromorphæ" proper, have an azygous vomer formed in indifferent tissue (*op. cit.* pl. 36. fig. 6; and "Fowl's Skull," pl. 83. fig. 1, pl. 84. fig. 6, pl. 86. figs. 3, 4, 5, 10, 14, 15, and pl. 87. fig. 5, *v*).

Thus, starting from the truly struthious face of the Tinamou, with its immense symmetrical vomer, we suddenly find ourselves in the very midst of vomerine modifications which are only a little more specialized even in types the furthest removed from the base[2].

In the young of *Turnix rostrata* the broad part of the vomer (fig. 8, *v*) is very short,

[1] The "prævomers" there spoken of are the true "maxillaries;" the "prævomerine" ossicles or "septo-maxillaries" are the *separated* "horns" of the vomer, as I shall soon show.

[2] If the convenient fancy of our ornithic *life-tree* be kept in mind, to help the memory, then this *tree* must be one of many branches, suddenly starting from the root.

and the styliform crura long and delicate; the fore margin is clearly notched; it then suddenly widens, and on each shoulder there is a triangular snag with its projecting base looking outward and fixed and grafted upon a sigmoid spatula of cartilage (*v. c*). This compound lyre-shaped vomer is strongly attached to the nasal floor (*al. n*) by a broad and short ligament composed of connective fibres. In the adult (fig. 9, *v*) the angular snags have been segmented off as small "septo-maxillaries" (*s.mx*), the body of the bone has become very thick, and the crura stronger. The inferior surface is subcarinate, the superior scooped. Here the main difference between this vomerine arrangement and that of the Passerines is, that the bony substance has affected the cartilaginous segment, but not the nasal labyrinth. Yet the amount of metamorphosis seen in these birds is greatly in advance of the *pupal* simplicity of the *Rhea*; even where the vomerine cartilage occurs in a high type, as in the Celebesian Woodpecker (*Hemilophus fulvus*), there is no morphological union with the vomerine bones.

The pterygo-palatine arch is very strong in its posterior half, and of extreme tenuity in front. The suspensorial segment, "pterygoid" (figs. 1 & 9, *pg*), is not tip-tilted as in most of the Coracomorphæ, but agrees in this respect with the forms that lie in its own lower stratum, the apex being compressed and bilobate, so as to abut against the quadrate up to its orbital process. For the rest, its form is exactly that of a Pigeon or Plover; but it appears to be gallinaceous in one important aspect—namely, that the mesopterygoid spur is fore-shortened, and is here formed into a crest, convex without and concave within, where it forms a gliding joint on the swollen basifacial beam (fig. 11, *pg*, *pa.s*). But in the young *Hemipodius varius* it is a long separate bone (fig. 13, *ms.pg*); and what is unusual is its coalescence with the pterygoid again, and not with the palatine. This being the case, the narrow outturned postpalatine bar fits but loosely to that beam, but converges to meet its fellow below it, to form a fibrous commissure, symmorphic of a very early condition of the lyriform trabecular arch. The small "interpalatines," which are inbent snags, are of less extent than the overlying ethmopalatine laminæ, which articulate with the feet of the vomer (figs. 1 & 9, *i.pa*, *e.pa*, *v*). Opposite these the palatines bend gracefully round to pass forward as the long præpalatine styles (*pr.pa*); there is therefore no rudiment of the "transpalatine angle;" yet the groove between the outer and inner edge on the lower face of the bone is rather deep. In front these bones reach to the solid part of the præmaxillaries, and stretch themselves in front of their chief splints, the maxillaries (figs. 1 & 9, *pr.pa*, *mx*). These latter bones are simple models, out of which, by further extension of bony matter, the maxillaries of any kind of "Carinate" bird might be evolved. Each frail bony bar has the usual processes and parts, namely:—the main or dentary portion, fish-like in lying within the præmaxillary; the ascending facial process, which articulates with the descending crus of the nasal (fig. 11, *n.mx*); the conjugational "maxillo-palatine" hook (*mx.p*); and the retral jugal style (*j. mx*), or zygomatic process.

In the young *Turnix* (fig. 1, *mx.p*) the former are very slender styles, blunt-pointed at the end, and *f*-shaped; but they are thicker in the young and old *Hemipodius*, are bowed outwards, and have a process at the base: this is most marked in the adult; it is pedate, its broad end looking to that of its fellow (fig. 9, *mx.p*). As far as mere length is concerned, this is equal to what is seen in their counterparts in the Coracomorphæ generally; it is a state of embryonic simplicity. The jugal styles of the maxillary, the slender jugals and quadrato-jugals of the young (fig. 1, *j*, *q.j*) are all coalesced together in the adult; so that whilst in *number* the bones conform to the Galline and Pluvialine types, in condition they approach the Passerines.

The same two-facedness is shown in the great tripartite ethmoid, which I will describe in the adult first, and then give the details of the nasal labyrinth in the young. Behind the very complete craniofacial "hinge" the trabecular base of the middle ethmoid is greatly swollen into an anterior and posterior mass, with a vertical sulcus between, a little in front of the pterygoid; for the pterygoids clasp the hinder of these swellings, and the ethmo-palatine laminæ that in front. Thus the trabeculæ give off a short pair of conjugationals as they converge towards their long and complete commissure; and then the two arches cling to each other by the reconsolidated mesopterygoids and the ethmo-palatines, the trabecular bar swelling towards them. But there is no "os uncinatum," and the conjugational process of the palatine (ethmo-palatine) clasps the splint, or parasphenoid, and the united trabecular bar.

The median ethmoid is continuous with the lateral masses, or "ecto-ethmoids;" and these have become *spongy bones* in another sense than their counterparts the upper and middle turbinals of Man. In us they infold themselves to give room for the olfactory mucous membrane; in the Hemipod they, by swelling into bony tubercles, exclude the olfactory tract (figs. 10 & 11, *e.eth*). This is seen in a lesser degree in Pigeons (especially the Dodo), in the Sandgrouse, and the Plovers; but the Hemipod has only one rival in this character, namely the Bell-bird (*Chasmorhynchus*), which I shall describe anon. The antorbital mass (*p.p*) is a rounded irregular cake of bone, and has no segmented angle answering to the "os uncinatum."

The frontals, nasals, and nasal processes of the præmaxillaries largely enroof the ethmoid, which, however, appears at the eave of the large orbit in front. That apparent subdivision into an antorbital and lachrymal, as described and *lettered* in my former paper, is a mistake, caused by my using *analogy* for my guide; *there is no lacrymal*; and in this respect the Hemipod differs from Plovers and Pigeons. In my former paper (p. 195) I supposed a lachrymal in *Syrrhaptes*; but it seems to be as apocryphal as in *Hemipodius*. In the great *Crow-group*, only the largest kinds have even a very secondary fore-wedged pupiform lacrymal; in most it is either absent or extremely small.

The nasal labyrinth of *Hemipodius* is neither struthious nor coracomorphic, nor does it correspond with what is seen in birds near its own ornithic level; it is a stepping-stone from the simplicity of these parts in the reptiles to their elegant labyrinthic condition in the ordinary bird. That of the Fowl (Phil. Trans. 1869, plate lxxxvi.) may be taken as a medium form; and a comparison of these together will reveal the ornithic shortcomings of the Hemipod. Seen from above (fig. 2) and from below (fig. 1) the whole labyrinth is large and tumid, the "alinasal" region (*al.n*) occupying two thirds of the whole; and of the remainder much belongs, like the fore part, to the *air-sifting* region, that which is supplied merely by the nasal branches of the fifth nerve.

A transversely vertical section through the first third of the long narial slits (fig. 3) shows the sharp fore end of the nasal septum (*s. n*) and the "alæ" given off by it, the alinasal roof. Near the septum a flap of cartilage is given off as a secondary growth, which turns its hollow face outwards and thickens below; this is the "alinasal turbinal" (*a. tb*); it is very similar to what is seen in the Fowl (*tom. cit.* plate lxxxvi. figs. 1 & 2, *n. tb*). Letting the eye follow this series of sections it will be seen that the continuity of the various flaps has been destroyed by the first section, these divided cartilages being only apparently separate. If the whole labyrinth were separated out, and held with its fore end upwards, it would be seen to be two imperfectly closed tubes with three upper internal divisions, with the *under surface* split into four ribbons of cartilage, and having the base or the antorbital region closed in by a large sheet of cartilage, continuous with all but the infero-median flaps. The alinasal roof overlaps the wall; and at this part the wall is *coped* with a double outgrowth; it is also coiled upon itself into three fourths of a cylinder, the inner edge coiling towards the turbinal (*a. tb*): thus the *wall* becomes the *floor*. Over this section we have the thick root of the nasal portion of the præmaxillaries (*n.px*); against it the dentary part (*d.px*), the apex of the maxillary (*mx*), and, below, the præpalatine spur (*pr.pa*).

In the next section (fig. 4), within these bony bars we have a changed condition of the labyrinth; the septum has its basal, trabecular (*tr*) thickening (rudimentary "subnasal laminæ"), and the alinasal turbinal (*a. tb*) bent knee-like at its upper third and much expanded below. The upturned nasal floor has become separate from the downturned nasal wall (*n. f*, *n. w*). In fig. 5 the fore part of the upper crus of the nasal (*n*) has been cut through, and the face has been severed where the skin of the forehead insheaths the skin of the beak, as we see in Ostriches and Tinamous. This sheath is indicated by a dotted line in fig. 2. This section is through the double valley between the alinasal and aliseptal swellings (fig. 2, *al.n*, *al.s*); and a branch of the nasal nerve (*n. n*) is seen piercing the thickness of the cartilage on each side of the septum, above.

As the alinasal region overlaps the aliseptal below, it (with its turbinal) lies lower in this section; its outgrowth (*a. tb*) has become more angular, or genuflexed, towards the septum, and thicker and upcoiled below. The uptilted floor-flaps (*n. f*) are brought closer to the turbinals (*a. tb*) and to the septum, and much further from the wall, the section of which is now largely hammer-headed. This section (fig. 5) is a front view; and from the short aliseptal region (*al.s*) we see a small ear-like process (outgrowth):

this is the anterior extremity of the true "inferior turbinal" (*i. tb*). This turbinal is shown in the next section at its fullest development (fig. 6, seen from behind), a mere foot-shaped outgrowth from the little extended "aliseptal" region, this part being almost aborted by the huge nostril-covers (alæ nasi). We shall see that in the Rook the "inferior turbinal" infolds itself two and a half times, in the Fowl twice, in the Rhea ("Ostrich Skull," pl. 10. figs. 14 & 15) and in the Tinamou (ib. pl. 15. fig. 9, *tb*) three times, whilst in the "Casuarinæ" (ib. pls. 10. & 12) this fold breaks up so as to be a veritable "arbor vitæ" in section. In this section (fig. 6) the septum (*s. n*) is thinning out towards the hinge; the alinasal wall is coiling inwards and thickening, still having its huge turbinal flap (*a. tb*); close behind this part the long submesial flap is tied strongly to the vomerine cartilage (fig. 8, lower view). The floor-flaps (*n. f*) are very large here; near their end their strongly bowed inner faces are very close together.

The next section (fig. 7) is viewed from behind; and the left antorbital plate or "pars plana" (*p. p*) is cut away: it is very large, as is shown on the other side. Between the alar and median parts of the fast-hardening ethmoid (*p. e*) and the antorbital wall there is a large open space, admitting the ingress of both first and fifth nerves (1, *n. n*).

This ecto-ethmoidal cartilage (upper ethmoid and pars plana) appears on the surface above and laterally; hence the abortion of the lachrymal, as in the Passerinæ. There is nothing to be called "upper turbinal" (*u. tb*) except the circular infolding of the aliethmoid (*al.e*) just in front of the antorbital wall; and the "inferior turbinal" shows a greater curvature just in front of that wall. The "middle turbinal" is only represented by a somewhat ridgy condition of the great posterior plate, between the other two. Having studied these parts in the highest Amphibia (*Rana*) and in the Snake, Lizard, Crocodile, and Turtle, I am enabled to say that the "Turnicomorphæ," although formed on the ornithic plan, yet have their nasal labyrinth very little in advance of what is seen in those cold-blooded types, and considerably below that of the "saurognathous" Woodpeckers. The postoral region presents a peculiarity which cannot be passed over, although the plan of the present paper does not strictly include those parts.

In my former Plates of these birds I figured in *H. varius* a large tympanic ("Gallinaceous Birds and Tinamous," pl. 35. figs. 1 & 2), and in the other species (pl. 34. figs. 1 & 2) a larger and a smaller bone; but in this invaluable skeleton, lent me by Mr. Salvin, I find *six* (Pl. LIV. fig. 12, *ty*)! and the last but one of this chain is much the larger, and is folded upon itself like a viper's tooth, as if to enclose some tube. I am not certain whether the "siphonium," which carries air into the lower jaw, is embraced by this bone or not; in my next instance it is, as I will soon show.

Considered by itself, the Hemipode is a low type of the "Carinatæ," more reptilian in some respects than the "Ratitæ" down below it. But if it be looked at as a remnant of an ancient and almost extinct race, a race from which the most highly gifted and the most numerous of all the feathered tribes have probably sprung, then the interest increases ten-fold, and the morphologist will never rest until the relations of every branch to this simple stock are understood.

To this end a clear conception of what is *highest* in the facial morphology of birds is, before all things, necessary; and our Old-World Crows and Warblers will furnish us with "that which is most perfect in its own kind," and therefore fit to be "the measure of the rest."

On the Morphology of the Face in the Coracomorphæ.

Example 1. *Corvus frugilegus.*

Habitat. Great Britain and Europe. Group "Oscines," Müller; family "Corvidæ."

In all respects, physiological, morphological, and ornithological, the Crow may be placed at the head, not only of its own great series (birds of the *Crow-form*), but also as the unchallenged chief of the whole of the "Carinatæ."

The earlier stages of the skull-face of this type have already been given (see 'Monthly Microscopical Journal,' Nov. 1872, pls. 34–39, pp. 217–226). The figures of the fledgeling here given (Pl. LV. figs. 1–4) are a further working-out of the oldest figured in that paper (pl. 38). The dissected palate of this bird (*C. frugilegus*) is a full revelation of an "ægithognathous face." Once clearly understood, this will serve as a ready diagnostic in the discrimination of numberless species; by this they all may be judged, and then take the right or left-hand file—either to be classed with the Coracomorphæ, or take their room lower down with the less-specialized groups.

The parasphenoidal rostrum (fig. 1, *pa.s*) is short, and spreads into the symmetrical tympanic wings or "posterior pterygoid processes." Near the end it has a slight rudiment of the basipterygoid processes. At the opposite, distal end of the trabecular arch the coalesced præmaxillaries have a strong scooped triangular body; from this proceeds the dentary and palatine process, very close together, and, above, the combined nasal processes (*d. px*, *p. px*, *n. px*). The parasphenoid (*pa.s*) has completely coalesced with its endo-skeletal part, the proximal half of the fused trabeculæ; but the præmaxillaries have formed no such union with the anterior half. The azygous prænasal cartilage (*pn*) is still only half absorbed; behind it the coalesced distal ends of the trabeculæ are developed into a "recurrent process" (*rc.c*); behind this part they reappear in their originally broad flat form (*tr*), and then immediately in front of the "hinge-notch" they are compressed again: this part is seen in front of and above the vomer (*v*). But this foremost facial arch (the trabecular) cannot be studied here separately from the nasal labyrinth. In this palatal or under view (fig. 1) the alinasal laminæ (*al.n*) are continuous with the fore ends of the trabeculæ (cornua trabeculæ, *c. tr*), and also with the azygous prænasal rostrum (*pn*), meeting beneath the axial parts; they are continuous with each other also; and this compound structure is one very important to be understood: morphologically the "recurrent trabecular cartilage" (*rc.c*) is formed by the free ends of the cornua trabeculæ.

The space between the front wings and their outer wall (*al. n*) is the external nostril (*e. n*). The outer wall of this nasal vestibule has in its inner side the large "alinasal turbinal" (*a. tb*); and this is separated by a narrow space from the subnasal (trabecular) laminæ (*tr*).

Behind, both wall and turbinal are continuous with the bony vomer (*v*). All this is made clear by the transverse sections.

The first of these (fig. 2) was made close behind the external nostril: the lateral and upper portions are here continuous. The razor has passed through the thick part of the nasal process of the præmaxillaries (*n.px*), the upper crus of the nasal (*n*), the dentary part of the præmaxillaries (*d.px*), the maxillary before it has given off the maxillo-palatine process (*mx.p*) and the præpalatine spur (*pr.pa*). Below, the nasal wall (*n. w*) rests in a groove of the maxillary; at its middle it gives off the "alinasal turbinal" (*a. tb*), which is large, and is thrice bent upon itself in an angular manner, giving off at the last two bends a slight secondary outgrowth. Above, the "alinasal" passes into the "aliseptal" cartilage (*al.s*, fig. 3); and here we have a section of the fore end of its turbinal, the "inferior"—anterior in the Bird, although below the others in Man. This is here scarcely more than half a cylinder. In this region the common wall between the nasal sacs is continuous with the crests growing from the flat, tilted, and coalesced "trabeculæ;" these are seen to be large and curved.

The next section (fig. 3) is through the maxillo-palatine processes (*mx.p*), which here are distinct in section from the marginal portion (*mx*); they form a pair of slanting planks, on which the compound vomer rests at its sides. The roof-bones (*n*, *n.px*) are here flattened out over the broad gently swelling "aliseptal" roof. At this point the wall has died out below; and the aliseptal lamina, after growing downwards and inwards for a short distance, folds itselt suddenly inwards, and is coiled two and a half times (*i. tb*). Between these large inferior turbinals a differentiating cleft has appeared, causing a dehiscence of the nasal septum (*s. n*) from the trabecular bar and crest (*tr*). The cartilages which lean towards this on each side are the common end of the alinasal wall and its turbinal; and the bony plate which is grafted upon both and binds them together is the vomer (*v*). The anterior face of the same somewhat solid section (fig. 4) shows more of the nasal cartilage; it is magnified twice as much.

The part of the trabecular commissure and crest (*tr*) seen here shows it to be small; it is not, however, far from the "hinge;" the trough formed by the vomer and the "inturned alinasal laminæ" (*i. a. l*) is very deep and large; and in the adult the bony matter, creeping along the cartilage to some distance, gives the vomer, in the macerated skull, the appearance of one very deeply scooped bone.

The bone itself (fig. 4, *v*) is concave above; it was formed from two symmetrical scythe-shaped moieties, each of which began as endostoses in the corresponding "vomerine cartilage:" they ossified it thoroughly, and then seized upon each alinasal wall, where they ended by turning inwards. But the broad cartilaginous band below (see fig. 4, *i. a. l*) has a separate bony graft, the "septo-maxillary" (fig. 6, *s.mx*); and this, with the extended bony matter in the nasal cartilages, gives the peculiar appearance the vomer of the adult bird has when viewed from below (fig. 6): it resembles the face of a bull, the ascending laminæ being little ears, and the outturned septo-maxillaries its short diverging horns. The septum nasi ossifies in the adult:—in front, from the ossification of part of the alæ; and the freed trabecular part (*tr*) by its own centre.

The compound "vomer" of the adult Crow has therefore been formed from:—

a. A pair of vomerine cartilages.
b. A pair of vomerine centres (endostoses of those cartilages).
c. A pair of septo-maxillaries—exostoses formed upon the following, namely
d. The end of each inturned alinasal wall, combined with the end also of its "outgrowth" the "alinasal turbinal."

Then, as if this amount of metamorphosis were insufficient, the crura of the vomer coalesce with the ethmoid processes of the palatines (*e.pa*), so that in each movement of the face the whole nasal labyrinth is carried forwards and backwards by the mobile pterygo-palatine arch. This second præoral arch has a short and stout suspensory segment, the "pterygoid" (*pg*), which, however, as the bird grows older, becomes slenderer, especially behind, where it acquires the epipterygoid hook or "hamular process." It flattens out horizontally in front, and then sends a spur to overlap the palatine. This becomes the "mesopterygoid"—separate in a young flyer (fig. 5, *ms.pg*), but soon to ankylose with the palatine.

The distal segment of this arch, the palatine (*pa*) is greatly longer than the pterygoid: with the fore end of the latter it tends to form a commissure, which is only completed by membrane; it is then bowed out on each side, and each moiety runs far forwards as a finely pointed style (fig. 1). Where it is overlapped by the pterygoid, there it is split mesiad into two laminæ; these end in front in sharp spurs, to the upper of which the vomerine legs are articulated; the lower or "interpalatine processes" are merely united by a ligament to the maxillo-palatine spatulæ.

If this were all, the palatines of the Crow would correspond with those of the Hemipod. But the first bony shaft does not calcify all the arch-moiety; it leaves an external outgrowth, which has *time to become* solid hyaline cartilage: this is the "transpalatine" element (*t.pa*), and it is a sure sign and correlate of *complete* ægithognathism. This free auricle of cartilage becomes, in a young summer-bird, a distinct bone (fig. 5, *t.pa*), ossifying at first by endostosis; and then, in the adult, it shows no sign of having ever been separate from the body of the palatine (fig. 6, *i.pa*, *t.pa*).

The fledgeling shows how ichthyic the maxillaries remain, even in this high type (fig. 1, *mx*); they wedge in below the dentary and palatine processes of the præmaxillaries, and then, growing broader, send inwards the great slanting spatulate maxillopalatine spur (*mx.p*). This has a struthious coarseness now, but becomes elegant in its curves and scoopings afterwards (fig. 6), and acquires a distinct pedicle. That pedicle is much more slender and defined in many of the feebler forms that crop up around the true "Corvidæ;" and its form, ruder or more elegant, is very useful as a mark of high or low breeding in any type. The long jugal style (*j*) has no quadrato-jugal subdivision, but binds directly on the quadrate.

This latter bone and its relationships, although not coming within my stricter plan, has to be brought in here. It curves backwards (fig. 7, *q*) to be articulated with a raised facet common to the periotic and exoccipital regions: this "otic process" is merely the expression, morphologically, of the hooked form of the proximal end of every facial bar; its orbital process is the "pedicle" or *apical* process (*pd*).

Here, in the bird, instead of being enclosed in the tympanic cavity, it forms its crescentic anterior wall and boundary, and to it the rim of the membrana tympani is largely attached. Our ancestors called the quadrate the "tympanic"[1]; but younger eyes have beheld the true tympanic in another form: here it is seen divided into a fine chain of bones, seven in all; one of the seven, the largest, has a side duty imposed upon it, namely the walling-in of the "siphonium." This tube (fig. 1, *spm*) is membranous in the fledgeling; but afterwards in the Corvidæ, and in many of the singing-birds, the principal tympanic is coiled upon itself, the opposite edges uniting; thus the tube is quite enringed.

My demonstrations of these parts are from an old Carrion-Crow (*Corvus corone*); this is the example mentioned by Prof. Huxley (Elem. Comp. Anat., note to p. 249) as having six tympanics, as I had then informed him.

In fig. 7 the bone attached to the jugal (*j*) and that behind the articulare are "sesamoids" (*sd*) in the "external quadrato-articular ligament;" but the more massive bone running downwards from the tympanic ring to the upper surface of the "internal angular process" of the mandible is the "os siphonii" or principal tympanic.

In fig. 8 the pneumatic passage into the lower jaw is shown, a bristle passing into it; in fig. 9 the bristle passes also through the lower third of the insheathing tympanic, which is seen to be folded upon itself. Fig. 9 *a* is the upper or tympanic end of the bone, its edges perfectly closed in, forming an oval aperture. In the Crocodile (see Huxley, "On the Representatives of the Malleus and Incus," Proc. Zool. Soc. May 27, 1869, p. 391) the siphonium carries air from the quadrate into the articulare—but in the bird, from the tympanic cavity, as Nitzsch has rightly described it.

Correlated with the compound vomer, attached to the nasal vestibule, we have, with

[1] This fine old race of teleological anatomists is nearly extinct; only Owen remains of the remnant of the giants.

one notable exception, the ecto-ethmoid (*e.eth*) standing out flush with the rest of the face, and cropping up on the forehead, in this latter respect agreeing with Crocodiles and Monitor Lizards.

The great, gently scooped antorbital wall (fig. 5, *p.p*) is ossified in the young flyer by its own centre—a centre which backs the middle and lower turbinal regions. But the back of the upper turbinal region has, in the *Crow*, its own centre of ossification (fig. 5, *e.eth*). This "upper turbinal bone" is seen in the retired, smaller ecto-ethmoid of *Buteo vulgaris* and some other birds; but here, in the Crow, it forms the top of the outstanding "præfrontal" bone. The first and fifth nerves have each their own chink or passage, the pars plana growing into the aliethmoid between them.

The lacrymal (fig. 5, *l*), with one exception (the same as above, namely *Menura superba*), is, at its uttermost growth, a mere pupiform bar, thrust forwards by the huge lateral ethmoid, and wedged in between it and the nasal.

In a very large number of the Ægithognathæ the lacrymal cannot be seen at any stage; and in many of those in which it does occur it soon ankyloses either with the nasal in front or with the ethmoid behind. I find no orbito-sphenoid in the eye-socket of the Coracomorphæ, only a "præsphenoid."

Before passing to the next family, it may be mentioned that the vomer of the Corvidæ is not always typical; in *Fregilus graculus* its anterior half is a decurved, narrow, thick spoon, subacute terminally (Pl. LV. figs. 10–12).

Example 2. *Ruticilla phœnicurus* juv. Europe.

Habitat. Migrating in spring to Great Britain. Group "Oscines," Müller; family "Sylviidæ."

To me it seems evident that the genus *Sylvia* contains the highest or most specialized of the small Passerines, and this notwithstanding the corn-husking and fruit-crushing powers of the small conirostral Passerines, which are the result of secondary specializations; but in the fulness of their organization as to all that lifts a bird on high above a reptile, or above a reptilian bird, these types are, as to *family*, what a blood-horse is as to breed; they are of the highest and the purest blood. That these birds (the very aristocracy of the "Oscines" or songsters) are small does not much affect the question; for if we wish to look for a *low* bird of mean reptilian blood, we search for it amongst the ponderous giants, the small-brained, wingless, raft-breasted Cassowaries and Emues. It is as difficult to see the fundamental reptile in these refined ovipara as it is to discover the lineaments of the Caterpillar in *Vanessa io*.

In this pin-feathered nestling of the Redstart (*Ruticilla phœnicurus*) I have given as simple an expression of the two præoral arches and the nasal sacs (Pl. LV. fig. 13) as possible, omitting nothing important. Being the palate of a very young bird, it will differ less from what is seen in the adult of lower types than that of an old bird of this genus.

The trabecular arch, hidden behind by its under-beam the parasphenoid (*pa.s*), has no basipterygoid processes. Beyond the "hinge" it is soft, and, as in the Crow, is first narrow, and then spreads out as two oblique wings with a crenate and wavy margin (*tr*). The prænasal cartilage has been absorbed; and, beneath, the coalesced trabecular horns have grown into a triangular tongue of cartilage: this is the "recurrent lamina" (*rc. c*). The ox-faced vomer (*v*) has two crescentic emarginations in front; it is not uncommon to find a fore-looking projection at the mid line. This bone becomes pinched behind, its sharp legs converging; it has below a scabrous appearance from the loss of its periosteum, which was supplying it with new osteoblasts. On its shoulders it carries the great nasal vestibule; its moieties are grafted upon the "inturned alinasal laminæ" (*i. a. l*). Neither in the young Redstart, nor in the adult Whitethroat (*Sylvia cinerea*) have I been able to detect any lateral ossicles or septo-maxillaries. I have also searched for them in vain in the Wagtails (*Budytes rayi* and *Motacilla yarrelli*); but in the Willow-wren (*Phylloscopus trochilus*) they are very evident on each side in the substance of the nasal cartilage. This bird differs in some other respects, as we shall see. In the Redbreast (*Erithacus rubecula*) they are very small. The segmentation of the trabeculæ to form the cranio-facial hinge is, if the now absorbed prænasal be taken into the measurement, in the middle of the bar.

On each side of the septum nasi the nasal wall bends in as a wavy-edged floor-plate (*n.f*), above which is seen the large alinasal turbinal (*a. tb*). The coalesced præmaxillæ are such as we see in the young of all these birds, the dentary portion (*d.px*) largely over-overlapping the maxillaries (*mx*), and the palatine spur (*p.px*) binding the outside of the præpalatal bar (*pr.pa*).

The large vomer almost wedges aside the moieties of the palato-pterygoid arch as much as in the "Ratitæ." Indeed the adults of the Coracomorphæ seldom form any thing like a "palatine commissure" such as is so common in other perching and climbing birds. The right and left bars are bound together by the inwedged vomers; and the practical commissure is made by the early fusion of these bones.

The long, slender, rounded pterygoids—more slender still in the adult—have but a little epipterygoidean process in the young (*e.pg*); but this is evident and well formed in the old bird. A "mesopterygoid" (*ms.pg*) is breaking itself off from the fore part, where it overlaps the palatine. But for the diagnostic transpalatine lobe of cartilage (*t.pa*), the body of the palatine would be the almost exact counterpart of that of the Hemipod (see Pl. LIV. fig. 1, *pa*), the main difference being the greater length of the ethmo-palatal spurs that bind the outer edge of the vomerine crura. The transpalatine element answers very exactly to that of the Crow, being a rounded auricle; but in the adult (at least in *Sylvia cinerea*) the periosteal layers grow backwards, and give it an angular finish behind. The maxillary (fig. 13, *mx*) ends in front as far forwards as the palatine, and behind almost reaches the quadratum. The delicate jugal (*j*) nearly reaches the angle of the præmaxillary in front. The maxillo-palatine process (*mx.p*) is narrow, thickish, scabrous, and solid, very unlike the elegant pedunculated trowel of the adult bird, with its angular projections and pneumatic chamber. But it is very much like its symmorph in the lower types of the Coracomorphæ, which seldom become pneumatic, and are but little pedunculated.

In the figure the rest of the nasal labyrinth is indicated on the left side by dotted lines; in the adult (*Sylvia cinerea*) the "os uncinatum" is only obscurely marked out on the rounded lower border of the pars plana.

Having endeavoured to give both the contrast and the harmony of the lowest and the highest of the birds possessing the ægithognathous palate, it will help to keep both writer and reader from embarrassment if we take next the *lowest* forms of the *true* but *rough-voiced* Coracomorphæ, all of them belonging to the "Notogæa"—old types inhabiting the New World.

The lowest of these is the Lyre-bird; at least it is the most abnormal in relation to the ægithognathous type; and, supposing it to have had an ancestry amongst extinct "Turnicomorphæ," they must have been far less passerine, and much more related to Tinamous and ancient Cranes than the modern forms[1].

Example 3. *Menura superba.*

Habitat. Australia. Group "Tracheophonæ," Müller; family "Menuridæ."

What I have to say upon the affinities of this bird will be merely from what I see in its *fore face.* Other workers may see what can be done with all the rest of its organization.

Side by side with Mr. Salvin's specimen I put the skull of the Trumpeter (*Psophia crepitans*). The comparison of these two types causes the mind to waver; and however necessary it may be to place the Lyre-bird with the Coracomorphæ, yet it belongs evidently to the same ornithic stratum, and most probably corresponds in *time* to this ancient Crane, with its dense, almost ophidian bones, and its lacertian chain of "superorbitals."

The basipterygoid processes are thoroughly aborted; the parasphenoidal beam (Pl. LVI. fig. 1, *pa.s*) is of moderate thickness, it projects little, in front, below the hinge. That subdivision of the facial axis is nearly perfect (fig. 3). In this skull, of a female evidently old, the nasal labyrinth in front of the hinge is unossified: it has been lost by maceration; yet the remnants of it are very *thin* lamellæ. The præmaxilla

[1] I say "ancient Cranes;" and the probability is that these abounded in the Tertiary period. The *Eurypyga* represents one family, the Kagu another, *Psophia* another, and *Thinocorus* (and I suppose with it we must associate *Attagis*) a fourth.

All these are ancient types that have lost their nearest relations. They are altogether more struthious than the ordinary "Gruidæ." Professor Newton, in a letter to me, insists that *Thinocorus* belongs to the "Limicolæ:" as to its *body* it *does*; its *head* is a morphological mixture.

(figs. 1–3, *px*) is of that moderately developed kind which might be found in a feeble-faced bird of almost any great group: notably it is like that of *Hemipodius* (Pl. LIV. fig. 11, *px*). The large open nasal space in the dry skull, the feeble differentiation of the palatal process of the præmaxillaries, and the subcarinate, triangular form of the fore part of the vomer (*v*)—all these are like what is seen in the young of the Crow (Pl. LV. fig. 1, *p.px*, *v*). At first sight the vomer appears to militate against the bird being of the "kind" of the Crows; but what I show in the young Rook clears the thing up, and still better what may be seen in the Chough (*Fregilus graculus*). In this bird the vomer (Pl. LV. figs. 10–12) is seen to be scarcely at all more passerine than that of *Menura*; it is more downbent in front; and the scooped facets, from which the angle of the "inturned alinasal lamina" (*i. a. l*) has been macerated, are somewhat larger.

As the relation of the vomer to the nasal capsule is my proper *text*, I think it will be seen that I have here pointed out the true diagnostics in *Menura*[1].

The vomer of *Menura* (Pl. LVI. figs. 1, 3, 5, *v*) is lanceolate, rather solid, carinate below, and ankylosed by its crura to the ethmo-palatine plates. It is bent downwards in front (fig. 3), but not so much as in *Fregilus* (Pl. LV. fig. 12, *v*). The nasal *scars* (fig. 5, *i. a. l*) are shallow-rimmed cups, as in *Fregilus*. In neither of these types does the vomer encroach so much on the nasal cartilages; and in neither of their adult skulls can any septo-maxillary centres be seen: they may have existed near the vomer on the nasal cartilages.

The pterygo-palatine arch is almost typical; the pterygoid itself is short, but neat and well-shaped, having a large "epipterygoid" hook, a well-formed cup for the quadrate, a large anterior lobe clamping the basifacial beam, and a well-detached large "mesopterygoid" (fig. 3, *pg*, *e.pg*, *ms.pg*). The palatines (figs. 1 & 3) have an evident transpalatine territory (*t.pa*), which, being uncinate, makes the angle almost as much developed outwards as in the Rook (compare Pl. LVI. fig. 1, with Pl. LV. fig. 6, *t.pa*). The interpalatine spurs (*i.pa*) are stout, and are exactly like those of the young Rook (Pl. LV. fig. 1, *i.pa*), being larger than those of the adult (fig. 6). The thin conchoidal ethmo-palatal laminæ (figs. 3 & 5, *e.pa*) do not extend further forwards than the interpalatine spurs; they rise and attach themselves to the upper edges of the vomer, exactly as in *Fregilus*. The angle on the outer edge of the palatine, where it suddenly narrows into the præpalatine bar (*pr.pa*), is precisely like what is seen in the Rook (Pl. LV. fig. 6); and so is the thickening of the edge at that part. The præpalatine bar remains distinct from the præmaxillary and maxillary (figs. 1 & 2).

The sides of the broad part of the palatines are much steeper than in the Corvidæ; the sulcus between the side and the interpalatine edge is deeper: and the interpalatine

[1] I have very long been familiar with the peculiarities of the passerine palate; but my recent paper, in the Monthly Microscopical Journal (Nov. 1872), on the Crow's skull is the first matter published by me directly on this subject.

laminæ grow much nearer together, and more perfectly enclose the nasal tube. The maxillary (figs. 1 & 2, *mx*) is a long, narrow bone, elbowing out very little at the angle of the mouth, and widening very slightly where the maxillo-palatine process (fig. 4, *mx.p*) is given off. This process has a very delicate, flat pedicle; and the broken root of this, in Mr. Salvin's specimen, appeared to me to be the whole process, very small. But, happily, at the last moment, Professor Garrod has corrected my mistake; and in his specimens, kindly lent to me, they are seen to be unusually large and pedate, quite like their counterparts in the Corvidæ. They are not pneumatic; but in *Corvus* they are very slightly so.

The long slender jugals are ankylosed to the jugal process of the maxillary. The nasals (*n*) and the large external nasal opening are altogether and thoroughly coracomorphous. Let these parts be compared with those of a Robin or a Wren, and their close correspondence will be seen.

But the ethmoid and its surroundings are the real stumbling-blocks in this bird; and if this part had been placed in my hands as an unnamed fragment, it would have taken a place close by *Psophia*. Yet the antorbital plate fits much more closely to the large spongy lacrymal (*l*) in *Menura* than in *Psophia*. In both there is, in this bone, a large superorbital portion, joined by a narrow waist to a pedate base, close to the jugum. In *Psophia* the antorbital runs into the osseous back wall of the upper turbinal; in *Menura* it is quite distant from the roof; a large oblong space, through which the olfactory and nasal nerves (1, 5, 5′) pass, extends from the meso-ethmoid to the inner face of the lacrymal.

The antorbital is wholly ossified (fig. 3, *p.p*), it is square, entirely lies within the orbit, and has a rounded infero-external angle, with no sign of an "os uncinatum;" this is aborted by the pedate base of the lacrymal; yet there is in that bone, *in front* of the angle of the antorbital, an elegant pyriform lobe, with its narrow end looking inwards, whose direction is towards the ecto-ethmoid. This is undoubtedly the same as the distinct "os uncinatum" of many birds. At the brow-edge of the great lacrymal there is a larger anterior and a smaller posterior superorbital. In *Psophia* there are seven such bones on one (the left) side; on the other they are ankylosed so as to form only five.

All the three orbital bones of *Menura* come up flush with the broad, flat frontal region (fig. 2, *f. l, s.ob*). There is one superorbital perched on the end of the long spur of the lacrymal in Eagles and Hawks; but a chain of bones, reduced here to three counting the lacrymal, is very rare; *Psophia* and the Tinamous are all I have seen with such a chain[1].

And now it may be asked, If *Turnix* be taken as a sort of *stock form* for the whole of the "Ægithognathæ," how is it that *Menura* is in some respects lower than *Turnix*?

[1] Since the above was written I have received from James Wood-Mason, Esq., his paper on the Arboricolæ (Wood-Partridges). He has found a perfect chain of superorbitals in four out of the eight known species of that genus (see Journ. Asiat. Soc. Bengal, vol. xliii. part 2, plate 2, 1874).

To this I answer that the existing "Turnicomorphæ" are most probably a few remaining wanderers, that still exist from Europe to Australia, of a huge family of birds of all sizes, in great variety of shape, and specialized to all sorts of life. We may imagine innumerable kinds of Struthionidæ, Tinamidæ, Turnicidæ, and that "by these was the whole earth overspread," and that amongst all this variety of "Ratitæ," and of "Carinatæ" with almost keelless breast-bones, there arose from time to time birds with new characters, the stocks and forefathers of walking, wading, swimming, diving, perching, and climbing types: hence came the Dodo and the Solitaire; and from the same ancient bird-world sprung the gigantic Rails of New Zealand (*Aptornis defossor*, Owen, and *Notornis Mantelli*).

The direct ancestors, in the wide paleontological sense of the word, of the Lyre-bird would most likely have a huge body, feeble wings, a less exuberant tail, an almost keelless breast-bone, bony eye-brows, and a vomer more pointed and relatively larger than in the recent bird; and that vomer would, like the same bone in *Turnix*, be attached to the nasal walls by a ligament, and not grafted upon it.

Then, on that level, possessing *incomplete* "ægithognathism," such a bird might have belonged to a family allied to the "Turnicomorphæ."

Example 4. *Pipra auricapilla.*

Habitat. Guiana. Group "Tracheophonæ," Müller; family "Cotingidæ."

This bird may be said to stand on the direct road from the lower Carinatæ to the Crows, and not on the *bridle-path*, like *Menura*.

The bat-shaped swollen basitemporals (*b.t*) underlie a thick parasphenoid (Pl. LVII. fig. 1, *pa.s*), with no trace of basipterygoid process; then the beam becomes gradually narrow to the cranio-facial hinge. In front of the hinge, which is as complete as in the Crow, there is an alate septal base (*tr*) also perfectly corvine. A fenestra partially separates the trabecular from the nasal part of the septum; below and behind the fenestra this part of the first arch had its own bony centre; in front and above, the bony matter belongs to the median part of the nasal labyrinth. A perforate nostril is here formed by the round deep notch below the alate septum (*tr*) and the recurrent fold (figs. 1 & 3, *rc. c*). Although the septum is so well ossified, the rest of the nasal labyrinth, in front of the hinge, is soft.

The gently curved beak has an almost triangular outline (fig. 1); and although its elements are ankylosed together, the various processes can be made out; the palatine bars of the præmaxillaries (*p.px*) end in a sharp point; the dentary processes (*d.px*) overlap the maxillaries (*mx*) at the angle of the mouth; and the nasal processes have shortened ends to articulate with the frontals. Here, again, the vomer (figs. 1 & 2, *v*) is the most important part.

The vomerine moieties are broadish and very thin in front, and become filiform behind. This part is three fifths the length of the whole; and their crura are very near together; they coalesce with the ascending palatine plate. The thickened shoulders of the vomer are bevelled off; and here it is seen that the bony matter has ossified only the posterior clavate portion of the vomerine cartilages (compare Pl. LVII. fig. 2, *v*, *v.c*, with Pl. LIV. fig. 8, *v*, *v. c*). The bony substance of the vomer is in immediate contact with the inturned alinasal lamina (*i. a. l*), but does not run into it; the same may be said of the small, triangular, apiculate "septo-maxillaries," which are attached (one on each side) to the posterior border of the nasal cartilage, where it overlaps the vomerine cartilage. These modifications form an exact half-way between the Crow and the Hemipod. These form the first variety of "complete ægithognathism," these parts in this type being quite distinct, the septo-maxillary grafting itself on the scarcely ossified vomerine cartilage, and not on the inturned alinasal wall (Pl. LVII. fig. 2, *i. a. l*, *v. c*, *s.mx*, *v*).

The "maxillo-palatine processes" (figs. 1 & 2, *mx.p*) are simple, flat, pedate outgrowths of the maxillaries; and in *Pipra* they do not bind tightly against the vomer, as in those next to be described, but lie on a considerably lower plane. Behind these processes, the maxillary continues broad for some distance, and then becomes filiform, running without any suture into the jugal (*j*).

In the endo-skeletal elements of the second arch we have a subtypical condition of the parts. The epipterygoid process of the pterygoid (*e.pg*, *pg*) is not much developed; but the bones themselves are thoroughly passerine, the flat anterior head articulating with its own segment, the mesopterygoid, which is now confluent with the palatines.

The palatines (fig. 1, *t.pa*, *pr.pa*, *pt.pa*) are very instructive; they are strongly bowed out behind the short, straight præpalatal portion; but the *angle* is small, square, and notched. This transpalatine process (*t.pa*) was evidently formed in a very slight angular cartilage; and I much doubt its having had a separate bony centre.

The interpalatine spurs (*i.pa*) are very large and spinous; and the concave bridge of bone between these and the angular process is of greater extent than the upper or ethmo-palatal lamina, which sends a small spur along the outer edge of the vomer. The postpalatal laminæ (*pt.pa*) meet each other below the parasphenoidal rostrum (*pa.s*), and are greatly enlarged, orbitally, by the mesopterygoid segment.

The lacrymals are, I believe, corvine (but are lost in this specimen); and so is the ethmoid (*p. p*). As in *Menura*, the passages for the first and fifth nerves are not distinct, one broad roadway, very wide on the inside, existing between the upper edge of the thick spongy antorbital and the ethmoidal roof.

The vertical width of the antorbital is small inwards; but it is flush with the face, and very massive outside and below (see fig. 1, *p.p*, where it is indicated by fainter shading). I have not found any separate "os uncinatum;" it may have been lost with the lacrymal.

Example 5. *Pachyrhamphus* ——?

Habitat. Guiana. Group "Tracheophonæ," Müller; family "Cotingidæ."

This skull, at first sight, might be taken for that of a Tanager; but it is widely different: it corresponds in all essentials with that of *Pipra.* Notwithstanding the great expansion of the face in front, the palatine region is less divergent behind, and in some respects we get here a truer repetition of *turnicine* characters than in *Pipra.*

The bat-shaped basitemporal region has a broader middle part (Pl. LVII. fig. 4, *b.t*); the basifacial bar (*pa.s*) has no basipterygoids. The hinge is not quite perfect; a bony isthmus connects the ossified septum nasi and perpendicular ethmoid above.

There is no fenestra in the deep, stout, thoroughly ossified nasal septum separating the nasal from the trabecular portion (*s. n, tr*); and thus this type is, in this respect, intermediate between the Tinamou and *Syrrhaptes* ("Gallinaceous Birds," pl. xxxvi. figs. 1 & 4; and "Ostrich Skull," pl. xv. fig. 8, *s. n, c.f. c*). The triangular expansion at the fore part of the base of the septum is due to the coalescence with it of the "recurrent lamina." The *depth* of the septum brings it into immediate contact with that retral process; and the nose is not perforated as in *Pipra*, with its alate, shallow septum (fig. 3).

The vomer (figs. 4 & 5, *v*) keeps its breadth better than in *Pipra*; its less convergent crura are ankylosed to the ethmo-palatine spurs. As in *Pipra* (see fig. 2), the ox-faced vomer has only utilized the clavate hinder part of the "vomerine cartilages" (*v. c*), which converge towards the septum, and are separated from the inturned laminæ (*i.a. l*) by a very moderate distance (fig. 4). The alinasal wall with its turbinal is ossified throughout by endostosis. It is not so hard as the vomer; but these two bones keep their own proper morphological territory; and the line of junction of the two is at the roof of a deep rounded sulcus (fig. 5, *i. a. l, v*), covered by the curling inwards and downwards of the inturned angle of the alinasal. Exactly where the two osseous tracts meet at their inner side, a small limpet-like bony centre stands, looking forwards, and forming a boundary-stone between the alinasal and vomerine regions: this is the septomaxillary (*s.mx*). It does not, as in the higher Coracomorphæ, form an ectosteal patch to the alinasal wall, which has ossified independently of it. The shoulders of the broad, stout vomer are strongly thickened and downbent to articulate with the maxillo-palatine plate (*mx.p*), the whole build of the palate being stronger than that of *Pipra.*

Thus the inferior face of the vomer is excavated in front, and its fore edge has a squared emargination. Another *upper* palatal element, the os uncinatum, or "palato-trabecular conjugational bone," is here beautifully distinct (figs. 4, 6, 7, *o. u*), but has been displaced outwardly by the *corvine* lacrymal (*l*) from its earlier ecto-ethmoidal relationship (*p.p, e.eth*). This small seed-like bone has a rounded outer edge, and articulates by an inner suture with the lower and outer edge of the lacrymal; its mother substance was a secondary bud, growing from the outer edge of the trabecula. In this type the great lateral ethmoids, although less swollen than in *Hemipodius*, have a greater lateral development; indeed they carry this to a greater extent than any known bird (figs. 4, 6, 7). The very narrow frontals covering the great outspread ethmoids ("præfrontals") give this part of the head a very crocodilian aspect. The spongy *inner* part of the pars plana (fig. 6, *p. p*), however, is of small vertical extent, as in *Pipra*; and the nerve-passages run freely into each other. Part of the alinasal is ossified on the outside round the external nares (figs. 6 & 7, *al.n*); this gives, in the dry skull, a notched appearance to these wide passages. The small semi-lacertian inferior turbinals are ossified by endostosis. Every thing hitherto shows *Pachyrhamphus* to be a very generalized bird in its own great family or suborder; the lower palatine structures will yield like evidence. The pterygoids (fig. 4, *pg*) are stronger and more arched outwards than in *Pipra*; but the epipterygoid spur is bound close to the front of the quadrate, as in the Turnicidæ and Gallinaceæ. The whole bar, by ankylosis, has relapsed into unity; for the pterygoid, mesopterygoid, and palatine have lost all their sutures (fig. 6, *pg*, *e.pa*, *ms.pg*). Between the postpalatine descending lips (*pt.pa*) there is more of the parasphenoid seen than in *Pipra*; and these inferior lip-like laminæ soon cease, passing into the interpalatine spikes (fig. 4, *i.pa*), which are spongy and have ragged edges.

The body of the palatine is but little bowed, and sends only a few toothlets backwards as rudiments of the transpalatine region (*t.pa*); thence the bar is narrow, feeble, bowed in, and then curved outwards a little before it ends, converging towards its fellow. The upper lamina or ethmo-palatine (fig. 6, *e.pa*) is of the same extent; but its spike, ankylosed to the vomer, is smaller than that of the lower or interpalatine lamina.

The præmaxillaries and maxillaries together form an elegant leaf-like rostrum (figs. 4, 6, 7), not unlike that of the Boatbill (*Cancroma*). The whole structure is extremely light, and coarsely spongy; and the coalescence of the maxillaries, præmaxillaries, nasals, and jugals is all but complete; a little remnant of the suture is seen above the hinge.

On each side, close inside the angular process of the præmaxillary, are seen the large, broad-based, *struthious*, maxillo-palatine processes (figs. 4 & 5, *mx.p*): these are pneumatic, somewhat hooked, and bind by their inner edge on to the downturned shoulder of the vomer. These processes also show that this form is more generalized than *Pipra*; the palatines and septum nasi show the same thing.

Example 6. *Thamnophilus doliatus.*

Habitat. Guiana. Group "Tracheophonæ," Müller; family "Formicariidæ."

This strong-billed bush-bird shows the "Formicariidæ" to be on the same ornithic level as the "Cotingidæ." They have both cleared the turnicine boundary *by a long distance*; but they are metamorphosed in the face much less than the typical Crows, Warblers, and Finches. A mere glance at the figures (Pl. LVII. figs. 1, 4, 8) of the palates will show how near *Thamnophilus* comes to those last described, especially to *Pachyrhamphus*; in some respects this form comes nearest to the Hemipods, in others the latter.

The basitemporal and parasphenoidal regions are precisely like those of the "Cotingidæ ;" and the nearly perfect hinge is bounded in front by a knife-like septum, as in *Syrrhaptes*, *Hemipodius*, and *Pachyrhamphus* ; but this is not ossified ; it is not alate in the middle, but has in front two triangular laminæ of bone underpropping it ; the lower of them is a median process of the præmaxillary ; and the higher is the "recurrent lamina" of the trabeculæ (*rc. c*) ; this is largely edged by unossified cartilage.

In *Thamnophilus* we have a pertinent instance of the occurrence of intense ossification in a low type, showing that arrest of ossification is not of itself a sign of low position[1]. The whole nasal capsule is ossified, with the exception of the margin of the very large recurrent laminæ and the septum, and had better be considered along with the vomerine structures.

The alinasal turbinals (*a. tb*) are very large and bony, and they articulate by their convex end with a concavity on the horns of the enlarged vomer (fig, 9, *a. tb*, *v*). The alinasal wall (*al.n*) is not even flush with the facial bones (fig. 10), but sinks in, and is thoroughly ossified ; below and within it is seen to have coalesced completely with the maxillo-palatine process (fig. 9, *i. a. l*, *mx.p*), and is of very small extent in the floor of the nose, which is here open, exposing the alinasal and inferior turbinals (*a. tb*, *i. tb*). Here the bony growths are much in conformity with the morphological regions, save that the ankylosis of the alæ nasi with the palatine plate of the maxillary has produced a form of desmognathism.

In *Thamnophilus* the vomerine moieties are as much indebted to hyaline cartilage for the formation of their wings and crests as in the Crow, but the *source* is different : here the cartilage is the vomerine spatula ; there, in the Crow, that cartilage is soon used up, and then the bone grows into the nasal capsule to a certain extent. In this instance the vomerine cartilages are themselves large enough to form a substratum for all the outgrowings of the vomer, so large and massive in the adult.

Not only does the alinasal turbinal form a cup-and-ball joint with the vomer, but the vomer itself has an elevated subconvex facet on each side, which fits into a subconcave facet on the upper surface of the corresponding maxillo-palatine plate. Altogether this ægithognathous palate is developed into a very complex kind of desmognathism. At first sight the septum would seem to be ossified ; but a side view shows that it is only the inferior edge which is bony, and the bone is quite free from the cartilage ; it is, in this state, merely a membrane bone, a "median septo-maxillary" (fig. 8, *m. s.mx*). We shall soon meet with this element again.

The præmaxillaries form the strong, narrowish, decurved beak, and are thoroughly ankylosed to their surroundings.

The pterygo-palatine arch has a typical apex, the epipterygoid hook (*e.pg*) ; it is longer than is usual even in the higher forms. The pterygoids are rather long, elegantly bowed, and have given off a large mesopterygoid, which has become ankylosed to the upper edge of the palatine ; the pterygoids remain distinct. The palatines are extremely like those

[1] Neither intense ossification nor pneumaticity of the bones are signs of "high degree."

of the "Cotingidæ," having a long, sharp, inferior postpalatine keel on each side, between which a small tract of the parasphenoid is seen. The middle palatine region is suddenly dilated, but is of very small extent—the band connecting the base of the præpalatine bar with the interpalatine spur being very narrow (fig. 8, *i.pa*), and the transpalatine rudiments very small and gnawed (*t.pa*). The middle nasal passage is made very wide by the large rounded fold of bone which connects the "ethmo-" with the "interpalatine" (figs. 8 & 9, *e.pa*). The præpalatine band is narrow, feeblish, a little bowed outwards; and ankylosed, in part, to the præmaxillary. Here, with very typical pterygoids, the palatines are the simplest and most turnicine I have hitherto seen in this great group, with the exception, perhaps, of *Pitta*.

The maxillaries and jugals are ankylosed together; the maxillo-palatines (*mx.p*), partly described already, have a very broad, pneumatic root, and are as struthious as in the "Cotingidæ." I miss the lacrymal, seen in the last family; but the lateral ethmoid is very similar; both above and below it is more than flush with the rest of the face; it shows no separate os uncinatum; yet the *foot* of the antorbital is very large (fig. 10, *p.p*). Above that plate there is, as in the "Cotingidæ," a large common chink for the nerves going to the nose; but the proximal part of the pars plana is much deeper (compare figs. 6 & 10, *p. p*).

Altogether this bird's face is of extreme interest, as instructive as that of the last type.

The structure of the face in *Thamnophilus atricapillus* is precisely like that of *T. doliatus*.

Example 7. *Pitta melanocephala.*

Habitat. Borneo. Group "Tracheophonæ," Müller; family "Pittidæ."

This form is closely allied to, and yet differs considerably from, the last.

The basitemporal and parasphenoidal regions are the same as in *Thamnophilus*; but the fore face is straighter, and the angles of the mouth expand more, so that the dentary part of the præmaxillaries is more outturned (Pl. LVI. fig. 6, *d.px*); the general structure of the bone is coarser; and altogether there is something more struthious in the stiffness of form and general inelegance of build. Instead of the intense ossification of *Thamnophilus*, the outer nasal structures are but little ossified, principally the septum. The vomer (*v*) is very flat below, and, above, rises towards the mid line, its groove receiving the large septum, which is not notched off from the ethmoid; the upper lobes, in front, are moderately developed; and the lower are swollen, so as to give a heart-shaped appearance to this part: these latter lobes (fig. 7, *v*) are strongly articulated to the maxillo-palatines (*mx.p*). The vomer has evidently grafted itself upon the alinasal turbinal, although it owes nothing, or scarcely any thing, of its size to that cartilage. Yet this intimate union of the vomer with the nasal capsule puts *Pitta* into the typical division; in this respect it has "complete ægithonathism" of the 2nd variety.

Thus this genus is very interesting as leading upwards towards the typical forms. In this macerated specimen, the septo-maxillaries have evidently been lost; for the angle of the alinasal turbinal has been removed.

The second arch has its hinder segment less, and its fore segment more typical than in *Thamnophilus*.

The epipterygoid is feeble; and the rest of the bone (fig. 6, *pg*) is like that of *Pipra* (Plate LVII. fig. 1, *pg*), short and straight; but it is thicker and coarser.

The mesopterygoid element has coalesced with the palatine, leaving the pterygoid itself free. The postpalatine keels (fig. 6, *pt.pa*) are deep, as in these low Coracomorphæ generally; and the broad part of the palatine is attached to the præpalatine region at right angles, so that the appearance is that of a pair of hatchets stuck into the basis faciei, opposite each other. The transpalatine portion (*t.pa*) is a badly developed snag; the interpalatine spurs (*i.pa*) are very small; and the two laminæ end in front, one above the other, very nearly—the ethmo-palatine swelling out as in *Thamnophilus*, and passing a little in front of the interpalatine plate (Pl. LVI. fig. 7, *e.pa*). The præpalatine bar is very flat and broad in front; and the whole of this arch is stiff, coarse, and untypical. So also are these great flap-shaped maxillo-palatines (figs. 6 & 7, *mx.p*); broad-based, lathy; with a thickened inner edge, roundly notched for the vomerine joint, these ear-shaped processes are strong marks of inferiority of type. The zygomatic process of the maxillary is broad and flat proximally, and is thin and vertical where it becomes one with the jugal (*j*).

The lateral ethmoidal region is quite *Thamnophiline*; but the pedate *processus uncinatus* of the thick pars plana is less marked. There is here, again, no lacrymal; and the 1st and 5th nerves pass through one wide, oval, very large cavity from the orbit to the nose: *Menura*, *Pipra*, *Pachyrhamphus*, *Thamnophilus*, *Pitta*, and *Grallaria* all agree in this character; and they do not agree by accident. This great open door will lessen, and be barred across, as we ascend. We have seen it to be so in the Rook.

Example 8. *Grallaria squamigera.*

Habitat. Andes of Columbia. Group "Tracheophonæ," Müller; subfamily "Formicariidæ."

In the palate of *Grallaria*, as compared with *Pitta*, two or three striking points of contrast are seen, modifying the great general harmony between the two.

The whole structure is less stiff and clumsy; the palatines are better developed; the angle of the mouth is not so wide; and the nasal labyrinth, in front of the vomer, is much longer. There is still less ossification of the interior nasal structures than in *Pitta*; but that this does not affect the zoological or even the morphological height of the type is evident; for in *Thamnophilus* below, and in the next higher than *Grallaria*, namely *Artamus*, ossification is intense, whilst in these two intermediate forms it is arrested.

As compared with *Pitta*, this form has the same gallinaceous epipterygoid (fig. 8, *e.pg*), and an equally straight but slenderer pterygoid (*pg*); between these the parasphenoid (*pa.s*) is thick and without basipterygoid processes. Above the parasphenoid the thick perpendicular ethmoid (*p. e*) and the septum nasi are but parts of one continuous orbito-nasal septum, as in the Tinamidæ; for here the *cranio-facial cleft* is as imperfect as in *Tinamus variegatus* ("Ostrich Skull," pl. xv. fig. 8, *c.f. c*): even in that species there is a considerable "notch." There is this carinate character, however; and that is, that the ossification stops at the usual place, and the bony matter does not pass from the ethmoid, forwards, to ossify the nasal septum (*op. cit.* pl. xv. fig. 10, *p. e*, *s. n*). Yet in respect of this almost undivided orbito-nasal septum, this ground-bird is one of the most struthious of the carinate types; it has, however, a small oblique fenestra in front of the "meso-ethmoid" (fig. 10, *c.f. c*).

The anterior part of this vertical plate in *Grallaria* is principally hyaline cartilage, unchanged; but above, a septal bone appears; and below, a very frequent centre, the "postseptal" or *trabecular* bone (*tr*) has commenced. This is the bone which, in many typical Carinatæ, forms the postero-inferior angle of the septum nasi; and it bounds the great "hinge" in front. Here it is seen midway between the ethmoid and the fore part of the huge, deep septum. The symmetrical parts of the nasal labyrinth are supplied with arrested centres of ossification; on the inner face of the alinasal turbinal (figs. 8, 9, *a. tb*) there is a long, lanceolate tract of endostosis; and on the base of the posterior third of the left alinasal turbinal there is a patch (fig. 9, *a. tb*) both ectosteal and endosteal.

On the outer face of the "inferior turbinal" there is a large wedge-shaped, well-ossified tract, with its base behind; and on the outer face of the upper turbinal there is a squarish bony tract, the size of that on the inferior turbinal. Also the posterior half of the alinasal wall is ossified as in *Gecinus viridis* and many of the "Coccygomorphæ." All these bony centres are of great interest; for they represent the various commencements of the continuous bony growths seen in this region in such birds as *Gymnorhina*, *Artamus*, and also in birds that lie beyond the passerine boundaries.

Perhaps in the whole range of ornithic morphology there is no character more to be depended upon than that cleft in the trabecular commissure which, growing upwards, divides also the anterior nasal from the true olfactory region. Yet in *Pitta* and *Grallaria* this is almost absent, and their intense *struthiism* is combined with ægithognathism of the highest degree. The vomerine moieties have grafted themselves upon the end of the alinasal turbinals (fig. 9, *a. tb*, *v*); and, on each side, a septo-maxillary (*s.mx*) supplements this peculiar metamorphic union of diverse parts. The thick, massive upper lobes of the vomer evidently owe their great size both to the alinasal turbinals and to the proper vomerine cartilages. As in *Pitta*, the rest of the vomer is flat, and the crura are near together; they coalesce with the coiled ethmo-palatine.

The next arch is extremely like that of *Pitta* (see figs. 6 & 8); the pterygoids (*pg*), however, are slenderer, and the postpalatine keels longer: these are separate from the pterygoid; but they are greatly developed above by a mesopterygoid segment, larger than that of *Pitta*.

So also we have in *Grallaria* slenderer præpalatine bars (*pr.pa*) and much more development of the transpalatine spike (*t.pa*), which is here in a state very common in the higher *Southern* Coracomorphæ. The arrest of the lower spike of the palatine (interpalatine, *i.pa*), the coil of the upper or ethmo-palatine (*e.pa*), and the narrowness of the band connecting these laminæ with the outer edge, these are all *pittine* characters; but this bond is oblique, and not transverse as in *Pitta*; in this, it agrees with the next and much higher type, namely *Artamus*. The elements of the upper jaw and zygoma are strongly soldered together; and from the maxillary region there grow *struthious* maxillo-palatines (*mx.p*), exactly like those of *Pitta*.

The nerve-passage above the antorbital is narrower than in *Pitta*; and the plate itself is thinner and more produced at its angle (fig. 8, *p.p*); but there is no sign of either a lacrymal or an "os uncinatum."

On the whole, the cranio-facial differences seen in these two types, whose habitat is so far apart, merely bespeak a subgeneric distinction. Close to the Struthionidæ in certain respects, in others they have made a stride past the lower Coracomorphæ generally. That the lower struthious characters are due to arrest at a stage which corresponds to the end of the second third of incubation in the true Crows (*Corvus*) and in the Fowl, does not affect the relationship of these birds to some lost forms of the "Ratitæ."

Example 9. *Artamus leucorhinus.*

Habitat. Celebes. Group "Oscines," Müller; family "Artamidæ."

The last instances were *two-faced*; they looked to the Ratitæ, and to the nobler Southern Coracomorphæ. My present instance is also one of these.

Looking at the palate of this "Wood-Swallow," it is difficult to say to which of these two types it is most related; it is in some things intermediate between them. This great similarity is modified by two things, namely by far intenser ossification and by complete ornithic metamorphosis. Although the growth of another branch, yet this bird culminates, as a southern type, at nearly the same level as the Piping Crow (*Gymnorhina*).

The basitemporal region (Pl. LVIII. fig. 1, *b.t*) is less evidently trilobate than in *Pitta*; and the parasphenoidal region (*pa.s*) is less bulky. The rostrum ends at an unusual distance behind the hinge; and the basis faciei shows no mark of its former compositeness.

The hinge, or cranio-facial cleft, is perfect, totally unlike its pittine prototype; and the fore part of the middle ethmoid shallows gradually, and is rounded in front. The trabecular and nasal elements are all ankylosed; and the bone here, as in the rest of the skull, is more elegantly light and spongy than in *Grallaria* and *Pitta*.

As in *Grallaria*, the nasal vestibule is of very great size; but here it is ossified to an unusual extent; and the nasal floor, so small in the types just described, but largely developed in the Turnicidæ (Pl. LIV.), is here quite perfect, has undergone thorough ossification, and is ankylosed with all the surrounding parts (Pl. LVIII. figs. 1 & 2, *n.f*); hence the septum (which is here a crest to this strong, bony plate) is not seen in the palatal views. Yet, within, the posterior part of the alinasal turbinals, and, without, the hinder part of the alinasal walls are soft; and so also are the inferior turbinals. The extreme end, however, of the alinasal turbinals has a borrowed source of bony matter in the large upper spongy lobes of the vomer (*v*); these have evidently coalesced with the small lateral septo-maxillaries (see *Grallaria*, Plate LVI. fig. 9, *s.mx*). The upper and anterior vomerine lobes wall-in a deep sulcus, and are extremely beautiful and pneumatic; their air-passage is above, and is very large. The difference which can be detected in this very *Pittine* vomer is, that it is more spongy, has drawn more upon the turbinals, is subcarinate below, and has a larger space between its crura; in the shortness of its conjoined part it is like *Grallaria* and not like *Pitta*: this oscillation between these two relations is to me a very striking thing[1].

Of exactly the same pattern, yet the palate, like the rest of the face, is broader than that of *Grallaria*; and this outspread form of the whole face gives wider individual parts. In mere form, the pterygoids, with their arrested epipterygoid hooks, are not altered visibly; but they, and their mesopterygoid segment, have become ankylosed to the palatines: this is part of the generally intense ostosis of this bird. In the palatines a change is easily discerned; it is the lessened condition of the postpalatine keels (*pt.pa*), so large in the lower Coracomorphæ. The "transpalatines" (*t.pa*) are broader and altogether more developed; they are flatter and better-formed; and, having had a fuller matrix of cartilage, they are less like mere periosteal outgrowths.

The ethmopalatine lamina takes a less sweep; its spur is fused with the upper edge of the vomer; as in the two last, there is no interpalatine spur (*i.pa*). Strongly as all the fore palate is fused together, the broad præpalatal bars (*pr.pa*) are only ankylosed by their tips; they are flat, very elastic, and yet exquisitely pneumatic. At first sight, the maxillo-palatines (*mx.p*) would seem to be as large as in *Grallaria*; they are, however, enlarged by their bony union with the "inturned alinasal well" (*i. a. l*).

The process, however, has a broad base, and belongs to the simple type; the maxillary, behind the process, is broad and spongy, and is widened by the divergent angular process of the præmaxillary: the jugal bar is one continuous bone.

In the ethmoid we see an ascent in type; for the common nerve-passage is more chink-like, the antorbital has aborted the lacrymal as in the last two kinds, its angle is modified; it is præmorse, as in *Pitta*; but the outer angle of the bitten part turns inwards, and forms a very distinct "processus uncinatus" (fig. 1, *o. u*).

The antorbital is spongy, but it is thin, as in *Grallaria*, not swollen as in *Pitta*—another instance of that peculiar oscillation of this bird towards the Bornean and

[1] Here is a lesson for the palæontologist! Fragmentary fossils, the palatine remains of this bird, especially if the second arch had remained intact, could never have told any other than a *pittine* or a *grallarian* tale.

American types; it is as if its father had been a *Grallaria* and its mother a *Pitta*, but to become an *Artamus* it had risen higher in the ornithic scale than either of its parents.

Example 10. *Dendrocolaptes albicollis*, Vieill., ♂.

Habitat. Brazil. Group "Tracheophonæ," Müller; family "Dendrocolaptidæ."

Mr. Salvin's collection yields me five types of this kind of Southern passerine, in which the ægithognathism is of the first or distinct variety of the complete kind; the members of this family and of the "Tyrannidæ" seem to me to stand near to, but in reality higher than the "Formicariidæ;" I speak thus, however, rather of their facial morphology than as an ornithologist.

In some of these, as in my present instance, the basipterygoids are indicated by spurs of the basitemporal (Pl. LIX. fig. 1, *b.t*, *b.pg*). At first sight this seems a trifle; but morphology has no trifles: it is a Lacertian stigma. Every student knows that the *innermost laminæ* of the massive "parosteal" basitemporals of the bird become the practical symmorphs of the Lizard's basisphenoids—symmetrical ectostoses; also that, whilst in the bird the basipterygoids are ossified by the parasphenoidal rostrum, in the Lizard they are hardened directly from the basisphenoids. In our ascent from the less developed to more highly metamorphosed types, we constantly come across this "changing of hands," in the finish of a part. That *Dendrocolaptes* should have the Lacertian character is like a touch of "atavism;" it can scarcely be other than a delicate link in a long evolutional chain. The strong, rounded parasphenoid (Pl. LIX. fig. 1, *pa.s*) is short in this long-faced bird; it forms the underbalk to a very massive, non-fenestrate interorbital septum.

The ossification of the nasal labyrinth is very similar to that of *Grallaria*; but I find no trabecular bone; the upper septal ossification is less; and so is that behind, on the upper turbinal; that on the inferior turbinal is larger.

The alæ nasi outside are quite soft; but their turbinals have each a long endosteal tract, as in *Grallaria* (see Pl. LVI. fig. 9; and Pl. LIX. figs. 1 & 2, *a. tb*). I find no subnasal alæ to the thin knife-like cartilaginous septum nasi: the fenestra separating it from the meso-ethmoid (fig. 3, *p. e*, *c.f. c*, *s. n*) has become a "notch" by extension downwards of the cleft, such a closed cleft as is seen in *Grallaria* (Pl. LVI. fig. 10, *c.f. c*). In this respect *Dendrocolaptes* has risen above those "Formicariidæ;" but in its ægithognathism it is below them; for I cannot find any advance of the bony matter of the vomer into the turbinals; it stops quite short. The vomer (*v*) is very curious, its coalesced part being very wide and short, and its legs almost close together. A small septo-maxillary (fig. 2, *s.mx*) is seen intervening between the outer angle of the upper vomerine lobe and the extremity of the alinasal turbinal. The flat, broad, closely clinging vomerine crura are ankylosed to the ethmo-palatine plates; the angular process on each side, in front, is articulated obliquely and strongly to the maxillo-palatine, in the manner of a zygapophysis. The ankylosis of the secondary bones of the upper jaw does not obscure this region; the dentary, nasal, and palatine processes of the præmaxillary are well marked (figs. 1–3); the body of that bone is of great length.

The palatine arch, like that of *Artamus*, has lost the distinction of proximal and distal segments; the pterygoids, as in the last three instances, are straight, stout bones, becoming alate in front; the epipterygoid hook (fig. 1, *e.pg*) is typically developed. The postpalatine crests (*pt. pa*) are less everted than in *Grallaria*, and are very close together; they are quite as large as in that type and in *Pitta*; the interpalatine spur is aborted, and the ethmo-palatine lamina is scrolled (fig. 3, *e.pa*). The mesopalatine region is becoming of greater extent; and the transpalatine snags have that remarkable development backwards seen in many Southern passerines. The præpalatines are very *pittine*, short, broad, fibrous, concave above, and convex below.

The maxillo-palatine laminæ are elegant little *ears* of bone, and are far apart, articulating with the angles of the broad-shouldered vomer; the strong but slender and compressed zygoma (*j*) is one with the rest of the fore face.

Dendrocolaptes is *above* the Formicariidæ in the condition of the maxillary palatal plates, as well as in the palato-pterygoid arch. As in many of the higher passerines, there is a small lacrymal (fig. 3, *l*) ankylosed to the upper part of the descending crus of the nasal. The antorbital (fig. 3, *p.p*) has a concave outer margin, and a very *uncinate* angle; below, it has a suture, dividing off the tip and the fore part of this bar from that which passes inwards to the meso-ethmoid (*p. e*). The angle and part of the outer face is the os uncinatum (*o. u*); and this has most probably coalesced above with an upper lateral ethmoid, the bone described in the Rook (Pl. LV. fig. 5). The foramen for the two nerves (figs. 3, 1, 5′) has lessened very much in size. The ecto-ethmoid is not flush with the face as in most passerines; and the frontal portion is small. This bird is not one of the highest of the Southern Coracomorphæ; it is an ascent, however, from the Formicariidæ.

Example 11. *Anœretes parulus.*

Habitat. Chili. Group "Tracheophonæ," Müller; family "Tyrannidæ."

This is one of the smallest of the family, and, like one of the smallest of our native Warblers (the Wren), shows a peculiarity not seen in larger forms, namely a development of the vomerine cartilages equal to what is seen in *Turnix*.

The bat-shaped basitemporal plates, and the rounded parasphenoidal beam (Pl. LIX. fig. 4, *pa.s*) are quite similar to those of the next example, *Synallaxis* (Pl. LIX. fig. 6, *bt*, *pa.s*); the hinge is perfect; and the septum nasi (*s. n*) is very large and thoroughly ossified; it is *alate*, as in *Corvus* and *Sylvia*.

The recurrent alinasal fold (fig. 4, *rc. c*) and the hinder part of the alinasal wall (fig. 4, *n. w*) are also ossified. The postero-inferior element of the septum nasi is entirely ankylosed with the bony matter from the roof and front of the septum; and the chink between the septum and perpendicular ethmoid is very small above: it agrees, then, in this respect, with *Dendrocolaptes*.

The vomer (figs. 4 & 5, *v*) is very large, relatively; and anteriorly it is twice as wide as it is behind: this answers to *Dendrocolaptes*. Here the vomers proper do not unite with the inturned alinasal lamina (*i. a. l*), but form the ossified and coalesced hinder portion of the "vomerine cartilages" (*v. c*), which are longer, relatively, than in *Turnix*, and reach more than halfway along the sides of the septum nasi towards the recurrent lamina (*rc. c*).

This species and the Common Wren (*Troglodytes vulgaris*), where the two vomerine cartilages coalesce in front, and the Hemipod, are the instances which satisfy me that the vomerine cartilages are not merely the long extremities of the recurrent fold, detached, and separately chondrified, through the rapidly produced "prognathism" of the bird's face, but are a pair of upper labials. The broad shoulders of the vomer are formed by the addition of a square septo-maxillary (*s.mx*) on each side; and it is this bone which grafts itself on the inturned alinasal wall (*i. a. l*).

The pterygo-palatine arch is very similar to what I am about to describe in *Synallaxis* and *Muscisaxicola* (Pl. LIX. figs. 6 & 9). The pterygoid retains its distinctness (fig. 4, *pg*); and its "hamular process" is long and slender. As in *Muscisaxicola* (fig. 9) and *Dendrocolaptes* (fig. 1), the postpalatine ridges (*pt.pa*) are fined off; and as in *Synallaxis* (fig. 6), the slenderer transpalatine spurs (*t.pa*) are turned outwards as well as backwards. Of the laminæ that form the roof and the floor of the nasal passage, the latter ends in a long interpalatine spur, and the former is arched (fig. 4, *i.pa*, *e.pa*). The forward continuation of the palatines is very slender (*pr.pa*).

The lateral ethmoids are large, square, and have one wide, large opening above the antorbital, for the 1st and 5th nerves. The frontal region of the lateral ethmoid is moderate, the os uncinatum below not distinct; and there is no lacrymal, as far as I can see; the maxillo-palatines are not pedunculated (see fig. 4, *mx.p*, which shows the *root* of this process).

Example 12. *Synallaxis flavigularis*.

Habitat. Chili. Section "Tracheophonæ," Müller; family "Dendrocolaptidæ."

The skull of this bird is unrivalled for elegance and delicacy of structure; this is especially seen in the palate (Pl. LIX. fig. 6). The swollen, cellular basitemporal plate (*b.t*) is bat-shaped, and has the median part not much produced forwards. The parasphenoidal beam (*pa.s*) is very broad-based, and is without basipterygoid processes.

From the Eustachian opening (*eu*) to the solid part of the præmaxillaries, the basifacial axis is one continuous structure; but the posterior or upper third of the trabecular bar is separated from the ethmo-præsphenoidal bar by a very large interorbital fenestra; the rest of this coalesced arch is in a state of permanent fusion with the descending septal crest of the nasal organs.

Moreover it is evident that in these songless passerines we have not travelled far from the level of the great *pluvialine stratum*; for the "notch" is only marked out by bony tracts (fig. 8, *p. e, s. n*), the fore part of the perpendicular ethmoid being separated by synchondrosis, and not by fibrous tissue, from the postero-inferior septal bone—a trabecular tract; and this has in front of it two bones belonging to the common septum of the nasal sacs. The foremost of these, as usual, ossifies the recurrent lamina, and the alate region of the septum nasi (*tr*). Let this state of things be compared with what the reader will see in *Ocydromus australis*, *Gavia ridibunda*, *Uria troile*, and *Alca torda*, and he will see at a glance how near this elegant little Southern passerine comes to the more specialized *pluvialine* "Schizognaths." The lateral parts of the nasal vestibule are all soft; the part of the compound vomerine bone joined to the inturned alinasal wall is a distinct, transversely placed bone, somewhat reniform—the septo-maxillary (fig. 7, *s.mx*). The vomerine elements themselves have ossified the fore part of the vomerine cartilages; and these serrated blades of bone lie on a higher level than the thick part of the vomer, the commissural part of which is squared in front, and has a rounded notch behind. The shoulders of the bone pass gently into broad crura, which stride along the parasphenoid, and are welded to the coiled ethmo-palatine laminæ. This type is ægithognathous in a complete manner; but it belongs to the *first variety.*

The pterygo-palatine arch displays the same *southern* characters as the trabecular. The pterygoid has a long, delicate hook, a straight shaft, spreading in front; its fore edge is free; and the palatines, which, although typical in borrowing a mesopterygoid lamina, have long, rod-like transpalatines (*t.pa*); these spurs are turned outwards. The broadish floor of the nasal passage is twice notched, in a shallow manner, behind, and sends a sharp interpalatine spur (*i.pa*) forwards. The *roof* of the tube is elegantly arched, passing forwards to combine with the vomer; the postpalatine keels are large and divaricate (*pt.pa*).

The thick edge of the outspread mesopalatine region passes on into the præpalatine (*pr.pa*). This is a most slender bar, which, from a compressed, becomes a depressed band, ankylosed in front to the præmaxillary.

The external bones, præmaxillary, maxillary, and jugals, are all ankylosed together. The maxillo-palatine process (*mx.p*) is delicate and falcate; it is subpedunculated; the body of the bone, where it arises, is pneumatic. The palatine processes of the præmaxillary (*p.px*) are very well marked and extremely slender.

The lateral ethmoid (fig. 8, *p. p*) has a concave outer edge—an uncinate "lower angle" (*o. u*), a large common foramen above, and is not flanked by any apparent lacrymal.

On comparing this type with the large *Dendrocolaptes*, it is easy to see that most of the difference between the two arises from *mere size.* All that is independent of that cause, however, is of a very instructive nature; and much as this elegant little bird resembles our Old-World Chats, Wagtails, Pipits, &c., it is a creature of the "Notogæa," and belongs to a lower level.

Example 13. *Muscisaxicola mentalis.*

Habitat. Chili. Group "Tracheophonæ," Müller; family "Tyrannidæ."

This is a larger bird, and has a stouter face than the last; yet, on comparing the palates together, it is easily seen how near they are in nature. The character of the bony substance in the two is exactly alike, both in the cellular and in the fibrous parts; it is of the most delicate kind. The basitemporal projects more at the mid line under the Eustachian opening (Pl. LIX. fig. 9, *b.t, eu*); and the posterior part of the parasphenoid (*pa.s*) is not so thick. The hinge-notch is more perfect than in *Synallaxis*, and the septum much deeper and more largely alate (Pl. LIX. figs. 9 & 10, *tr*); it much resembles that of *Homorus* (see Pl. LX. figs. 1–4), but it is deeper, as in *Dendrocolaptes* (Pl. LIX. fig. 3, *s. n*). The alæ nasi are soft externally; but their turbinals are ossified (fig. 9, *a.tb*), as is also the nasal floor (*n. f.*) and part of the recurrent fold (*rc. c*). The inferior turbinals have patches of endostosis. On the whole, the anterior part of the palate is very much ossified for so small a bird. The vomer is large (figs. 9 & 10 *v*); and the inturned lamina (*i. a. l*), like the alinasal turbinal, is ossified by its own endosteal deposit, and *articulates* with the large swollen lobes of the vomer—that is, with its coalesced septo-maxillaries: this belongs to the 1st variety of "complete desmognathism."

The bony septum, behind its large subnasal alæ, is very solid and even bulbous; and it is almost embraced by the still more bulbous upper lobes of the vomer. The vomer is broad, flat, largely united at the mid line; and its flat crura are near together, and ankylosed to the ethmo-palatines.

The likeness and the unlikeness of the next arch in this type and in *Synallaxis* is very instructive, as showing very fine, and yet quite measurable and evident diversity. The delicate, arcuate, ascending apex of the pterygoid (*e.pg*) has here its fullest ornithic growth; the whole pterygoid (fig. 9, *pg*) is longer, more arcuate, and clings more closely to its fellow in front, where it sends upwards a flat, leafy lobe, which articulates in front with the mesopterygoid lobe of the palatine, once a separate bone.

The postpalatine laminæ are cut away, as it were, below; and the body of the bone is more spongy than in *Synallaxis*; the præpalatal bars are equally delicate, and form one continnous and almost straight bar with the edge of the broad part and the retral transpalatine (*t.pa*). The ethmo-palatal is dome-shaped, as in all these types.

The investing bones are all ankylosed together; the maxillo-palatines (figs. 9 & 10, *mx.p*) are like pruning-hooks, and are somewhat pedunculate.

The ecto-ethmoid is squarer than in *Synallaxis*, its outer side being less concave, and its angle less developed; it is a flat, spongy plate, appearing moderately above, and having over its antorbital region a huge doorway from the orbit into the nasal sac, through which both kinds of nerve pass.

Example 14. *Homorus unicolor.*

Habitat. Mendoza, La Plata. Group "Tracheophonæ," Müller; family "Dendrocolaptidæ."

My third example of these South-American "Dendrocolaptidæ," is twice as large as the others; it is likest *Muscisaxicola*, and is of great interest, inasmuch as it *underlies* the Piping Crow, just as *Grallaria* underlies the Wood-Swallow (*Artamus*).

If this should seem to be fanciful, I would request the most imaginative believer in *sudden, separate* creations, to compare the two as they have been drawn by me in Pl. LX. (figs. 1 & 5).

Moreover, if the same grave doubter of the unity of Nature will supply me with the *ripe chick* of a Piping Crow, I will promise to make a drawing of its palate that shall be superimposable on that of *Homorus*, and the twin drawings shall, for lack of difference, be undistinguishable.

On the whole, this type comes very close to *Dendrocolaptes*; and the first thing to be remarked is, that beneath the metamorphosed apices of the trabeculæ we come upon the basipterygoid processes, springing from the basitemporal bones, as in *Dendrocolaptes* (see Plate LX. fig. 1, and Pl. LIX. fig. 1, *bt*, *b.pg*).

The parasphenoidal rostrum (*pa.s*) is full behind, and narrows gently forwards; it scarcely projects below the hinge; the crest of the trabeculæ is of moderate height, below the interorbital fenestra. The septum nasi is well ossified, *alate*, and typical (Pl. LX. fig. 4, *s. n*); it is separated from the diminished front end of the meso-ethmoid (*p. e*) by synchondrosis, as in *Synallaxis* (Pl. LIX. fig. 8, *s. n*, *p. e*); so that the notch is only half through the ethmo-septal plate. The ossified septum sends its bony matter along the well-marked recurrent lamina (*rc. c*); and this process lying below the septal subnasal alæ (*tr*), a space is formed; this is the well-known *perforation* of the ornithic nostrils. Here the alinasal floor is large and unossified (*n. f*); and the *wall* (fig. 4, *n. w*) is partly ossified behind.

The alinasal and inferior turbinals are soft, or nearly so; behind the flat part of the septum, which is ossified—a true facial (trabecular) bone, there is a median ossicle, one of the "septo-maxillary" series (figs. 2 & 4, *m.s.mx*); we shall find this bone in the next higher type. The vomer (figs. 1 & 2, *v*), is of immense breadth in front, and very spongy; it soon narrows; and its crura are compressed and wide apart. A point of cartilage still unossified on the inner angle of the large upper lobe of the vomer shows that here this bone largely owes its size to the vomerine cartilages (*v. c*); they are also partly ossified by a pair of septo-maxillaries, which form large epiphyses to the vomer (figs. 2 & 3, *s.mx*). The groove on the upper surface of the vomer is narrowish and tolerably deep. In this type the alinasal turbinal is attached to the large septo-maxillary; and this kind of complete ægithognathism is of the first variety. The ethmoidal region is wholly dendrocolaptine: the falcate pars plana (*p. p*) is widely severed from the roof, and carries a seed-shaped "os uncinatum" (*o. u*) on its outturned extremity; this, as we have seen, is an endo-skeletal element of the first or trabecular arch.

The pterygo-palatine arch is true to the family character. The short, straight pterygoids (fig. 1) are elegantly hooked behind, and terminate in front by ankylosis; this element and the rest fall back into the original simplicity of this bar. The mesopalatine region (fig. 1, *pa*) is large, both fore and aft and transversely; the postpalatine ridges are moderately developed; and the transpalatine processes are strong, retral, somewhat out-turned spines; they are continued as an outer ridge to the broad part, and then the bone is passed forwards as a stiff bar, gently converging to its fellow: thus there is but a slight sinuosity from the terminal point of the bar and that of the retral process. The space between the outer ridge and the interpalatine ridge is well scooped; the spurs are short. The arched ethmo-palatine is notched in front. The investing facial bones are strongly ankylosed together; the maxillo-palatine processes (*mx.p*), like those of *Muscisaxicola*, are flat, gently curved, and knife-like; they do not form a strong connexion with the shoulders of the vomer.

Thus, with its own peculiarities and an evident tendency towards the Southern-Crow type, this bird is related very intimately, right and left, to the other members of the family "Dendrocolaptidæ."

The lacrymal (fig. 4, *l*) is very small in *Homorus*, as in many Coracomorphæ.

Example 15. *Gymnorhina tibicen.*

Habitat. Australia. Group "Oscines," Müller; family "Gymnorhinidæ."

Here is another *eastern* type, which is merely a more highly specialized, a more completely metamorphosed *dendrocalaptine* bird. Suggesting to the observer its own name (Crow) with the modifying epithet "Piping," this is yet a bird which is the culmination of a very different branch of the Ægithognathæ from that of the true Crows of the Old World ("Arctogæa"). There are not many internodes between this upper type and the Chilian and Brazilian birds that grow out below it. Two of the further specializations that characterize it from these are a greater intensity of ossification, and the metamorphosis of the *contractor tracheæ* muscle into the motors of the "syrinx."

Comparing the skull of this bird with that of *Homorus*, in a general way, as to form and strength, the difference is very similar to that between those of *Gecinus viridis* and *Picus major*; yet there is, altogether, in *Gymnorhina* a rise, both zoological and morphological.

The basitemporal and parasphenoidal regions (*b.t*, *pa.s*) in these birds would, to a hasty observer, seem to differ only in size; so much is one a repetition of the other. Yet a second look shows that in *Gymnorhina* the basipterygoid processes (Pl. LX. fig. 5, *b.pg*) have found their proper ornithic position, namely on the parasphenoid (*pa.s*). This bar itself is also more elegantly narrow than in *Homorus* (fig. 1). Yet the presence of these basipterygoids, even as prickly rudiments, is a rare thing amongst the Coracomorphæ, and bespeaks a nearer relationship to the plebeian types below than obtains in the true Crows of the Old World.

In the absence of the young of this bird no other type could have been found more apt as a key than the far-western *Homorus*; for in *Gymnorhina*, ossification runs riot, and the very numerous osseous centres melt into each other, if not *here*, yet *there*; at some point or extremity, or jutting snag, they lose their individuality, making the morphologist wonder why this puzzle grew from so many pieces. The notch in the basifacial axis is a very large triangle, with its apex upwards; it is perfect, and the point of the parasphenoid does not reach it. In front of the notch, or hinge, is the well-ossified nasal septum, which is fenestrate and deep in front, and shallow behind; and its lower edge and subnasal alæ are ankylosed to the intensely ossified nasal floor (fig. 5, *n.f*); and this is a continuation of the solid, bony alinasal. Where they arise, there the alinasal turbinals are ossified; for the rest, they are soft, save at the end, where the upper vomerine lobes (figs. 5 & 6, *v*) have run into them, by grafting (fig. 7, *v*, *i. a. l*). So also the aliseptal has coalesced by bony union with the outer facial walls, as in the mammal, and has also, as in the young mammal, a top-shaped bone, formed by ossification of its posterior end, the part attached to the bony "pars plana." Hence, in seeking in the adult for the "trabeculæ cranii," we find that foremost facial arch metamorphosed into a great variety of substructural bars and beams and outgrowths of periosteal bone. The apices of the two early coalesced bars are involved in the great "temporal wings of the parasphenoid," forming the "anterior tympanic recess" (fig. 5, *a. t. r*); then the narrowing portion forms the sides of the sella turcica; narrowing still, it forms the base of the interorbital fenestra, where the two primordial bars first formed their commissural union.

A continuation of this part substructs the septum between the functional part of the nasal sacs—the perpendicular ethmoid; there the notch severs the once double bar, and the rest of the trabeculæ form the base of the partition between the vestibular parts of the nose and also, where the trabeculæ keep flat, the floor of the nose between the outer nostrils. The azygous process of the trabeculæ (the prænasal cartilage) is absorbed, being aborted by the huge splints formed upon it, as upon a model: I refer to the foremost facial splints, the præmaxillaries. Yet this does not exhaust even the "endo-skeletal" parts of this arch; for the lateral ethmoid has a small os uncinatum (fig. 8, *p. p*, *o. u*) attached to its lower angle; this is the conjugational bone between the two præoral arches.

I have spoken of the dense and everywhere ankylosed præmaxillaries; these are the foremost splints: but five more *secondary* ossifications belong to the trabecular arch; these form a single bone in the adults. But these five osseous elements were brought into relation with a pair of "vomerine cartilages." All these things are hidden in the curious three-horned vomer of the adult; and this now single bone has lost its freedom, being bound to the ascending plates of the palatines behind, and *grafted* upon the alinasal turbinals in front (fig. 5, *v*, *e.pa*; figs. 6 & 7, *v*, *i. a. l*); also it is articulated strongly by a kind of zygapophysis to the maxillo-palatine on each side (figs. 5, 6, 7, *v*, *mx.p*). The stones and the cement used in this building, the strength and safety of which have been "cared for with all this care," are illustratively shown in the more general type last described, namely *Homorus* (Pl. LX. figs. 1–4).

The septo-maxillaries have become fixed with the vomerine moieties to form the shoulders of the compound bone (compare figs. 2 & 7); but these paired ossicles do not account for the *spine* which grows from the middle of the vomer above (figs. 5–7, *m.s.mx*); this is not symmorphic with the long style in which the vomer ends in the Humming-birds, which is in them merely an ongrowth of the two halves of the bone; but here the membrane-bone seen separate in *Homorus* (figs. 1, 2, 3, *ms.mx*) has coalesced with the other vomerine elements.

But for *Homorus*, I should have spoken more cautiously of the median vomerine spine of *Gymnorhina*; but now I speak boldly, and can show the sceptical reader the same thing in many a type. It is, indeed, an ossification of the lower edge of the membrane that fills up the "cranio-facial notch," and is therefore peculiarly ornithic: he who would seek for it in other classes should consider that it *cannot* be there, as they possess no such cleft in their facial axis. In *Gymnorhina* there is in this bone a growth upwards, tending to fill the gap; this crest is fenestrate (fig. 7, *m.s.mx*).

There are differencing characters in the two types here compared; but the South-American bird is merely a more embryonic and smaller bird than the Australian Piping Crow, which in size and in specialization has stolen a march upon its meaner relative. The observer reads this in a moment in the two palates (figs. 1 & 5); and the portrayal of these parts on one scale makes the comparison easier. The short, stiff, uncinate pterygoids (fig. 5, *pg*) of *Gymnorhina* are not quite so alate in front as those of *Homorus* (fig. 1, *pg*); yet they are in both ankylosed to the palatines. This continuity of bone-matter makes a wall on either side of the posterior nasal canal, which is here much longer than in *Homorus*; and these ridges, belonging chiefly to the palatines, are not so strong and outstanding as in "Dendrocolaptidæ" and "Formicariidæ;" they are also more bevelled off towards the end. The ridges which enclose the basifacial balk are principally due to the coalesced mesopterygoids; and they end in front in a less arched ethmo-palatine, which is ankylosed to the vomerine crura. Both the interpalatine plates, with their aborted spurs, and the upper ethmo-palatine laminæ are of small extent, fore and aft, as compared with *Homorus* (fig. 1); hence the postpalatine region and the trans-palatine spikes (*t.pa*) are much longer than in the lesser bird.

These peculiar styliform transpalatines are found, as far as I have seen, only south of, or upon the equator; and their very curious character, always correlated with other differences, might justify one in dividing the "Coracomorphæ" into two sections, the "Noto-Coracomorphæ," and the "Arcto-Coracomorphæ." With a most remarkable amount of harmony between the two types, namely *Corvus* and *Gymnorhina* (Pl. LV. figs. 1 & 6; and Pl. LX. fig. 5), this modification of the palatines strikes the eye at once; and looking abroad we find it characterizing the "Formicariidæ," "Dendrocolaptidæ," "Gymnorhinidæ," "Tanagridæ," and "Artamidæ," and in those exquisite little Australian types *Acanthorhynchus* and *Ptilotis* ("Meliphagidæ").

In the "Cotingidæ" and "Tyrannidæ" the transpalatine process is very rudimentary, and also in some of the "Formicariidæ" (as in *Thamnophilus*), also in the Australian *Menura*. In *Artamus* and in *Elainea* (Tyrannidæ) the process is flattening out; and they approach our own "Laniidæ."

In *Gymnorhina*, from the retral apex of the transpalatine process to the extremity of the palatine, in front, this bony bar is straight and stiff; from being obliquely compressed it becomes, further forwards, depressed, and is fast bound down to the præmaxillary in front (fig. 5, *pr.pa*); but, as in *Artamus*, it is quite free from the hard nasal floor, and is, indeed, some distance below it.

The palatines and maxillaries are only in contact in front, where they are ankylosed to each other and to the præmaxillaries; for the maxillo-palatine flaps (figs. 5 & 6, *mx.p*) are a good height *above* the strong elastic palatine bar. These processes are ankylosed to the inturned alinasal floor, the edge of the lower process of which fringes the antero-internal edge of the maxillo-palatine (*n. f*, *i. a. l*, *mx.p*).

The form of the maxillo-palatines is like an ear; and they are thin, sinuous, tooth-edged laminæ, shaped like those of the Crow (Pl. LV. fig. 6, *mx.p*), but not possessing the thickened inner edge which in that type borders a large air-cell. Behind these processes the maxillaries are developed inwards behind the angle of the præmaxillaries, still striving to floor-in the palate. In front they are ankylosed to the præmaxillaries, nasals, and ossified nasal sacs, and behind to the strong compressed jugal (*j*).

With the exception of *Pachyrhamphus* ("Cotingidæ"—Pl. LVII. fig. 7, *e.eth*), *Gymnorhina* has the largest frontal plate to its lateral ethmoid. The antorbital is very thick and spongy; it has a concave outer margin, an outward lower angle, a large common foramen above it (as large, relatively, as in *Homorus*), and, as in that species, the angle carries a small epiphysial *os uncinatum* (Pl. LX. fig. 8, *o. u*). As to the lacrymal, it is thoroughly corvine (fig. 8, *l*) both in position (jammed in below the præfrontal and nasal) and in shape and substance.

In short, to sum up the characters and relationships of the Piping Crow, it is a "Notocoracomorph," an ascent from the short-billed "Dendrocolaptidæ" of the western regions of the "Notogæa," a true singer, having large inferior laryngeal muscles; and it has a *fine voice*. It crops up in the great *bird-tree* like another and scarcely inferior "leader" to that formed by the Old-World Crows, Daws, and Magpies.

Example 16. *Hyloterpe sulfuriventer.*

Habitat. Celebes. Group "Oscines;" family "Sylviidæ."

This Malayan type (Pl. LVIII. figs. 3 & 4) strongly reminds one of the South-American "Cotingidæ," *Pipra* and *Pachyrhamphus* (Pl. LVII. figs. 1–7); and indeed it seems to me to be another eastern form which has undergone further metamorphosis than its western relatives. It appears to be related to the "Cotingidæ" just as the Piping Crow is to *Homorus* and the Wood-Swallow to *Grallaria.*

If this be the case, if these instances of *changed forms* in the Eastern "Notogæa," corresponding to unchanged (or less changed) types in the Western "Notogæa," can be shown to be common, it will go far towards the establishment of a true theory of the dispersion and modification of types[1].

Near this type I should place *Lanius* (Pl. LXI. figs. 3–6), and below it *Elainea* ("Tyrannidæ"—Pl. LXI. figs. 1 & 2); and I think the true order of these types upwards is "Cotingidæ," "Tyrannidæ," "Laniidæ," and "Sylviidæ."

The peculiarly soft spongy character of the skull in *Pachyrhamphus* and *Pipra* is replaced by a somewhat denser structure in *Elainea* and *Hyloterpe*; but this latter differs much from *Lanius*, the skull of which is much more dense and fibrous, like that of a true *Corvus*, only on a smaller scale. So also in these the basitemporal (Pl. LVIII. fig. 3, *b.t*, and Pl. LXI. fig. 1) region is bat-shaped, as in the "Cotingidæ;" and the strong rounded cellular parasphenoidal rostrum (*pa.s*), without a trace of "basipterygoid processes," is very similar. In *Hyloterpe* the notch is perfect in the basifacial axis, and the upper or nasal part of the nasal septum is ossified. Mr. Salvin's specimen does not show whether it is *alate*.

The alæ nasi have a bony patch on each side behind the nostril; and the large alinasal turbinals (figs. 3 & 4, *a. tb*) have a large patch on their inner face of an ectosteal character (*s.mx'*); it represents the anterior part of the ophidian septo-maxillary.

This bone articulates with another shorter bony scale, the proper septo-maxillary (*s.mx*), and this with the upper edge of the front of the vomer (*v*). This latter bone has its two halves thoroughly ankylosed for the first half of its length: it is now a large flattish bone with a sharp shoulder, a median and two lateral points below in front, and very flat gently diverging crura that are ankylosed to the palatines. The vomer is slightly carinate in front, that part dipping very evidently.

The os uncinatum is very evident and very instructive (Pl. LVIII. figs. 3 & 4, *o. u*): it is a sharp prickle with a broad bulging base, and appears as an outgrowth of the inner face of the swollen ecto-ethmoid (*p. p*); this latter element has a notched outer margin and a *common passage* for the olfactory and nasal nerves, as in the low types. I see no trace of a lacrymal in *Hyloterpe*.

The second præoral arch (fig. 3, *pg*, *pa*) may be seen at a glance to be intermediate, both in its primary and secondary elements, between a low Cotingine type and the high Corvines. The pterygoids (*pg*) are very similar to those of *Pipra* (Pl. LVII. fig. 1); but they have a better "hamular process," and are slightly arcuate. The laminate anterior end articulates with the leafy plate of the palatine—its mesopterygoid region. The palatines (*pt.pa*) have strong posterior keels, a large median portion with its post-

[1] If not, if every zoological species has been created as it is now, and fenced in by laws that cannot be broken, "a hedge set about it and all that it hath," then I trust, for the sake of true science, that this glamour will soon be removed from our eyes, and that we shall not be lured on further after evolutional Will-o'-the-wisps.

narial roof and floor, and a much more definite two-toothed transpalatine region. The roof-plate, or ethmo-palatine (*e.pa*), has lost its highly arched form, and has become more typical; it coalesces with the vomer. The præpalatine bars are narrow behind, flatter in front, and bowed like those of *Pachyrhamphus* (Pl. LVII. fig. 4); their apparent width in front is partly due to their coalescence with the palatine process of the præmaxillary. That bone, the maxillary, and the jugal are all ankylosed together. The maxillo-palatine processes (*mx.p*) are of great interest, as they retain the non-pedunculate shape of the low types, and are large, broad-based, pointed knives of bone, less typical, indeed, than those of the "Formicariidæ" and "Dendrocolaptidæ." They are like those of *Lanius*, but simpler (Pl. LVIII. figs. 3 & 4, and Pl. LXI. figs. 3 & 4, *mx.p*).

Example 17. *Elainea* ——, sp.?

Habitat. Barbadoes. Group "Tracheophonæ," Müller; family "Tyrannidæ."

In comparing together the skulls of an old *Lanius collurio*, a young first-summer bird of the same species, and an adult *Elainea*, I saw clearly that I had before me three clear morphological strata (see Pl. LXI. figs. 1, 3, 4). The likeness in the fashion of these three palates, and their measurable degrees of difference, are neither fanciful nor accidental. If I can show that the skull of *Lanius* is, morphologically considered, a further metamorphosis of a *Tyrannine* type of skull, and that of *Tyrannus* the modification and ornithic improvement of a *Cotingine* type, then surely there must be some common root for all these. Below the *Cotinga* comes the *Hemipod*, and below the *Hemipod* the Tinamou and the terricolous *Ratitæ*; and here we have ground-leaves, stem-leaves, bracts, calyx, and corolla to our fanciful bird-tree: the metamorphosis is real, however expressed in words.

The basitemporal region in *Elainea* is bat-shaped, and the well-shaped rostrum is of moderate size, and without basipterygoid processes (Pl. LXI. fig. 1, *b.t*, *pa.s*).

The cranio-facial hinge is perfect, and is bounded by bone both before and behind; that in front is a well-formed thoroughly bony nasal septum (figs. 1 & 2, *s. n*). This wall runs, in front, into the two recurrent laminæ (*rc. c*); it is then alate for the foremost half, and the hinder part of the base is alate also where the nasal nerves run. The posterior part of the alæ nasi is ossified; and the bony matter runs inwards above and in front of the maxillo-palatine process as the inturned lamina (fig. 1, *i. a. l*). The vomer (figs. 1 & 2, *v*), where it has utilized the vomerine cartilages and part of the alinasal cartilage, is formed of two swollen divergent lobes, each of which is open outside, (fig. 2), the hollow cavity within having a gaping air-passage. The rest of the double bone is flat and quite normal; no remains of the suture exist between the subsidiary septo-maxillary and the true vomerine piece. The thick spongy ecto-ethmoids are well seen above, have a straight outer margin, a huge common foramen above, and are scarcely pedate below.

The lacrymal (fig. 2, *l*) is pedate, and also shows a good face in the frontal region;

it is one of the largest, relatively, in the whole of the "Coracomorphæ," agreeing with *Pachyrhamphus* among the "Cotingidæ" at one end of the series, and with the "Corvidæ" at the other end.

I find no trace of a separate "os uncinatum," nor of a process that can be certainly claimed as its symmorph. Yet I suspect that the pedate base of the lacrymal is the real element disguised, as a long lacrymal in the Coracomorphæ will at times have an os uncinatum at its outer angle—for example, in *Sturnella militaris* (Icteridæ) and in *Phytotoma rara*.

The pterygoids (Pl. LXI. fig. 1, *pg*) are very similar to those of *Pipra* (Pl. LVII. fig. 1), but have the hamular or epipterygoid process much more developed; they articulate with the palatine and its borrowed mesopterygoid region. The palatines are bevelled off behind, as in *Pipra*; and in like manner the broad part is a mere isthmus of bone, uniting the almost equal and equally pointed ethmo- and interpalatines with the fore-stretching main bar. From this bar there is a jutting snag, outturned as in *Pipra*, but not denticulated: this is the very *embryonic* transpalatine (*t.pa*), very similar in form and proportions to that of the embryo Rook (Monthly Micr. Journ. Nov. 1872, pl. 35. fig. 1, *pa*). From thence forwards the palatine bar is rather broad and very flat, and at its extremity has coalesced with the præmaxillary (fig. 1). The palatine processes of the præmaxillary (*p.px*) are very distinct, as in embryo Crows; but the nasals, præmaxillaries, maxillaries, and jugals (*n*, *px*, *mx*, *j*) are all ankylosed together. The maxillo-palatine processes (*mx.p*) have the stamp of lowness upon them; they are broad-rooted decurved flaps of bone, essentially like those of the "Cotingidæ" and "Formicariidæ."

The importance of this type to the morphological zoologist will be best seen in the next, a more specialized and nobler form of the "Coracomorphæ."

Example 18. *Lanius collurio.*

Habitat. Great Britain. Section "Oscines," Müller; family "Laniidæ."

These rapacious passerines, the Butcherbirds, come next beneath the lesser Corvidæ, such as the Jay (*Garrulus*); they are not equal to them ornithically.

The whole structure of the skull is of a denser more fibrous bone than in the lower related types, and is very similar to that of the Jay. The basitemporal (Pl. LXI. fig. 3, *b.t*) region is now a low triangle with its base behind. The rostrum of the parasphenoid is slender and void of outstanding basipterygoid processes behind; it is thoroughly blended with the overlying trabecular beam. The notch in front of these parts is perfect; and in front of the notch there is an ossified septum nasi in the adult (fig. 5, *s. n*). Here, however, the ossification is not so intense as to mask the composition of the parts; for the large postero-inferior bone is separate from the anterior and upper part, which is not quite ossified below the large internarial fenestra (*i.n. f*).

In front of the fenestra the recurrent lamina (*rc. c*) is ossified (fig. 5); and behind its posterior boundary there is another, smaller opening—a posterior nasal fenestra (*p. n. f*).

The alæ nasi are not ossified, except where they turn inwards, behind; and here also the aliseptal lamina is partly osseous.

The fore part of the septal base is alate (fig. 4); and behind this the thick lower edge of the large deep septum is pneumatic; the large opening is seen from below (fig. 4, *s. n*). In the young (fig. 3, *v*) the vomer is almost exactly the counterpart of that of *Elainea*; but its lobes are not so divergent. In the adult it is a huge bone (figs. 4 & 5, *v*) alate laterally, and with large swelling pneumatic lobes above. So high are these lobes that they allow the posterior septal (trabecular) bone to ride in between them; for they rise as a wall on either side. The air-cell within opens on each side, looking also forwards; these foramina gape widely, and show through the fore part of the vomer, the diploë of which has been extensively absorbed to form this thin-walled, two-mouthed air-bottle. The septo-maxillaries are lost in the lateral alæ of the vomer.

The pterygoids (*pg*), as in *Elainea*, are long and slender, well hooked behind, and laminar in front. Even in the young the mesopterygoid has coalesced with the palatine: in the old bird the pterygoids and palatines coalesced. The palatines (*pa*) are of great interest zoologically. In the young (fig. 3) they have less of that weak outbent form seen in *Elainea*, and the præpalatine bars are wider; the bilaminar tract running from the outer angle to the mid line is much longer fore and aft, and ends in front in almost equal ethmo- and interpalatine spurs.

The postpalatine keel (*pt.pa*), running from the interpalatine, is bevelled, as in *Elainea*; and the transpalatine spur (fig. 3, *t.pa*) is exactly such as that of *Elainea* might have been if periosteal growths had gone on lengthening and sharpening the retral process. In the old bird (fig. 4) all this is intensified. And now, if the reader will refer to the figures of *Hemipodius*, *Thamnophilus*, *Pachyrhamphus*, *Pipra*, *Elainea*, *Lanius* young, and *Lanius* old, he will see a most perfect series, with the exception of the crowning typical form, namely *Corvus* (compare Plates LIV., LV., LVII. & LXI.)[1].

Near the fore end of the præpalatal band there is on the inside in the adult a broadening of the bone with a free retral spur; this is not, as in the Woodpecker, the end of the palatine process of the præmaxillary, but the end of the recurrent alinasal lamina, the right and left processes being wide apart and not near as in *Elainea* (fig. 1); the relation of the palatine to the præmaxillaries is quite normal (see figs. 1 & 3, *p.px*, *pr.pa*).

The dentate, bract-shaped maxillo-palatines (*mx.p*) are very elegant hooked flaps of bone, only pneumatic at their broad, non-pedunculate root: they are not typical. And here also I have to note the "Laniidæ" as being *below* the Crows.

[1] If this is accidental, then we search in vain for order, law, or Lawgiver in the Cosmos; for these gradational instances of relation are only culled haphazard from thousands of bird-forms.

There is in *Lanius*, as in *Gymnorhina* (Pl. LX. fig. 5), a tendency to fill-in the hard palate; for the maxillary keeps a good width behind its maxillo-palatine process, and, indeed, forms the rudiment of another and similar palatine spur. The pars plana (figs. 5 & 6, *p.p*) has the concave outline, externally, of the Formicariidæ; but the first and fifth nerves have separate passages (1 & 5'). There is no separate os uncinatum; but the lacrymal is moderately developed. Here also there is a curious gradation; for in *Elainea* (fig. 2, *l*) it is large and corvine and is seen above, in the young *Lanius* (fig. 6, *l*) it is much reduced in size, and in the old bird (fig. 5, *l*) it is still smaller. Here we see that an "investing" bone, which has a very precarious existence in the great group "Coracomorphæ," and is never full-sized except in a most exceptional form, becomes partly absorbed during age, as if to reduce it to the general level of these particular types.

Several Celebesian passerines claim attention now; they stand on the same general level as our familiar genus *Lanius*: some of these lean, however, more to the Crow side; and others look towards the Birds of Paradise. Two types from that island have already been described, namely *Hyloterpe* (Pl. LVIII. figs. 3 & 4) and *Artamus* (Pl. LVIII. figs. 1 & 2); my next instance, namely *Dicrurus*, seems to be almost equally related to the Shrikes, Wood-Swallows, and Crows: the ornithologists shall set me right, and place it where they list amongst these types.

Example 19. *Dicrurus leucops.*

Habitat. Celebes. Section "Oscines," Müller; family "Sylviidæ."

This genus comes very close to the last (*Lanius*); but there are some very interesting differences[1].

The basitemporal and parasphenoidal regions are quite corvine (Pl. LVIII. fig. 5, *b.t*, *pa.s*); the cranio-facial hinge is perfect, and is bounded by a high dividing wall of bone both before and behind; that in front is the very strong, thoroughly ossified, nasal septum (figs. 5 & 6, *s. n*). This bony mass is broadly alate below, as in *Corvus*; and of these alæ the right is notched and fenestrate, and the left fenestrate. The postero-inferior region is umbonate on each side behind and above the subnasal alæ; these *bosses* arise on the septum over the nasal nerve; and the septum is partly divided behind by a slanting, lanceolate fenestra, where the right and left nerves almost touch each other.

In front the septum has a large, elongated fenestra, which re-differentiates the tra-

[1] Here let me confess that I am studying these Celebesian passerines in profound ignorance of their acknowledged zoological position as to "families," "subfamilies," and the like. These invaluable specimens belong to my friend Osbert Salvin, Esq., F.R.S.; and the spirit-specimens from which they were prepared were named for him by the Viscount Walden, Pres. Zool. Soc. I am now (Dec. 5th, 1872) waiting for Mr. Salvin's help in placing these birds so that they shall please the eye of the systematist. I mention this to show that my little adjudications are unbiased.

becular crest from the true *nasal partition-wall.* The recurrent lamina is fused with the median part of the præmaxillary; the alæ nasi are slightly ossified at their edges above and below; the os uncinatum is not separate from the large, leafy, inturned base of the pars plana (*p.p*); above the pars plana there is a large opening, divided within by a small bar of bone into two nerve-passages. A lacrymal, the size of that of the *old Lanius*, is ankylosed to the upper region of the ecto-ethmoid.

The broad vomer (*v*) has strong crura, not far apart, ankylosed to the palatines; its solid anterior part is very remarkable. The part running by ossification into the semi-ossified alinasal turbinals is very large indeed (fig. 6, *s.mx*); and on the left side only one septo-maxillary can be seen; but on the right side, not only is the junctural part with the nasal cartilage separate, the upper edge has a small ossicle, and the shoulder and lower face another, much larger, osseous centre.

Thus, counting the ectosteal plate on the right alinasal turbinal, there are four bones on that side that correspond to the single septo-maxillary of the Snake. The pterygo-palatines are like those of the Shrike in form, but like those of the Crow in strength. The pterygoids and palatines are thoroughly ankylosed together; the postnasal keel and the internasal spars are well developed. The bridge connecting the great trans-palatine snag with the inner edge of the bone is less developed than in *Lanius.*

The maxillo-palatine processes are thoroughly *corvine*, being like those of the Jay (*Garrulus glandarius*), pedunculated, with a thick, rounded, pneumatic extremity; for the rest, the facial bars, internally, are all ankylosed together.

Example 20. *Enodes erythrophrys.*

Habitat. Celebes. Section "Oscines," Müller; family "Sturnidæ."

This bird is evidently not a distant relation of the last; and yet to the morphologist it yields certain very important characteristics. *Dicrurus leucops* is nearly the size of a Jay, and has a more arched and a stronger face; this bird is the size of a Song-Thrush, and their skulls are very similar; but *Enodes* has a stronger head and face, and is more *laniine*, and the arcuate bill and the palatines give it some claim to be related to the Birds of Paradise. In a wide sense of the word, it is *corvine*, as it belongs to the higher Coracomorphæ; but wherever placed, it must go near *Dicrurus.*

The basitemporal and parasphenoidal regions agree with the last; the nasal sac is very little ossified, and the nasal septum is soft.

The vomer (Pl. LVIII. fig. 7, *v*) is very emarginate in front, and it is altogether flatter and more fibrous than in *Dicrurus*; its lobes are less; and mounted on them are prickle-shaped septo-maxillaries (*s.mx*), one on each side.

The pterygoids are well uncinate behind, and are distinct in front, as also the meso-pterygoids (Pl. LVIII. fig. 8, *pg*, *ms.pg*). The palatines (*pa*) are intermediate between those of a Shrike and those of a Crow (Pls. LXI. & LV.), and, although feebler, are of the Paradiseine type (see Pl. LXII. figs. 2 & 3, *pa*). They have, in the depth of their postpalatine keels and their ethmo-palatine scrolls (*pt.pa*, *e.pa*), likeness to the "Formicariidæ;" but the transpalatine process (*t.pa*) is halfway between the broad lobe of the Crow and the sharpened spur of the Shrikes and Wood-Swallows. The maxillo-palatines (*mx.p*) are not so delicately pedunculate as in the Thrush; and the free retral end is formed into a narrow air-bottle.

The nerve-passages (fig. 8, 1 & 5) above the huge lateral ethmoid (*p. p*) are distinct; and the lacrymal (*l*), like that of the Thrush, but larger, is an oval leaf of bone ankylosed to the descending crus of the nasal. There is no distinct os uncinatum. The upper part of the swollen lateral ethmoid appears free in the front of the wide frontal region.

Example 21. *Trichastoma celebense.*

Habitat. Celebes. Section "Oscines," Müller; family "Sylviidæ."

This bird is only three fourths the size of the last; but it has a stouter head, and with its large skull and straight beak reminds the observer of the Tits, the Nuthatch, and the lesser Woodpeckers; but in what is essential it belongs to these other Celebesian birds; and it is intermediate between a northern and a southern type. I should place it nearer to the Flycatchers than to our Old-World Thrushes and Crows. In the basal region it agrees with the last; and the nasal labyrinth in front, and the septum nasi, are unossified; the hinge is perfect. The vomer (Pl. LVIII. fig. 9, *v*) is similar to that of *Enodes*; but it has a projecting median region, and the parts attached to the alinasal turbinal (*a. tb*) are thin and scaly, and are indeed formed laterally of a large perforate scale-like septo-maxillary (*s.mx*) attached to the spiked fore end of the true vomer.

The palatines (*pa*) are altogether more slender, and have a still more southern character; they come near to what I have described in the "Formicariidæ" and "Cotingidæ."

The postpalatine keels are sharp and deep, the inter- and ethmo-palatines well developed; and the transpalatine is feeble, intermediate between that of *Enodes* and the more delicate triangular form seen in *Anthreptes* ("Nectariniidæ," Celebes). The præpalatine bar is slender, the pterygoid bone is slender, arcuate, and moderately hooked.

The maxillo-palatine processes (*mx.p*) are almost in their full degree of typical specialization, with long stalks bowed outwards and backwards, and with terminal pneumatic ladles, such as we see in Tanagers, Buntings, and Thrushes.

Example 22. *Lalage leucopygialis.*

Habitat. Celebes. Section "Oscines," Müller; family "Muscicapidæ."

This skull is the size of the last, being as much smaller than that of *Enodes* as that of *Enodes* is smaller than the skull of *Dicrurus.*

It agrees with these two, and not with *Trichastoma*, in having a curved beak. This is more curved than in *Hyloterpe*; but that genus is a natural ally of *Lalage*, which stands between it and *Enodes* (compare Pl. LXII. fig. 1, with Pl. LVIII. figs. 3 & 7).

In this type there are prickly basipterygoids in front of the basitemporal lip (Pl. LXII. fig. 1*a*, *b.pg*, *b.t*). The pterygoids are slender, subarcuate, and with a short hamular process; they articulate with the deep postpalatine keels (fig. 1, *pt.pa*), and with the superadded mesopterygoid crest. The diverging vomerine crura, united to equally divergent ethmo-palatines, which are but little arched, show the rostrum clearly on the mid line. The interpalatine spurs (*i.pa*) are well developed; and the two lamellæ, upper and lower, are large fore and aft. They end externally in a thick edge, which runs backwards as a roughly gnawed transpalatine process, like that of *Hyloterpe* (Pl. LVIII. fig. 3), but better developed. The præpalatine bars are slender, but expand in front, where they are ankylosed to the præmaxillaries. The broad, flattish vomer comes very near to that of *Hyloterpe*; it is subcarinate, slightly apiculate in front, and has moderate and rather square upper lobes, in which the septo-maxillary is lost. The cranio-facial hinge is perfect, and the septum nasi (*s. n*) partly ossified. The maxillo-palatines (*mx.p*) are intermediate between those of *Enodes* and those of *Trichastoma* (Pl. LVIII. figs. 7 & 9), and are much like those of a Thrush and of the Flycatcher. The first and fifth nerves are divided by a delicate rod of bone, which lies forwards inside the upper turbinal; the pars plana (*p. p*) is squarish and moderately thick; there is a semidistinct seed-shaped os uncinatum (*o. u*) attached to the angle of the pars plana; and the lacrymal is very small and ankylosed to the posterior crus of the oasal[1].

The other Celebesian species examined by me, and to be described hereafter, are two of them of the family "Nectariniidæ," namely *Nectarophila grayi* and *Anthreptes malaccensis*; the other comes near the Tanagers, namely *Prionocheilus aureolimbatus*. The six just described are all very near akin; these are *Artamus*, *Hyloterpe*, *Dicrurus*, *Enodes*, *Trichastoma*, and *Lalage*.

All these are evidently more metamorphosed offshoots of some common southern "leader" of a lower type: *these* are "Oscines;" *that* was most probably of the section "Tracheophonæ."

The ancient non-singing passerines still abound in the American division of the "Notogæa;" and in the Malayan region they are not extinct, as, for instance, in the case of *Pitta*, a Bornean genus closely allied to *Grallaria*.

I have some Australian types to describe; but these, on the whole, come nearer to the Malayan forms than to the South-American. Yet, of seven genera dissected by me, *two* had the muscles of the lower larynx quite indistinct, namely *Petroica* and *Sittella*; these must therefore be classed as "Tracheophonæ."

[1] The skull of *Muscicapa grisola* will be treated of in the second part.

Example 23. *Petroica bicolor.*

Habitat. Australia. Group "Tracheophonæ;" family "Muscicapidæ."

This is the largest of those of this genus whose osteology is displayed in the Museum of the College of Surgeons. Its number in the 'Catalogue' is 1584; the other species there are *P. multicolor* (1584 A), *P. phœnicea* (1584 B), and *P. fusca* (1584 C).

Petroica bicolor is one of the strongest of the smaller Passerines in pelvis and hinder limb; its general osteology is as full of interest as that of the Australian type already described, namely *Menura.*

In its skull and face, however, it comes near the soft-billed passerines. Yet its affinity is not with our native Wrens and Sylviæ; but, in its palate at least, it approaches those types that are found in the Panama district of America, the "Mniotiltidæ," afterwards to be described, coming nearer to these, in some respects, than to *Muscicapa.* The pterygoids (Pl. LX. fig. 10, *pg*) agree with those of the "Formicariidæ," save that they are longer, and more arched, but little uncinate, and are elegantly expanded in a falcate manner in front.

As in *Grallaria,* the postpalatine keels (*pt.pa*) are deep, wide apart, and angulate, and the rostrum shows well between the right and left bone and the crura of the vomer.

The interpalatine spur is very short, the transverse part of the bone of the medium extent; and the transpalatine spur (*t.pa*) is arcuate, and of a width intermediate between that of a common and of a Piping Crow; it is bluntly pointed, as in *Anthreptes.* The vomer (*v*) is of great interest. The moieties of the true vomer are seen distinct for a long distance behind, and for a short space in front, where they end in two short horns, with a rounded emargination between them; this part is subcarinate below. But the outside of the bone is formed of the septo-maxillaries (*s.mx*), which are nearly as large as the halves of the true vomer, as in the Serpent. The upper lobes of this compound vomer are but little developed; the maxillo-palatine processes are obliquely handled spatulæ, as in many *high-class* passerines.

Example 24. *Petroica monticola.*

Habitat. Australia. Group "Tracheophonæ;" family "Muscicapidæ."

The palate of this smaller species (Pl. LX. fig. 9) differs from the last principally in slenderness; and the transpalatine processes come very near to those of the "Nectariniidæ."

The vomerine crura are more bowed, and the united part of much greater extent. The true vomerine bones (*v*) unite in front by a rounded point; and the sutures between these and the marginal septo-maxillaries (*s.mx*) are very distinct, as in the "Mniotiltidæ." A bone answering to the prævomerine portion of the Snake's septo-maxillary (*s.mx'*) has grafted itself on the inturned alinasal lamina (*i. a. l*). The maxillo-palatines are alike in both species.

There is a close affinity, one with another, in many of the lesser narrow-billed

Australian passerines, and that whether their *song-muscles* are developed or not. In this first paper I have only space for one more of these, namely *Pachycephala*; but afterwards *Sittella* and *Sericornis* will come under notice, besides those very unique types *Ptilotis* and *Acanthorhynchus*.

Example 25. *Pachycephala fusca* (?).

Habitat. Australia. Group "*Oscines*," Müller; family "Laniidæ."

Notwithstanding the superiority of this type over *Petroica* in the separation of the tracheal muscles for song, it is yet, I am satisfied, on the whole, only a slightly modified *Petroica*. Its large skull, shortish beak, and most remarkable vomer are the proofs of this. In some respects, *Pachycephala* is less specialized than *Petroica*—that is, in its palatine arch, both the primary and investing parts.

On each side of the basitemporal there is the tubular "tympanic" on the "siphonium," with one or two additional ossicles. The basitemporal (Pl. LXI. fig. 7, *b.t*) itself is bat-shaped, as in the "Cotingidæ" and "Formicariidæ;" and there are no basipterygoids on the rounded parasphenoidal beam. The hinge is almost perfect. The septum nasi (*s. n*) is alate in front; and the trabecular bone (*tr*) has appeared in this part behind the alæ. The recurrent alinasal fold (*rc. c*) is well marked, and the inturned alinasal fold (*i. a. l*) is narrow; mesiad of this we see the huge alinasal turbinal (*a. tb*) with two bony patches. The alinasal scale (Plate LXI. fig. 8, *al.n*) externally is unossified, but of large extent. The inferior turbinals are narrow and very long (*i. tb*): they are mostly soft; but there is a bony patch postero-superiorly.

A hasty observation might lead to the opinion that the peculiar form of the vomer (like baggy Turkish trowsers) was a mere freak of Nature; but its meaning lies deeper than this. In *Petroica monticola* (Pl. LX. fig. 9, *v*, *s.mx*), we have the same form, coupled with an alinasal turbinal ossicle close to the angle of the vomer. This curious outgrown form depends upon the very large size of the supero-lateral elements, the septo-maxillaries (*s.mx*), which here rival those of Lizards and Snakes. The vomer is subcarinate in front, but does not project at the mid line; the bone, especially at its edges, is thick and spongy; its upper lobes are scarcely developed: altogether it is a slightly masked reptilian structure.

The pterygoids (Pl. LXI. fig. 7) are like those of *Petroica*, but shorter; they have, like the palatine arch, altogether a very *cotingine* appearance.

The postpalatine keels are sharp and deep; the mesopterygoid and ethmo-palatine laminæ are low, the interpalatine spurs abortively developed, as is the transpalatine (*t.pa*), the bony bridge across of slight extent, and the præpalatine bar a narrowish subsinuous bar. The maxillo-palatine processes (*mx.p*) are broad-based, thick and clumsy, not so well developed as in *Petroica* (Pl. LX. figs. 9 & 10, *mx.p*), and on a level with those of *Pachyrhamphus* ("Cotingidæ") and *Thamnophilus* ("Formicariidæ"). The continuously bony jugum (*j*) is feeble and sinuous, and but little inturned behind. The præfrontal, or ecto-ethmoid (fig. 7, *e.eth*, *p. p*), is a huge swollen mass of bone, perfectly *turnicine*, appearing well above, externally, and below; it sends a large kidney-shaped mass into the true olfactory region (Pl. LXI. fig. 8, *p.p*), as in *Hemipodius varius* and *Chasmorhynchus*. There is no separate os uncinatum; this is represented by the swollen lower angle of the pars plana; above that plate the 1st and 5th nerves pass through a large common opening. The lacrymal (fig. 8, *l*) is small; it has a high position, as in the Starling.

The *intermediate* position of this bird is self-evident; and it is also clear that the ascent, by metamorphosis, does not take place equally in all parts, but that some in one thing, some in another, become specialized and improved into nobler races and species. Moreover the existence of the proper organs for any special function in the life of the bird does not show that they are used for that purpose; *else why does not the Sparrow sing? Pachycephala* comes closer to *Elainea* than to *Lanius*.

It is no easy task to be a morphologist pure and simple whilst discussing the characters of the next type—the "Bird of Paradise." I shall endeavour to speak soberly, although treating of so beautiful a bird.

Example 26. *Paradisea papuana*.

Habitat. New Guinea. Group "Oscines," Müller; family "Paradiseidæ."

That which is peculiar to the bird's skull, namely ankylosis of part with part until nearly every land-mark has been removed, here attains its fullest possible extent, an extent only conditioned by the necessities of motion in certain parts of the face (Pl. LXII. figs. 2–4).

Setting aside for the time all side-relationships, I should place the Bird of Paradise in a position almost exactly intermediate between the *true* Crow of the Old World and the Piping Crow of Australia; its morphology and its geographical distribution agree alike with this view.

Yet the Malayan types just described, from Celebes, must be kept in mind; for any bird that should be like an exact *cross* between a Piping and a Common Crow, would not be a *Paradisea*.

The pterygoids (Pl. LXII. fig. 2, *pg*) are straight, strong, and have a flat, short hamular process; they articulate by a moderately laminar process with the posterior end of the palatine, the mesopeterygoid part of which (fig. 4, *ms.pg*) is small. The basipterygoid processes are absent from the rostrum (*pa.s*), which appears for a long distance along the mid line between the palatines and vomerine forks. The hinge is perfect; and in front of it the septum nasi (figs. 2 & 3, *s. n*) is solid bone, and very thick where the nasal nerves pass; this solid wide-winged part is seen in the front of the vomer (*v*). The rest of the septum still keeps its rounded inferior edge, the bony alæ on each side belonging to the "alinasal floor" (*n.f*), which, like the recurrent lamina in front, is one continuous mass with the surrounding facial bones.

The turbinals within this lamina, which is curiously dentate, are well ossified, as also are the true inferior turbinals (fig. 3, *i. tb*)—but not the alæ nasi themselves (fig. 4, *al. n*); these are the only soft part of the labyrinth. The rest of the labyrinth is very instructive; the ecto-ethmoid (*e.eth*) appears well above as an egg-shaped mass of bone, and it projects outwardly so as to reduce the lacrymal (fig. 4, *l*) to a small point of bone. The perpendicular plate, or meso-ethmoid, ends free behind the orbito-sphenoid, forming a postorbital band, with a rudimentary præsphenoid depending free. Thus the interorbital fenestra (*i.o.f*) is very large, and the separateness of the trabecular keel (fig. 4) considerable.

Laterally, the pars plana (*p.p*) returns inwards, and then appears to swell into an elegant egg-shaped mass of bone, which lies on the jugum (*j*). This bony egg (figs. 2–4, *o. u*), however, is separate, and belongs to the trabecular arch; it is the "os uncinatum," or "palate- trabecular conjugational" element.

The vomer (figs. 2 & 3, *v*) is very elegant, and is fashioned like a *Salisburia* leaf, spreading out, radiating its fibrous structure, and breaking into lobes, by notches that lie in the line of these fibres. The two principal notches are near the side; they half cut off the septo-maxillaries (*s.mx*).

Within, the vomer and the maxillo-palatines (*mx.p*) have been ankylosed to the inturned alinasal floor (*i. a. l*); behind, the twin stalks of the vomer run insensibly into the upper palatine lamina, the ethmo-palatine (*e.pa*).

These parts of the palatines are of moderate size. The interpalatine spurs are roughly pointed, like rusty nails, and they run into a ridge which becomes the postpalatine keel (*pt.pa*); it is pared away or bevelled, as in *Gymnorhina* and *Corvus*, and not sharp-angled, as in *Trichastoma* and *Thamnophilus*.

The bridge extending from this inner edge to the thick transpalatine portion is oblique, deep, and large; and thus the ear-shaped transpalatine snags (*t.pa*) are divergent. These subrotund lobes are flatter and more solid than those of *Enodes* (Pl. LVIII. figs. 7 & 8); they are not sharp spikes as in the Wood-Swallow and *Dicrurus* (Pl. LVIII. figs. 1 & 5). The whole fore beak (Pl. LXII. figs. 2–4) is very solid bone, riddled behind, at the sides, with large holes for the air-cells. Here are given off the characteristic maxillo-palatine processes (*mx.p*); they are like pruning-knives, are slightly bilobate at their end, and are not unlike those of *Artamus* (Pl. LVIII. figs. 1 & 2), being, as in that type, greatly enlarged by fusion with the intensely ossified nasal floor (*i. a. l*). This borrowed substance makes them look, in both these cases, larger than they are in reality. The same thing is seen in *Gymnorhina* (Pl. LX. figs. 5 & 6).

The continuously bony jugal is sinuous and moderately strong; it is but little incurved behind. This bird has the singing-muscles large and finely developed. It lived in the Gardens of the Society for some time, was dissected by me, and then put into the hands of Professor Flower for the Museum of the College of Surgeons.

I may remark that its digestive organs seemed somewhat aberrant: I only found one cæcum coli; and that was very small.

Example 27. *Chasmorhynchus nudicollis* (the Naked-throated Bell-bird).

Habitat. Brazil. Group "Tracheophonæ," Müller; family "Cotingidæ."

It would seem as though the "embryon atoms" of three diverse types had striven for mastery here: the Hemipod, the Goatsucker, and the Crow were put into the "limbeck;" the spirit that arose was the "Bell-bird."

The skull of this loud-voiced caprimulgine Crow is modified from the ordinary coracomorphous type far more than the skeleton generally; this is often the case in birds.

As far as the skull is concerned, this type has the same (but no more) right to be considered one of the "Coracomorphæ" as the Swift (*Cypselus*). In some respects it is truer to the Fissirostral type than the Swift itself; indeed, in the general texture of the skull, which is most exquisitely cellular and light, it comes close to *Caprimulgus*; whilst *Cypselus* has a thin fibrous skull, much more so than its passerine relatives the Swallows. Here, then, is a point on the great Coracomorphous circle which impinges on the circle containing the Frog-faced *Podargus*, the Oil-bird (*Steatornis*), and the Goatsucker; which latter forms the touching-point.

Still the *tracheophonous* Swift goes far away from the passerines, even those nearest to it, the Swallows, in all the structures behind the occiput. One of the lesser of the true Corvidæ, the Jay, being of the same size as the Bell-bird, is good for comparison; then let the student provide himself with the skull of a Goatsucker (*Caprimulgus europæus*) and of a Hemipod, and he will be able to follow the writer. Moreover our task, though asking delicate discrimination and familiarity with the bony framework of many birds, is yet a very easy one compared with that of tracing the atavistic germs of a Darwinian "Pangenesis." I may remark here, how smoothly the bone-surface has been polished and almost enamelled! the walls also being of the thinnest periosteal bone, and the diploë reduced to the uttermost degree of delicacy. The elegant two-winged basitemporal region (Pl. LXII. fig. 5, *b.t*) is everywhere completely welded to the surrounding parts, save in front, where the Eustachian openings (*eu*) are merely separated by a little wall of bone. Here the basitemporal lip is free; it is thick and spongy, like a *stonecrop* leaf.

The parasphenoid (*pa.s*) has spread abroad beneath the true posterior sphenoidal region, behind, facing most of the floor and sides of the "anterior tympanic recess," in which it is helped by the thoroughly continuous basitemporals. Like a true corvine, this bird has no basipterygoid processes, and the beam or rostrum runs forwards—thick, rounded, and solid—to the nearly perfect cranio-facial hinge. It is underfloored, all but its hinder part, by the palatine bones, as in *Caprimulgus*. The true nasal septum is ossified all along and directly in front of the hinge, in the middle; and in front the bony matter creeps down into the depth of the septum (fig. 7, *s.n*). Behind and below, a small tract of the septum is ossified (figs. 5 & 8, *tr*); this is the trabecular bone (belonging to the first facial arch); in front of it are two smaller bones, not united to the cartilage (fig. 8, *tr′*, *tr″*). In front, the septal bone grows round the end and returns along the trabecular base, hookwise, up to the end of the expanded or alar portion (fig. 8, *s. n*).

The alæ nasi and their various outgrowths and processes are such as, being well mastered, will explain the peculiarities of a coracomorphous nasal labyrinth, as compared with that of the Fowl and Hemipod. Yet these parts, in the Bell-bird, are curiously intermediate between those of the Hemipod and the Crow; and only by comparing all these together shall we see their real meaning, or make out a harmony between them. If the parts in the Fowl (Phil. Trans. 1869, pl. 86) be compared with what I have described in the Rook (Pl. LV. figs. 1–3), it will be seen that the alinasal turbinal is given off from the *roof* in the Fowl, and from the *wall* in the Crow. In the Fowl, the alinasal wall is largely inturned; in the Rook, only at the end. In the Fowl, the *wall* having become the *floor*, coalesces behind with sides and base of the septum (*tom. cit.* fig. 3); in the Rook, this inturned part is continuous with, and ossified by, the compound vomer. In the Rook, the internasal part of the trabeculæ (Pl. LV. fig. 2) is largely alate; in the Fowl (*tom. cit.* figs. 1–4), the trabeculæ only caused the thickening to the base of the septum. But the most profitable comparison is to be made between the Crow and the Hemipod in these respects; and only by such a comparison shall we be able to see the meaning of these parts in the Bell-bird.

There is evidently, amongst birds, a primary difference in the manner in which the primary nasal slit (see "Fowl's Skull," pl. 81. fig. 1) becomes enclothed with cartilage, and drawn out into long, broken-up, labyrinthic passages.

In the Crow and Warbler (Pl. LV. figs. 1 & 13, *rc. c*) the alinasal scale of cartilage is, as it were, tucked in at its fore end, a broad flap on each side passing backwards and inwards to meet, and afterwards coalesce with, its fellow beneath the septum nasi. This I have worked out in the embryo of the Gorse-Linnet, and shall describe elsewhere; these retral parts are in reality the "cornua trabeculæ."

In the figures given of these parts in the young Rook and Redstart, these recurrent flaps have united at the mid line into a triangular tongue of cartilage (*rc. c*); but in a form to be given in my next part, namely one of the "Vireonidæ" (*Vireosylvia olivacea*), the part is twice the size of what is here shown, and nearly the hinder half is ununited, so that it is a large forked flap, the "tines" looking backwards: this is a step towards what I shall describe in the Bell-bird. Now it is evident that in the Rook (Pl. LV. fig. 1) the air passes in between the recurrent alinasal laminæ (*rc. c*) and the outer alinasal wall, with its ingrowing turbinal (*al.n*, *a.tb*), the turbinal being *lateral* in its origin, and not *superior* as in the Fowl (*loc. cit.*) and the Hemipod (Pl. LIV. figs. 3 & 4, *a.tb*); it arises, in the Rook, from the *wall* behind the external nostril, and not, as in the Fowl and Hemipod, from the *roof* in front of it. Here also note another important difference—namely, that instead of the recurrent flap being an ingrowth backwards of the forefront of the alinasal *roof*, in the Hemipod it is given off from the *wall* (Pl. LIV. figs. 1, 3–6, *n. w*, *n. f*). So there is an exact reversal as to the origin of the recurrent laminæ and the alinasal turbinals in these two types, the "Turnicomorphæ" and the "Coracomorphæ." Moreover in *Turnix* these recurrent folds are of immense size; they are, as it were, the uptilted floor of the nose slit up from the *wall*, nearly as far as to the fore end of the long, linear, valvular nostril.

A far simpler form of nasal labyrinth may be taken as the common prototype of both these, namely that of the common Snake (*Natrix torquata*).

My unpublished figures of the morphology of this type show that the aliethmoid, aliseptal, and alinasal outgrowths of the short and simple ethmo-septal plate are all one common roof-scale of cartilage.

Where this scale ends in front, it sends backwards, or passes into, on each side, a large outcurved spatula of cartilage—the recurrent alinasal lamina or "cornu trabeculæ," which is jammed in, with the nasal gland, between the applied edges of the septo-maxillary and the vomer of the same side. These two ribbons of cartilage have the same relative size as in the Hemipod, and generally coalesce with an upper labial, the counterpart of the "vomerine cartilage" of the Hemipod.

Now both the harmony and the disagreement of the Bell-bird and the Hemipod will be understood; the former is a true "Coracomorph," and yet has a certain turnicine *strain* in it.

The ala nasi (Pl. LXII. fig. 7, *al. n*) is a long oval scale; and the nostril is a low arched doorway: altogether this has a turnicine appearance. Part of the alinasal turbinal is seen in the narial opening; from below (figs. 5 & 8, *a.tb*) they are seen to be large flaps, bent on themselves, and underlain behind by a narrow, inturned cartilage (*i. a. l*).

As seen in figs. 5, 6, & 8, the alinasal and its turbinal end are cartilaginous *horns* to the large vomer (*v*), which grows into the cartilage for some distance. At the shoulders of this bone there is no appearance of a septo-maxillary; but a little in front there is a small suboval patch—a piece, as it were, of the fore part of the Ophidian bone. On the right side (fig. 6) it is ankylosed to the maxillo-palatine (*mx.p*); and on the left it is merely grafted on the nasal wall. These ossicles vary greatly; but the thing of interest here is the huge size of the recurrent laminæ (fig. 8, *rc. c*). These are long flaps, gradually decreasing in size backwards, and reaching close to the vomer, which has used up the lobes of cartilage that form the spatulate end of these long laminæ in the Snake. Here we have not the structure of the Hemipod exactly repeated, but a case of parallelism with it, as these bands are far larger than those spoken of as existing in *Vireosylvia*.

These laminæ adhere closely to the septum in their front half, and then are free for the remainder of their length; the larger and smaller trabecular splints (figs. 8 & 9, $tr,'$ tr'') are formed in the fibrous interspace between these ribbons of cartilage. Our native Wren (*Troglodytes vulgaris*) rivals the Hemipod in its vomerine cartilages, and the Bell-bird in its recurrent laminæ. The *disjecta membra* of the Snake's septo-maxillary turn up everywhere in the tracts that are symmorphic with the membrane in which it is produced; at the inner edge of the recurrent bands there is another ectosteal patch (fig. 8, *rc. c, s.mx'*). The vomer (figs. 5 & 8, *v*) is a copy of, or pattern for, that of the young sylviine (Pl. LV. fig. 13, *v*).

Very large, squared in front, subcarinate, rough and cellular, this bone has a low-type character; it has fully coalesced with the ethmo-palatine laminæ, and with them forms to a large extent a nearly finished floor to the basifacial beam. I note nothing more as belonging to the trabecular arch; for there is no appearance of the os uncinatum on either the larviform lacrymal or the bulbous pars plana (fig. 7, *l,p.p*). These latter parts are of extreme interest here; the lacrymal has a more than corvine development, and has the shape of a caterpillar when moving with its procession, erect-headed. Coming to the top, in front of the great ecto-ethmoid, it there is bent at a right angle, and then twists itself in a sigmoid manner to reach the jugum (*j*), first wedging in the angle of the pars plana (*p.p*). This lower part of the ecto-ethmoid is, like the upper or frontal portion, all swollen and spongy, like that of *Hemipodius varius* (Pl. LIV. figs. 9 & 10). The only room of any extent in the nasal labyrinth is in front, and is supplied by the nasal branch of the ophthalmic; the true olfactory region is occluded by the bilobate præfrontal mass, which is smoothed into flatness in front of the orbit.

The pterygo-palatine arch is, on the whole, corvine: but the pterygoids (*pg*) are extremely long and slender, and are elegantly arcuate; they are but little laminate in front, and but little uncinate behind (*e.pg*).

There is a long, overlapping process of the pterygoid on the upper edge of the palatine (fig. 7); and there *appears to be* no mesopterygoid. If this is so, we have a remarkable caprimulgine character; at any rate the segment must have been small, as the palatines are very little crested above, where they support the basis faciei. The post-palatine region is very *turnicine*, the ends being bevelled off instead of being crested and keeled; and the inner edges of the bone are closely approximated, hiding the parasphenoid below, but do not make a true commissure as in the great "Fissirostres." As in *Hemipodius* and *Turnix* (Pl. LIV.), the interpalatine ridges and spurs form a large, elegantly lyriform opening for the posterior nares. The upper or ethmo-palatine lamina is of less extent than the lower, and is thoroughly ankylosed to the vomer.

The transpalatine (*t.pa*), although at first view very caprimulgine, is not a general leafy breadth of the bone as in the Fern-Owl, but its true segment is shown as a square superaddition to the simple *struthious* or *turnicine* bar. The cartilaginous segment of the young Rook (Pl. LV. fig. 1, *t.pa*) needs only to grow further outwards and to be squared by periosteal growth, to be like what occurs in the Bell-bird; this bird has retained a certain embryonic distinctness in this particular segment. Whilst the pterygoid is a dense, *non-aërated* bone, the palatine, like that of *Caprimulgus*, is delicately spongy, and altogether thick and inflated.

From being very broad, it gets an extremely slender præpalatine bar, as in *Caprimulgus*; and this slenderness of the fore part corresponds with *Turnix*. The outline of the maxillo-palatine processes (*mx.p*) is quite corvine; in texture they correspond with those of the Fern-Owl, and, indeed, are more spongy, the outer part of the distal process being a mere sieve of delicate bone.

The bowing outwards of the zygomatic process of the maxillary (*mx*), and its slenderness, are quite equal to what occurs in the Fern-Owl; but the *jugal* itself is a high compressed bone (fig. 7, *j*), unusually high for a bird, and having no other rival in this respect than the *Balœniceps*.

In other parts of the face, and in the skull, this bird is a *Crow* with *caprimulgine* leanings and isomorphisms. *Caprimulgus* itself, as I shall show in another paper, has narrowly escaped from the Coracomorphous territory; whilst the Bell-bird, being of a lower type than the Old-World Crows, is a nearer relation to the Goatsuckers than to the more passerine "Fissirostres." Even that for which this bird is famous, its voice, appears to me to be no mere *caw* of a true and proper Crow, but something akin to the mysterious sounds uttered by the Goatsuckers of the New World.

In concluding this instalment of my observations on the "Ægithognathæ," I cannot help remarking that the subject seems to me to be worthy of great extension.

As for the birds of South America, I shall be grateful to those naturalists who will in any way assist me in throwing light upon the various groups of the Coracomorphæ of that region, or, indeed, of the other natural divisions of the Class; for from that land of enchantment we have already the Palamedea, the Cariama, the Sun-Bittern, and the Trumpeter (*Psophia*), and numberless other types well worthy of careful study. My belief, being fairly expressed, is this, namely that there (in South America) we have representatives of the lost *Miocene* birds of our own geographical area.

Additional Remarks on the General Morphology of the Palate and Mandible.

I would beg of the reader to believe that the *limited region* here taken for comparison is not conterminous with the ground I have been digging.

This is not true of birds, as such, with regard to their structure throughout, nor of birds as a "topmost fruitful bough" of the Vertebrate life-tree.

Even the twigs of this bough have to be broken one by one, and not after they have been faggoted. This dark forest (Vertebrate morphology) may have the light let in upon it at some one spot by a laboured monograph of one type; or a fine line of light may be made to stream through it by the thorough working-out of one part or tract of the organization, the clearing being merely sufficient for the treading of the feet and for the peering of the eyes.

The utmost degree of modification of the facial parts that has been attained by a mere fish (a branchiate Vertebrate) has been shown in my essay on the skull of the Salmon (Phil. Trans. 1873); but a new stand-point has to be taken with regard to the air-breathers, most of which have their faces modified largely in relation to the function of hearing, the first postoral cleft being converted into the cavity of the ear-drum, and the contiguous parts modified behind this air-space to wall it in, and to perfect it for the conveyance of the aërial vibrations.

Above the "Pisces Dipnoi," as soon as we reach the *Proteus* and *Siren*, a stapedial plug is formed in the osseo-cartilaginous ear-ball; above these, many of the tailless Batrachia utilize the first postoral cleft for an ear-drum, and the parts of the face around this opening become profoundly modified and metamorphosed to perfect this new sensorial apparatus.

But the simplest Amphibia are the best for comparison, as to their facial morphology, with the nobler types; and none of these is more instructive than the one treated of in the 'Proceedings' of this Society for 1874 (pp. 186–204, pls. 29–32), by Professor Huxley: this type is *Menobranchus lateralis*, one of the lowest of even the "Perennibranchiate Amphibia."

If the visceral arches of this form be carefully compared, as we slowly travel up through the types, with the Axolotl, Salamander, Frog, Chelonian, Non-carinate and Carinate Bird, we shall have a very adequate idea, at last, of the meaning of the multitude of bones that are to be found in the building of a bird's face,—during the growth of its face, rather; for Nature, ready with her cementing "osteoblasts," is incessantly obliterating the once distinct and shapely stones by which it was gradually built.

In the adult skull just referred to (Proc. Zool. Soc. 1874, pls. 29–31, pp. 186–204), the "chondrocranium" is in a condition of arrested ossification very similar to that of a chick at the beginning of the third week of incubation (see my paper on the Fowl's Skull, Phil. Trans. 1869, plate 83). It may sound like a contradiction; but this skull is nearly all *face*; for the axial structures are exceedingly feeble, and end between the huge ear-sacs (hinder *paraneural* elements). This aborted fore end of the axis, the ear-sacs, and the visceral or *pleural* arches are "by joints and *bands* knit together" into a sort of ground-plan for the higher types of Vertebrate skulls.

In these higher types the osseous metamorphosis, combined with the clefts (oblique, transverse, and longitudinal) that take place in the cartilaginous bands, or in their granular counterparts, give the results which we see in reptile, bird, or mammal.

The most important binders, with their subdivisions and their changes, are formed by the tops of the mandibular and hyoid arches; of the former only I wish to speak here.

In the bird, the mandible is articulated to the skull by a huge bone (the quadrate) which is the dorsal part of that arch, the mandible itself being the ventral part. But in this the bird conforms to all the Vertebrata with the exception of the Lamprey and his companions below, and the Mammalia above. In the early condition of the skull, whilst unchondrified (see Huxley, Elem. Comp. Anat. p. 138, fig. 57, F′), there is no discontinuity of tissue between the pedicle of the mandibular suspensorium and the trabecular band; but soon afterwards ("Fowl's Skull," pl 81. figs. 1 & 2) these tracts become cartilage; and then the quadrate can be distinguished as a separate nodule, and the mandible as a separate bar. At that time the maxillo-palatine process of the embryonic mandible has a pith of tissue in it more granular than the rest, but no cartilage; the chick now corresponds exactly to the *Menobranchus*, save that the pedicle does not pass into the trabecula by continuous cartilage.

The same process may be traced in the Chelonia; and in them the free apex of the suspensorium, which, as in the bird, turns forwards as well as inwards, underlying the second and third branches of the trigeminal nerve, is pointed and permanently cartilaginous, even in the largest Sea-Turtles. That pointed soft end of the suspensorium is the orbital process of the quadrate bone; in the bird this free end is often broad and spatulate. Here I may remark that I once held the erroneous opinion that this part answered to the orbital process of the Tadpole's suspensorium—a cartilaginous leaf, folded over the *outside* of the temporal muscle, and only an evanescent structure.

The "otic process" is only one of two parts that join the ear-sac in the Amphibia (see Huxley on *Menobranchus*, pl. 30. fig. 1); for, besides the proper otic process which coalesces in most Amphibia with the antero-superior region of that organ, the pedicle gives off a facet below, which is well seen in the common Frog, gliding on the smooth antero-inferior face of the prootic region.

Now, in birds, the huge otic process of the suspensorium (the head of the quadrate) generally has an outer and an inner fork, and always, save in Ostriches and Tinamous, has two articular facets, even in the Gallinaceous birds and the Parrots, where the head is most undivided.

This inner facet does not, however, correspond with the otic facet of the amphibian pedicle, but is a mere fork of the "otic process."

So far we see that the suspensorium of the bird is altogether attached to the head (auditory region) by joints with joint-cavities, whilst in the Amphibia it is attached by bands and joints.

It is not an easy matter to harmonize the other parts of the palato-mandibular apparatus. The ascending process of the Urodela is a mere fibrous band in the Batrachia proper; and I do not think that Prof. Owen's view is tenable (see Huxley on *Menobranchus*, note to p. 189), namely that it answers to the epipterygoid columella of the Lizard. In Lizards and, as I have also discovered, in the Chelonia there are two pterygoid bones—one the broad flat membrane bone which forms so much of the posterior palate (the true pterygoid), and the other a rod-like bone lying above the great plate; this is the columella or epipterygoid.

In the Chelonia, when recently hatched, this bone is seen to be the separate ossification of the only part of the pterygo-palatine arcade which acquires any thing like a cartilaginous consistency: it is the postero-superior extremity of the arcade; and its hinder *tilted* end articulates with the apex of the free pedicle, joining it at right angles, and altogether in front of it; it cannot, therefore, answer *accurately* to the Amphibian "ascending process," which is due to bifurcation of the pedicle itself; it is rather analogous than homologous.

In birds the pterygoid is single. In the Ratitæ it approximates in character to the lower Chelonian bone, being a large fibrous slab; in the Carinatæ, especially the higher aërial types, it is most like the lacertian *columella*; but the true homologue of that bone is the ascending or epipterygoid process. This corresponds to the "hamular process of the internal pterygoid plate" of Man and the other Mammalia, and is the apex of the *secondary* pterygo-palatine arch.

In the Lizard the pedicle of the suspensorium is quite lost in the adult, the facet or facets for the quadrate with the outstretched ear-sacs being formed on the "otic process." In the Chelonia the otic process, instead of being solid as in the bird, is hollowed out to form the large drum-cavity, the roof of which is largely formed by the "tegmen tympani" and its bony roof-tile (the squamosal).

The most instructive series of types for these comparisons would be found in this order, namely *Menobranchus*, *Dactylethra*, *Chelone*, *Dromæus*, *Tinamus*, *Turnix*, *Pipra*, *Coccothraustes*.

Such a comparison would yield much more than a view of the procession of the forms of the palatine and mandibular regions; the relations of the rest of the skull would force themselves upon the mind of the observer.

DESCRIPTION OF THE PLATES.

PLATE LIV.

Turnix rostrata (young).

Fig. 1. Lower view of palate, × 4 diameters.
Fig. 2. Upper view of face, × 4 diam.
Fig. 3. First section of face, × 10 diam.
Fig. 4. Second ditto, × 10 diam.
Fig. 5. Third ditto, × 10 diam.
Fig. 6. Fourth ditto, × 10 diam.
Fig. 7. Fifth ditto, × 10 diam.
Fig. 8. Vomer and cartilages, lower view, × 10 diam.

Hemipodius varius.

Fig. 9. Lower view of palate, × 4 diam.
Fig. 10. Upper view of face, × 4 diam.
Fig. 11. Side view of ditto, × 4 diam.
Fig. 12. Tympanics and quadrate, × 4 diam.
Fig. 13. Pterygoid and mesopterygoid of young, × 14 diam.

PLATE LV.

Corvus frugilegus.

Fig. 1. Lower view of palate of young, × 2 diam.
Fig. 2. Anterior section of face of ditto, × 4 diam.
Fig. 3. Posterior ditto, × 4 diam.
Fig. 4. Part of a similar section to last, × 8 diam.
Fig. 5. Side view of face of one more advanced, × 3 diam.
Fig. 6. Part of palate of adult, lower view, × 3 diam.

Corvus corone.

Fig. 7. Tympanic region of adult, × 4 diam.
Fig. 8. Internal angle of lower jaw, × 3 diam.
Fig. 9. Ditto, with part of "siphonium," × 3 diam.
Fig. 9 *a*. The upper end of "siphonium" ossicle, × 3 diam.

Fregilus graculus.

Fig. 10. Lower view of vomer, × 4 diam.
Fig. 11. Upper view of ditto, × 4 diam.
Fig. 12. Side view of ditto, × 4 diam.

Ruticilla phœnicurus (young).

Fig. 13. Lower view of palate, × 17 diam.

PLATE LVI.

Menura superba ♀.

Fig. 1. Lower view of palate, × $1\frac{1}{2}$ diam.
Fig. 2. Upper view of face and frontal region, × $1\frac{1}{2}$ diam.
Fig. 3. Side view of ditto, × $1\frac{1}{2}$ diam.
Fig. 4. Part of fig. 2, × 3 diam.
Fig. 5. Upper view of vomer and part of palatines, × 8 diam.

Pitta melanocephala.

Fig. 6. Lower view of palate, × $2\frac{1}{2}$ diam.
Fig. 7. Part of ditto, × 4 diam.

Grallaria squamigera.

Fig. 8. Lower view of palate, × $2\frac{1}{2}$ diam.
Fig. 9. Part of ditto, × 4 diam.
Fig. 10. Sectional view, showing septum nasi and part of ethmoid, × $2\frac{1}{2}$ diam.

PLATE LVII.

Pipra auricapilla.

Fig. 1. Lower view of palate, × 4 diam.
Fig. 2. Part of ditto, × 7 diam.
Fig. 3. Side view of face, × 4 diam.

Pachyrhamphus.

Fig. 4. Lower view of palate, × 4 diam.
Fig. 5. Part of ditto, × 7 diam.
Fig. 6. Side view of face, × 4 diam.
Fig. 7. Upper view of ditto, × 4 diam.

Thamnophilus doliatus.

Fig. 8. Lower view of palate, × $3\frac{1}{2}$ diam.
Fig. 9. Part of ditto, × 6 diam.
Fig. 10. Side view of face, × 4 diam.

PLATE LVIII.

Artamus leucorhinus.

Fig. 1. Lower view of palate, × $2\frac{1}{2}$ diam.
Fig. 2. Part of ditto, × 5 diam.

Hyloterpe sulfuriventer.

Fig. 3. Lower view of palate, × $3\frac{1}{4}$ diam.
Fig. 4. Part of ditto, × 6 diam.

Dicrurus leucops.

Fig. 5. Lower view of palate, × 2 diam.
Fig. 6. Part of ditto, × 4 diam.

Enodes erythrophrys.

Fig. 7. Part of lower view of palate, × 4 diam.
Fig. 8. Part of side view of face, × 4 diam.

Trichastoma celebense.

Fig. 9. Part of lower view of palate, × 5 diam.

PLATE LIX.

Dendrocolaptes albicollis.

Fig. 1. Lower view of palate, $\times$ $2\frac{1}{2}$ diam.
Fig. 2. Part of ditto, $\times$ 4 diam.
Fig. 3. Part of side view of face, $\times$ 3 diam.

Anæretes parulus.

Fig. 4. Posterior two thirds of palate, lower view, $\times$ 6 diam.
Fig. 5. Part of ditto, $\times$ 12 diam.

Synallaxis flavigularis.

Fig. 6. Lower view of palate, $\times$ 4 diam.
Fig. 7. Part of ditto, $\times$ 10 diam.
Fig. 8. Septum nasi, $\times$ $4\frac{1}{2}$ diam.

Muscisaxicola mentalis.

Fig. 9. Lower view of palate, $\times$ 4 diam.
Fig. 10. Part of ditto, $\times$ 10 diam.

PLATE LX.

Homorus unicolor.

Fig. 1. Lower view of palate, $\times$ 3 diam.
Fig. 2. Part of ditto, $\times$ 5 diam.
Fig. 3. Ditto (upper view), $\times$ 5 diam.
Fig. 4. Side view of face, $\times$ 3 diam.

Gymnorhina tibicen.

Fig. 5. Lower view of palate, $\times$ $1\frac{1}{2}$ diam.
Fig. 6. Part of ditto, $\times$ 4 diam.
Fig. 7. Vomer and cartilages (lower view), $\times$ 3 diam
Fig. 8. Pars plana and lacrymal (side view), $\times$ 3 diam.

Petroica monticola.

Fig. 9. Hinder part of palate (lower view), $\times$ 7 diam.

Petroica bicolor.

Fig. 10. Hinder part of palate (lower view), $\times$ 8 diam.

PLATE LXI.

Elainea.

Fig. 1. Lower view of palate, × 4 diam.
Fig. 2. Side view of middle of face, × 5 diam.

Lanius collurio.

Fig. 3. Lower view of palate (young), × 3½ diam.
Fig. 4. Greater part of palate (old), × 5 diam.
Fig. 5. Side view of middle of face (old), × 5 diam.
Fig. 6. Ditto (young), × 5 diam.

Pachycephala fusca (?).

Fig. 7. Lower view of palate, × 3½ diam.
Fig. 8. Side view of face, × 5 diam.

PLATE LXII.

Lalage leucopygialis.

Fig. 1. Hinder part of palate (lower view), × 6 diam.
Fig. 1*a*. Part of basis cranii, showing "basipterygoids," × 6 diam.

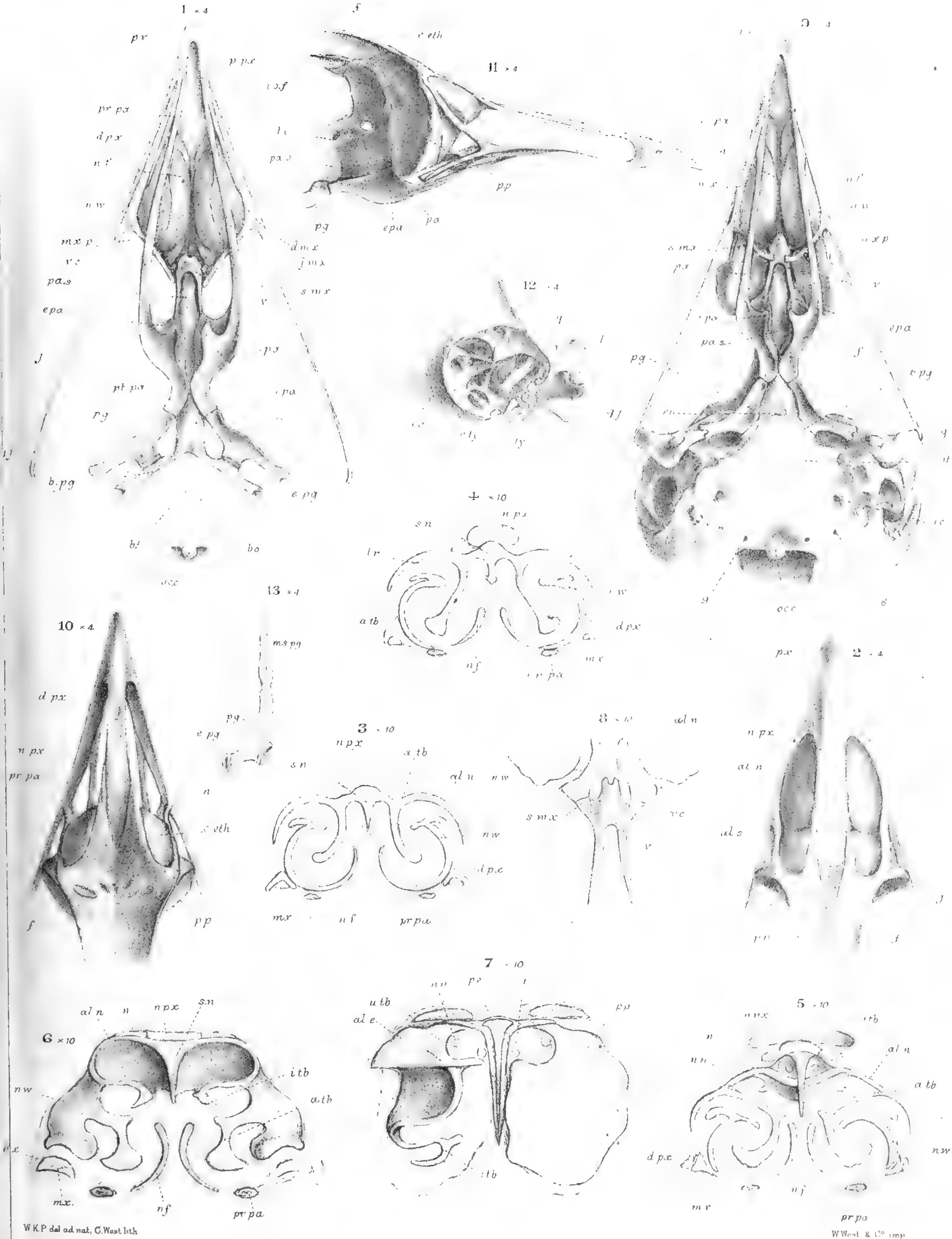
Paradisea papuana.

Fig. 2. Lower view of palate, × 2½ diam.
Fig. 3. Part of ditto, × 4 diam.
Fig. 4. Side view of face, × 2 diam.

Chasmorhynchus nudicollis.

Fig. 5. Lower view of palate, × 2 diam.
Fig. 6. Part of ditto (upper view), × 4 diam.
Fig. 7. Side view of face, × 2 diam.
Fig. 8. Part of fig. 5, × 4 diam.

N.B. The terms used here are the same as those in my paper on the Fowl's skull (Phil. Trans. 1869, pls. 81–87, pp. 755–807). A few new ones, however, will be found—namely, "recurrent alinasal lamina" (*rc. c*), "inturned alinasal lamina" (*i. a. l*), "vomerine cartilage" (*v. c*), "median septo-maxillary" (*m. s.mx*), and perhaps a few more.



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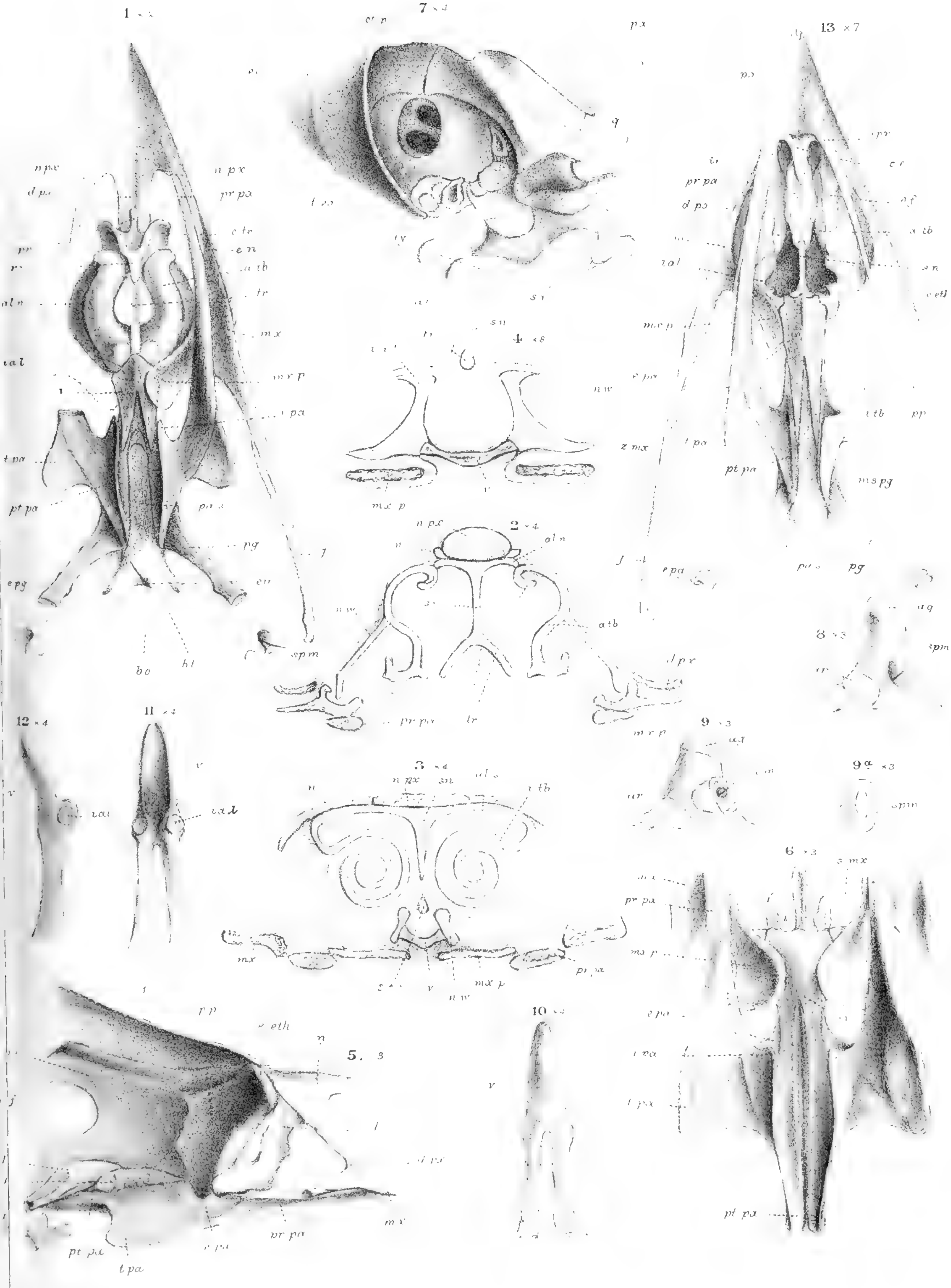
W. West & Co. imp.

FIGS. 1–8. TURNIX ROSTRATUS, 9–13. HEMIPODIUS VARIUS



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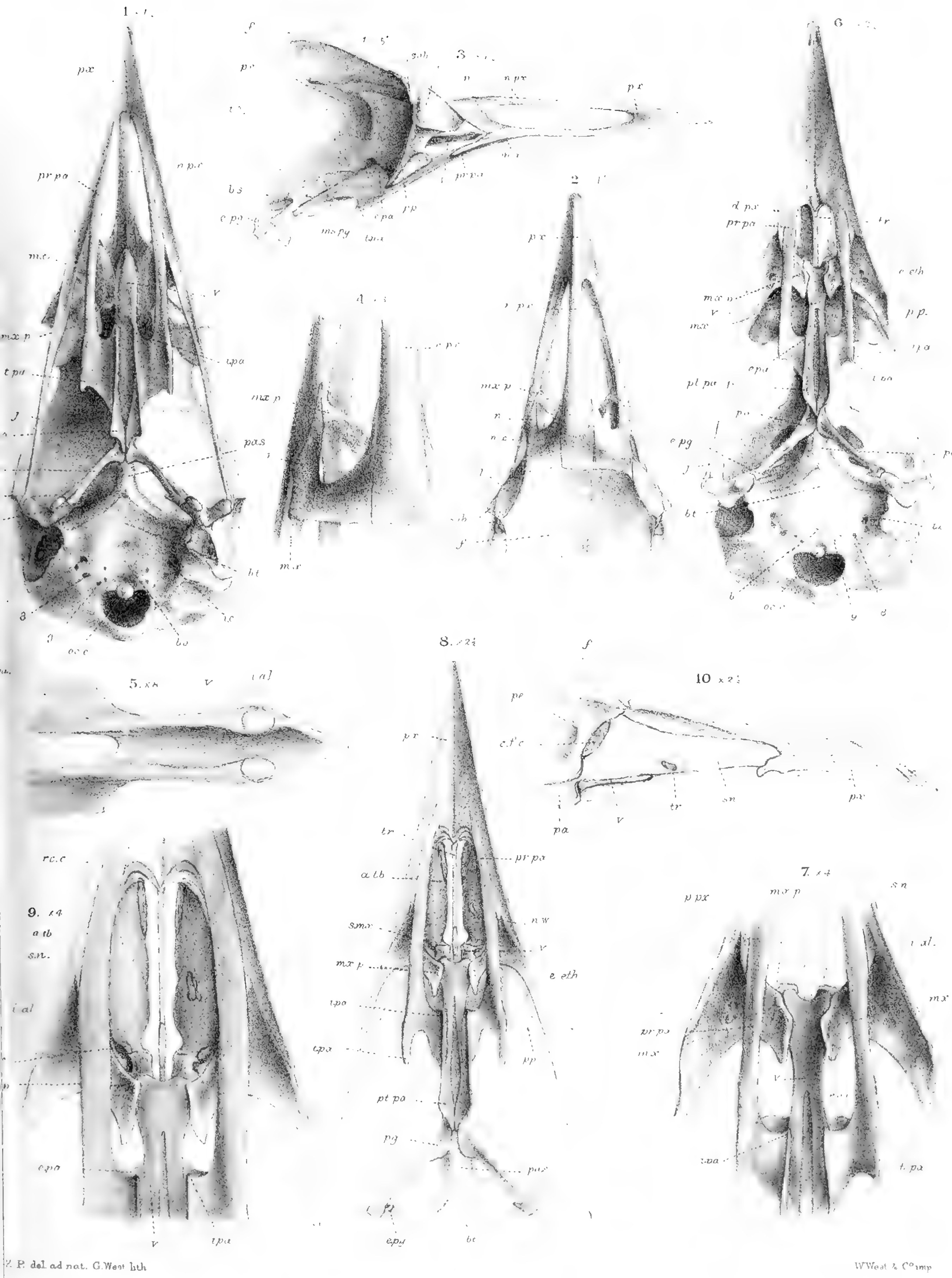
FIGS 1–9a CORVUS, 10–12 FREGILUS 13 RUTICILLA.



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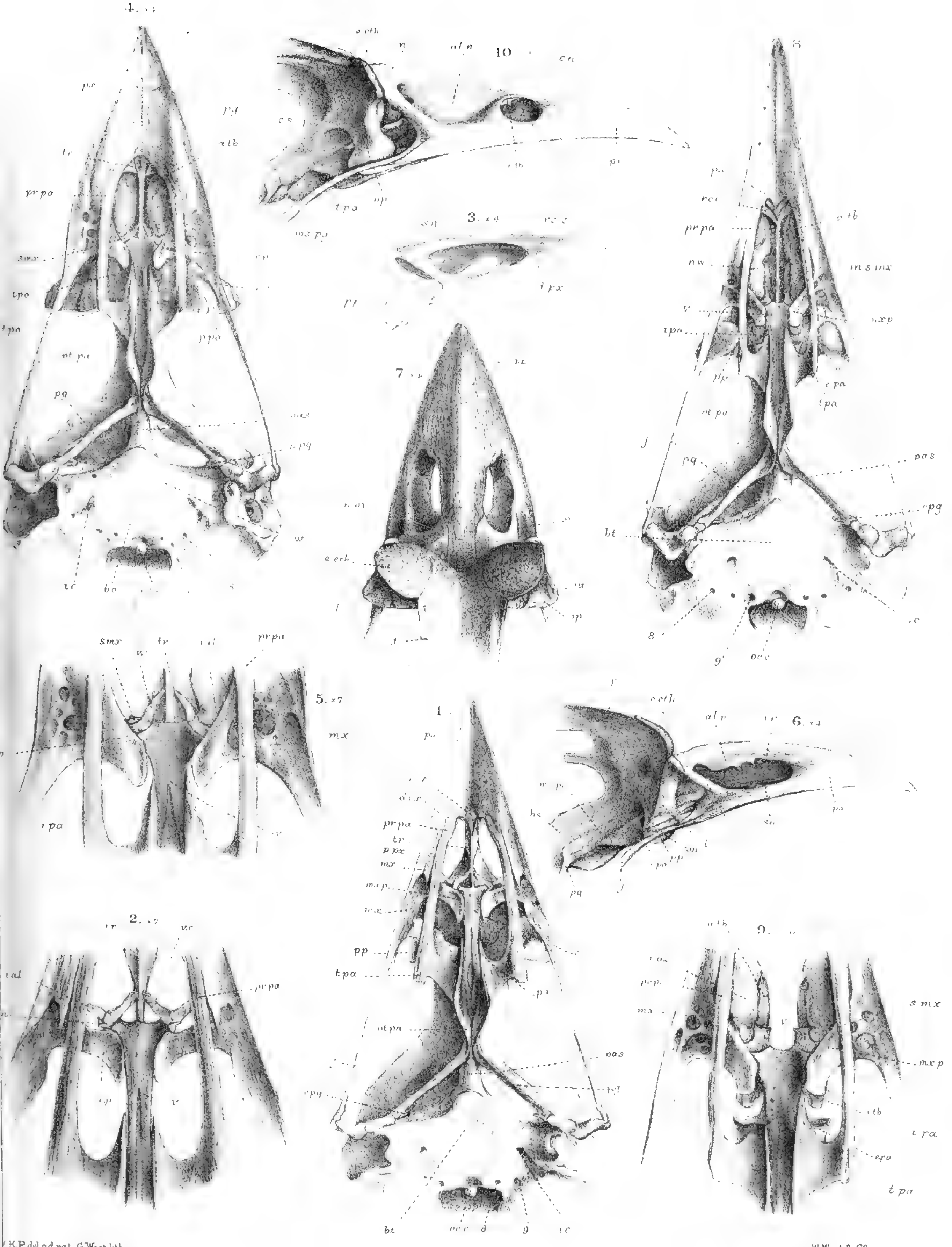
FIGS 1-5 MENURA, 6, 7 PITTA, 8-10 GRALLARIA.



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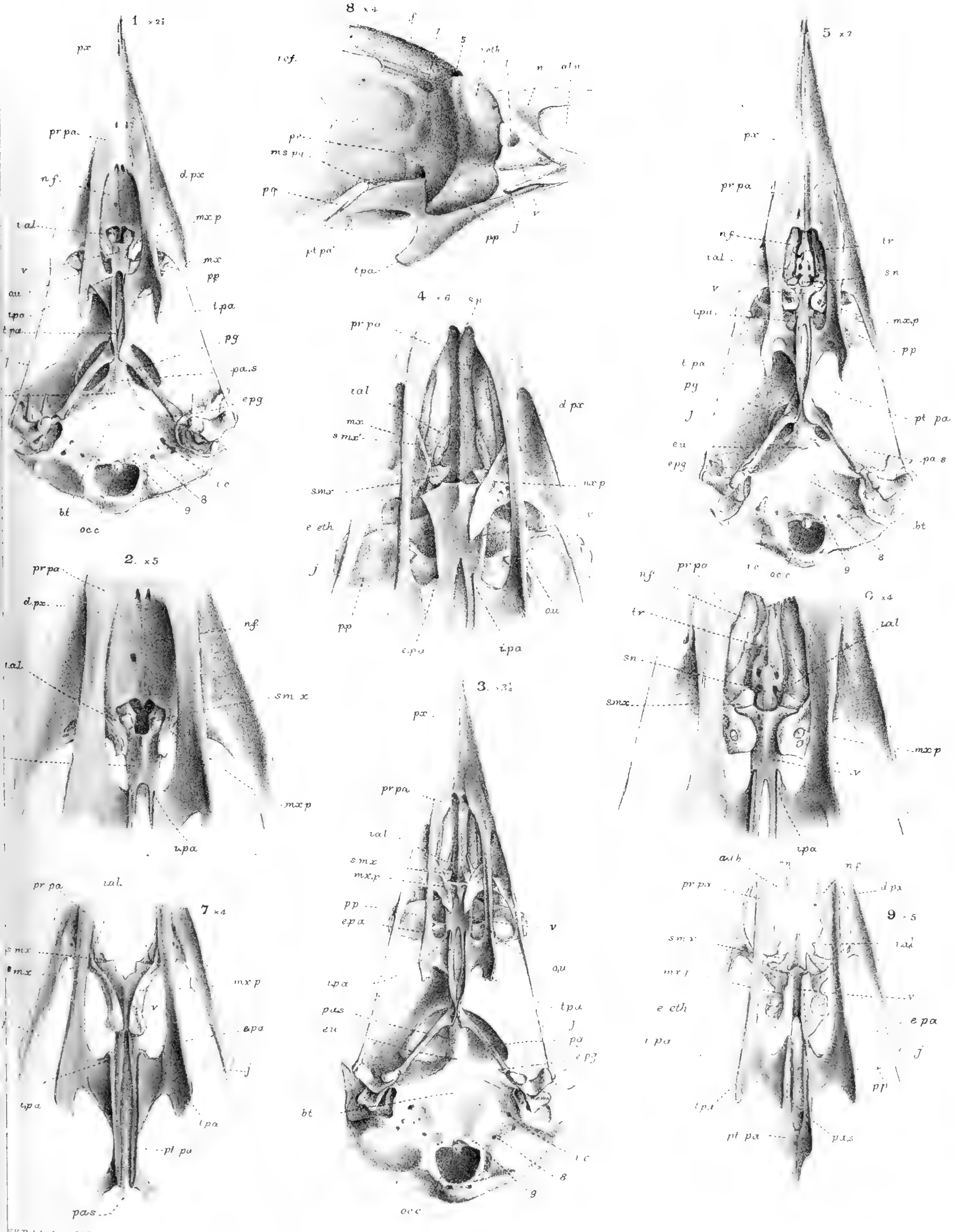
FIGS 1-3 PIPRA, 4-7 PACHYRAMPHUS, 8-10 THAMNOPHILUS.



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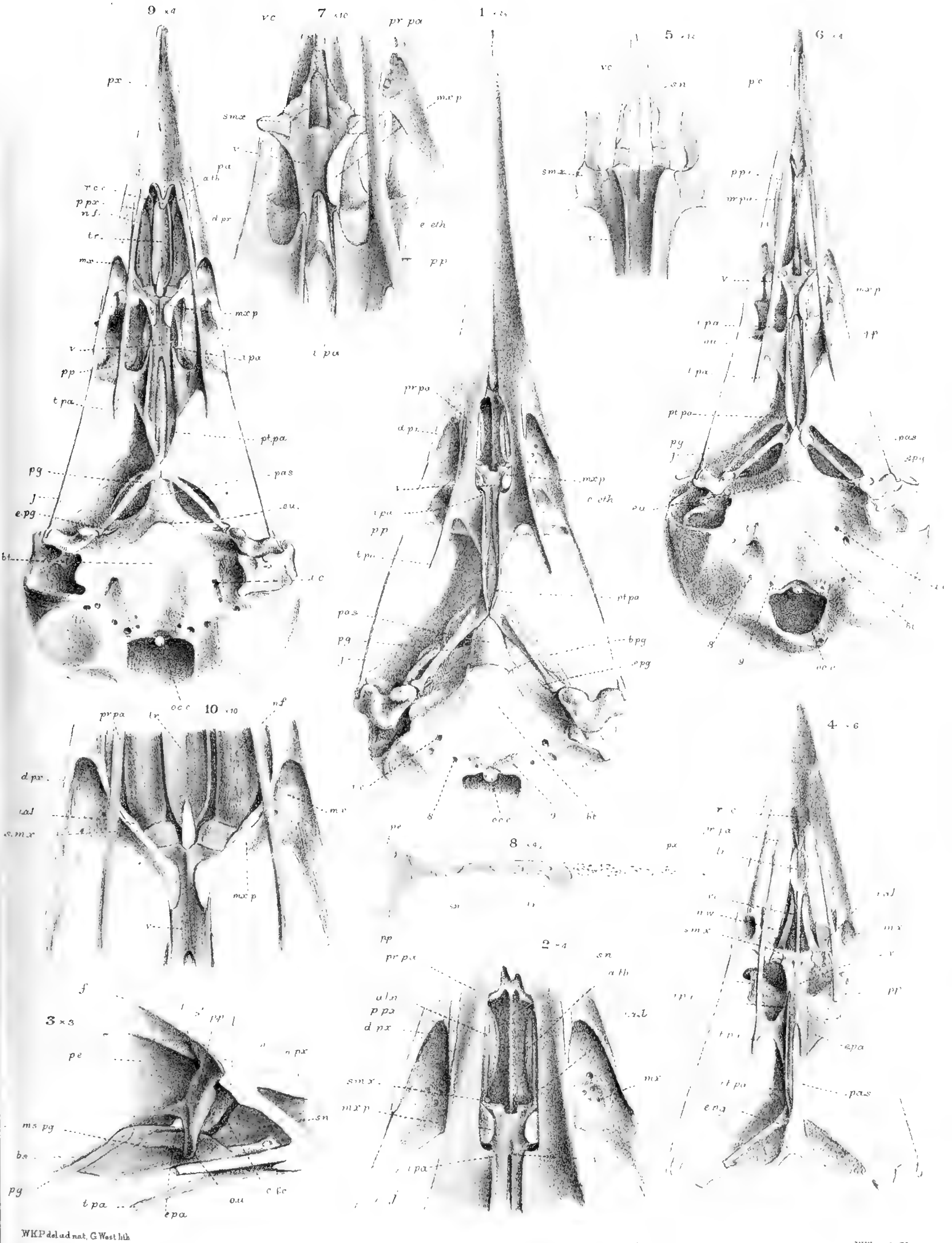
FIGˢ 1, 2. ARTAMUS, 3, 4. HYLOTERPE, 5, 6. DICRURUS, 7, 8. ENODES, 9 TRICHASTOMA.



WKP del ad nat. G West lith

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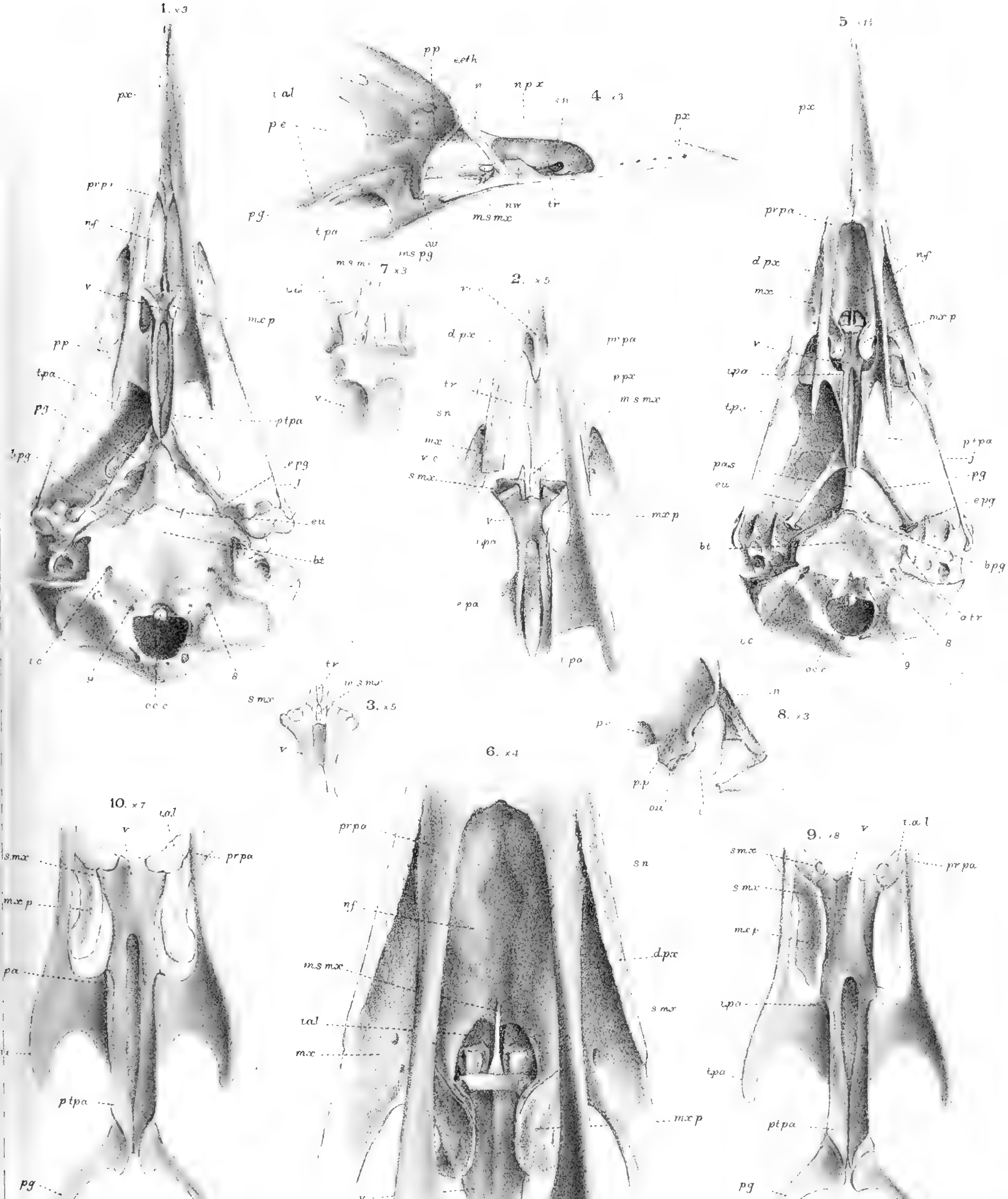
FIGS 1-3. DENDROCOLAPTES; 4, 5. ANÆRETES; 6-8. SYNALLAXIS; 9, 10. MUSCISAXICOLA.



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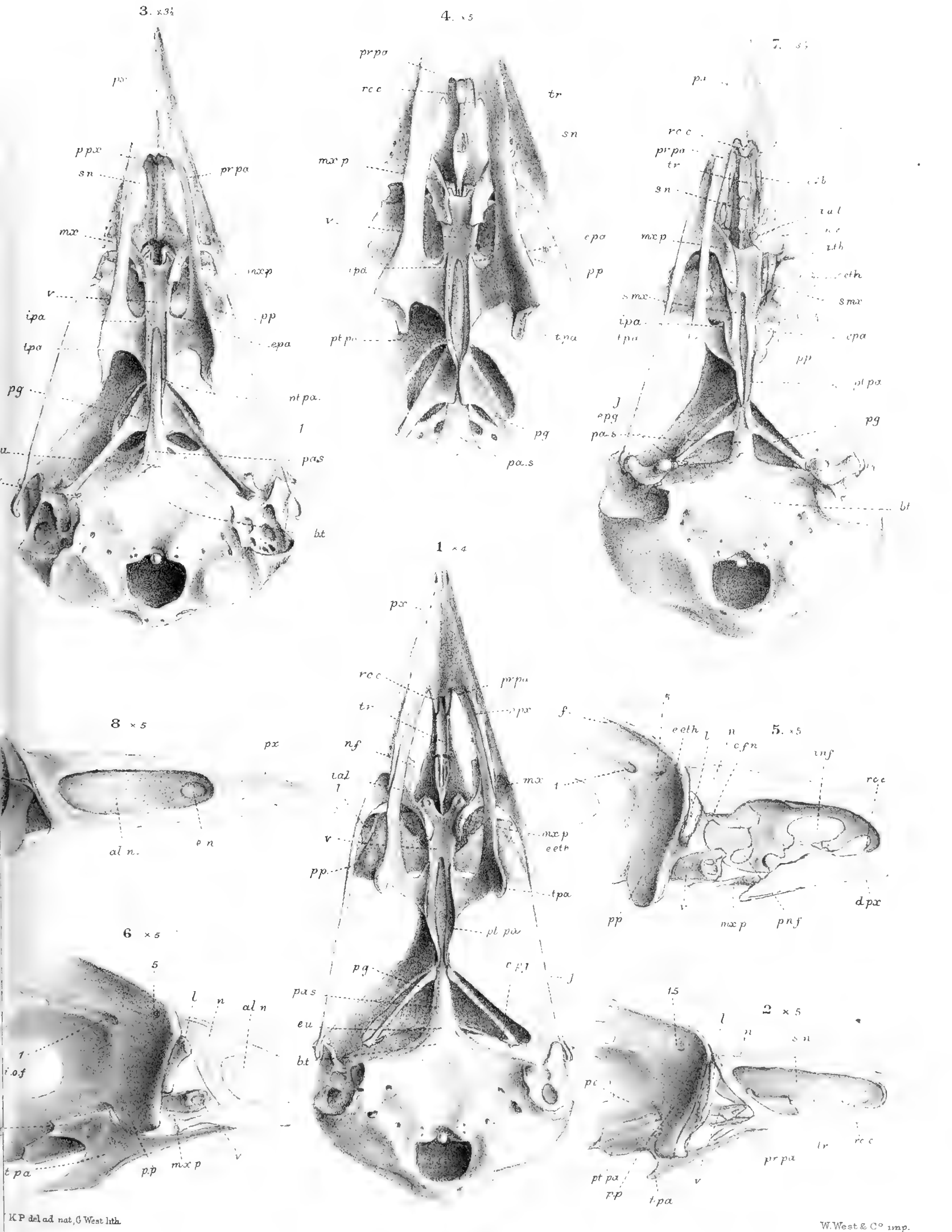
W West & Co imp

FIG.s 1–4. HOMORUS, 5–8. GYMNORHINA, 9, 10 PETROICA.



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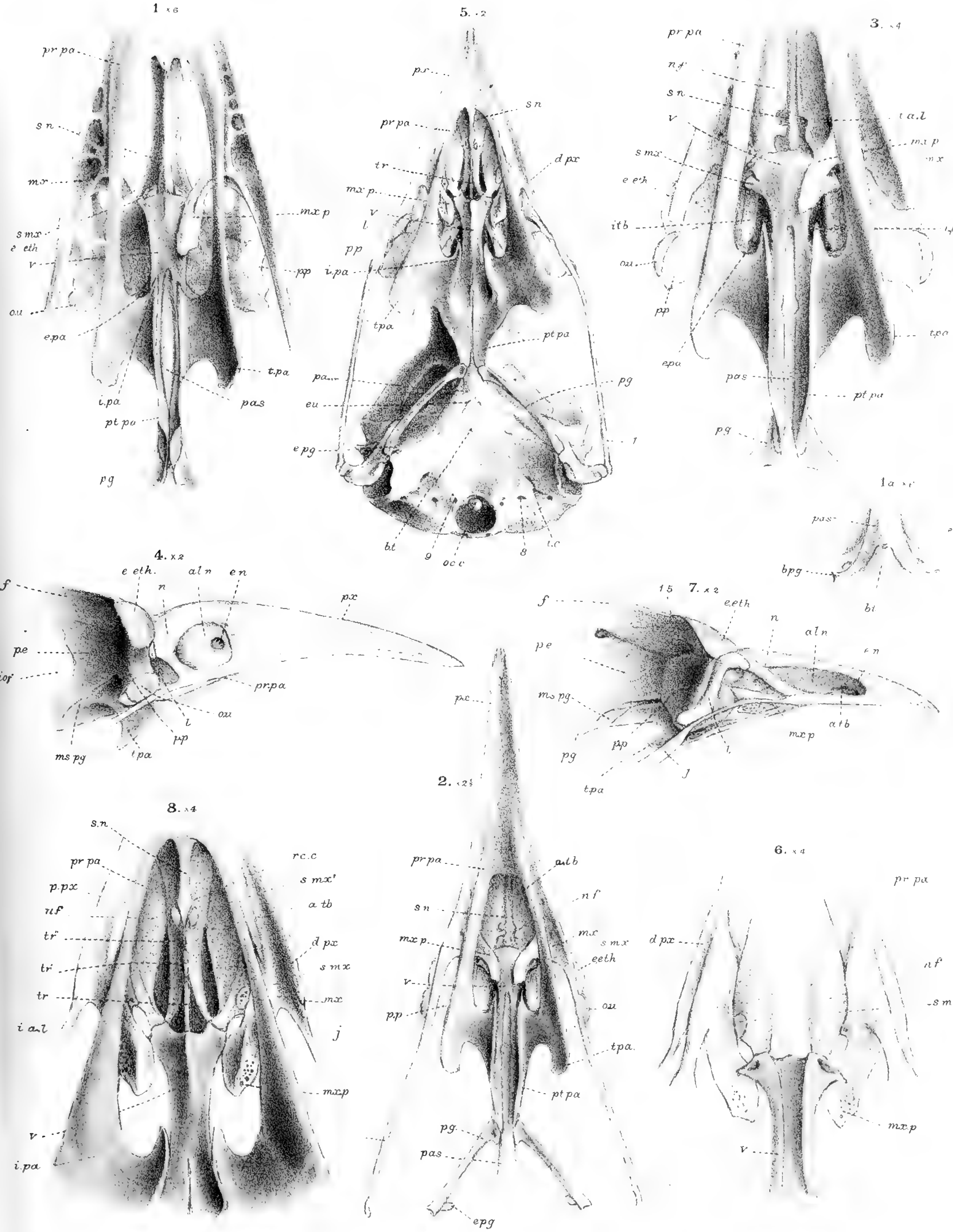
FIGs 1, 2. ELAINEA, 3–6. LANIUS, 7, 8. PACHYCEPHALA.



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FIGS 1, 1a LALAGE, 2–4. PARADISÆA 5–8. CHASMORHYNCHUS.

VI. *On the Myology of* Opisthocomus cristatus. *By* J. Beswick Perrin, *Demonstrator of Anatomy in Owens College, Manchester.*

Read November 4th, 1873.

[Plates LXIII.-LXVI.]

THIS interesting bird has attracted the attention of naturalists from the time of M. L'Herminier, in 1837, a physician in Guadaloupe, who communicated a paper to the Academy of Sciences on the anatomy of certain rare birds, and amongst others of the Hoazin, under the name of Sasa, by which it was said to be known to the inhabitants of Guiana[1].

There seems to have been considerable diversity of opinions amongst authors as to what family the *Opisthocomus* belonged to. These have been well summed up by Prof. Huxley in a paper "On the Classification and Distribution of the *Alectoromorphæ*," read before, and published in the 'Proceedings' of, this Society, May 14th, 1868, as follows:—"L'Herminier is of opinion that the sum of the characters of the bird incline it towards the Gallinaceæ. He puts it, with Vieillot and Latreille, in the distinct family of the Dysodes, before the Pigeons and Gallinaceous birds. M. Gervais, on the contrary, denies that it has any thing to do either with the Gallinaceous birds or with the Pigeons. He considers that it forms part of the great series of 'passeriform birds,' but is so different from the others that it ought to form a separate order in this series, near the Scansores, and "near the *Musophagidæ*, though its affinities with the group may have been exaggerated." Prof. Huxley further states that its peculiarities necessitate the placing of the bird in a special division of the Schizognathæ. Whatever the true position of this bird may be, there are many peculiarities in structure which are, so far as my knowledge goes, found only in this bird. As regards the muscles of the shoulder-girdle, they are more condensed—and exhibit modifications, though of a minor character—than usually met with in birds. The attitude of the crop, its large size, its peculiar shape, and its still more peculiar nidus at once stamp the bird as one of no common kind[2]. I could not with any certainty obtain a drawing of the bird in its undissected condition. Having been in spirit so long, a sketch would only have perpetuated a falsity.

[1] "Observations faites en Amérique sur les mœurs de différentes espèces d'Oiseaux-Mouches, suivies de quelques Notes Anatomiques et de mœurs sur l'Hoazin, &c. par M. Emile Deville," Revue et Magasin de Zoologie, tome iv. 1852.

[2] I must here thank Professor Flower and Mr. Sclater for their kindness in allowing me the privilege of dissecting two beautiful specimens of this bird, obtained in Surinam by Hr. Kappler, of Albina, Maroni River.

The pterylography of both specimens was almost identical with that figured in Nitzsch's work, so ably translated by the gifted Secretary of this Society[1].

Pectoralis magnus.—All the pectoral muscles are large and well developed.

The superficial or great pectoral is the most remarkable (Pls. LXIII. & LXIV). Before the integuments have been removed from the thoracic region, the prominent and regular contour of the breast gives one the idea of highly developed pectorals. This, however, is not absolutely the case, the prominence of the anterior half being due to the large discoid crop, which is implanted upon the great pectorals (Pl. LXIII.); the latter are large, condensated, and quadrilateral in shape. The superior and anterior halves are entirely concealed by the crop, the posterior and superficial portions rising to a corresponding level with the crop. When the crop is removed, it is seen that the upper conjoined halves of both pectorals form a spherical cavity in which the crop rests (Pl. LXIV.). The keel of the sternum is aborted to a corresponding thickness with the pectorals in this situation.

These interesting modifications are widely different, and exhibit in a more remarkable manner the law of cause and effect than is usually met with in birds bearing an extra-thoracic crop. Take for example the Common Pheasant. The sternal keel is

[1] From Nitzsch's Pterylography, translated from the German by Dr. Sclater, Ray Society's pub., 1867:—
A. 9. *Amphibolæ.*

"The presence of an after-shaft on the contour-feathers is a pterylographic character common to all members of this family; as also the occurrence of a circlet of feathers on the tip of the oil-gland, and the number of rectrices, which is always ten. With these characters, however, we seem to have exhausted the points of agreement of the genera belonging to the group; and their essential differences necessitate the following arrangement:—

A. With the bands of the inferior tract narrow, and the outer branch distinct and freely divergent.

B. With the stems of the inferior tract dilated, and no divergent outer branch.

a. Dorsal tract dilated on all sides and sparsely feathered.

b. Dorsal tract much contracted, especially its hinder part, which forms a very narrow serial band.

"Here I place the genus *Opisthocomus*, which is anomalous in many respects. The figure of its pterylosis (Plate VI. figs. 12 & 13) shows that the continous plumage of the head, which is very sparse, but denser on the vertex, is continued upon the neck, and does not allow the formation of lateral neck-spaces. From the lower extremity of this neck-plumage the inferior tract commences as two broad bands, which run down close to the keel of the sternum, and become somewhat stronger at the outer margin, where the branch would be situated. At the end of the sternum these are narrowed, and pass on, gradually becoming weaker, to the anus, at which they terminate with a breadth of only two feathers. Both on the tract itself and on the spaces between its bands, true down feathers are placed, although not very closely. The same sparse condition is exhibited also by the lumbar tracts and the plumage of the crura and wings; but the narrow axillary tracts and the dorsal tract contain more closely approximated, although smaller feathers. The latter starts as a strong, triserial band from the midst of the plumage of the lower part of the neck, and divides between the shoulders into two limbs, with which the originally divergent feather rows of the biserial hinder part are united at the end: from the caudal pit onwards it becomes somewhat broader, and encloses the oil-gland, which is larger, and has a circlet of feathers at the tip, stronger than in the preceding genera. In the wings there are nineteen remiges, of which ten are on the pinion; the first four are graduated, and the fifth and sixth the longest. The tail has ten large rectrices."

prominent, and preserves the diameter of its ridge very uniformly throughout its length; the pectorals are, also, of an equal thickness throughout the whole of their sternal attachments; and the crop disports itself awkwardly enough upon their superficial aspect and the receding furcular angle, more especially when moderately distended. The *Opisthocomus* illustrates a perfect crop and calyx-like receptacle; but the Pheasant only the former, its nidus being referred to a rugged and uncomfortable habitat.

Probably the most remarkable feature in the sternum is the prominent tubercle (Pl. LXIII. *tb*) in which the distal extremity of the keel terminates. It appears as an ovoid surface, somewhat flattened, and projecting to a corresponding level with the superficial surface of the pectorals, the fibres of which it separates at this particular spot. It is only covered by the integument, which is condensed upon it and closely connected with it. In the bird undivested of its plumage it can be readily seen—the skin over the tubercle being destitute of feathers. The keel in front and behind the tubercle bevels off in an arcuate manner, the posterior border being inconsiderable in length. The pectorals adapt themselves to a nicety to the alternating width of the keel, throughout its extent. Section of the pectoral muscle shows its gradually increasing thickness from the furcula to the double angular distal bends of the muscle. Its proximal attachments are similar to those of the generality of birds, viz. to the whole length of the furculum, keel of the sternum, to the distal margin of the lateral half of the sternum, and also to its lateral shelving plate (external xiphoid process) external to the attachment of the second pectoral. The under or sternal surface of the great pectoral is channelled for the accommodation of the 2nd pectoral and its minor associate. The muscle undergoes considerable condensation at its distal extremity, immediately prior to its insertion into the delto-pectoral ridge of the humerus. At the latter point it has some tendinous fibres mingled, but sparingly, with the muscular.

From the middle of the superficial aspect of the insertional fibres, a few detach themselves as a small wedge-shaped muscle, about ½ an inch long (Pl. LXIV.); this speedily terminates in a slender tendon, and receives the anterior portion of the differentiated deltoid muscle. The conjoined tendon traverses the brachium as far as the lower end of the humerus, where it divides into two tendons: the anterior one is inserted into the tendon of origin of the extensor carpi radialis longior; and the posterior, smaller than the preceding, crosses the outer aspect of the extensor muscles, continues its course along the bases of the wing-feathers as a fascial expansion, and is finally lost upon the dorsal aspect of the carpus. This tendon gives slips of attachment to all the cubital feathers except the last three or four.

There is another small muscle (Pl. LXIV. fig. 3) which arises from the fascia covering the biceps, immediately below the lower border of the great pectoral muscle. Its muscular belly is three quarters of an inch long, fusiform in shape, and ends in a slender tendon, which traverses the cubit as far as the base of the 1st metacarpal. These muscles constitute the extensor plicæ alaris of Professor Owen[1].

[1] Prof. Owen (Anat. & Phys. of Vert. vol. ii.) describes this extensor as consisting of "two portions, of which

The description of the extensor longus alaris presents remarkable differences from that commonly met with in birds. I could not detect any trace of the elastic band which is so common a constituent of the central portion of the alar tendon. Again, the biceps portion (Pl. LXIV. fig. 3) was isolated from the delto-pectoral portion, and constituted the main distal alar tendon. This arrangement is only one of the many dispositions met with in different birds[1].

The *2nd pectoral* is an oblong, bipennate muscle, the angular extremity of the fibres being directed forwards and outwards. It is attached proximally to the lateral aspect and keel of the sternum in entire length, to the sternal extremity of the coracoid, and

---

the anterior and shorter arises from the internal tuberosity of the humerus, the posterior and longer from the clavicular extremity of the coracoid bone. In the Ostrich and Rhea, however, both portions arise from the coracoid. The posterior muscle sends down a long thin tendon, which runs parallel with the humerus, and is inserted, generally, by a bifurcate extremity into both radius and ulna. The anterior muscle terminates in a small tendon, which runs along the edge of the aponeurotic expansion of the wing. In this situation it becomes elastic; it then resumes its ordinary tendinous structure, passes over the end of the radius, and is inserted into the short confluent metacarpal." Professor Owen has evidently in this description combined the biceps flexor with the alar flexor.

[1] In the *Strix flammea* the flexor longus alaris consists of two portions, one derived from the peripheral extremity of the great pectoral, the other from the anterior differentiated portion of the deltoid, as already described. From the common point of union of these two muscles three tendons result, which proceed to their respective insertions enclosed between a duplicate fold of the integuments. The outer tendon occupies the anterior and outer fold of the wing, traverses the base of a triangle, the two sides of which are formed respectively by the humerus and the bones of the forearm in their semiflexed position. It is finally attached by its distal extremity to the base of the rudimentary first metacarpal. This tendon is of considerable thickness, owing to the development upon it of a fusiform band of elastic tissue, which, irrespective of muscular action, maintains, in the inactive state, the wing in a flexed position. The two remaining tendons pass down in the interval between the preceding and the biceps, running parallel to each other, and are connected in the middle of their course by an intercommunicating tendon, about an inch long. Both tendons are attached by their distal extremities to the tendon of origin of the fusiform extensor carpi radialis longior, one about a quarter of an inch in front of the other. In advance of them there is a second intercommunicating tendon which connects the outer elastic tendon with that of the extensor carpi radialis longior.

In the Heron (*Ardea cinerea*) and Cormorant (*Phalacrocorax carbo*) only a part of the middle one of the three tendons joins the extensor carpi radialis longior. Very frequently this excentric muscle is still further complicated by the addition of another tendon, or muscle, which arises either as a segmentation of the biceps, and decidedly continuous with it, or from a fascial expansion springing from that covering and investing the biceps, and invariably from opposite a point corresponding to the lower border of the great pectoral. It usually joins the outermost of the three above-described tendons, although there are several differences from this more general mode of distribution. In the Common Duck, Wild Duck, Wood-pigeon, Ptarmigan, Cormorant, Red-throated Diver, Lapwing, Snipe (*Scolopax gallinago*), and many other birds I have noticed this biceps addition to the extensor longus alaris, not always, however, joining it, but sometimes forming a distinct muscle in its entirety. In some specimens, *e.g.* the Wild Duck, the pectoralis major does not contribute a muscular slip to the extensor longus alaris, the muscle simply consisting of the biceps and deltoid portions, which embrace, prior to their union, the great pectoral insertion. Again, the resulting tendons do not always spring from a common one, but sometimes as three independent tendons from the deltoid portion of the muscle alone.

to the costo-coracoid membrane against which it is immediately applied. It is expanded and rounded at its distal extremity, corresponding to the club-shaped lateral extremity of the sternum between the incurvated great pectoral origin. Its tendon of insertion commences on the coracoid, and plays over it in a pulley-like fashion, crosses the head of the humerus to a prominent ridge on the middle of the dorsal surface, immediately above the articular facet on the summit of the great tuberosity of the humerus.

The *3rd pectoral* has its usual origin. It is moderately well developed. It runs almost parallel with the coracoid, crosses behind the coraco-brachialis; its tendon of insertion glides over the pulley-like summit of the ulnar tuberosity of the humerus to be inserted into a depression immediately below the tuberosity, and below the insertion of the teres major, the latter muscle crossing it obliquely. This muscle and the coraco-brachialis cover the axillary space, and are applied directly against the axillary vessels and nerves.

The *coraco-brachialis* is inserted into the summit of the inner tuberosity of the humerus by a short slender tendon, which joins with that of the subscapularis.

The *subscapularis* arises from the anterior two-thirds of the ventral surface of the scapula; it is a triangular-shaped muscle, and rapidly converges towards its insertional tendon. It is crossed by the coraco-brachialis and the 3rd pectoral. The tendon of the latter muscle lies imbedded in the muscular fibres of the subscapularis, but does not divide it into two parts, as described by Owen in other birds.

Depressor coracoideus and costo-scapularis are closely associated at their origin, arising as a broad, but thin, muscular band from the anterior external angle of sternum, and 1st sternal rib as far as its angle. The muscle then divides into two portions—the coracoid factor passing obliquely upwards, forwards, and outwards, to be inserted into the sternal 3rd of the coracoid, its lower border and posterior surface; the scapular factor is slender and elongated, and passes horizontally outwards, terminating in a short flattened tendon, which is inserted into the ventral border of the scapula about half an inch posterior to its articular extremity. The subscapularis muscle lies in front and partially conceals it. It is applied for half its length against the 1st vertebral rib.

Teres major, large, fleshy, and wedge-shaped, arises from the anterior border of the lower half of the scapula, and from the posterior two thirds of its dorsal aspect. It terminates by blunted cone-shaped musculo-tendinous fibres in a large depression situated below the inner tuberosity of humerus. There was no scapular attachment as mentioned by Owen in the birds which he dissected.

Serratus magnus is a thin muscular band imperfectly developed. It arises, apparently, from the 3rd, 4th, and 5th vertebral ribs, about midway between the sternum and the vertebræ. It is inserted into the lower third (or a little more) of the ventral border of scapula, and also into the inferior angle.

The *supraspinatus* is represented by a small muscular fasciculus.

I did not notice in either of the two specimens the small muscular slip, called by Owen the dermo-humeralis, which is so commonly present in birds. The latissimus dorsi, rhomboids, &c., presented no peculiarities.

The coracoid and furculum are immovably fixed[1].

The subfurcular space, and the membrane which separates it from the cervico-axillary space, are very narrow and ellipsoidal in shape.

The *deltoid* presents a similar arrangement to that met with in the Wood-pigeon, viz. a posterior detached portion inserted into the lower end of the outer border of the humerus and perforated by the musculo-spiral nerve, a middle portion, which mainly joins the tendon of origin of the extensor carpi radialis longior, and an anterior portion, which gives a contributory tendon to the extensor plicæ alaris. Virtually the posterior, corresponding to the spinal fibres of mammals, is the only part of the muscle belonging to the first arm-bone, unless the small muscle which is situated on a deeper plane, and inserted into the upper and dorsal extremity of the humerus, can be regarded as a portion of the deltoid rather than an infraspinatus muscle.

Biceps flexor cubiti, though strictly speaking a monogastric muscle, has a tendency to divide proximally into two portions. It arises by a thin tendon, which becomes expanded as it crosses the shoulder-joint, thus playing a twofold purpose:—1st, as a protective ligament to the joint; and, 2ndly, to allow the great pectoral muscle to glide freely over it. The tendon abruptly terminates opposite the lower border of the great pectoral in a strong fusiform muscular belly. In other respects the muscle presents the average avian distribution.

The triceps is a digastric muscle. The humeral head, however, exhibits slight traces of a tendency to further section. It presents the average arrangement.

Muscles of the Cubit.

Pronator radii teres.—Monogastric. Fusiform in shape. Attached proximally by a strong pointed tendon to the internal humeral condyle, distally to the middle of the shaft of the radius.

Flexor carpi radialis.—Large and fleshy. It springs from the inner condyle of the humerus beneath the preceding. It is inserted mainly into the lower third of the preaxial surface of the radius, and by a few fibres into the radial carpal bone.

Flexor sublimis digitorum.—Springs from the inner humeral condyle by a strong flat tendon. It is fusiform in shape. Immediately above the carpus it terminates in a single tendon, which grooves the lower end of the ulna and afterwards runs along the superior border of the long (2nd) metacarpal. It is inserted into the middle of the antepenult phalanx.

Palmaris longus.—Is simply represented by a strong flat and ribbon-like band of fascia, extending between the inner condyle of the humerus and the carpus.

[1] Prof. Huxley says, "a rare peculiarity, which has been observed in *Didus*." "In the ankylosis of the furcula with the manubrium, *Opisthocomus* stands alone." Proc. Zool. Soc. May 14, 1868.

Flexor carpi ulnaris is well developed. Origin similar to preceding muscles. Insertion into the ulnar carpal bone. Arising in conjunction with the latter, also from the olecranon of the ulna, is a moderately developed muscle, which is applied closely against the bases of the five or six posterior ulnar wing-feathers. This terminates in a long fibro-elastic tendon, and is connected to the bases of the remainder wing-feathers as far as the carpus; this is the extensor carpi ulnaris. Immediately inferior to the latter is another elastic tendon, which connects the bases of all the wing-feathers together, its line of attachment corresponding to that of the integuments. It is strong, powerful, and as elastic as a piece of india-rubber. Its action is to approximate all the wing-feathers, and to maintain the carpus flexed on to the metacarpus.

Flexor profundus digitorum.—Consists of two portions. The first arises from the proximal two-thirds of the inner or flexorial aspect of the ulna, and terminates in a common tendon, which grooves the carpus, and there divides into two tendons,—a short and a radial one, which is inserted into the base of the distal phalanx of the 1st or rudimentary digit; the second or long one (internal to the preceding) goes to the distal extremity of the second or long digit. The second portion is the flexor metacarpi pollicis.

It arises by fleshy fibres from the lower third of the ulna. It crosses obliquely over the lower end of that bone, terminating in a short tendon which grooves the outer portion of the carpus (the radial carpal). It is inserted into the superior and dorsal aspect of the carpus adjoining the rudimentary 1st digit. It is a powerful flexor of the carpus.

Muscles on the superior border of the Radius.

The *extensores carpi radialis longior et brevior* are both closely associated at their origin, and receive, respectively, a tendinous slip from the extensor plicæ alaris. The distal tendons of these two muscles unite opposite the lower end of the radius, to be inserted into the base of the first metacarpal. The latter arrangement is common in many mammals, and is occasionally found in Man.

The *extensor ossis metacarpi pollicis* arises from the posterior surface of the upper half of the shaft of the radius, and by a few fibres from the ulna. It is inserted by a slender tendon into the base of the 2nd metacarpal immediately posterior to the conjoined tendons of the extensors carpi radialis longior et brevior. A small rudimentary interosseous membrane intervenes between the extensor and flexor muscles.

The *extensor indicis* arises from the lower half of the shaft of the radius (from the interosseous membrane) and from the adjoining portion of the ulna. It terminates in a strong tendon, which grooves the lower end of the ulna, crosses beneath the innermost tendon of the extensor communis digitorum to its ulnar side, and is finally inserted into the base of the 2nd phalanx of the 2nd digit.

The *extensor longus digitorum* consists of two muscles, both of which arise from the external condyle. The radial one terminates in a slender tendon, which is inserted into the base of the 1st phalanx of the 2nd digit; the ulnar one, into the middle of the ulnar side of the 2nd metacarpal.

The *extensor brevis digitorum* (interosseous) is situated in the interval between the 2nd and 3rd metacarpals. It is inserted into the base of the 2nd phalanx of the 2nd digit, and to the ulnar side of the preceding tendons. In the latter respect it resembles the extensor indicis more than the muscle which I have already described under that name.

The supinator brevis and anconæus present their usual arrangements, as also the remainder small muscles of the manus.

Caudal Muscles.

These are well developed, and may be divided into three classes—dorsal, ventral, and lateral. The dorsal muscles are two in number, the levatores caudæ superficialis and profundus.

The *levator caudæ superficialis* is attached by its proximal end to a deep depression external to the posterior median sacral ridge by tendinous fibres; distally, to the spines of the caudal vertebræ by aponeurotic fibres, which seem to decussate across the median line.

The *levator caudæ profundus* is situated on a deeper plane than the preceding, and is partially overlapped by it. It springs from the distal dorsal extremity and excavated surface of the ischium, and also from the lateral aspects of the caudal vertebræ. It is inserted into the fascia covering the bases of the three or four inner feathers of the tail, partly into the superior surface of the caudal gland, and also into the extremity of the median spine of the caudal vertebræ.

The lateral muscles are three in number:—

1. Abductor caudæ externus.
2. " " anterior.
3. " " posterior (quadratus coccygeus).

Abductor caudæ externus (pubo-coccygeus) arises from the posterior extremity of the os pubis. It is inserted into the bases of the one or two outer tail-feathers.

Abductor caudæ anterior.—This is a large and extensive muscle. Its lateral edge only, however, can be seen in the figure. It arises from the tuberosity of the ischium, from the apex of the transverse processes of the coccyx, occupying the lateral free aspect of the tail. It is inserted into the base of the outer aspect of the fifth tail-feather.

Situated upon the bases of the tail-feathers is a large triangular-shaped rump-gland.

The Ventral Muscles of the Tail.

These are:—

1. The depressor caudæ superficialis.
2. The depressor caudæ profundus.
3. Dilator caudæ rectricum.

The *depressor caudæ superficialis.*—This is a large, broad, fleshy muscle. It arises from the posterior aspect of the slender rod-like pubis, anterior and internal to the pubo-coccygeus. It is inserted into the prominent ventral elongated coccygeal tubercle, and into the ventral aspect of the bases of the 3rd, 4th, and 5th tail-feathers. By its inner border it is in immediate contact with its fellow of the opposite side.

Depressor caudæ profundus.—Lies immediately beneath the preceding. It is a broad and expanded muscle. It arises from the posterior margin of the sacrum, immediately external to the middle line. Its fibres run in a slightly oblique direction backwards and inwards, terminating in the median coccygeal tubercle, on its upper aspect, and also attaching themselves to the sides and bodies of the transverse processes of the coccygeal vertebræ situated above the terminal tubercle. Some of the fibres are prolonged on to the bases of all the wing-feathers except the outermost one. Besides these muscles there is another one on each side of the median line. It is attached by one extremity to the distal end of the coccygeal tubercle, and spreads out into small digitations to be attached by its other extremity to the bases of the three or four outer tail-feathers. The action of this muscle is evidently to approximate the tail-feathers.

Actions.—The extensors caudæ superficiales, acting separately and alternately, move the tail from side to side. Acting in combination they are powerful extensors of the tail. It is these muscles which produce that persistent and over-erect position of the tail in birds of the Pheasant-species. In show-fowls I have several times divided these muscles to obviate that condition, which is adverse to success in prize-showing. In fact, in the highly bred Pheasant-fowl this peculiar and persistent erection of the tail considerably militates against the chances of success, as well as detracts from its beauty.

The abductores caudæ interior and externus abduct and flex the tail laterally. The abductor caudæ posterior abducts and elevates the tail and spreads the tail-feathers.

The flexor muscles, acting in conjunction, are powerful flexors of the tail; singly or the two of one side cooperating they abduct it to one or the other side.

The femoro-caudal muscle is large. No peculiarities.

Muscles of the Leg.

The *Sartorius* is long, well developed, and entirely muscular. It arises from the anterior extremity and outer margin of the innominate bone. It traverses the thigh obliquely, crosses over the knee-joint, and opposite it joins the *rectus femoris* muscle. It is inserted into a tubercle upon the front of the tibia, and into the bone immediately below it.

The *rectus femoris* is situated immediately behind the preceding. It springs from the outer margin of the innominate bone, and from a tendinous aponeurosis common to it and the *tensor fasciæ femoris* and *gluteus externus.* It is broad at its origin, but diminishes in size as it descends, terminating in a thin flat tendon which abuts on the conjoined tendon of the tensor fasciæ and gluteus externus. The two latter muscles are inseparably blended at their origin, and united also with the rectus. Combined they occupy the whole length of the innominate bone. The conjoined muscles end about the middle of the thigh in a broad aponeurosis, which joins with that of the *vastus externus*.

The *vasti* muscles present a similar arrangement to their analogues in the higher animals. The externus is large and well developed.

The *gracilis* is a large and triangular-shaped muscle. It arises by a broad fleshy base from the posterior margin and surface of the os pubis. It passes downwards, forwards, and inwards, terminating in a broad, flat tendon which passes between the outer and middle heads of the gastrocnemius, and is inserted into the inner surface of the tibia below the head.

The *biceps femoris* is a unicipital muscle, of considerable size, situated on the posterior aspect of the limb, anterior to the semitendinosus. It arises partly tendinous and partly muscular from the ischium, above and behind the acetabulum. It terminates at the lower and back part of the thigh in a short and rounded tendon, which passes through a loop thrown around it, which acts as a pulley to it. This loop is attached by one extremity to the outer surface of the lower end of the femur, just above the origin of the middle member of the gastrocnemius, and by its inferior extremity to a tubercle situated upon the outer surface of the head of the tibia. It gives origin to a few fibres of the outer head of the gastrocnemius. The tendon of the biceps, after passing through this loop, is covered by the plantaris, the outer gastrocnemial factor, and two of the superficial flexor muscles. It is inserted into the posterior surface of the fibula about half an inch below the head of that bone.

Owen states that, by means of this loop, which seems to be common to birds in general, the weight of the hinder parts of the body is partially transferred, when the leg is bent, to the distal end of the femur; and the biceps is enabled, by the same beautiful and simple mechanism, to effect a more rapid and extensive inflection of the leg than it otherwise could have produced by the simple contraction of its fibres.

The *semitendinosus* arises from the ischial portion of the pelvic bone and its small prolonged bony process. It is situated behind the oiceps. It is inserted by a broad flat tendon into the upper and inner surface of the tibia, immediately below its head.

The glutei muscles are:—1st, the maximus vel externus already described; 2nd, the medius; 3rd, the minimus; 4th, a small slip of muscle analogous to the gluteus quartus.

The *gluteus medius* arises from the large concave dorsum of the iliac portion of the innominate bone, terminates in a broad flat tendon, which is inserted into the upper and external surface of the great trochanter of femur.

The *gluteus minimus* is situated immediately below the preceding, and beneath the rectus and conjoined tensor and gluteus externus. It arises from the inferior margin of the iliac portion of the innominate bone, extending from the acetabulum to the upper part of the middle third. It is inserted into the base of the great trochanter, its external surface, below the medius and above the origin of the vastus externus.

The *gluteus quartus* is a small muscle arising from the prominent process of bone which springs from the posterior acetabular border. It is inserted into the great trochanter of the femur, behind the medius and on the same plane. This muscle resembles rather the gemellus superior than a fourth gluteus, especially as its position is immediately above the obturator internus.

There is a somewhat peculiar muscle, which I am inclined to think is the semimembranosus. It arises from the shelving process of the ischium, and from the surface of bone below and behind it, by muscular fibres. It increases in size as it passes downwards and forwards, and is inserted into the lower end of the femur, behind the outer head of the gastrocnemius and the bicipital loop. A few of its fibres extend as low down as the posterior surface of the upper extremity of the tibia. The great sciatic nerve lies superficial to it.

The femoro-caudal muscle is connected by a small band of muscular fibres with the preceding muscle.

The obturators, adductors, and quadratus femoris are present and well developed, but present no special peculiarities.

The psoas, iliacus, and pectineus are rudimentary.

The great sciatic nerve is divided into peroneal and popliteal from its exit through the ischiatic foramen. They lie parallel, and are enveloped in the same sheath. About the middle of the thigh there is an intercommunicating branch. In the common Pigeon &c. this division only takes place, as in Man, opposite the lower third of the thigh. Probably it is accidental, or if not, is present occasionally in different specimens of the same species of birds.

The external popliteal (peroneal) nerve passes through the bicipital loop with tendon of biceps. This is constant in birds.

The *peronæus longus* is a broad and expanded muscle at its origin. It arises by an aponeurosis from the mesial tubercle of the tibia, which conceals the upper half of the tibialis anticus muscle. It springs also by fleshy fibres from the whole length of the rudimentary fibula, and it receives a few additional fibres from the tibia. The tendon resulting from its fleshy belly divides opposite the lower third of the tibia into two portions, an anterior and a posterior. The anterior tendon terminates on the dorsal aspect of the foot in a broad expansion, which is inserted into the base of the first phalanx of the external digit. The posterior tendon follows the usual course.

The peroneal nerve has the same relation to this muscle as in the higher animals.

The *peronæus brevis* arises from the remainder true portion of the fibula, also from the lower two thirds of the shaft of the tibia. It is inserted by a short tendon into the base of the outer metatarsal bone.

The *tibialis anticus* (Pl. LXV.) is a large fleshy muscle. Its origin is average. It is inserted by a slender tendon, which passes beneath the anterior annular ligament into the fibular side of the base of the innermost metatarsal bone.

The *extensor longus hallucis* (Pl. LXV. fig. 2) is closely associated with the preceding muscle. It arises by a pointed tendinous process from the outer aspect of the head of the tibia. It is fusiform in shape, and terminates in a slender tendon which passes underneath the annular ligament with the tendon of the preceding muscle, and is inserted by its side into the base of the inner metatarsal bone and shaft.

The *extensor longus digitorum* (Pl. LXV. fig. 1, 2) is situated behind and on a deeper plane than the tibialis anticus. It springs from the upper and anterior half of the tibia, also from its head and median tubercle. An inch above the ankle-joint it terminates in a slender tendon which passes underneath the anterior annular ligament, traverses the metatarsus as a single tendon as far as the phalangeal bases, where it undergoes an increase in size, and then divides into three tendons, which are distributed to the three outer digits. The middle one is the longest and strongest tendon. All pass to the bases of the distal phalanges. Opposite the ankle-joint the tendon passes through the tibial intertrochlear groove, and then crosses behind the tendons of the tibialis anticus and extensor proprius hallucis.

The *extensor brevis digitorum* (Pl. LXV. fig. 2, 11, 12) is a powerful muscle consisting of an outer and an inner portion. The *outer* arises from the whole length of the dorsal aspect of the outer metatarsal bone, and from the proximal third of the external surface of the inner metatarsal. Opposite the distal extremities of the metatarsals it divides into two short tendons, which pass to be inserted into the dorsal aspect of the bases of the first phalanges of the 2nd and 3rd digits. The *inner portion* arises by a pointed process from the inner metatarsal bone. It terminates in a single tendon, which is inserted into the base of the first phalanx of the 2nd digit, more internal than the preceding.

This muscle partakes more of the character of an interosseous than a legitimate extensor brevis digitorum.

On the tibial side of the extensor brevis are two other muscles—a long, and a short one. The long one arises from the base of the inner metatarsal bone by fleshy fibres. It terminates opposite the lower third of the metatarsus in a moderately strong tendon, which passes obliquely forwards to the extensor aspect, as far as the base of the distal phalanx. It is the only long extensor tendon to this digit. The short muscle arises from the lower half of the tibial side of the inner metatarsal bone, and is inserted into the base of its first phalanx on its extensor aspect. The position of this digit is exactly the reverse of that of the 2nd, 3rd, and 4th digits.

The rudimentary aponeurotic plantar expansion, analogous to the plantar fasciæ, sends a slip to the tibial side of the base of the first phalanx superficial to the preceding muscle.

On the outer side of the 1st digit is a small opponens muscle (interosseus). It arises from the whole length of the outer side of the shaft of the proximal phalanx, and is inserted into the external surface of the base of the distal phalanx. This muscle abducts the first digit, and draws it across the plantar aspect of the second.

The articulation between the first metatarsal and its phalanx is of the nature of an enarthrodial joint, the head being proximal, and the cavity distal. The bones are connected by a capsular and a strong ligamentum teres.

The gastrocnemius, plantaris, and popliteus present their usual arrangement.

The analogue of the soleus consist of a series of differentiated muscular slips. The most external of the series arises from the outer tuberosity of the tibia, and from nearly the whole length of the shaft of the fibula. It terminates in a long slender tendon, which grooves the ankle-joint, and traverses the plantar aspect of the foot as far as the 1st phalanx of the 3rd digit, where it splits into two tendons to allow of the passage of the deepest flexor tendon. It is finally inserted into the sides of the 2nd phalanx of the same digit. This is the perforans portion of the soleus series to the 3rd digit.

The perforatus portion to the same digit arises tendinous from the back of the lower end of the femur. It terminates in a strong tendon which grooves the lower end of the tibia, traverses the plantar surface of the foot, and divides opposite the distal end of the metatarsal bone to permit the passage of the tendon of the perforans (preceding tendon). The two minor tendons are inserted into the sides of the 1st phalanx of the 3rd digit.

The next muscle of the series is situated on a deeper plane. It arises from the external condyle of the femur, and from the adjacent portion of the head of the tibia. It is inserted into the sides of the base of the 1st phalanx of the 4th toe, its tendon previously splitting to allow the passage of the perforans tendon. The latter springs from a muscular belly, which arises in conjunction with the former. On a still deeper plane is another segment, which sends a tendon to the sides of the 1st phalanx of the 2nd digit. There is still another segment, which, by its tendon, joins the long flexor tendon on its tibial side in the plantar region.

The *flexor longus hallucis* and *tibialis posticus* are represented by two small muscles; one arises from the outer half of the upper third of the tibia. It soon ends in a strong tendon, which is inserted into the proximal end of a large pulley-like sesamoid bone, which plays over the posterior aspect of the ankle-joint. The other, about half an inch above the ankle-joint, joins the preceding as a small muscle, which springs from the lower end of the fibula.

The *flexor longus digitorum* is a large and fleshy muscle. It is attached proximally to the upper half of the posterior surface of the tibia, and fibula nearly its whole length. It is bipenniform in shape; its muscular fibres extend as far as the ankle-joint, resulting in a strong tendon, which passes behind and between the two sesamoid bones covering the joint. It then passes between the two metatarsals and through a distinct osseous canal into the plantar region, where it divides into four tendons, previously receiving, as already mentioned, a tendon from the soleus series. The tendons are distributed respectively to the bases of the distal phalanges of the 1st, 2nd, 3rd, and 4th digits (that to the 3rd digit being the largest). The tendon to the 1st digit presents a remarkable arrangement. It passes through a cleft between the 1st and 2nd metatarsal bones to attain the flexor aspect of the hallux, grooving the trochlea of the metatarsal phalangeal articulation. On the under surface of the tendon of this muscle is a lumbrical muscle which springs solely from it. It is inserted into the proximal phalanges of the 2nd and 3rd digits.

Besides these muscles there are an extensor and flexor brevis hallucis, and a flexor brevis and abductor minimi digiti. These muscles present no remarkable peculiarities in their attachments. The same may be said of the cephalic, cervical, and abdominal muscles[1].

The muscles of birds present considerable uniformity in disposition, more so than their multitudinous differences in external configuration and diverse habits would lead us to infer. What tendency there is to muscle-change culminates in a great measure into a difference in degree of development. In a bird that cannot fly, the muscles of the wing are of an impoverished kind ; in birds which use their wings the muscle are large and substantial; and intermediate between modified and abundantly developed muscle-tissue there are many shades of difference.

However interesting muscular anatomy may be, as applied to birds only, it is of a secondary character to the broader view which must be considered—namely, general morphology. Every one in the habit of dissecting animals and comparing one with another cannot fail to be impressed with the wonderful adhesion manifested to one type or plan. There is more or less absolutely a general similarity, with minor illustrative differences, the latter indicating evolution, but not by any great and untraceable strides, but by an easy gradation, which seems to continue uninterruptedly irrespective of function. There is one fact—and a significant fact it is—that muscles are met with in birds, which are of not the slightest use, just as we meet with them in animals higher in the scale. But these muscles are as important to the morphologist as the ruins of ancient cities, old castles, and other time-shattered remnants of architectural design and skill are to the archeologist. The former are illustrative ruins of natural structures, as the latter of artificial ones. It must not be inferred that function, circumstantial conditions and other operative agents do not play a prominent part in muscle-evolution; there can be no doubt that they do ; but these are the lesser lights which disport themselves round the adapting master power.

In the *Opisthocomus* the muscles of both upper and lower extremities are remarkably well developed, especially those of the latter.

[1] I am sorry that a combination of circumstances has prevented me consulting the extensive bibliography which exists on Avian myology. I have simply described what I found, and named the muscles as nearly in accordance with their analogues in the higher animals as I possibly could.

There is a massive sort of grandeur about the digits of this bird, the more interesting when comparison is made between the size and weight of the bird and the degree of development of the feet.

In many respects there is a wonderful analogy between the myology of the common Barn-owl (*Strix flammea*) and the *Opisthocomus*.

In some minor respects the analogy seems to depart from the Barn-Owl, and coincide with that of the common Wood-pigeon.

Judging from its general anatomy, I should infer that it was a bird that did very little flying, but rather spent the greater part of its time on the ground. Although there is no evident lack of power in the alar muscles (rather the contrary), the shortness of the limb and the absence of the elastic membrane, contrasted with the powerful development of the crural muscles, favour the supposition that the habits of the bird are more pedestrian than volant.

Both specimens had been eviscerated; therefore I cannot give any account of the viscera. Fortunately this has already been done by abler pens than mine.

As I have mentioned, and as can be seen by the diagram (Pl. LXIII. fig. 3), the ingluvies or crop was preserved. The œsophagus leading to it is large and wide, much more so than I should have anticipated from the nature of the food found in the crop.

Immediately prior to its termination in the crop it undergoes enlargement or dilatation. A constriction rapidly succeeds, followed by the primary dilatation which constitutes the upper cavity of the crop, bending and directed towards the left side. It then recurvates to the right side, its extremity being directed upwards and inwards, terminating in a canal of about the same calibre as the œsophagus, which passes vertically downwards, being closely applied against the dorsal aspect of the crop in the median line. Broadly speaking, the crop may be said to consist of two portions bent in a horse-shoe fashion upon one another, the lower segment being the greater and stronger. Applied over the crop is a strong membrane, in which are muscular fibres apparent to the unaided eye. This membrane is continuous upwards with the deep layer of cervical fascia. If it has any function, it would be as a restraining barrier to the undue distention of the crop.

The outer layer of muscular fibres of the œsophagus is circular; and these, as they approach the crop, become oblique and finally vertical in direction, although circularly disposed round each segment of the crop, those of the lowest segment being much stronger, firmer, and more numerous.

Immediately beneath the circular fibres of the gullet is a layer of longitudinal fibres. These are lost in the first segment of the crop; at all events I could not find a trace of them in the second and lower segment. This arrangement of the muscular fibres is diametrically opposite to that which prevails in the higher animals.

On opening the crops of both specimens I found them distended with semipultaceous masses of vegetable food, consisting of numerous coriaceous envelopes of a sort of bean and their farinaceous pulp. A few short hair-like stems were intermingled with the mass, probably fibres from the same plants from which the seeds or beans were obtained. I obtained a few specimens of almost perfect beans; they are somewhat smaller than the smallest specimens of the English bean. Their envelopes are hard, and of a pale brownish red colour.

On opening the crop, the mucous lining was found to be exceedingly strong. In the œsophagus it was plicated longitudinally, as in higher animals. The plicæ traverse both segments of the crop in an arcuate fashion, becoming larger, more numerous, and more corrugated. The terminal point between the two segments is marked off by a strong vertical stem or modiolus, over which the mucous membrane is perfectly smooth. The total number of corrugations opposite the modiolus, and in the second segment, is twenty-seven. The plicæ are marked by transverse ridges. About eight of the plications spring independently from the modiolus, and converge towards the pylorus of the crop.

The mucous membrane is strong and thick.

The whole conformation of the crop, especially on its posterior aspect, resembles the gizzard more than a crop. That the food undergoes rapid and powerful digestion in this alimentary cavity there can be no doubt, from the appearance which the contents presented. There is a slight constriction simulating a pyloric valve at the distal end of the crop.

DESCRIPTION OF THE PLATES.

PLATE LXIII.

Figs. 1 & 2. Feather-tracts of *Opisthocomus cristatus*, after Nitzsch and Sclater.

Fig. 3. Crop, large pectoral muscles, &c.

tr. Trachea.
o. Œsophagus.
cp'. Upper segment of crop.
cp''. Lower segment of crop.
pc mg. Pectoralis magnus muscle
tb. Sternal tubercle.

PLATE LXIV.

Fig. 1. *a.* Concave surface of pectoralis magnus for reception of crop.
b. Anterior and outer surface of pectoralis magnus.
1, 2, 3. Factors of the extensor longus alaris.

Fig. 2. Muscles of flexor aspect of left wing (full size). Quills numbered and drawn full size

a. Biceps.
b. Triceps.
c. Extensor plicæ alaris.
1. Extensor carpi radialis longior.
2. Extensor carpi radialis brevior.
3. Pronator radii longus.
4. Flexor carpi radialis.
5. Flexor sublimis digitorum.
6. Flexor carpi ulnaris.
7, 8. Elastic bands connecting the cubital feathers.
9. Flexor metacarpi pollicis.
10. Flexor profundus digitorum. Palmaris tendon has been removed.

Fig. 3. Muscles of breast and wing (nat. size).

pt. Pectoralis magnus. Right side sectioned.
pt'. Pectoralis secundus.
pt''. Pectoralis tertius.
1. Furculum.
2. Coracoid.
3, 3'. Humerus.
4. Sternum.
5. Sternal tubercle.
Sc. th. Scalenus thoracis.
a, b, c, d. Factors of the extensor plicæ alaris.
gl. Gullet (sectioned).
tr. Trachea.

PLATE LXV.

Fig. 1. Muscles of foot, ventral aspect (full size).

1. Gastrocnemius.
2. Flexor perforatus of 2nd digit.
3. Flexor longus hallucis.
4. Flexor perforans of 2nd, 3rd, and 4th digits.
5. Peronæi.
6. Tibialis anticus.
7. Extensor longus digitorum.
8 Flexor perforatus of 3rd and 4th digits.
9. Additional tendon grooved for perforatus tendon of 2nd digit to pass through.
10. Extensor longus hallucis.
A, B, C, D. 1st, 2nd, 3rd, and 4th digits.

Fig. 2. Muscles of foot (left). Dorsal aspect.

1. Extensor brevis hallucis.
2. Extensor longus hallucis.
3. Gastrocnemius.
4. Flexor perforatus of 2nd digit.
5. Flexor longus hallucis.
6. Flexor perforans of 2nd, 3rd, and 4th digits.
7. Peronæus.
8. Tibialis anticus.
9. Extensor longus digitorum.
10. Flexor perforatus of 3rd and 4th digits.
11, 12. Extensor brevis digitorum (outer and inner portions).

PLATE LXVI.

Fig. 1. Muscles of tail (dorsal aspect). Full size.

a. Levator caudæ superficialis.
b. Levator caudæ profundus.
d'. Pubo-coccygeus.
d. Abductor caudæ anterior.
c. Coccygeus quadratus.
f. Sartorius.
gg. Tensor fasciæ femoris and gluteus externus.
h. Biceps.
i. Gracilis.
p. Rump-gland.

Fig. 2. Ventral muscles of tail (full size).

Nos. 1–10. Tail-feathers.
t. Opponens rectricis caudæ.
rr. Depressor caudæ superficialis.
pp. Femoro-caudal.

Fig. 3. Left foot, dorsal aspect (full size).

Fig. 4. Left foot, ventral aspect.

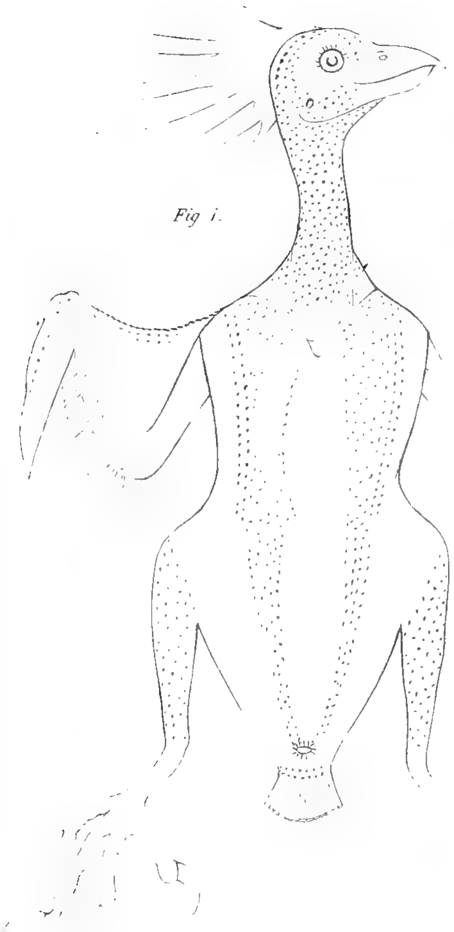


Fig 1.

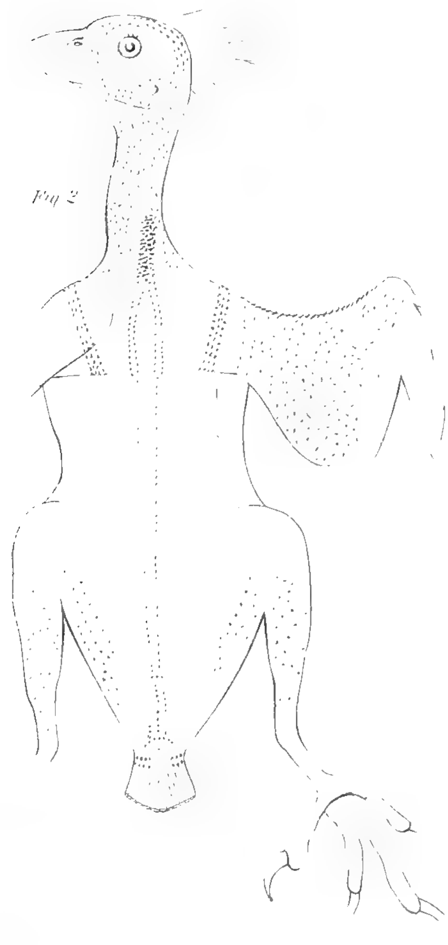


Fig 2

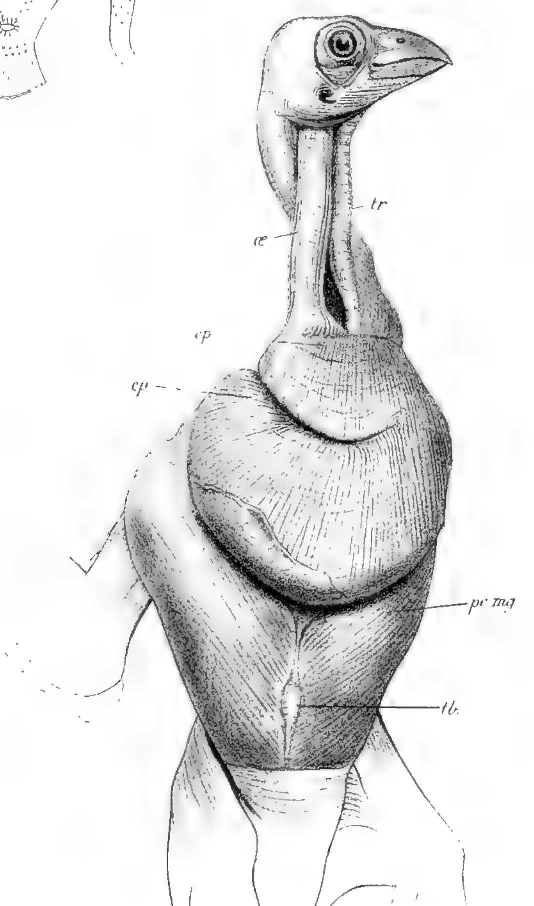
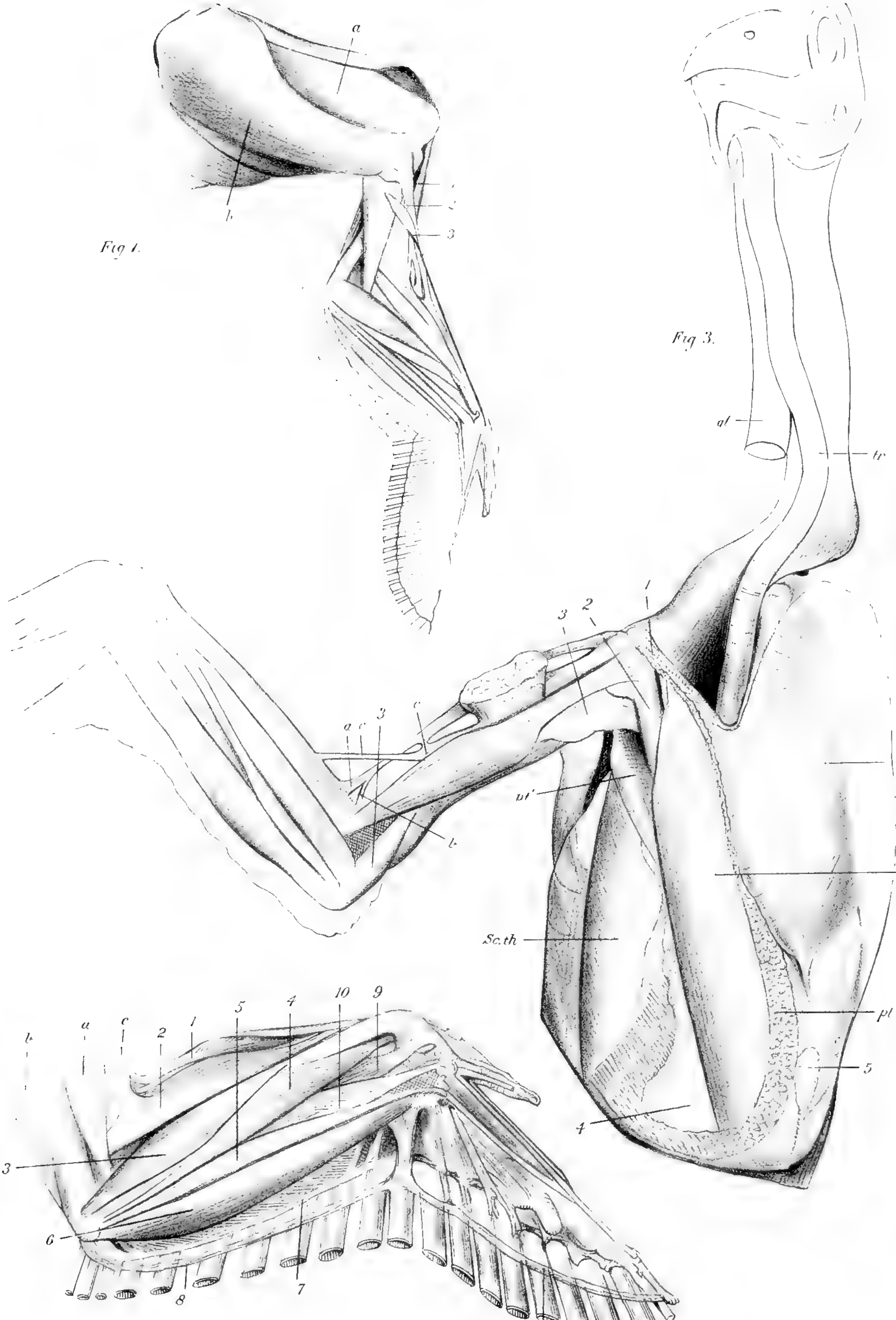


Fig.3

J.Smit lith.

M&N Hanhart imp

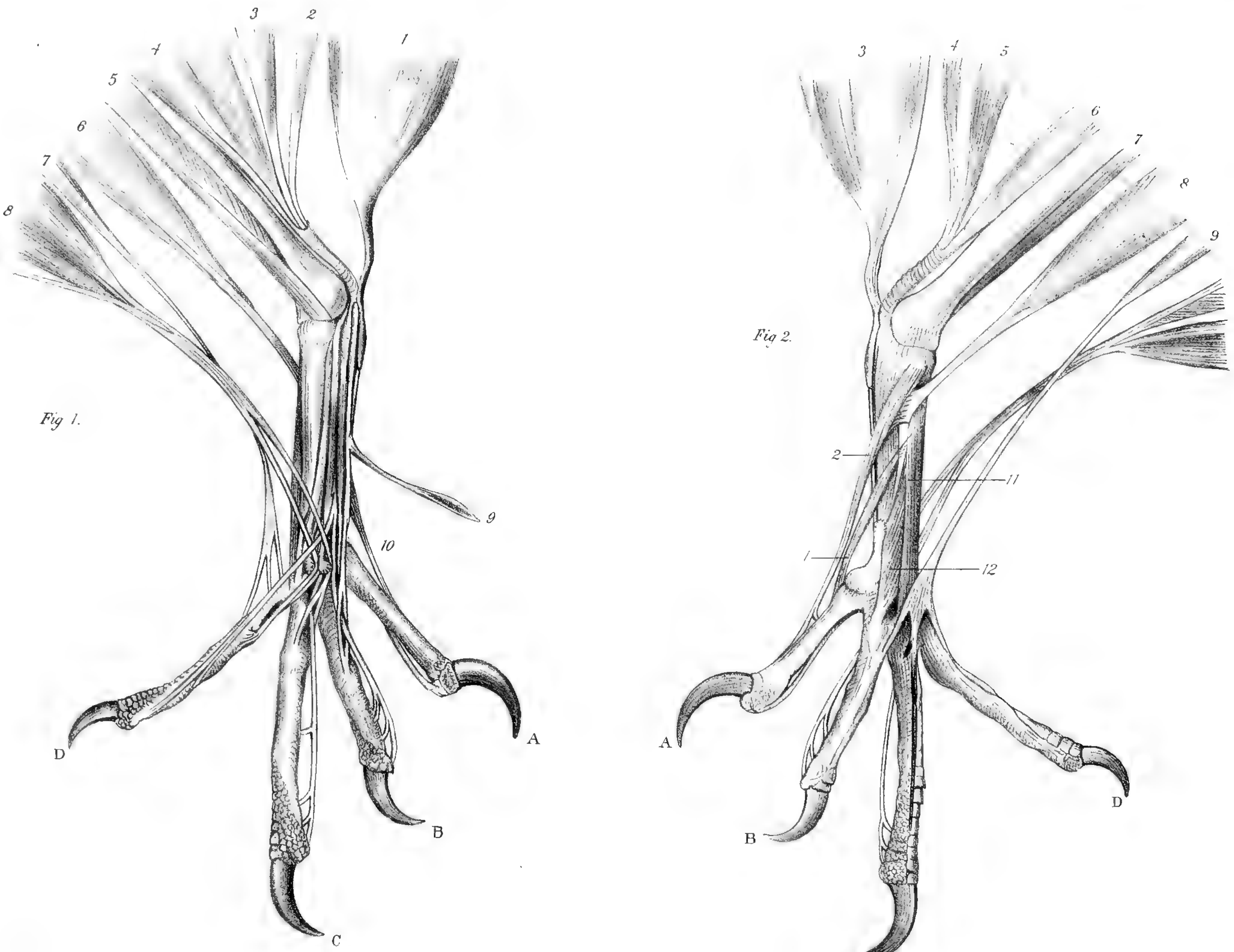
OPISTHOCOMUS CRISTATUS.



J Smit lith

M&N Hanhart imp

OPISTHOCOMUS CRISTATUS



J Smit, lith

M&N Hanhart imp

OPISTHOCOMUS CRISTATUS.

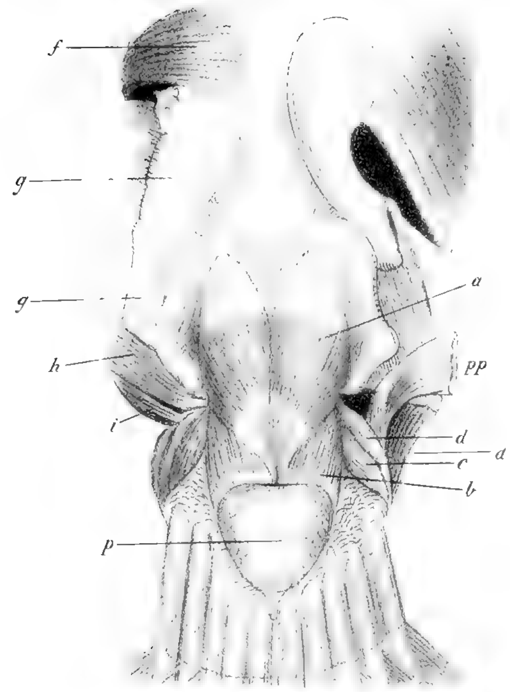


Fig 1

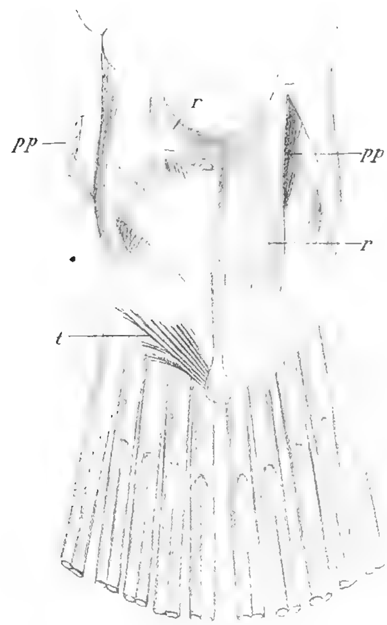


Fig. 2

Fig. 3.

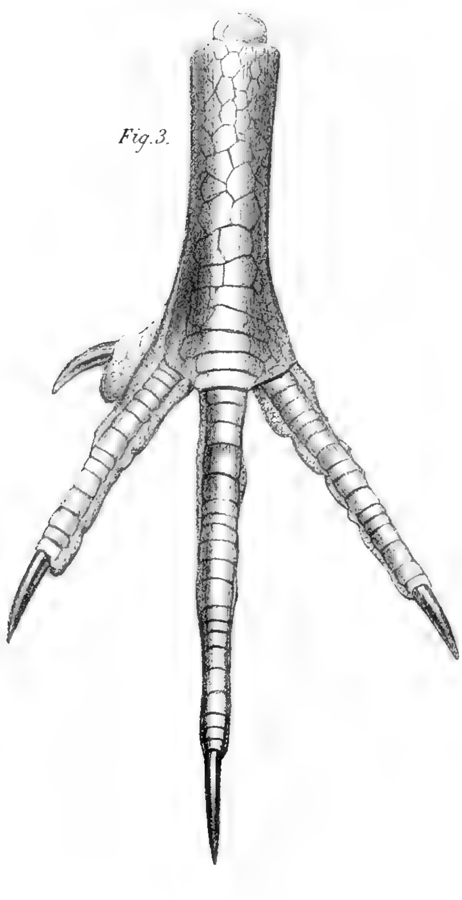
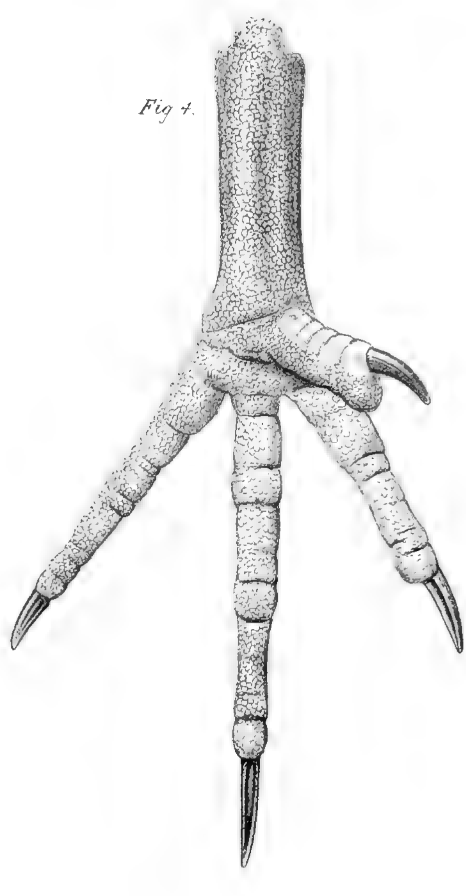


Fig 4.



J. Smit lith

M&N Hanhart imp

OPISTHOCOMUS CRISTATUS

VII. *On British Annelida.* *By* W. C. M'Intosh, *C.M.Z.S.*

Read May 19th, 1874.

[Plates LXVII.-LXX.]

Part I.—Euphrosynidæ, Amphinomidæ, Aphroditidæ, Polynoidæ, Acoëtidæ, *and* Sigalionidæ.

In the first of a series of papers on the British Marine Annelida, which I propose to offer to the Society, one or two reflections which have occurred during the study of the present forms may not be inappropriate, especially as they apply with equal force to the succeeding groups. Few students of the Annelida proceed far in their investigations before becoming aware that in many of the descriptions of their predecessors there is nothing decisive, and that they must wade through many superficial remarks without being able to lay hold of any stable character by which to extricate themselves from doubt. In some cases it would almost seem that the authors meant their successors to spend valuable time to little purpose in vainly endeavouring to find out the exact nature of the species, of which they themselves entertained only a hazy conception. It would appear in the majority of these instances that such inadequate and unsatisfactory descriptions have been due to the fact that the nice distinctions between closely allied forms have hitherto attracted little attention and less study. It is impossible, for example, to describe too minutely in groups like the Polynoidæ, in which the specific separation rests on so many fine characters. The mere statement that a bristle is slender and serrated conveys little more to the mind of an observer than the assertion, in comparing the hair of the bat with that of the sheep, that each is serrated. Even some of the most distinguished modern investigators of the Annelida have failed to appreciate the valuable results derived from a strict and faithful apprehension of the structure of the bristles, the other characters of course being duly attended to. If, instead of writing pages of weary Latin descriptions, a few terse sentences had been given, and a single characteristic bristle accurately figured by the author, very great labour and not a little doubt would have been saved to his successors. The characteristic markings at the tips of the bristles of *Hermadion pellucidum* and *H. assimile*, for instance, show how valuable such characters will some day be in classification. The same peculiar feature is exhibited by the *Gastrolepidia clavigera* of Schmarda in the upper series of the ventral branch of the foot, and in the whole of the dorsal bristles; moreover their transparency is remarkable. The distinctions between many of the species are nice, yet exact, and afford a good field for scientific accuracy in microscopic work. Thus the three forms *Harmothoë sibbaldii*, *H. zetlandica*, and *H. macleodi* would not readily strike the observer as specifically different from each other or *H. imbricata*. It is possible that the *Parmenis ljungmani* of Malmgren may refer to one of them; but the want of precision in description and figures makes it impossible to find out without an actual reexamination of the original specimen. A wide field also remains in regard to the sexual variations of the bristles; but it will be easy to accomplish this matter if once the true character of each bristle is appreciated and accurately figured. Moreover, just as the bristles of a species show a tendency to adhere to the same type in all their characters (for instance, in the Polynoidæ), the cilia on the scales, tentacle, antennæ, tentacular and dorsal cirri, and the form of the tips of the latter organs preserve a similar uniformity.

Further, in delineating the structure of the Marine Annelids it is absolutely necessary to have an artist who is sensitively alive even to a tendency to variation in a character of a particular part; it is deficiency in this respect that makes the voluminous plates of many authors of little scientific value. It is well if the author himself uses his pencil; for a mere artist, however skilful, almost always fails to appreciate the nice distinctions upon which so much depends. I have seen only one who fulfilled the requirements of science in this respect. Malmgren's artist, for example, represents the spinous rows in the bristles of the Polynoidæ as opposite instead of alternate, yet he is one of the best delineators of the group in modern times. The engraving of an accurate drawing is often sufficient to alter the character of some of the minute points; and it is not to be supposed in the case of an inaccurate one that this process will improve the original.

The collection from which the following descriptions are drawn up has been the result of many years' labour. Amongst others, Dr. Gwyn Jeffreys most kindly handed over his valuable and extensive collections from Shetland, the Hebrides, and the west coast of Ireland; the late Dr. Baird sent specimens from Cornwall and other parts; Dr. Perceval Wright favoured me with the examination of the late Mr. Thompson's collections, as well as those found by himself on the west coast of Ireland; Mr. More likewise sent specimens collected in the latter region; and Dr. Carrington forwarded a collection from Southport; Mrs. Collings, Prof. E. Ray Lankester, and Dr. Cooper gave me some from Guernsey and Herm; Prof. G. S. Brady, those dredged on the coast of Durham; Dr. Howden, many from the deep water off Montrose; Dr. John Grieve from the Frith of Clyde; and Dr. Albert Günther, Professors Ogilvie and Dickie, some from the North Sea; while Mr. Spence Bate and Mr. Rowe sent a collection with drawings from Plymouth and neighbourhood; and I am also much indebted to the late Dr. J. E. Gray, of the British Museum, and to the late Mr. G. R. Gray for their invariable courtesy in giving me every facility for examining the national collection of the Annelida; and to Mr. Smith and the other Assistants in the Zoological Department for their kind aid on many occasions. The British coast has been explored by myself at many points, from the Shetlands to the Channel Islands.

EUPHROSYNIDÆ.

Euphrosyne foliosa, Aud. & Ed. In Dr. Johnston's Catalogue of the Annelida in the British Museum, two species of *Euphrosyne* are described, viz. the above-mentioned *E. foliosa* and *E. borealis*, Œrst. So far as can be observed, however, there seems to be considerable confusion in regard to the common species. It is possible that the *E. myrtosa*, Sav. (Ehlers), *E. foliosa*, and *E mediterranea* of Grube, may refer to the same animal. The common species (*E. foliosa*), at all events, ranges from Shetland to the Channel Islands, and especially on the west coasts of Great Britain and Ireland. Little reliance can be placed on the length of the bristles and branchiæ, the former being generally much larger in young specimens. I have also some hesitation in considering the *E. racemosa* of Ehlers[1] other than a variety of the common species.

Euphrosyne borealis, Œrst.[2] A specimen of this species occurs in the collection of the British Museum under the name *E. foliosa*, Aud. & Ed., from the Frith of Clyde. The branchiæ have much larger and less acute tips than in *E. lanceolata* from the 'Porcupine;' and the bristles are also characteristic.

The only occasion on which *Spinther oniscoides*, Johnst., occurred was in the Minch, off North Uist. It had the usual yellow hue; and the body was flanked by a series of lamellæ with long bristles and opaque white spots. The bristles of the lateral processes were united together by a delicate granular stroma, so that under the microscope each had a granular appearance. They are arranged with considerable regularity; and all are peculiarly curved (Pl. LXVII. fig. 1, and a somewhat shorter and stouter form, more highly magnified, in fig. 2). There are some obscure markings in the fork of the bristle. In the centre of the dorsal branch of the foot are also some simple bristles. The ventral cirrus has one conspicuous hook (fig. 3) projecting from the soft papilla, generally another of similar form (but shorter) within the foot, and the distal curved parts of other two embedded in the tissues. Numerous simple bristles with tapering tips support the chief hook. The forked bristles on the dorsal surface are similar to the stouter series in the dorsal branch of the foot, but, on the whole, have stronger shafts and more tapering tips.

AMPHINOMIDÆ.

Of this family the only British representative yet encountered is the *Eurythoë borealis* of Sars, which extends from Shetland to the Channel Islands, occupying deep water in the former, and the littoral region in the latter. A description is given in the 'Transactions' of the Royal Society of Edinburgh (vol. xxv. p. 406) under the head of *Amphinome vagans*?, Leach.

[1] Die Borstenwürmer, i. p. 67, taf. i.

[2] Grönlands Annulat. dorsib. p. 170, f. 23–27.

APHRODITIDÆ.

In the Catalogue of the British Museum three species of this group are described, viz. *Aphrodita aculeata*, L., *A. borealis*, Johnst., and *Hermione hystrix*, Sav. An examination of Dr. Johnston's specimens from Berwick Bay (in the British Museum) shows that his *A. borealis* is the young of the first mentioned. A third species (*Lætmonice filicornis*, Kbg.) is not uncommon from Shetland to the Atlantic south of the British Channel.

POLYNOIDÆ.

Eight species are indicated in the Catalogue, viz. *Lepidonotus squamatus*, L., *L. clava*, Mont.[1], *Evarne impar*, Johnst., *Eunoa nodosa*, Sars (as *L. pharetratus*, Johnst.), *Dasylepis asperrima*, Sars (as *L. pharetratus*, Baird), *Lagisca propinqua*, Mgrn. (as *Lepidonotus semisculptus*), *Nychia cirrosa*, Pallas (as *L. imbricatus*), and "*L. pellucidus*," probably a young form of some of the foregoing.

Eunoa nodosa, Sars, was first dredged by Lieut. Thomas, and termed by Dr. Johnston *L. pharetratus*; Prof. E. Ray Lankester, from a specimen procured in Shetland by Dr. Gwyn Jeffreys, named it *Antinoë zetlandica*. It has a very wide range. Dr. Malmgren vouches for the specimen in the British Museum; and accordingly, though it is in bad condition (apparently having been dried), it has been figured. A dorsal bristle is represented, Pl. LXVII. fig. 4, and a ventral in fig. 5, both mounted in balsam, fig. 6 being another in water. The bristles of a specimen from the coast of Durham are given in Pl. LXVII. figs. 7, 8, the former representing the dorsal, the latter the ventral.

Dasylepis asperrima, Sars. This was first recognized as British by Dr. Malmgren (in the British Museum, where it was labelled *Lepidonotus pharetratus*). The specimen had been sent to the late Dr. Baird by Mr. D. Robertson from the Frith of Clyde. The great density of the dorsal tufts of bristles gives the animal a woolly appearance; and their ferruginous colour is also peculiar. The length of the example is about one inch. The head has two large eyes at the posterior border, and one on each side on the median prominence. The scales are roundish in front, reniform posteriorly, and boldly armed on the posterior and outer margins and the neighbouring surface

[1] The *Aphrodita punctata* of O. Fabricius may be this form; but it is doubtful what connexion the *L. punctatus* of Œrsted in his 'Grönlands Dorsibr.' has with it. He evidently means the common *L. squamatus* in his 'Annulat. Danic.' The *Polynoë fuscescens* of De Quatref. (Annél. i. p. 242) appears to be intimately allied to *L. clava*; and the same may be said of his *P. modesta* and the *P. clypeata* of Grube. The *Polynoë levis* of Aud. & Ed. (including in the diagnosis the allusions afterwards made to it by H. Rathke, M. Sars, and De Quatrefages), does not seem to be this species; indeed I have sometimes thought, from the descriptions of Audouin & Edwards and De Quatrefages, that this *P. levis* might be a variety of *P. setosissima* with fourteen pairs of scales. The *P. grubiana* of Claparède may be a variety of *L. clava*, since he does not distinguish it from the latter while contrasting it with *L. squamatus*.

with long pointed spines, a few having a bifurcation at the tip, or a series of blunt points. No cilia are present. The difference between this scale and that of *Polynoë areolata*, Grube, is marked; for the arrangement on the surface of the scale is not only more regular in the latter, but the spines are much larger, less acute, few in number, and surrounded by a series of exquisite reticulations, while the margin is densely ciliated, especially at the outer and inner borders. The dorsal bristles are long (only a little shorter than the ventral), and much tapered at the tip (Pl. LXVII. fig. 9). The tips of the ventral bristles are also elongated, and show a distinct process below the curve (figs. 10, 11).

Lagisca propinqua, Mgrn. A specimen of this species occurs in the British Museum, from Shetland. It is possible that the *Lepidonotus semisculptus* of Dr. Johnston, from the south coast of Devon, may be this form; but the original example has not been seen. A young specimen was found in the débris of the boats from deep-sea fishing off St. Andrews Bay. In this condition it is distinguished by the scabrous greyish scales mottled with black, the dark spots at the bases of the feet, and the coloration of the dorsum beneath the scales, by the form and position of the eyes, and the structure of the bristles.

The head is curiously mottled. A pale band of considerable breadth occurs posteriorly, boldly defined by the blackish collar of the first body-segment. A pale band runs from this forward in the central line to the base of the tentacle, which is blackish; and the anterior angles of the head thus mapped off are brownish red, with dark grains along the edges. The posterior pair of eyes are large and widely separated, and situated on the pale band of the region. The anterior pair are not observed from the dorsum, being placed laterally exactly at the junction of the pale posterior and the coloured anterior regions. The tentacle is absent. The antennæ are short, brownish at the base, furnished with long and clavate cilia, and a filiform tip. The palpi have a dense series of minute papillæ with enlarged tips. The tentacular cirri have a blackish patch at the base, a light brownish one on the slightly dilated portion near the tip, then a whitish patch, and, lastly, a dark brown one at the base of the filiform termination; they possess long cilia with globular heads. The dorsal cirri have a similar colour to the latter. Besides the long cilia with the globular heads on the column of the organ, some shorter cilia proceed upward rather beyond the lower third of the extremity. The ventral cirrus is subulate, with sparsely distributed and short papillæ.

The scales are dull greyish, with a dark patch in the centre. On the dorsal surface the blackish pigment is broken into fragmentary portions. On the under surface, again, it is more uniform. The outer and posterior edge of the scale is ciliated; as indeed is the greater part of the circumference. The cilia commence as short, almost baccate processes, and toward the outer edge assume the form of long organs with nearly globular extremities, the series again diminishing to terminate in short papillæ. The greater part of the surface of the scale is densely covered with minute and rather blunt horny spines, which toward the free edge become large acute processes. The extreme roughness of the surface of the scale readily causes mud and débris to lodge. In shape the scales are for the most part reniform. They therefore present a marked difference from those of the Zetlandic specimen (which show small papillæ over the surface, a few large pale examples only projecting beyond the free edge, and eight or nine subglobular processes at intervals in the same region), as well as from the form described by Malmgren.

The dorsal branch of the foot bears a somewhat dense mass of rather short pale bristles with a slight curvature. The tips are comparatively short, and by no means acute. One of the longer forms is sketched in Pl. LXVII. fig. 12. The ventral division has translucent bristles with moderately long shafts. The tips of the superior series (Pl. LXVII. fig. 13) are long and somewhat taper, with rather distant rows of long and distinct spines, the end being minutely bifid. The tips gradually become shorter and stouter inferiorly (fig. 14), the strongly curved terminal division, and the inferior process, with its characteristic angle of incidence, being noteworthy. Some of the latter bristles show traces of a curve outward between the secondary process and the first row of spines. Toward the ventral border the secondary process diminishes with the general size of the bristle; there is a minute trace, however, in almost all. It is difficult to separate these bristles from those of the larger example (with smoother scales) from Shetland.

MALMGRENIA CASTANEA[1], n. sp. Dredged by Dr. Gwyn Jefferys off North Unst, Shetland, in 90–96 fathoms, in 1867, and again, in 1868, on *Spatangus purpureus* (near the mouth), in 85 fathoms, on shell-sand. The same gentleman procured it in 80 fathoms, off Valentia (S.W. Ireland), and 110 fathoms off the Blasquet. It has also been found in the Channel Islands.

Two species only are mentioned by Malmgren as having smooth palpi, antennæ, tentacles, and cirri, viz. *Melænis loveni* and *Enipo kinbergi*. The first is easily distinguished from the present form by the fact that the scales leave the centre of the dorsum uncovered anteriorly, while in the second the scales occur only on the anterior part of the body. Both diverge much in the structure of the bristles. In this form the head is slightly pinkish in life, as is also the proboscidian region. Two eyes are situated near the posterior border, and two laterally on the anterior prominence. The tentacle is moderately developed, and has a slight enlargement below the tapering tip. The antennæ have brownish pigment a little above the base. The scales are fifteen pairs, smooth to the naked eye, but under the microscope showing some minute papillæ in the line of the pigment, and a more distinct group opposite the curve or covered

[1] The generic name is in honour of Dr. Malmgren, of Helsingfors, the author of the valuable 'Annulata Polychæta Spetsbergiæ,' &c.

anterior border of the scale. The first pair are rounded; but the next are reniform or irregularly quadrate. They are surrounded by a madder-brown belt, with a tendency to the development of a denser portion in the anterior band. Some specimens have the centre of the scale likewise filled up with pigment, which also becomes deeply tinted. Every cirriform process is perfectly smooth, presenting neither wart nor granulation. The dorsal cirri taper much less than in *Hermadion pellucidum*, Ehlers: and there is a slight enlargement toward the tip, of a different character from that in the latter; and the organs are shorter. The under surface of the body is iridescent pinkish.

The bristles are pale, and the dorsal much shorter than the ventral. The former are slightly curved, taper toward the tip, and are faintly serrated (Pl. LXVII. fig. 15). The tips of the ventral bristles are short, and present the usual gradational series from above downward. The ordinary appearance of one of the superior ventral bristles is shown in Pl. LXVII. fig. 16: scarcely any trace of the minute process is seen below the tip; and it disappears altogether ventrally (fig. 17). The developing forms, however, have this clearly indicated (Pl. LXVII. fig. 15). In specimens from Valentia (S.W. Ireland) the process is very distinctly seen—for instance, when the bristle is slightly turned round (Pl. LXVII. fig. 18). It would also appear that the process is developed at the end of one of the spinigerous rows, and is therefore lateral in position. A well-formed Irish specimen is represented in fig. 19. The secondary process is less marked in the examples from the Channel Islands and Shetland, though indications are present in all.

The specimens found near the mouth of *Spatangus purpureus* are of a deeper madder-brown or chestnut hue on the scales and cirri.

MALMGRENIA ANDREAPOLIS, n. s. Not uncommon in the débris of the boats from deep-sea fishing, on the West Sands after storms, and in the stomachs of cod and haddock, St. Andrews. It is a species of some size, a few of the incomplete specimens being about an inch in length and about one fifth of an inch in breadth. It is readily distinguished by the persistent brown ring on the scales after preservation in spirit. The first pair of scales have a brown ring all round their border, and a brown spot in the centre. The second scale has a brown ring round the exposed part, and a patch near the outer border anteriorly, representing the spot in the centre of the first pair and that of the scales behind. Those after the second have a ring more or less complete, the broadest part being toward the inner margin, and the spot at the end of the anterior leg of the V-shaped mark becoming more evidently separated. About the sixth or seventh pair the V-shaped mark and the spot become distinct. The number of scales seems to be considerable; but as none of the specimens were complete it could not be determined. They are nearly smooth, a few small papillæ (under a power of 350 diam.) being grouped in a limited area on the outer border, and no trace of these appears beyond the margin.

The head is slightly tinted with brown. Two eyes are situated toward the posterior border and two on the lateral prominence in front. The tentacle is incomplete in all; the antennæ are small, with two brown rings at the base. The palpi are tapering and quite smooth. The tentacular cirri are brownish, and have a few clavate papillæ. The dorsal cirri are stout, brownish, and in spirit taper from base to tip. They have a very few clavate papillæ. The ventral cirri are slender and tapering, and do not reach, by a considerable way, the tip of the foot.

The feet are much developed. The dorsal division bears a series of slender, inconspicuous, translucent bristles with a peculiar tip, which forms a kind of knob, of much interest when contrasted with those of the ventral branch, since it shows how closely the same type holds in both divisions. One of the larger bristles is represented in Pl. LXVII. fig. 20. The superior examples in the ventral branch have an elongated, tapering, spinous portion (Pl. LXVII. fig. 21), with a distinct round knob at the tip. The shafts of all the ventral bristles are long and pale. The tips quickly shorten (from above downward), the claw (a modification of the knob) being quite characteristic; and there is a secondary process beneath (Pl. LXVII. fig. 22). Toward the inferior border some have no secondary process (fig. 23), but a very distinct knob at the tip, an intermediate series, of course, occurring between the first and last.

HARMOTHOË SIBBALDII[1], n. s. This species ranges from Shetland to Cornwall. At first sight it appears to be a boldly marked variety of *Harmothoë imbricata*; but a closer inspection shows the distinction both from the latter and *Parmenis ljungmani*, Mgrn., a species which has short-tipped ventral bristles with a deep fork. It is recognized superficially by its somewhat firm, elongated body, and the remarkably dark (blackish) pigment of its anterior scales. It is about seven tenths of an inch long.

The head is characterized by the pointed nature of the anterior lobes and by the position of the eyes. Two of the latter are placed at the posterior border, almost under the fold of the first segment, and two on the under surface of the pointed anterior lobes, though the pigment shines through the dorsum. The pairs are thus separated by a considerable antero-posterior interval. The tentacle has an enlarged basal portion, a brownish column, a pale tip with little or no enlargement beneath, and is covered with clavate papillæ. The antennæ are small and brownish. The palpi are brownish, with rows of small blunt papillæ, which are sometimes bifid at the tip. The tentacular cirri are also brownish, furnished with clavate papillæ, and slightly enlarged below the tip. The buccal cirri are brownish. The number of the bristle-hearing segments was thirty-seven; and the animal seemed nearly complete.

The scales are fourteen pairs. The first are small, and nearly circular, their light brownish colour contrasting strongly with the succeeding. The second pair are reni-

[1] Named after Dr. John Sibbald, F.R.S.E., Deputy Commissioner in Lunacy, who displayed much courtesy in Shetland, where he happened to be visiting when the author was dredging in 1871.

form, with the exposed parts almost uniformly black. The third are also very dark, with a few minute pale points. The latter increase in size in the succeeding scales; and the pigment becomes less dark as we proceed backward, the posterior scales being mottled like granite. The scales increase in size from before backward, the last pair, however, being diminished, especially in breadth. The dark anterior scales have a peculiar sheen in certain positions, and microscopically have the best-marked papillæ, a few of which project at the posterior edge as short clavate processes. None of the latter occur on the edge of the posterior scales.

The superior branch of the foot has a short cirrus, the tip of which just reaches the extremity of the bristles in spirit. It is almost cylindrical, except near the tip, where a gradual diminution occurs. The surface is furnished with a few stout clavate papillæ, best developed just beneath the filiform part at the extremity. The inferior cirrus has an enlarged base, reaches a little further than the insertion of the inferior ventral bristles, and has a few clavate papillæ.

The bristles are comparatively short. The dorsal branch of the foot has a series of somewhat short and not very stout bristles, slightly curved, and finely serrated in the usual manner. The tips are peculiar, being fashioned rather like a blunt harpoon or paper-scraper, as represented in one of the larger examples (Pl. LXVIII. fig. 1). The spinous rows at the upper part stand out characteristically at a greater angle than usual. The ventral bristles are translucent, with comparatively short spinous tips, and are boldly bifid, but after a different manner from the attenuated divisions of *Parmenis ljungmani*. One of the superior series is shown in Pl. LXVIII. fig. 2; and it is noticed that both terminal divisions are somewhat blunt when contrasted with a bristle from the inferior series (Pl. LXVIII. fig. 3).

This species, then, presents the following differences from *Parmenis ljungmani*. The body is larger and broader, the segments thirty-seven, instead of thirty-five or thirty-six, the anterior eyes are situated very much in front of those in Malmgren's form, being almost at the tip of the pointed anterior lobes. The scales are fourteen pairs instead of fifteen; but this is not of much consequence. The dorsal bristles are slightly thicker than the ventral, and have the peculiar tips, and the ventral differ in structure—features diverging from Malmgren's species. Some of these characters may be exaggerated, owing, perhaps, to the want of scientific accuracy in Malmgren's artist; and there are many points of similarity between them, so that, unless the bristles had diverged so much, I should have been inclined to unite them.

HARMOTHOË ZETLANDICA, n. s. Dredged in 5 fathoms, amongst the tangle-roots, in Bressay Sound. The specimens are small, about half an inch long, with an elongated and somewhat linear body, consisting of about thirty-five bristle-bearing segments. The colour in spirit is uniformly pale yellow, the scales having only a few pale touches.

The head has two pointed anterior lobes, and very distinct eyes. The posterior pair are situated at the posterior border, and the anterior toward the front, of the cephalic prominence, but not so far forward as in *H. sibbaldii.* The tentacle is short, not much, if any, enlarged below the filiform tip, and furnished with a few clavate papillæ. The antennæ are short, enlarged at the base, and taper at the tip (after the manner of the ventral cirri), and with sparse but distinct clavate papillæ. The palpi are gently tapering from base to apex, and have minute papillæ under a high power (they are smooth or only wrinkled under a low power). The tentacular cirri taper from base to apex, have no enlargement below the latter, and, similarly to the antennæ, are supplied with clavate papillæ. The cephalic appendages are rather short. The dorsal cirri resemble the latter; and their tips reach anteriorly to the extremity of the ventral bristles. The ventral cirri are enlarged at the base, and have a few clavate papillæ.

There are fourteen pairs of scales, smooth under a lens, but showing sparsely distributed clavate papillæ along the posterior border, and over the usual area, under a high power. The first pair are small and round, the size increasing posteriorly till the twelfth, when a diminution again occurs in the thirteenth and fourteenth. Most are rather ovoid than reniform.

The dorsal bristles are divergent, stout, sharp-pointed, and extremely brittle. A lateral view of a large specimen is given in Pl. LXIX. fig. 1. There is a slight bend at the tip, as well as a marked curve in the shaft. A front view of another is exhibited in Pl. LXVIII. fig. 4. The ventral bristles have superiorly a short spinous region and a long bifid tip (Pl. LXVIII. fig. 5). The tips diminish as usual toward the ventral edge of the fascicle, a few of the lowest having no distinct secondary process at the termination.

Contrasted with the young of *Harmothoë imbricata*, the head of this form is much more elongated antero-posteriorly; and the four eyes are visible from the dorsum, whereas in *H. imbricata* the posterior pair only are generally seen. The tentacle, antennæ, and other cephalic processes are different. The bristles are much larger in *H. imbricata*, so as to give a different outline; and their structure and the scales are essentially at variance. From the *Parmenis ljungmani* of Malmgren it differs in the number of the scales, their colour, the structure and size of the dorsal bristles. Its nearest ally seems to be *H. sibbaldii.* The *Polynoë vasculosa* of M. Claparède[1] likewise approaches it.

Polynoë floccosa, Sav. This species seems to be in want of careful revision, since it is doubtful if M. de Quatrefages, unless he had Savigny's specimen, would be able to decide with accuracy what the older author meant. It is the *Harmothoë sarniensis* of Prof. E. Ray Lankester[2], and abounds all round our coasts, from Shetland to the Channel Islands. It is distinguished from *H. imbricata* by the general colour of the dorsum,

[1] Annél. Chétop. du Golfe de Naples, Supplément, p. 12, pl. i. f. 4.

[2] Trans. Linn. Soc. vol. xxv. p. 374, tab. 51. f. 14, &c.

the position of the eyes (only the posterior pair, as a rule, being visible in *H. imbricata*—in which there is a much larger interval also between the anterior and posterior pairs than in this form; indeed the anterior pair are near the anterior border, whereas in this they are just halfway forward), and the number of the scales (sixteen to twenty pairs), which, with the dorsal cirri, have larger and more slender cilia than in *H. imbricata.* The ventral papilla is smaller than in the latter. The structure of the bristles, moreover, is characteristic. In looking over spirit-preparations in which both forms are mixed, there is a trimness in the line of the bristles, and a general firmness which is peculiar to *P. floccosa*, and the dorsal and other cirri are shorter, and have no enlargement below the tip.

The dorsal branch of the foot has rather long and more distinctly tapering bristles than in *H. imbricata*, from which, moreover, they are at once distinguished by the much closer spinous rows. Bristles of the same length are decidedly more slender in this species than in *H. imbricata.* One of the longer forms is represented in Pl. LXVIII. fig. 6, and it may be contrasted with one from a large *H. imbricata* (Pl. LXVIII. fig. 7). The tip tapers to a blunt point; and immediately below the bare portion very fine and close spinous rows occur. A glance at the latter in running over specimens is one of the most satisfactory points in discrimination. The ventral division bears superiorly a series (Pl. LXVIII. fig. 8) with long spinous tips (more slender and with longer spinous processes than in *H. imbricata*, Pl. LXVIII. fig. 9) and smooth extremities, one or two having no secondary processes. Then a small secondary process appears, and the spinous portion gradually diminishes in length, one of the stout examples from the middle of the foot being shown in Pl. LXVIII. fig. 10. It will be observed that this bifid tip differs quite from that of *H. imbricata* (Pl. LXVIII. fig. 11), from a similar part, and especially in the minute size of the secondary process. The spinous rows are also larger and more distinct. Some of the inferior ventral bristles are devoid of the secondary process. The *Polynoë foliosa* of Savigny[1] seems to come near this species. Savigny only mentions sixteen pairs of scales; but specimens often vary in this respect.

HARMOTHOË AREOLATA, Grube. A complete description of this remarkable form is not necessary on the present occasion; for Prof. E. Ray Lankester (his *Antinoë nobilis*) and others have indicated the general structure since the original account by Grube (his *P. areolata*). It may be mentioned that this species has the same arrangement of its eyes as *Harmothoë*, two being at the posterior border of the head, and two under the lobes in front. The dorsal group form a rather conspicuous tuft of elongate slightly curved bristles, the curve being about the middle of the latter, so that the bristle is bent like a bow in the exposed part (Pl. LXVIII. fig. 12). The spinous rows are dense; then the tip is smooth for some distance, and has a slight though distinct streak, best marked

[1] Syst. des Annél. p. 23.

in the shorter forms, in which it grooves the extremity. The ventral branch has a series of rather slender bristles with tapering tips. Superiorly the latter are alternate, with only a trace of the secondary process; and it is sometimes broken off, so that the tip appears simple—a condition, indeed, apparently normal in some. One of the superior attenuate forms is represented in Pl. LXVIII. fig. 3. The pectinate or spinous rows are rather prominent. One of the best-marked shorter forms, with a somewhat worn extremity, is given in Pl. LXVIII. fig. 14. Toward the inferior border the bristles again have attenuate tips, with a very slender secondary process; and in some the latter is absent. The ventral cirrus reaches beyond the base of the bristles, and has somewhat slender clavate papillæ. The remarkable condition of the dorsal cirri has been noticed by Prof. Lankester; once, indeed, I received from a correspondent detached specimens which were supposed to be "parasites." The structure of the scales is most elaborate. In Britain this species was first found by Prof. Lankester in the tubes of *Terebella nebulosa*, and afterwards by Mr. Cooper in the tubes of *Chætopterus*, and by myself frequently under stones at Herm. It appears to be figured by O. G. Costa in Tav. 2 of his 'Annel. di Napoli,' 1857.

HARMOTHOË MACLEODI[1], n. s. Found between tide-marks, Lochmaddy, North Uist, Shetland, and in the stomach of the cod, St. Andrews. Body elongated, rather narrow, and with comparatively short bristles; segments thirty-five. Head elongated from before backward, and with distinct eyes similarly placed to those in *H. zetlandica*—two at the posterior border, and two at the side in front of the middle line, all being visible from the dorsum. Palpi similar, as also are the tentacle, antennæ, and tentacular cirri, which have clavate papillæ. The scales appear to amount to fourteen or fifteen pairs, are pale, semitranslucent, and with a very few short papillæ along the outer and posterior border. The scales are arranged like those in *H. zetlandica*, circular in front, and increasing in size to the last two pairs. The dorsal cirri scarcely extend beyond the bristles, are slender, tapered from base to apex, and furnished with sparsely distributed clavate papillæ, which leave the tip bare. The ventral cirrus has a large base and a few clavate papillæ.

The bristles of the dorsal branch of the foot differ from those of *H. zetlandica*, since their spinous rows continue to the tip of the organ. They are comparatively short, moderately robust, very slightly curved, and not much tapered toward the tip. The spinous rows are also very closely placed. One of the larger examples is sketched in Pl. LXIX. fig. 2. In the smaller forms next the body the spinous rows are somewhat wider. The ventral division has boldly bifid bristles superiorly (Pl. LXIX. fig. 3), the whole tip being rather broad, and the spinous region short. The secondary process at the tip diminishes in length from the superior to the inferior series; thus in the latter

[1] Named after Dr. Kenneth Macleod, of H.M. Indian Army, who aided me in dredging at Paible, North Uist, in 1865.

it scarcely reaches halfway to the tip of the peculiarly curved terminal hook. The bristles throughout are faintly yellowish.

This differs from *Parmenis ljungmani* in the proportional strength and structure of the dorsal bristles, and in the pale semitranslucent condition of the scales; but the ventral bristles approach each other closely.

HARMOTHOË ANTILOPES, n. s. First procured in 1865, at Lochmaddy, North Uist, and off the Hebrides, as well as frequently in the 'Porcupine' Expeditions.

Body moderately elongated, from three quarters to nearly an inch. Bristle-bearing segments about thirty-six. Head with the anterior angles characteristically truncated. Two comparatively large and somewhat widely separated eyes occur near the posterior border. In good preparations the anterior pair are not visible from the dorsum, as they occupy a position immediately beneath the truncated anterior angles of the snout. Median tentacle moderately long, slightly enlarged below the filiform tip (in spirit), and covered with clavate papillæ. The latter also occur on the antennæ, which are small and subulate, and lie beneath the level of the former. The palpi have minute papillæ, which toward the termination are dilated and then constricted below the slightly warty tip. The tentacular cirri are somewhat enlarged below the extremity, and covered with long cilia having bulbous tips. Moreover these organs are continued a considerable way (about one third) on the filiform termination above the enlargement. The dorsal cirri, again, resemble the latter; and their cilia reach within a short distance of the tip—a rather unusual arrangement. The ventral cirri are slightly enlarged at the base, have sparsely distributed short papillæ; and the tips of the organs reach the exit of the nearest bristles.

Only one specimen had scales, which seem to amount to fourteen or fifteen pairs. All are fringed, chiefly along the outer border, with long filiform cilia with somewhat enlarged tips. The papillæ on the surface are large and boldly marked, the dilated tips being formed of blunt processes or spines. A slight brownish coloration occurs on the dorsal surface where they touch each other; but the rest of the scale is pale, except from the minute brownish spines of the papillæ.

The dorsal branch of the foot carries a series of conspicuously long and strong bristles, most distinctly marked by transverse spinous rows at rather wide intervals (whence the name of the species, from the resemblance of these organs to the horns of certain Antelopes, such as *Hippotragus oryx*). Those next the ventral series are long and nearly straight, while the inner are shorter and distinctly curved. One of the larger is represented in Pl. LXIX. fig. 4. The bristle tapers much distally; and by careful adjustment the spinous rows on the opposite side are brought out, as at *ac*. Such a bristle, of course, is not round, but conspicuously angled, apparently broad posteriorly and thinned, with a curve to the edge. The ventral bristles, again, are rather short and fine, commencing superiorly with a series having a long tapering and delicate spinous region with a bifid and scarcely curved tip, careful examination being necessary to detect the slender secondary process (Pl. LXIX. fig. 5). The tips become stouter though shorter inferiorly, and the bifid extremity more apparent, the secondary process proceeding halfway upward in the stronger forms. This process becomes a mere speck and finally disappears in the lowest bristles. One of the stoutest forms (three or four of which spring from the region of the spine) is drawn in Pl. LXIX. fig. 6. The spinous region has its upper third even narrower than that immediately behind the hook at the tip—a peculiarity not often seen.

HARMOTHOË HALIAËTI[1], n. s. Dredged in the Minch by Dr. Gwyn Jeffreys. A fragment of the posterior end of the worm was obtained; and the feet are the only parts that can be described at present. It is a species of some size.

The dorsal branch of the foot bears a series of rather slender slightly curved bristles with conspicuous rows of spines (Pl. LXIX. fig. 7). Such bristles, when viewed antero-posteriorly, present a much narrower aspect than when seen in profile. The arrangement of the spinous rows is alternate, as in the ventral bristles. The superior ventral bristles have elongate spinous portions and slender tips (Pl. LXIX. fig. 8). At first the bifid tips are almost straight or very slightly curved, but they soon become more characteristic (fig. 9). The alternate rows of prominent spines are conspicuous in both figures. The *facies* of the tip is even more characteristic in the inferior series (Pl. LXIX. fig. 10). In the superior group the secondary process is nearly straight; but in the others it bends outward at the tip.

The inferior cirrus is slightly enlarged at the base, slender and filiform superiorly, and furnished with rather long papillæ, sparsely distributed.

The species is at once distinguished from *Polynoë floccosa* by the structure of the bristles, both dorsal and ventral, and by the presence of rather long papillæ on the ventral cirrus.

HARMOTHOË MARPHYSÆ, n. s. From the galleries of *Marphysa sanguinea* in Guernsey, and chinks of the rocks, Polperro (Brit. Mus.).

Length about three quarters of an inch. Bristle-bearing segments thirty-one; but the posterior region is in process of reproduction. Of a pale brownish hue, inclining to buff, with a red patch on the head and a purplish one (due to the proboscis) behind; a faint median line from end to end; cirri pale brownish, pellucid, the two caudal styles being darkest. The under surface is pinkish, with a broad streak of pale carmine in the centre.

The head is rather elongated from before backward, and rounded in front. Eyes small; the anterior pair widest apart and situated in front of the middle line at the edge of the red patch on the head. The posterior pair lie in front of the posterior

[1] Named after Dr. Gwyn Jeffrey's yacht 'Osprey.'

border, and behind the red patch. The tentacle is absent. The antennæ are short, with filiform tips, and furnished with a few clavate papillæ. The palpi are short and stout with delicately tapered extremities. The tentacular cirri taper to a fine point, and have a few sparsely distributed clavate papillæ. The dorsal cirri are similar to the latter, and have no trace of any swelling below the tip. The ventral cirri have a few short papillæ, and do not extend beyond the fleshy portion of the foot.

The scales in the specimen are fourteen pairs, smooth and pellucid, the anterior only having a faint brownish patch on a whitish portion. Under a power of 350 diam. minute and widely separated papillæ occur in the usual positions. Few or none appear on the edge of the scale. They are rounded in front, reniform, or even somewhat quadrate posteriorly.

The dorsal bristles are very slender, and much more delicate than in *Malmgrenia castanea*. Only a few of their tips project beyond the skin. One of the longer is shown in Pl. LXIX. fig. 11, and one of the shorter and stouter in Pl. LXX. fig. 18. The ventral bristles have long shafts and comparatively short terminal portions. The superior examples present a simple termination (Pl. LXIX. fig. 12), while a distinct secondary process is observed in the succeeding forms (figs. 13, 14, the latter being seen from the front). Toward the ventral edge of the group the tips are again simple (fig. 15).

In this species the body is moderately and the head peculiarly elongated. The feet are long and prominent, and the ventral tubercle at their base very distinctly marked. They become decidedly larger about the fourteenth or fifteenth segment; but whether this is due to abnormality or otherwise is unknown. After nine longer pairs the rest (posteriorly) are shorter. When the animal was placed in an open vessel beside *Marphysa sanguinea* it clung to the body of the latter near the head.

Closely allied to the foregoing is Harmothoë lunulata, Delle Chiaje, a form very generally distributed throughout British waters, from Shetland to the Channel Islands, and from the west coast of Ireland to the east coast of Scotland. Dr. Carrington, of Eccles, first found it in this country, in company with *Acholoë astericola*, D. Ch., on *Astropecten irregularis* tossed on Southport sands.

The head resembles that of *H. marphysæ*; only the eyes are somewhat larger, and the head less elongated. The tentacle terminates in a filiform tip, and has sparsely distributed clavate papillæ. The antennæ and tentacular cirri have the same shape and papillæ. The palpi are smooth. The dorsal cirri taper to a fine point, and have well-marked clavate papillæ sparsely distributed. The ventral cirri also have the same processes, and reach considerably beyond the bases of the nearest bristles.

The scales are fifteen pairs (not twelve as stated by Dr. Carrington). In some of the Zetlandic examples they are faintly tinged with brown toward the posterior border; in others each scale has a brownish ring, or the brown pigment forms a bold border for the inner (exposed) third, and sends a process (in some cases enlarged near the termination) toward the centre of the scale, so as to indicate a V. In the forms from St. Andrews the pigment assumes the shape of the shell of *Pandora*, with a spot corresponding to the hinge anteriorly. They are as smooth as in *H. marphysæ*, only a few small papillæ occurring on the surface.

The dorsal bristles are somewhat longer than in *H. marphysæ* (Pl. LXIX. fig. 16—in profile, and in fig. 17 antero-posteriorly, so as to show the usual alternate disposition of the rows of spikes, the specimens in both cases representing the longer forms next the ventral). One of the shorter bristles next the body is shown in Pl. LXIX. fig. 18. The ventral branch has superiorly a long series, having at the tip a secondary process separated only by a narrow fissure (Pl. LXIX. fig. 19). The fissure becomes more evident as the distal part decreases in length, but it again is less distinct ventrally, some at the extreme verge having a very short secondary process. A bristle from the middle of the ventral group is drawn in Pl. LXIX. fig. 20.

The Zetlandic examples are somewhat elongated, and have longer feet, and longer and more delicate pale bristles; moreover the dorsal and ventral cirri are rather longer than in the southern forms. The persistent attachment of the scales is not a feature characteristic of these examples; for they readily fall off. They are in contrast in regard to the former characters with examples from the Channel Islands. As mentioned by Dr. Carrington, the majority show inferiorly a series of brown spots, which commence as four rows rather behind the middle. In some the sets are united so as to form two rows of bars at the junction of each segment; this junction sometimes occurs posteriorly, even when there are four rows in front. It is a very active species amongst the Laminarian roots, and displays as much irritability as *Evarne impar*. It sometimes lives in the tube of *Polycirrus*. The colours are for the most part retained after immersion in spirit; but the animal often breaks into pieces. It is brightly phosphorescent, glowing, when irritated, at the bases of the feet for a considerable time, and giving off flashes when immersed in spirit.

It will be observed that the species approaches *H. marphysæ* very closely, though the cirri of the latter are shorter and smoother, the bristles of the dorsal branch much shorter and less conspicuous, and those of the ventral shorter and more slender; moreover those of the superior ventral series have no bifurcation at the tip, the closest approach to the latter condition being in a variety of *H. lunulata* from St. Peter Port, Guernsey, which had an indistinctly bifid tip in one or two of its superior bristles. Such is unusual. I have united it with Delle Chiaje's form[1], especially on carefully considering the further descriptions of M. Claparède[2], whose figures, however, are not very characteristic.

EVARNE IMPAR, Johnst. This species is generally distributed throughout the British

[1] Descrizione e not. pl. 144. f. 5, 6, and vol. v. pp. 56, 57.

[2] Annél. Chét. du Golfe de Naples, p. 63, pl. 2. f. 1.

area. The aspect of the dorsum is greenish brown. The tentacle is madder brown. The fifteen pairs of scales have brownish pigment toward the inner edge; and in the centre of each is often a yellowish speck, best marked posteriorly. The cirri are very finely tapered. The dorsal branch of the foot bears a series of bristles with very distinct spinous rows (Pl. LXX. fig. 1), with a short tip, the ventral edge showing a differentiation as in the figure, which represents one of the stouter examples; the more slender forms have the spinous rows even more widely separated. The ventral division has superiorly bristles with long bifid tips (Pl. LXX. fig. 2), the latter, as usual, becoming shorter and stouter in the inferior series (as in fig. 3—from the middle of the tuft). A few at the ventral edge have simple tips, without the secondary process. In a large example from Herm the tubercles on the scales are most conspicuous clavate organs, very much more developed than Malmgren shows; they are pyriform, with tubercles on the summit. A large specimen, again, dredged by Dr. Gwyn Jeffreys off Valentia had no tubercles on the scales. There is, indeed, considerable variation; for some of those from Herm have shorter cilia on the scales with more distinctly globular heads, and the dorsal bristles are smaller. The entire animal has a rougher aspect than *H. imbricata*, and is much more lively and active, as well as more irritable, frequently breaking in pieces if molested. It is a graceful species from its taper form and the long caudal styles. The *Polynoë reticulata* of Claparède[1] is in all probability this form; and the *Polynoë spinifera* of Ehlers is closely allied.

LÆNILLA SETOSISSIMA, Savigny[2]. This would appear to the *Polynoë longisetis* of Grube[3] (and, as such, mentioned in the Trans. R. Soc. Edin. vol. xxv. pt. ii. p. 408, pl. 15. fig. 3), the *Harmothoë malmgreni*, E. R. Lankester, and the *Lœnilla glabra*, Malmgren[4]. The *P. lævigata* of Claparède[5] is probably the same form. It occurs generally round the British shores. The ventral bristles are sufficiently characteristic when contrasted with those of *H. imbricata*. The dorsal are also much longer, have closer rows of spines, and a differently formed smooth tip. Savigny indicates most of the characters, such as the much larger anterior eyes and the light golden bristles; and M. de Quatrefages makes the diagnosis more evident by finding bifid inferior bristles in a large specimen.

ANTINOË FINMARCHICA, Mgrn. Dredged off the west coast of Ireland in the 'Porcupine' Expedition of 1869.

HERMADION ASSIMILE, n. s. First found at St. Andrews, afterwards on the west coast of Ireland, south of England, and off the Spanish coast in the 'Porcupine' Expedition.

[1] Supplément, Annél. Chét. Nap. p. 10, pl. 1. f. 1.

[2] Syst. des Annélides, p. 25.

[3] Archiv f. Naturges. xxix. p. 37, taf. 4. f. 1, 1863.

[4] Annulat. Polychæt. &c. p. 12.

[5] Supplém. Annél. Chét. p. 14, pl. 1. f. 3.

The species seems to be somewhat elongated (three quarters of an inch), those hitherto observed being easily discriminated in spirit by a brownish black band which commences behind the head, and continues along the centre to the posterior end. It is widest over the œsophageal region, and has a separate line (interruption) at each segment.

The head has a similar structure to that of *Hermadion pellucidum*, Ehlers (formerly described as British[1]), the eyes being placed close together on each side, while they are wide apart transversely; the anterior pair appear to have "lenses"—that is, show a whitish centre. The tentacle is long, smooth, dilated below the filiform terminal appendage, and minutely dotted under a low power. The antennæ are short and slightly enlarged below the long filiform tip. The palpi are quite smooth. The tentacular and dorsal cirri are also smooth, and slightly enlarged below the filiform extremity; they are much shorter than those of *H. pellucidum*. The ventral cirri, again, are rather slender, quite smooth, and reach about the tip of the fleshy part of the foot. The scales are very delicate and translucent, and show minute rounded papillæ, sparsely placed on their exterior border and neighbouring surface.

The dorsal bristles are translucent and somewhat smaller than in *H. pellucidum*, the spinous rows toward the tip being much less prominent, and covering a shorter region of the bristles; moreover the tip is more rounded than in *H. pellucidum*, and the notch is distal rather than lateral. One of the longer forms is represented in Pl. LXX. fig. 4, and one of the shorter (which exhibits the spinous rows more clearly) in fig. 5. The ventral bristles are also translucent, with the terminal portion gently narrowed from the basal collar of spines upward (Pl. LXX. fig. 6). The tip, which is more obtuse than in *H. pellucidum*, turns bluntly round toward the spiked side, and ends in a small beak; then an oblique edge occurs between this and the secondary process, which is lateral. The whole characteristically differs from *H. pellucidum*.

Halosydna gelatinosa, Sars. Generally distributed from Shetland to the Channel Islands. The bristles are figured in Trans. R. S. Edin. vol. xxv. pl. 15. f. 6.

Enipo kinbergi, Mgrn.? Fragmentary and half-digested specimens of a very elongated form are not uncommon in the stomachs of cod and haddock caught off St. Andrews Bay. The condition of these forbids a minute account. Only one had a dilapidated head; and in this no eyes remained. The largest fragment had upward of fifty segments, and it was far from being complete. The dorsal cirri are quite smooth. The feet, like those of *E. kinbergi*, are prominent; and if, as I am disposed to think, the species is to be referred to the latter, Malmgren's figures require improvement. The dorsal bristles are very minute, slender hairs, finely serrated (Pl. LXX. fig. 7). The ventral are of two kinds, viz.:—that indicated by Malmgren, and correctly

[1] Trans. R. S. Edin. vol. xxv. p. 408, pl. xv. f. 2, *a*, *b*.

represented in fig. 8 (the serrations in all our examples are apparently less numerous and wider apart than shown by Malmgren's artist); and, secondly, a few with characteristically curved tip and secondary process beneath (fig. 9). The rows of spines or serrations are not opposite, but alternate, as shown in fig. 10, which is a drawing of a larger form than the latter. There is a slight enlargement of the shaft beneath the spinous portion.

Polynoë scolopendrina, Sav. Occurs at various points, both east and west, from Shetland to the Channel Islands, and generally in the tubes of *Terebella nebulosa*. The finest specimens come from the Outer Hebrides. The dorsal branch of the foot bears a small tuft of spinous bristles with curiously dilated and peculiarly wrinkled tips, but often so covered with extraneous growths that their structure is difficult to determine. When the foot is pressed between glasses the tips of this series just reach the bases of the ventral bristles. The latter consist superiorly of one or two stout, simple bristles, much stronger than the succeeding, and with short spinous rows; the rest have short serrated portions and boldly bifid tips. The presence of the first series renders generic distinction necessary. At the posterior part of the body only one of this kind occurs in each foot. The dorsal cirrus is almost subulate, with short clavate papillæ slightly dilated at the tip. The ventral cirrus has similar appendages. Malmgren's figures of the bristles are imperfect.

Acholoë astericola, Delle Chiaje. This species appears to have been first clearly distinguished as British by Dr. Carrington (his *Polynoë asterinæ*), who found it at Southport on *Astropecten irregularis*; and I am indebted to him for my specimens. Dr. E. Perceval Wright likewise procured it at Galway. It is easily discriminated by its comparative length, and the large number and coloration of the scales. The dorsal cirrus tapers from base to apex, and has a very few short papillæ. The ventral cirrus appears to be smooth. The bristles of the dorsal branch are minute, and a limited portion in the specimens projects beyond the surface (Pl. LXX. fig. 11). The ventral bristles are furnished with long shafts, a well-marked hook at the tip; and although there are spines on the concave surface, no larger processes occur at the base of the rows as in allied forms (Pl. LXX. fig. 12). M. Claparède[1] gives a very fair account of the species, which he found in company with *Stephania flexuosa* on "*Astropecten aurantiacus*" in the Bay of Naples.

ACOËTIDÆ.

The only representative of this family found in British waters is *Panthalis œrstedi*, Kbg., which was dredged by Dr. Gwyn Jeffreys in 75 fathoms, thirty-five miles off the Skerries, Shetland. It is a large species, distinguished by the massive body, the

[1] Supplém. Annél. Chét. Nap. p. 18, pl. 2. fig. 1.

apparent absence of eyes in the spirit-preparations, and the large smooth scales. Kinberg, however, states that the eyes are on the peduncles. The feet are uniramous, with short ventral and dorsal cirri. Superiorly there is a series of long brush-shaped bristles with tufted tips; next, the characteristic strong bristles with the brush on one side, and with a pencil-like crest at the tip; while inferiorly are elongate subulate bristles, which are boldly serrated at the commencement of the terminal region, then gradually taper to a finely serrated extremity. With the first or brush-like series are many short and apparently simple bristles. They project only a short distance, and do not seem to have been noticed by Kinberg, who, however, mentions a similar kind in *Eupompe*. The structure of the terminal whip of the strong bristles is somewhat indistinctly represented by the latter author, since it is a true prolongation of the shaft with lateral setæ.

SIGALIONIDÆ.

A single species of *Sthenelais* (*S. boa*, Johnst.) and *Pholoë minuta*, Fabr., are the only representatives of the family mentioned in the Catalogue of the British Museum. To these *Sthenalais limicola*, Ehlers (a scale of which is represented in Pl. LXX. fig. 13), *Sigalion mathildæ*, Aud. & Ed., and *S. buskii*, M'I., have since been added. The present notice further extends the list.

STHENELAIS BOA, Johnst., is a species widely distributed from Shetland to the Channel Islands; and the *S. idunæ*, H. Rathke, is, in all probability, referable to the same animal.

S.? ZETLANDICA, n. s. A fragmentary form dredged by Dr. Jeffreys in Shetland. The anterior region is injured, and the head absent, though the proboscis is present. The scales are somewhat reniform, irregularly rounded anteriorly, and densely covered with flat papillæ over the whole surface; on the folded edge of the scale they form low, smooth warts, larger in proportion than those in *S. boa* (Pl. LXX. fig. 15). The outer edge, again, bears a somewhat closely arranged series of short clavate papillæ, almost globular at the commencement, and with minute processes or palpocils on the summit.

The superior lobe of the foot has numerous and rather small papillæ, which end rather bluntly, the tip being provided with several secondary papillæ. The superior bristles are well developed, and have their rows of spines very distinctly marked. The divisions of the inferior lobe are somewhat indistinct; but all are furnished with the small papillæ having the secondary processes or warts at the tip. There is a well-marked group of the latter just at the ventral margin where the inferior group of bristles emerges. The superior ventral bristles (Pl. LXX. fig. 16—in chloride of calcium, and with the basal part of the terminal process slightly folded) are strong, with four or five rows of spines at the tip of the shaft, visible, however, only at the edge. The terminal portion consists of two divisions—a long basal, and a terminal portion only about one fifth the length of the basal. The claw at the tip is distinct and much curved; and the secondary process beneath is apparently separate, just touching the former at the tip. The next, inferior group of bristles are less robust, but have only two divisions in the terminal portion. The more slender ventral series, again, have three divisions in the distal region (Pl. LXX. fig. 17, which represents one of the larger forms). The bristles throughout are tinged of a light brownish hue. The ventral cirrus is slender and does not reach the tip of the fleshy part of the foot. There is a series of globular warts or papillæ along the ventral margin of the foot, and apparently three ciliated processes beneath the branchiæ on the dorsum.

Sigalion buskii, M'I. In the 'Transactions' of the Royal Society of Edinburgh I was inclined to unite this form with the *Sthenelais dendrolepis* of Claparède; but a more careful consideration of all the facts has caused me to revert to the name originally given. The species is of some size, and stouter than *S. mathildæ*.

The head is pale, no eye-specks being visible in the preparation. The scales anteriorly are somewhat quadrate, with the inner edge rounded. Remarkable pinnate processes (Trans. R. S. E. vol. xxv. pl. 12. f. 12) occur on the outer edge (Pl. LXX. fig. 14), and are quite visible under a lens. Instead of the hyaline cylindrical processes of *S. mathildæ*, this form has lanceolate and granular pinnæ with narrow tips. They likewise differ from the arborescent papillæ of Claparède's *S. dendrolepis*.

The superior lobe of the foot (which is somewhat spathulate in lateral views) has very long and, superiorly, boldly serrated bristles, the inferior (in ordinary views) being much shorter and more delicate. The former show a bare portion of the shaft at the base. The superior series of the ventral lobe are simple serrated bristles with a fine tip. Those next resemble that figured in the Trans. R. S. E. pl. 15. fig. 5, though in some cases there are eighteen rows of spines, which, as shown in the figure, and as noticed by Claparède, are arranged in a spiral or whorled manner, some much resembling the stalk of *Equisetum*. The jointed tips of these have from five to ten divisions, and finely tapered and minutely bifid extremities. Below these are a few represented by fig. 4 in the same plate, the terminal process consisting of about eleven segments, and being rather distinctly bifid at the tip. Others have more delicate shafts with a few serrations at the end, and a shorter terminal portion of six or seven segments. One or two below the papillæ for the spine have stout shafts only faintly crenated at the distal end, and a terminal process of one or two segments with a characteristic claw. The inferior bristles have slender shafts with two or three serrations at the end, and terminal processes of eight or nine divisions ending in rather deeply bifid tips. The inferior cirrus is slender and long, reaching beyond the tip of the foot. Three ciliated pads occur on the curve below the branchial process. Anteriorly a single papilla, as a rule, is found on the superior lobe of the foot. Those on the posterior feet are ramose, like the growing antlers of the Stag.

The *Pholoë inornata* and *P. eximia* of the British-Museum Catalogue refer to the same species, viz. *P. minuta*, Fabr. I doubt, also, if the *P. synophthalmica* of Claparède[1] is other than a mere variety.

DESCRIPTION OF THE PLATES.

PLATE LXVII.

Fig. 1. Ventral bristle of *Spinther oniscoïdes*, Johnst. Magnified 90 diameters.

Fig. 2. The tip of a somewhat stouter and shorter form. Magn. 350 diam.

Fig. 3. Hook from ventral cirrus. Magn. 350 diam.

Fig. 4. Dorsal bristle of *Eunoa nodosa*, Sars, from the specimen recognized by Malmgren in the British Museum. Magn. 210 diam.

Fig. 5. Ventral bristle of the same specimen in balsam. Magn. 210 diam.

Fig. 6. Ventral bristle mounted in water. Magn. 210 diam.

Fig. 7. Dorsal bristle of a specimen of the same species from the coast of Durham. Magn. 210 diam.

Fig. 8. Ventral bristle of the same. Magn. 210 diam.

Fig. 9. Tip of a dorsal bristle of *Dasylepis asperrima*, Sars. Magn. 210 diam.

Figs. 10, 11. Tips of ventral bristles. Magn. 350 diam.

Fig. 12. One of the longer dorsal bristles of *Lagisca propinqua*, Malmgren. Magn. 350 diam.

Fig. 13. Superior ventral bristle. Magn. 350 diam.

Fig. 14. Inferior ventral bristle. Magn. 350 diam.

Fig. 15. Dorsal bristle of *Malmgrenia castanea*, n. s. Magn. 350 diam.

Fig. 16. Superior ventral bristle. Magn. 350 diam.

Fig. 17. Inferior ventral bristle. Magn. 350 diam.

Fig. 18. Tip of a ventral bristle of the same species from Valentia, showing the process beneath the hook. Magn. 350 diam.

Fig. 19. Another example, from the west coast of Ireland, with a very evident secondary process at the tip. Magn. 350 diam.

Fig. 20. One of the larger dorsal bristles of *Malmgrenia andreapolis*, n. s. Magn. 700 diam.

Fig. 21. Superior ventral bristle. Magn. 350 diam.

Fig. 22. Median ventral bristle. Magn. 700 diam.

Fig. 23. Inferior ventral bristle. Magn. 700 diam.

[1] Annél. Chét. Nap. p. 79, pl. 3. f. 1.

PLATE LXVIII.

Fig. 1. Dorsal bristle of *Harmothoë sibbaldii*, n. s. Magn. 350 diam.
Fig. 2. Superior ventral bristle. Magn. 350 diam.
Fig. 3. Inferior ventral bristle. Magn. 350 diam.
Fig. 4. Front view of a dorsal bristle of *H. zetlandica*, n. s. Magn. 210 diam.
Fig. 5. Superior ventral bristle. Magn. 350 diam.
Fig. 6. Tip of one of the longer dorsal bristles of *Polynoë floccosa*, Sav. Magn. 350 diam.
Fig. 7. Tip of a dorsal bristle from a large specimen of *H. imbricata*. Magn. 350 diam.
Fig. 8. Superior ventral bristle of *P. floccosa*. Magn. 350 diam.
Fig. 9. Superior ventral bristle of *H. imbricata*. Magn. 350 diam.
Fig. 10. Median ventral bristle of *P. floccosa*. Magn. 350 diam.
Fig. 11. Median ventral bristle of *H. imbricata*. Magn. 350 diam.
Fig. 12. Tip of a dorsal bristle of *H. areolata*, Grube. Magn. 350 diam.
Fig. 13. Superior ventral bristle. Magn. 350 diam.
Fig. 14. One of the most characteristic median ventral bristles. Magn. 350 diam.
Fig. 15. Tip of a developing bristle of *Malmgrenia castanea*, n. s., showing the secondary process at the end of the spinous rows. Magn. 350 diam.

PLATE LXIX.

Fig. 1. Dorsal bristle of *Harmothoë zetlandica*, n. s. Magn. 350 diam.
Fig. 2. Dorsal bristle of *H. macleodi*, n. s. Magn. 350 diam.
Fig. 3. Superior ventral bristle. Magn. 350 diam.
Fig. 4. One of the larger dorsal bristles of *H. antilopes*, n. s. Magn. 350 diam.
Fig. 5. Superior ventral bristle. Magn. 350 diam.
Fig. 6. One of the stouter forms from the neighbourhood of the spine. Magn. 350 diam.
Fig. 7. Dorsal bristle of *H. haliæeti*, n. s. Magn. 350 diam.
Fig. 8. Superior ventral bristle, viewed antero-posteriorly. Magn. 350 diam.
Fig. 9. Another superior ventral bristle, seen laterally. Magn. 350 diam.
Fig. 10. Inferior ventral bristle. Magn. 350 diam.
Fig. 11. One of the longer dorsal bristles of *H. marphysæ*, n. s. Magn. 350 diam.
Fig. 12. Superior ventral bristle. Magn. 350 diam.
Fig. 13. Median ventral bristle, viewed laterally. Magn. 350 diam.
Fig. 14. Antero-posterior view of a median ventral bristle. Magn. 350 diam.
Fig. 15. Inferior ventral bristle. Magn. 350 diam.
Fig. 16. Profile of one of the longer dorsal bristles of *H. lunulata*, Delle Chiaje. Magn. 350 diam.
Fig. 17. Antero-posterior view of another dorsal bristle. Magn. 350 diam.
Fig. 18. One of the shorter dorsal bristles. Magn. 350 diam.

Fig. 19. Superior ventral bristle. Magn. 350 diam.

Fig. 20. Median ventral bristle. Magn. 350 diam.

PLATE LXX.

Fig. 1. One of the stouter dorsal bristles from a large specimen of *Evarne impar* from Herm. Magn. 350 diam.

Fig. 2. Superior ventral bristle. Magn. 350 diam.

Fig. 3. Lower median ventral bristle. Magn. 350 diam.

Fig. 4. One of the longer dorsal bristles of *Hermadion assimile*, n. s. Magn. 350 diam.

Fig. 5. One of the shorter dorsal bristles. Magn. 350 diam.

Fig. 6. Ventral bristle. Magn. 350 diam.

Fig. 7. Dorsal bristle of *Enipo kinbergi*, Mgrn.? Magn. 350 diam.

Fig. 8. Ventral bristle with simple tip. Magn. 350 diam.

Fig. 9. Bifid ventral bristle. Magn. 350 diam.

Fig. 10. Ventral bristle (a large form with simple tip) viewed antero-posteriorly. Magn. 350 diam.

Fig. 11. Dorsal bristle of *Acholoë astericola*, Delle Chiaje. Magn. 350 diam.

Fig. 12. Ventral bristle. Magn. 350 diam.

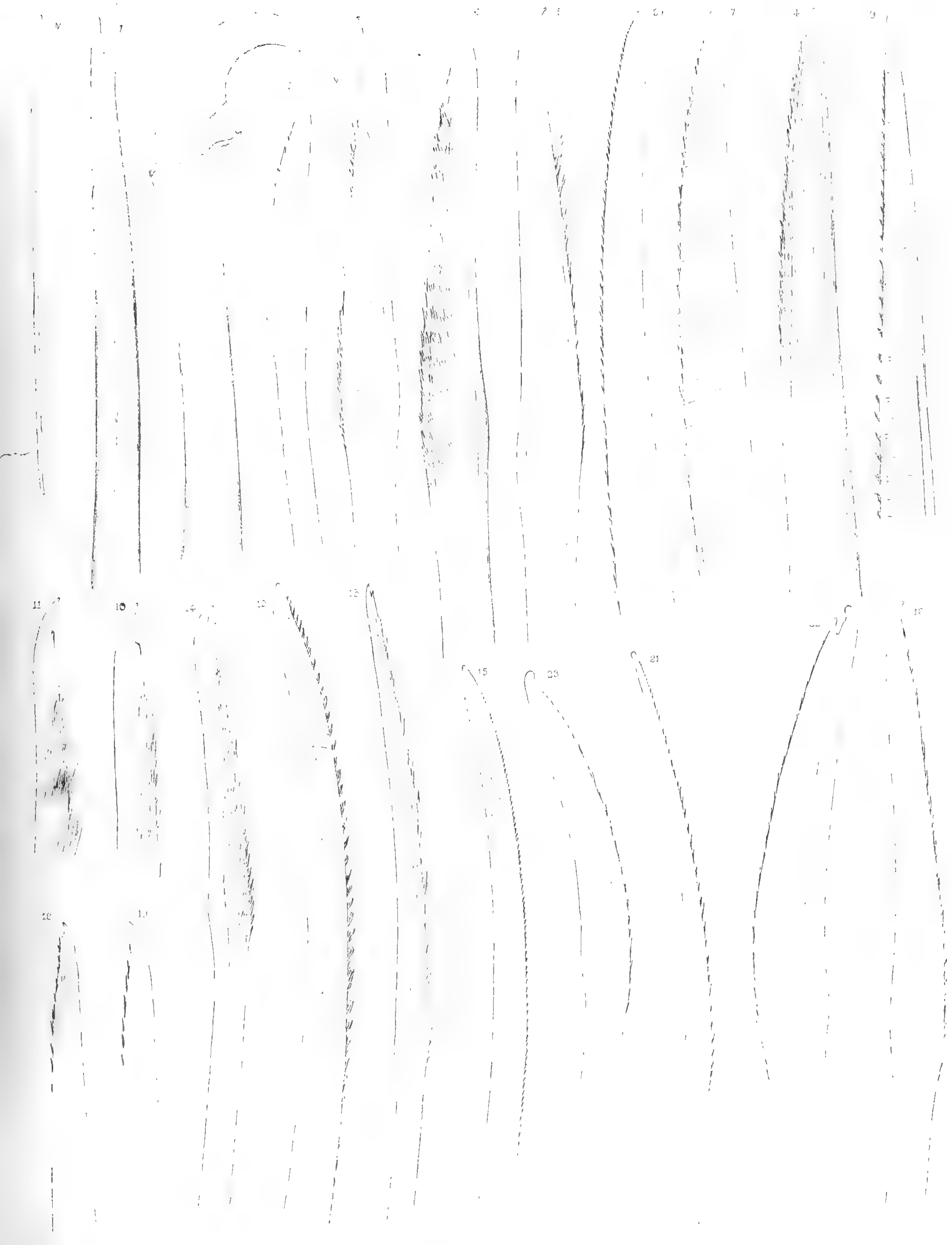
Fig. 13. Anterior scale of *Sthenelais limicola*, Ehlers. Magn. 40 diam.

Fig. 14. Scale of *Sigalion buskii*, n. s. Enlarged.

Fig. 15. Portion of the edge of a scale of *Sthenelais? zetlandica.* Magn. 350 diam.

Fig. 16. Superior ventral bristle in chloride of calcium. Magn. 350 diam.

Fig. 17. Inferior ventral bristle. Magn. 350 diam.



BRITISH ANNELIDA

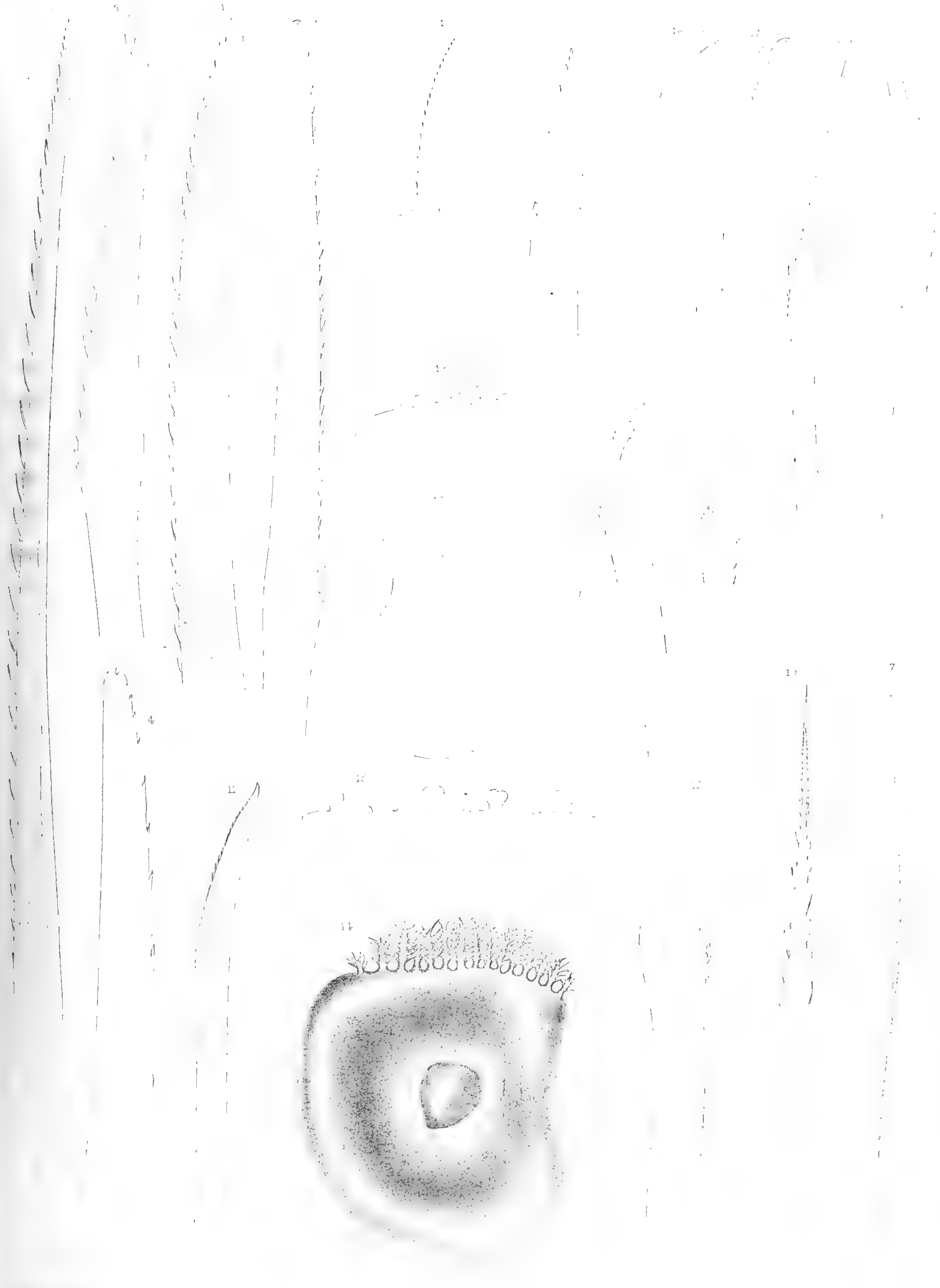
W. C. M. del. G. H. Ford lith.

BRITISH ANNELIDA.

W. C. M. del. & H. F. del.

Mintern Bros. imp.

BRITISH ANNELIDA.



Mintern Bros imp.

BRITISH ANNELIDA.

VIII. *On the Annelida of the 'Porcupine' Expeditions of* 1869 *and* 1870.
By W. C. M'Intosh, C.M.Z.S.

[Plates LXXI.-LXXIII.]

Read May 19th, 1874.

Part I.—Euphrosynidæ, Amphinomidæ, Aphroditidæ, Polynoidæ, Acoëtidæ, *and* Sigalionidæ.

THE materials from which the following observations have been made were kindly placed in my hands by the distinguished naturalists who superintended the dredging-operations in these expeditions, viz. Dr. Carpenter, Dr. Gwyn Jeffreys, and Prof. Wyville Thomson. I have, in the first place, to record my obligations to these gentlemen for their great courtesy.

EUPHROSYNIDÆ.

Of the Euphrosynidæ a minute example (*Euphrosyne lanceolata*, n. s.), about one tenth of an inch in length was dredged in 173 fathoms in sandy mud and corals off Ireland in 1869. It is at once distinguished from the common *E. foliosa* by the shape of the branchiæ, which for the most part are divided dichotomously, and terminate in lanceolate processes (Pl. LXXI. fig. 1). As in allied forms, the inferior bristles are simple; the dorsal are almost all injured in the single example, only one or two with the curved and serrated fork being visible. From *E. borealis*, Œrst., another British species, it is likewise separated by the form of the branchiæ and the structure of the bristles. The late Prof. M. Sars describes[1] the branchiæ of his *E. armadillo* as having the apices "conico-acuminatis," else I should have been inclined to unite the present form therewith.

AMPHINOMIDÆ.

Chloëia fucata, De Quatref.?, occurred in considerable abundance in the collection made by Dr. Carpenter in 1870; viz. in 40 fathoms off Algiers, 60–100 fathoms east of Cape de Gatte (six miles from shore), 45 fathoms eight miles N.W. of Cape Sagres, 92 fathoms in sandy mud on Adventure Bank, 128 fathoms off Tangiers, and 227 fathoms off Cadiz—the bottom temperatures in the two latter being 55°. The species seems to be most closely connected with the *C. fucata* of M. de Quatrefages[2] from Mascate. It differs, however, in the presence of four very distinct eyes—a larger pair in front on each side, and a smaller pair behind.

[1] Forhandl. Vid.-Selsk. 1861, p. 55.

[2] Annelés, ii. p. 390.

The body is somewhat elongated for a typical example of the group. Most of the specimens retain traces of colour, the dorsal cirrus being brownish purple; and some have a brownish median line on the dorsum, and a band of the same hue at the anterior part of each segment. The dorsal edge of the caruncle is likewise deep purplish.

The caruncle extends to the posterior border of the fourth segment. The tentacle is much longer than the antennæ; and the latter, again, are longer than the buccal processes (tentacles of M. de Quatrefages). The branchiæ are bipinnate, commence at the 4th body-segment, and terminate on the last. The tail has two blunt styles.

The dorsal fascicle springs to the exterior of the branchiæ in each foot, and consists of a brittle series of radiating bristles (Pl. LXXI. fig. 2) with serrated tips. The dorsal cirrus takes its origin from the same papilla. The ventral division is furnished with a fan-shaped tuft of bristles, which are more slender and elongated in the centre of the bundle. The bifid tips of the bristles diminish from above downward. The upper series (Pl. LXXI. fig. 3) have a large process beyond the fork, while the lower (fig. 4) have a shorter. The ventral cirrus is pale in the preparations, and comes from the posterior and inferior edge of the bristle-papilla. It is about the same length as the dorsal; and both continue to the last segment. Air readily passes into the central cavity of the dorsal bristles; and, in common with the others, they have a minutely granular appearance under the microscope. Acetic acid demonstrates a considerable amount of calcareous matter in their composition, a flexible translucent chitine remaining, while the dorsal bristles lose their serrations. Some of the bristles show fine transverse lines, which even notch the edge—a feature more conspicuous after the addition of the acid.

APHRODITIDÆ.

The representatives of the Aphroditidæ are three, viz.:—*Aphrodita aculeata*, L., young examples of which occurred in 690 and 257 fathoms on Stations Nos. 3 & 8 on the Channel slope in 1870, and in 90 fathoms off the west coast of Ireland in 1869; *Lætmonice filicornis*, Kbg., off Rockall in 164 fathoms, and in 358 fathoms on the Channel slope; and *Hermione hystrix*, Sav., in 40–80 fathoms off Algiers in 1870.

POLYNOIDÆ.

Lepidonotus squamatus, L., was dredged in 30–40 fathoms on stony and muddy ground off Dingle Bay, Ireland, in 1869, and *Eunoa nodosa*, Sars, in 690 fathoms on the Channel slope in 1870.

Eunoa hispanica, n. s. Dredged in 539 fathoms in the Atlantic (Channel slope) 1870. The single specimen is fragmentary and without scales. There is a pale purplish hue along the dorsal and ventral surfaces. The eyes are remarkably large; indeed the pairs almost touch each other; and, from the whitish centre in the spirit-preparation, each appears to have a lens—a feature, however, probably due to the opacity of the translucent covering. The palpi are smooth. The inferior cirrus is long, slender, and smooth, reaching even beyond the tips of the bristles. The latter are yellowish, not very numerous in either branch, and characteristic. The dorsal division bears tolerably straight bristles, with an unusually prolonged smooth tip (Pl. LXXI. fig. 5, and again more highly magnified in fig. 6). The ventral series (Pl. LXXI. fig. 7) have also a very long smooth termination, and a comparatively short region with spines. The bristle represented has intermediate or average characters. This form comes nearest the *Eunoa scabra*, Œrst. (*E. œrstedi*, Mgrn.), but it differs in the more pointed anterior lobes of the head, the much larger size of the eyes (which are considerable in *E. œrstedi*), in the smoothness of the cirri and palpi, in the greater length of the ventral cirri, and, lastly, in the characteristic structure of the bristles, which have a much longer smooth portion at the tip. A single loose scale with a series of minute, pointed papillæ in the usual positions, a few large conical processes, and a few cilia occurred in the bottle; but its ownership is of course open to question. It is much softer and smoother than that of *E. œrstedi* or *E. nodosa*.

Lagisca jeffreysi, n. s. Dredged in the Expedition of 1869 in the tube of a *Eunice* in 163 fathoms off the west coast of Ireland, and also in a free condition on the same ground (muddy sand), and in 690 fathoms on the Channel slope in 1870. It is an interesting species, which in superficial characters somewhat resembles *Harmothoë imbricata*, so that there is some excuse for collectors mistaking it. The same may be said of *L. rarispina*, Sars, which Dr. Malmgren saw in the bottles containing *H. imbricata* in the British Museum. It may be recognized externally by its more slender bristles (both dorsal and ventral), and the greater delicacy and (under a lens) minutely spinous nature of the scales, as well as the longer and more tapering dorsal cirri. There are 45 segments bearing bristles; and the tail is not quite complete.

The head of this form somewhat resembles that of *Harmothoë imbricata*; but the eyes are decidedly larger. The tentacle is longer and less dilated below the tip; indeed the specimens scarcely show any dilatation. The antennæ are shorter; but the palpi are similar, having minute papillæ. The tentacular cirri and tentacle are covered with very long papillæ, with a slight dilatation at the tip, and thus contrast with those of *Harmothoë imbricata*, irrespective of the presence of the enlargement in the latter below the termination.

The scales appear to reach the number of 14 pairs. They are rounded in front, somewhat reniform posteriorly, and throughout (in the spirit-preparations) of a uniform greyish hue. Their surface is nearly smooth to the naked eye; but under a lens the whole is densely covered by a series of minute, pointed, slightly brownish spines, and the free portion is profusely ciliated (Pl. LXXI. fig. 8). The cilia are pellucid tapering structures, terminating in a slightly dilated tip. A considerable part of the body posteriorly is devoid of scales. The dorsal cirri extend beyond the tip of the bristles, and are covered with long cilia similar to those on the scales. In both organs these are much longer and more numerous than in *L. rarispina.* The ventral cirri have a few short cilia, and extend nearly to the tip of the fleshy portion of the foot.

The dorsal division of the foot has somewhat stout bristles (Pl. LXXI. fig. 9), and the tip has a tendency to follow the same form as in the ventral. This is observed in a more highly magnified view in fig. 10, while another with a sharper tip is seen in Pl. LXXIII. fig. 17, and a third in Pl. LXXIII. fig. 18, sketched from one of the shorter (developing?) forms toward the body-line of the dorsum, and having a slender process at the tip. The ventral division commences superiorly with a series having very long tips, the rows of spines being much finer and more dense than in *Harmothoë imbricata*—indeed, in this respect approaching *Dasylepis asperrima.* The peculiar shape of the terminal portion is distinctive (Pl. LXXI. fig. 11, representing one of the longer, not longest, forms). Some of those next the upper series also show a distinct process beneath the tip (Pl. LXXI. fig. 12). The tips diminish in length in the usual manner toward the ventral surface, those at the lower edge showing no secondary process.

Malmgren's descriptions and figures demonstrate considerable differences between his forms (*L. rarispina* and *L. propinqua*) and the present. It is a fact of interest also in connexion with the strictness necessary in all scientific drawings, that his artist has overlooked the fundamental condition of such bristles, viz. to have alternate rows of minute spines or spinous processes. None of the specimens exhibited the elongated processes on the scales shown by Malmgren in *L. rarispina*, and, in some, few or none of the bristles of the inferior branch showed the secondary process beneath the tip—characters which diverge both from the latter and *L. propinqua.*

Harmothoë imbricata, L., occurred in 60–160 fathoms six miles E. of Cape de Gatte. In a specimen of *Harmothoë floccosa*, Sav., dredged off the west coast of Ireland in 173 fathoms, some of the posterior ventral cirri had a few clavate papillæ. *Harmothoë antilopes*, M'Intosh, is not uncommon in both collections, being found with the latter in (No. 6) 358 and (No. 11) 567 fathoms on the Channel slope, in the Atlantic, and outside Gibraltar in 227 fathoms.

Evarne impar, Johnst. An example from 567 fathoms (Station No. 1, 1870) does not show the large tubercles on the scales, and the cilia along the border of the latter are unusually long. The characters in some respects (except the slenderness of the ventral bristles) approach certain varieties of *Harmothoë imbricata.* The scales, moreover, have none of the ordinary brown touches, being pale greyish. The same variety was procured in Station No. 6 (358 fathoms), and outside Gibraltar.

Evarne Johnstoni[1], n. s. Dredged at Station 3, 1870, in 690 fathoms in the Atlantic.

[1] In honour of the late Dr. George Johnston, of Berwick-on-Tweed, who did much to bring the Annelida into notice in this country.

The species is roughly distinguished from *E. impar* by the deep brownish hue of the dorsum, by the minute and rather indistinct eyes and the brownish purple proboscis, by the structure of the tips of the ventral bristles and their greater delicacy, and by the longer and more delicate dorsal bristles, which give the observer quite a different impression, though somewhat difficult to describe in words.

The head has the same form as in *E. impar*, and is pale throughout, no pigment occurring at the base of the tentacle. The eyes appear only as minute black points; two lie at the posterior border of the head, almost hidden by the collar; two (of the same minute size) are situated to the front and outside these, as in the ordinary species. The tentacle is absent; antennæ pale and filiform; palpi pale with filiform tips; tentacular cirri absent. A single reniform scale occurred in the vessel. It had long clavate papillæ on the usual surface and border, thinly distributed. The dorsal cirrus has a filiform tip without enlargement, and rather long clavate papillæ, sparsely distributed. The ventral cirrus has also a filiform tip, slightly enlarged (probably from the spirit) at the end, and with short clavate papillæ. It reaches considerably beyond the base of the lowest bristles.

The dorsal branch of the foot bears bristles of a similar character to those of *E. impar*, but they are on the whole longer and more slender, with better-marked spinous rows. The smooth portion at the tip, again, is decidedly shorter than in the common species. The tip, moreover, shows a characteristic conformation in some cases, having a slight mucro at the termination, then a shallow notch, and another elevation or faint mucro a little above the first row of spikes. One of the stronger bristles is represented in Pl. LXXI. fig. 13. A long clear shaft projects beyond the fleshy part of the foot before the rows of spikes appear; so that the bristles are comparatively long. The tendency to differentiation of the tip is observed in fig. 14 (from another strong bristle). The superior edge of the ventral series has a few with tips so attenuate that it is difficult to make out their structure; the bifid condition, however, appears to be present. The next lower series have much longer and stronger tips; and though the extremity is extremely delicate and translucent, the bifid condition is apparent. The terminal hook is short, and very slightly curved; and the secondary process is rather short and broad, and passes far up. The rows of spines are distant and well marked. The tips of the succeeding (lower) bristles become broader and shorter; but the character of the termination remains the same. All are very translucent and delicate. Toward the inferior edge the tip is simple, only a faintly developed hook being present. One of the elongated forms near the dorsal edge of the fascicle is shown in Pl. LXXI. fig. 15. The arrangement of the spines and the short bifid tip are characteristic. Fig. 16 represents a bristle from the middle of the foot; it is exceedingly translucent and very faintly serrated. A more highly magnified tip, corresponding to each kind, is given in fig. 17 (corresponding to fig. 15) and in fig. 18 (corresponding to fig. 16).

It is curious that in both examples of the species the proboscis is extruded. From an examination of many preparations of *E. impar* this would not seem to occur frequently; and it is possible the same cause acts here as in the case of the deep-sea fishes, which are drawn up with eyes and intestine projecting.

HERMADION ASSIMILE, M'I., was dredged in 160 fathoms east of Cape de Gatte (six miles from shore) in 1870.

ANTINOË FINMARCHICA, Mgrn. In his 'Annulata Polychæta' Dr. Malmgren mentions[1] (in two lines) a species of this name having thirty-five segments, the elytra scarcely if at all ciliated, and stouter and shorter bristles than in *A. sarsi*. A small translucent specimen which was dredged off the west coast of Ireland (Donegal) in 20 and 420 fathoms, in the Expedition of 1869, seems to agree with all that is published about the above-mentioned species.

On contrasting it with *A. sarsi* of the same size, the head is found to be similar; but the eyes seem slightly larger. The slender cirri with filiform tips are furnished with long and conspicuous clavate papillæ, the latter often showing a fine terminal ciliary process. The soft pellucid scales have short and sparsely distributed clavate papillæ along the outer and posterior borders; but the general surface has only a few sparse subacute papillæ, occasionally with the summits curiously truncated. Most of the papillæ show the fine palpocils at the tip.

The dorsal bristles are translucent, sharply tapered from the commencement of the spinous portion to the tip, so as to give them a peculiar character. Those next the ventral series (in the ordinary position under the microscope) are nearly straight (Pl. LXXII. fig. 1), while a thicker and more curved group occupy the inner edge (Pl. LXXII. fig. 2). Contrasted with the bristles from a specimen of *A. sarsi* they are on the whole much longer, less curved, more acutely tapered at the tip, and with more closely arranged spinous rows. The ventral bristles, again, are decidedly stouter than in *A. sarsi*, and the character of the tip differs. Superiorly, instead of those with capillary tips, are bristles with a very long and delicate portion of appreciable breadth, distinctly spined, and ending in a slightly curved point. The spinous rows continue nearly to the latter. The tips gradually diminish in length toward the inferior edge, and the spinous rows are closer. Some show a tendency to have long filaments at the tip as in *A. mollis*; but the feature is indistinct.

ANTINOË MOLLIS, M. Sars. In an excellent brochure published lately by Prof. G. O. Sars[2], from the materials left by his distinguished father, this form is described as *Lænilla mollis*. It seems to me, however, to be linked in a very close manner to the foregoing. Two fragments were procured in 257 fathoms in the Atlantic in 1870.

[1] Page 13.

[2] 'Bidrag til Kundskaben om Christianiafjordens Fauna,' 1873, p. 7, pl. xiv.

The head is at once distinguished from the previous form by the large size of the eyes, both anterior and posterior. The palpi have minute papillæ. The scales are furnished with the same sparsely distributed clavate papillæ, but differ in having a close array of short acicular spines (which are much more numerous than represented by Prof. Sars) scattered over the surface. The ventral cirri have short clavate papillæ.

The dorsal bristles are slightly yellowish, and, though as conspicuous in size as those of *A. finmarchica*, are much less acutely tapered at the tip, and have closer rows of spines. The contour and curves also diverge. The superior ventral bristles have slightly shorter tips than in *A. finmarchica*; and the rows of spines are not so distinctly separated. The tip is similar, viz. slightly hooked; but the spines become so elongated toward the tip that they stand out on each side like a series of filaments (Pl. LXXII. fig. 3, and the same bristle more highly magnified in fig. 4, the specimen being from the middle of the foot).

PHYLLANTINOË MOLLIS, n. s. Dredged in 539 fathoms in the Atlantic, 1870. The fragmentary specimen measured about $\frac{3}{4}$ inch. There are about forty segments besides head and tail. The whole body is soft and delicate; and very few bristles were found in any of the feet. The dorsum has a brownish colour throughout; and the pigment posteriorly is somewhat regularly disposed in the segments. The body is characteristically elongated, and tapers much posteriorly. The head differs from most of its allies in the very large size and situation of the eyes. The posterior pair lie quite at the posterior border; the anterior, which are about twice as large as the former, occupy the lateral region of the cephalic prominence. The pairs are comparatively close to each other, and appear to have lenses. The median fissure for the tentacle is deeply marked, and almost splits the head into halves. No scales were present.

The structure of the feet could not be fully made out from the condition of the specimen; but they seem to differ considerably from the ordinary types. Anteriorly the dorsal division is much elevated in many as a soft process, probably for the attachment of the scale; while the ventral branch posteriorly projects as a long soft lobule. The dorsal bristles (Pl. LXXII. fig. 5) are short and stout, very translucent, considerably curved, and with prominent rows of spines. The specimen figured is one of the largest and least curved. There is a smooth portion at the tip. The ventral bristles (Pl. LXXII. fig. 6) are extremely slender and translucent, both as regards shaft and tip. The latter is long and tapered, and ends in a slender point, which in some is slightly bent. The spinous rows have the usual arrangement, and disappear before reaching the extremity. There is no form which appears to resemble this species.

LEPIDASTHENIA BLAINVILLII, Aud. & Ed. Dredged in 45 fathoms, eight miles off Cape Sagres, in 1870. An elongated form with distinct characters. The colours have, for the most part, disappeared; but the dorsum is still somewhat brownish along the median line, and the outer part of the scales is tinted of a pale brownish hue. The bristle-bearing segments amount to eighty-seven; and the feet are deeply cut. The body tapers from head to tail and terminates in the anus, on each side of which there is a short cirrus. The head is small, and covered by the first pair of scales. Eyes four, somewhat indistinct; two placed near the posterior border, and two (which are wider apart than the former) in front of the prominent lateral region. Tentacle absent; but the base is of a dusky brown hue, thus causing the somewhat elevated divisions of the head next it to appear in relief. Antennæ smooth. Palpi absent. Tentacular cirri long, filiform, and smooth. There is no trace of enlargement below the tips of any of these processes. The scales are almost all detached, so that it is difficult to determine them exactly; but they appear to number about thirty pairs, the first occurring on the second segment and the last reaching the anal papilla; they are pellucid, smooth, iridescent, brownish organs, and under a high power are minutely granular, like the scales of certain fossil fishes. In the pigment-region, moreover, pentagonal or hexagonal spaces are formed with a clear point in the centre of each. A few clavate papillæ occur at intervals on the posterior surface and edge. From the surface of attachment various finely branched nerves (?) proceed to the circumference. The first pair seemed to be large; but several loose scales exceeded them, so that a regular diminution from head to tail may not hold.

Each foot, when viewed from the dorsum, is bifid, having a long pointed papilla in front, and one less acute posteriorly. The same appearance is noticed from the ventral surface, the bristles emerging between the papillæ. The dorsal cirrus arises near the base superiorly, and is a smooth tapering process extending to the tip of the bristles. The inferior cirrus springs about the middle of the foot, reaches a little beyond the angle of the fork, is filiform, tapering, and smooth. Between this and the process at the base of the foot there is a line of clavate papillæ. Viewed laterally the foot is pointed from below upward, a slight curve only existing at the dorsal edge; the tip seems to be furnished with whitish pigment along the border of the papillæ. The dorsal division is represented only by a spine, the blunt point of which projects as a prominent process covered with cutaneous tissues to the exterior of the dorsal cirrus. The ventral branch has a vertical series of dull yellowish bristles projecting between the pointed papillæ of the feet. The superior group (Pl. LXXII. fig. 7) have long tapering tips ending in a slight mucro or thickening of the point. The portion beneath is scaly rather than spinous, from a series of sheath-like processes, which, in the position of the specimen figured, are seen somewhat on their edge; they form the usual alternate double rows; and their arrangement often gives the bristle the aspect of a diminishing rod with a spiral band. The inferior series, often separated by an interval, commences with bristles having the type of the former, but with shorter tips, terminated by a slightly curved hook; and the bifid nature soon becomes developed in the others (Pl. LXXII. fig. 8). The large scale-like processes stand out prominently; but it is difficult to represent these satisfactorily, as every change of position alters the appearances. The tips become shorter at the ventral edge; but the terminal hook and secondary process remain.

The specimen afforded a site for a swarm of *Loxosomæ*, which occurred on the feet and dorsum beneath the scales. MM. Audouin and M.-Edwards mention that Blainville[1] figures a *Polynoë scolopendrina* which differs quite from that form in having scales extending to the posterior extremity of the body; they therefore term the form *P. blainvillii*. In all probability the *P. elegans* of Prof. Grube[2] refers to the same species.

Lepidasthenia longissima, Blainville. Dredged in 45 fathoms off Cape Sagres, 1870. The specimen is imperfect, consisting only of the anterior region. In external appearance it is distinguished from the preceding by the somewhat large head, the small though better-defined eyes, and the shorter bristles. The head has two tumid lobes on each side. Eyes small; the posterior pair are placed some distance in front of the posterior border; the anterior pair are further apart, and occupy the front of the lateral eminence. Tentacles and palpi absent. Tentacular cirri similar to those in *L. blainvillii*; the cephalic processes appear to be somewhat larger. The dorsum is brownish in front in the median line, the pigment being transversely barred some distance behind the head. The scales appeared to be similar to those in the former species; but all had been injured before preservation. The same sparsely distributed clavate cilia are present.

The feet are similar to those of *L. blainvillii*, having, when viewed from either surface, bifid extremities and intermediate bristles. The dorsal cirrus, however, is longer, and arises from a point nearer the extremity of the foot. The ventral cirrus is somewhat larger at the base than in the former species; and the row of clavate papillæ running from the cirrus to the inner ventral process is more distinct. The dorsal branch is represented, as in the former, only by a single spine covered by the cutaneous tissues, the whole forming a conical papilla. The ventral division of the foot has a series of bristles with simple tapering tips and scale-like rows, the spinous region being much shorter than in the former species, as observed in Pl. LXXII. fig. 9, which represents one of the superior bristles. Toward the ventral border the tips become still shorter (Pl. LXXII. fig. 10), with a slight hook at the extremity, and the spines are continued almost to the latter. When the bristle is seen from the front or the back it is shaped like a feather, since the tip is not so attenuate as in the superior series. In the figure the bristle is slightly turned round, so as to show the rapid diminution above the commencement of the spinous rows. At the ventral edge of the series a few have the shape represented in Pl. LXXII. fig. 11.

[1] Dict. des Sc. Nat. art. Vers, p. 459, pl. x. f. 2.

[2] Actin. Echin. u. Würmer des Adriat. u. Mittelmeers, 1840, p. 85.

Blainville's figure of *Eumolpe scolopendrina*[1] represents an elongated form with much smaller scales than the foregoing *Lepidasthenia blainvillii*; and the dorsal division of the foot (in fig. 2*a*, *op. cit.*) has a tuft of short hairs, and a dorsal cirrus with a dilated extremity. The ventral bristles are in two tufts—an upper small and an inferior large group. The scales proceed to the end of the body. The feet are similar in shape and longer than those of the next species. His *Eumolpe longissima*[2], from the shores of Genoa, is a form with a narrower and much longer body, with eighteen pairs of very small scales at the margins of the body, and with the tips of the tentacular cirri and tentacle enlarged at the extremity. The superior lobe of the foot has a tuft of fine bristles; and the dorsal cirri are enlarged near the tip. Though I would not trust much to figures alone in such a case, there are certain close resemblances and mutual relations between Blainville's and the 'Porcupine' specimens. The feet in both are similarly pointed from below upward; the bristles of the latter species (*E. longissima*) are shorter than those of the former; and the relations of the dorsal cirri, the ventral cirri, and the size of the feet are the same. Blainville's artist may have represented the forms with developing scales; and the bulbous condition of the dorsal cirri may likewise have been exaggerated. The *Polynoë malleata*, *P. tuta*, and *P. vittata*, Grube[3], are species having elongated bodies with numerous scales, but they do not seem to approach the foregoing forms.

ACOËTIDÆ.

Panthalis œrstedi, Kinberg. In an example dredged in 477 fathoms outside the Strait of Gibraltar the second or strong series of bristles had a deep brownish or amber colour; and rows of spines occurred on the posterior edge of the bristle, where in the ordinary form none appear.

Eupanthalis kinbergi, n. s. Found by Dr. Carpenter at a depth of 92 fathoms on Adventure bank in 1870.

The species is about $1\frac{1}{2}$ in. long, and somewhat resembles *Eupompe*, differing, however, from any example of the Acoëtidæ described by Kinberg in having sessile eyes. The head is rounded, as in the Polynoidæ, with two large eyes furnished with "lenses" on the lateral prominences in front, and two smaller a little behind. There is no tentacle in the specimen; but on each side of the median groove is a filiform or slightly subulate

[1] Atlas, Dict. des Sc. Nat. pl. x. f. 2 & 2*a*. The reference in the text (vol. lvii. p. 459) simply is, l'E. scolopendrine=*E. scolopendrina*, Sav. *loc. cit.* p. 25, no. 6, &c.

[2] Vers, vol. lvii. p. 459; Atlas, pl. x. f. 3 & 3*a*.

[3] Archiv für Naturges. 1855, p. 81.

antenna. The tentacular cirri are larger than the latter, and arise from the ordinary basal process. There is a little brownish pigment on the head. The proboscis is extruded, and has the usual papillæ at the tip, besides two superior and two inferior brownish fangs and about four short blunt teeth on each side. The dorsal cirrus is a short, almost conical, process, with an enlarged base and tapering tip. The ventral is longer and more slender, but does not reach the extremity of the fleshy part of the foot. There is the usual soft process between the dorsal cirrus and the tip of the foot.

The uniramous foot bears superiorly curved subulate bristles finely serrated from base to apex, and more slender than those represented in Pl. LXXII. fig. 14 (from the ventral edge of the foot); others are more delicate, the tip beyond the enlarged base having widely distant and opposite setæ (Pl. LXXII. fig. 12, one of the smaller examples). The stout bristles (fig. 13) have a long terminal serrate whip, and the shaft at the base of the latter has a blunt hook and a brush of setæ. A tuft of bristles, similar in structure to the superior series, occurs at the ventral edge (fig. 14, and a lateral view in fig. 15); but there are none with the widely distant setæ on the terminal portion. The most remarkable feature is the entire absence of the "brush-like" bristles so characteristic of *Panthalis œrstedi*, Kbg.

Such scales as remained presented a peculiar funnel-shaped aspect, the anterior half being pale, the posterior madder-brown, deepest on the under surface. Microscopically they had a reticulated appearance, from the pentagonal or hexagonal arrangement on the posterior half; the aspect, indeed, resembled a section of cork. The surface was also studded with minute papillæ and brownish granules.

SIGALIONIDÆ.

Sthenelais atlantica, n. s. · Dredged in 305 fathoms, at Station 2, 1870.

A portion of the anterior region of the body only is present. The head is furnished with four distinct eyes, observable from the dorsum and situated at the base of the tentacle, close together on each side. The scales are somewhat rounded or ovoid in front, reniform posteriorly, covered with sparsely distributed but distinct papillæ, and having throughout the greater extent of the margin a fringe of short clavate papillæ, longest exteriorly. The papillæ are decidedly longer and more slender, as well as more numerous, than in *S. zetlandica*; and palpocils occur frequently on the summit (Pl. LXXII. fig. 16).

The superior division of the foot bears finer bristles, with more delicate serrations, than in *S. zetlandica*; but the papillæ have similar dimensions. The inferior branch possesses similar papillæ with warts or secondary processes at the tip: the lobes of this division are not boldly marked. The superior ventral bristles (Pl. LXXII. fig. 17) have about six rows of spines at the upper part of the shaft; and the terminal division has three or four segments, the basal (in the case of those possessing four) being about as long as the three distal; the tips are slender and bifid. The next lower series are stouter, with about four distinct spinous rows on the upper part of the shaft, and a terminal division of one or two segments, the tip resembling the beak of an eagle. The inferior series are slender, with about two rows of spines at the upper part of the shaft, and a terminal region of two or four divisions, with a delicately bifid tip. There appear to be some minute warts along the inferior margin of the foot. The ventral cirrus is slender and rather short, scarcely reaching the tip of the foot.

STHENELAIS LIMICOLA, Ehlers, occurred in 30–370 fathoms off the Irish coast in 1869, and an eyeless variety in 420 fathoms in the same region.

STHENELAIS JEFFREYSI, n. s. Dredged in 165 fathoms off the west coast of Ireland (Station 9) in 1869.

The specimen is about $1\frac{1}{2}$ inch long, and apparently eyeless (in spirit). The scales are furnished with a limited number of papillæ, which greatly exceed those of *S. boa* in length, though they are much less numerous. The surface of the scale is comparatively smooth; and the organs are delicate, translucent, and somewhat reniform in outline. The number of papillæ on the truncated exterior border is about ten (Pl. LXXII. fig. 18); and the contrast with those of *S. boa* is evident by glancing at a fragment of a scale from the latter similarly magnified (fig. 19). In the latter figure the edge of the scale has been doubled, so as to show (somewhat out of focus) the smaller papillæ on the surface. Very large examples of *S. boa* from Herm have the same relations between the various papillæ of the scales.

The superior division of the foot bears about three papillæ at its tip, and a series of the usual slender bristles, most delicately serrated, with fine and rather closely set rows of spines. The inferior branch has one or two papillæ at the tip of the central part, and one on each of the lobes above and below. The superior series of bristles have four rows of spines at the end of the shaft, and a most delicate tapering terminal process, finely pointed (Pl. LXXIII. fig. 1, which shows a bristle somewhat compressed by others). From the neighbourhood of the inferior lobule are some with shorter tips, and a claw with a flat secondary process filling up the concavity. There are apparently two or three segments in the terminal process of the latter bristles, a basal about half the total length (when there are two segments), and one or two shorter beyond (Pl. LXXIII. fig. 2). The most inferior are delicate bristles with a long terminal process of six or seven segments, and a very minute claw at the tip, the secondary process again filling up the hollow (fig. 3). Ventrally there are thus three series:—(1) the strong superior, with tapering filiform tips; (2) the short bifid forms; and (3) the inferior, with long delicate bifid tips. All are very delicate and translucent, and the basal region of the terminal process is often wrinkled. The appearance of the bristles varies (as usual) with their position. The ventral cirrus extends nearly as far as the tip of the fleshy part of the foot.

EUSTHENELAIS HIBERNICA, n. s. Dredged in 106 fathoms in 1862, on Station 8, off the west coast of Ireland, and in 45 fathoms off Cape Sagres in 1870.

The form is allied to *Leanira*, but distinguished by having the inferior group of the ventral bristles bifid.

The head is eyeless in the spirit-preparations. Tentacle rather longer than the tentacular cirri, and with two minute processes at the base. Palpi of the usual elongated form, with a scoop-like sheath at the base; the peduncle of the tentacular cirrus bears four processes besides the bristles. The tentacular cirrus proper is external (dorsally), and somewhat less than the tentacle. A smaller process lies within, its filiform tip being shorter than the former. Beneath are two processes—an inner, short and somewhat blunt, with the tip extending a little beyond the peduncle, and another slender subulate process nearly half the length of the tentacular cirrus. The long slender bristles are directed forward and inward. All the scales are absent.

The dorsal lobe of the foot has long papillæ at the tip, and finely serrated bristles, of the usual character (a series more distinctly, another more minutely spinous); the inferior division carries also long papillæ, slightly diminished at the tip. The superior ventral bristles have rather slender shafts, and the distal ends are furnished with from six to nine whorls of spikes. The tips are long jointed processes ending in a capillary termination—resembling those of *Sthenelais* or *Sigalion* rather than *Leanira*, since the necklace-like canaliculi are absent (Pl. LXXIII. fig. 4, the figure representing one of those next the superior lobe of the foot); the serratures on the tip of the shaft are more numerous in this kind, but the jointed extremities are much shorter. The segmentation of the tip is faint and widely distant. The basal segment is fully one third the length of the process. In the stouter bristles below, the ends of the shafts are smooth, and the divisions of the terminal process shorter. The slender group at the ventral border have a slightly enlarged tip, obscurely bifid (Pl. LXXIII. fig. 5). The character of these bristles also leans to the two forms previously mentioned, and not to *Leanira*. A few of the inferior group of ventral bristles present one or two spines at the end of the shaft. The dorsal cirrus (branchia?) is short anteriorly, but gradually increases in length till about the middle of the body. There is a single large ciliated pad on the dorsal edge of the foot, and about three smaller pads in the curve below the cirrus. The ventral cirrus is long and subulate, reaching almost to the tip of the foot; as usual, it is longest on the first foot.

SIGALION MATHILDÆ, Aud. & Ed. A fragmentary specimen dredged in 7 to 51 fathoms (No. 50) along the shore of the Algerine coast, between Capes Falcon and Tenez, in 1870.

LEANIRA HYSTRICIS, Ehlers[1]. Simultaneously with the diagnosis of this and certain other Annelids of the 'Porcupine' Expedition, published by Dr. Ehlers in the 'Annals and Magazine of Natural History' for April 1874, I had mentioned the same form (pp. 268, 269) under the title of *L. lævis*; Dr. Ehlers's name, however, may with propriety be adopted. My examples were dredged in 808 fathoms off the south-west coast of Ireland (Station 2) in 1869, on a bottom of soft thick mud. The same station is amongst those mentioned by Dr. Ehlers.

It is a comparatively small species, none measuring more than an inch in length.

The head is slightly dusky from the presence of pigment along the anterior border. The tentacle is remarkably short and small, being shaped like the handle of an awl—narrow at the base, dilated in the middle, and tapering to a blunt point at the tip. The palpi spring close together on each side inferiorly, and have throughout a perfectly smooth investment; they are long and tapering; each has at its base, towards the inner side and ventral surface, the usual scoop-shaped lamella. Immediately above the palpus on each side is a peduncle bearing three processes, viz.:—superiorly a tentacular cirrus about a fifth the length of the palpus; inferiorly a minute organ of the same nature, extending only a short way beyond the peduncle; and an awl-handle-shaped minute process attached to the base of the peduncle superiorly. The latter is similar in form to the median tentacle, near which it is placed. Inferiorly the oral aperture has prominent rugose lips, with a blunt papilla on each side of the median fissure in front. No eyes are visible in the spirit-preparations; and none showed traces of the bristles usually present in allied forms on the peduncle of the tentacular cirri. Only a single scale remained attached to a specimen. It is rounded, translucent, and perfectly smooth in outline and surface.

The first foot is directed forward, its dorsal division being represented by a superior rounded papilla, which bears about a dozen digit-like processes and a series of fine hair-like bristles (Pl. LXXIII. fig. 6), minutely or in others more distinctly and spirally spinous. The inferior lobe has characteristic spirally marked bristles with tapering extremities (Pl. LXXIII. fig. 7, one of the superior forms), those near the spine being stoutest, while of the others the superior, as usual, are stronger than the inferior. The distal margin of the shaft of these bristles has blunt projections or spines analogous to those in *Phyllodoce* and others. The inferior lobe has also a papilla superiorly and

[1] Ann. Nat. Hist. ser. 4, vol. xiii. p. 292, April 1874. The specimens examined by Dr. Ehlers were in all probability those given by Dr. Carpenter and Prof. Wyville Thomson to the lamented Prof. E. Claparède, and procured in 1869 at a greater depth than 500 fathoms.

inferiorly, each being larger than those on the dorsal lobe. The inferior cirrus is stout, and reaches nearly to the tip of the fleshy part of the foot.

The superior division of the foot gradually increases in size from before backward, until it projects about as far as the inferior; and the bristles also become stronger and longer, a few smooth hairs appearing in each bundle. The digit-like papillæ, however, diminish in number; and, as a rule, there are only two in each division of the foot in the middle of the body, those of the inferior lobe being the larger. Posteriorly the superior division has three of the papillæ above the bristle-bundle, the inferior frequently only a single large pedunculated clavate process. The ventral cirrus is also reduced in size. The inferior bristles of the ventral tuft in the same region have a more distinct enlargement at the distal end of the shaft (Pl. LXXIII. fig. 8). Anteriorly there is no branchial process; and it is only at the twenty-fourth foot that a minute one appears, which gradually elongates as we proceed backward, so as to extend outward as far as the tip of the foot.

The bristles are rather shorter and proportionally stouter than in *Leanira yhleni*; there is no ciliated pad on the dorsal edge of the foot; and the papillæ of the latter do not show the disparity in size characteristic of *Leanira yhleni*. The ventral cirrus is also shorter, and in the preparations shows no process at the base. It diverges much from *Leanira tetragona* in regard to the tentacle, bristles, and other parts.

At the anterior end of a fragmentary specimen is apparently a crustacean parasite immersed in the dorsal muscles.

Leanira yhleni, Malmgren? Dredged in 81 fathoms off Cape Finisterre (Station 10), and in 45 fathoms off Cape Sagres, in 1870. It is a form of some size; but none of the specimens are complete. The largest fragment measures about 2 inches.

The head has a little dark pigment in front, on each side of the base of the tentacle. The latter is scarcely as long as the tentacular cirrus, and more slender; at its base are two short lamelliform processes. A pair of eyes of small size lie on each side of the tentacle, and a larger anterior pair in the sulcus beneath. Two elongated tapering palpi spring from the inferior surface, with the usual scoop-like lamellæ at the base. The tentacular cirrus is about one fourth the length of the palpus. A filiform process arises on the inner side below the peduncle of the tentacular cirrus, and extends some distance beyond it. There are also several elongated papillæ, one of which extends beyond the peduncle. From the basal part below the latter a series of very fine bristles pass forward—very minute traces of spines being present along the edge of the majority, while others, at the outer border of the tufts, show more evident spikes. The bristles form two tufts; and there is a spine between them. All the tentacular processes of the head are quite smooth.

The first foot has a very short superior lobe, with about a dozen long papillæ and the usual bristles. The inferior division is also short, with many papillæ and the peculiar tapering bristles. The ventral cirrus is large, but does not quite reach the tip of the fleshy part of the foot. After the divisions of the feet become more distinctly marked, one of the papillæ in each becomes larger, that on the inferior lobe especially showing cellular loculi; posteriorly the papillæ are not thus differentiated. The superior fascicle has many whorled bristles with large spines, as well as the more finely serrated kinds. All the bristles of the inferior lobe have the canaliculated terminal process, tapering to a fine point (Pl. LXXIII. fig. 9). There is a semilunar process on the superior border of the foot; but no cilia are present. The branchial process begins about the sixth or seventh segment, and soon increases in size, reaching the tip of the foot about the twentieth segment. Certain whitish specks (parasitic?) appear in many of the branchiæ, and also in the skin of the ventral surface. The ventral cirrus has a process like a diverticulum at its base anteriorly; but such is not noticeable posteriorly. The scales are perfectly smooth round the margin, minutely granular under the microscope, and are tinged with light-brownish pigment. In small specimens curious nucleated anastomosing nerve-fibres are very conspicuous.

I doubtfully refer this form to the *Leanira yhleni*, Malmgren, who, unfortunately, says nothing more than that the scales are smooth, and that there are four eyes—two larger directed forward at the base of the antennæ, and two smaller superiorly in the middle of the head, the other parts resembling those of *L. tetragona.*

Psammolyce herminiæ, Aud. & Ed.?[1] Dredged in 35 fathoms in Tangier Bay, and more abundantly in Station 50, in 7–51 fathoms off the Algerine coast, on a bottom of mud and muddy sand, in 1870.

A large and boldly marked form, though all the specimens are incomplete. The largest reaches $1\frac{1}{2}$ inch in length, and is about $\frac{4}{10}$ inch broad. The dorsum is barred anteriorly with brown or black bands from the scales, then assumes a uniform dark brown or blackish brown, the scales especially being black with a lighter margin from the cilia. The under surface is pale or mottled in front for a short distance, then blackish or brownish. The bristles form a pale margin dorsally and ventrally.

The head is entirely concealed by the first pair of scales; and on their removal it is still overlapped by two large fleshy processes bearing their surfaces of attachment, and having a prominent papilla between them. The head, indeed, which extends behind these fleshy processes, is small and somewhat ovoid, with the anterior part produced into the enlarged base of the tentacle. A comparatively small eye is situated at the anterior border a little exterior to the base of the tentacle on each side, and another, somewhat larger, quite in the front of the head and below the former, so that it is scarcely visible from the dorsum. The tentacle arises by a broad and somewhat lozenge-shaped base, which gradually contracts into a prismatic process that reaches as far as the tip of the peduncles of the tentacular cirri. At this point the rounded filiform tip commences;

[1] If this should prove to be a new form, the name *P. carpenteri* may appropriately be given to it.

and it extends rather beyond the bristles of the region. The basal process of the tentacle rests on the large peduncles of the tentacular cirri, each of which has its termination (superiorly) rounded, and bears a tuft of bristles above, and the tentacular cirrus at its inferior surface, on a special peduncle. The bristles of this group are supported by a spine (which has its point near the inferior margin of the special peduncle just mentioned), and are for the most part stouter, especially in the neighbourhood of the tentacular cirrus, than those of the next ser es. A considerable portion of the shaft is bare, the distal end having whorls of distinctly separated spines, which, from the stoutness of the bristles, have a different appearance from the same parts in the succeeding forms, and which appear to typify the jointed kind of the next segment. A dense tuft of very fine bristles springs from a projection near the base of the peduncle; and beneath is another tentacular process, about a third shorter than the foregoing. The bristles have very slender tapering shafts with long whorled spikes. The palpi are fully twice the length of the tentacle, arise immediately below the peduncles of the tentacular cirri, are shorter than in *Leanira*, and quite smooth. At the inner edge of the base of each is a short curved lamella.

The first pair of scales are distinguished from all the others by their colour, shape, and coverings, and they form a sort of prow to the anterior part of the animal; they are irregularly rounded, with two prominent frills separated by a deep groove in front. The anterior margin of each frill is prolonged in the form of an ear-shaped process, the inner being the longer; the latter projects forward and inward, so as to guard the tentacular processes and bristles of the head, and, with its fellow of the opposite side, to constitute the prow formerly mentioned. The other process is directed slightly outward. The scale has a dense coating of grains of sand, which causes it to be of a lighter hue than any of the succeeding organs. This scale therefore agrees with what M. Claparède says of that of *Lepidopleurus inclusus*, viz. in being quite different from the succeeding scales; while the first pair in his *Psammolyce* scarcely differ from the others. Nearly the whole of its margin is covered with a close series of short papillæ—strongest on the posterior and outer margin, but largest on the internal border. They are short on the internal ear-shaped process in front, longer on the outer. The tips of the papillæ are somewhat blunt, and in the shorter ones occasionally globular, as at the posterior border. To modifications of cutaneous processes the fragments of gravel and sand are attached, the stalks being frequently wrinkled transversely, and generally of greater diameter than the ordinary granular papillæ. The second scale is irregularly reniform, the larger portion being external and the hilum in front; the anterior margin is smooth from the outer angle to the inner and anterior edge of the hilum. On the inner convexity of the scale some papillæ exist, few and somewhat short at first, then longer and more filiform at the inner margin of the scale. The latter has rather short granular papillæ as in the first scale (inner border), intermingled with more slender and much longer forms; the posterior border is furnished with both kinds, and also has very short papillæ with globular heads, the distal margin being generally truncated. At the anterior and outer angle of the scale a few very short and somewhat globular papillæ occur on the anterior edge. The outer border, again, is occupied by a series of eminences, from each of which springs a series of long papillæ (Pl. LXXIII. fig. 10, the figure showing the first four papillæ), the short clavate warts of the anterior border being also continued in the intermediate space and over the surface. The first eminence (to the left in the figure) occupies the anterior angle, and has four long papillæ; the others follow, to the number of nine or ten, the last merging into the ordinary ciliated posterior border. The eminences vary in size; and the papillæ thereon range from one to ten in number. Moreover the latter are considerably larger than the ordinary papillæ on the scale; and a process (nerve or vessel) passes from the scale into the centre of each. The dorsal surface of the scale has many dark grains; and minute specks also occur on the cilia. The third scale has its anterior and outer angle more produced, thus extending the outer border, which has thirteen or fourteen eminences with papillæ, each increasing in size from before backward, though solitary papillæ occur between the eminences after the twelfth, thus by degrees linking them to the ciliated posterior border.

The scales gradually become shorter and rounder (though still reniform), and the cilia longer; while the eminences on the external border are fewer though more prominent, and with a larger number of papillæ. In some specimens eight or ten of the anterior scales are quite pale, covered with ordinary sand-particles, so that they are very rough, the last, however, becoming gradually darker. The first three pairs meet in the middle line of the dorsum; the rest are widely separated. The anterior portion of the dorsum is smooth; but by-and-by the surface is rendered rough by sand-particles, which, again, are frequently coated with black pigment. The under surface of the body varies in like manner—in pale specimens of a sandy hue, in dark specimens blackish. It is smooth in front, but thereafter covered with minute papillæ, which in the dark specimens are black. A parasitic *Loxosoma* occurs on the scales.

The first foot (which is directed forward) bears dorsally two dense tufts of long delicate hairs with an intermediate spine, each bristle being furnished with whorls of long spikes. Ventrally is a series of stronger bristles with long tapering shafts, having whorls of spikes and a slender smooth terminal piece tapering to a fine point (Pl. LXXIII. fig. 11, one of the superior ventral bristles). Towards the ventral edge of the foot the bristles become much more slender, and, instead of having most of the shaft covered with whorls of spikes, there are only ten or twelve at the distal end: a progressive decrease in this respect, indeed, occurs from above downward. The bristles have the same long needle-like terminal process. Just below the exit of the spine a long clavate process of the foot, like a short cirrus, occurs. The ventral cirrus is long and subulate, with a peduncle at its base. Both divisions of the foot are short; and the superior is furnished with a thin and broadly lanceolate lamella on its upper border, so that the lobe has a bifid appearance. The second foot shows the leaf-like lobe superiorly, and a similar tuft of delicate bristles (stoutest inferiorly) with long spines. The inferior division has superiorly three or four rather stout bristles, with the distal end of the shaft enlarged and furnished with alternate rows of spines. The terminal process is comparatively small and bifid (Pl. LXXIII. fig. 12). Near the spine is a group of stronger bristles, the upper with, and the lower (Pl. LXXIII. fig. 13) without the spines on the shaft (the terminal process is bifid, and also comparatively small); then follow some slender forms with eight or ten spinous rows near the end of the shaft, and slender bifid tips (Pl. LXXIII. fig. 14), and others more slender than the first series, with spinous rows on the tip of the shaft; lastly, the dense inferior tuft with slender shafts spinous at the distal end, and long tapering terminal processes minutely bifid. There are a few minute bifid papillæ on the superior and inferior edges of the lower lobe, and a tuft of long filiform papillæ (often loaded with blackish pigment) below the spine. The ventral cirrus is of considerable size, long and tapering; it extends nearly to the tip of the bristles. There are some small papillæ on its basal process. The third foot shows a diminution in the length of the inferior bristles and their processes, and an increase in their strength. One of the upper bristles of the inferior ventral (long-tipped) series is represented in Pl. LXXIII. fig. 15, the bifid tip being scarcely noticeable. The dorsal bristles are likewise shorter; and their arrangement is interesting; for they spread all round in a fan-shaped manner, passing on the posterior aspect between the feet, so that the tips appear on the ventral surface. The leaf-shaped lobe is in front, and is the main cause of their disposal outward and backward. As we proceed posteriorly (*e.g.* in the region of the tenth foot) the strength of the ventral bristles increases, their number decreases, and their terminal processes become shorter. The filiform papillæ are also more numerous. The ventral cirrus presents a slight enlargement (in spirit) at its base, and the tip is somewhat dilated. The dorsal tuft of bristles is similar to the others, forming a kind of funnel open inferiorly, where the ventral lobe of the foot completes it, the tip of the superior lobe occurring in the pit of the funnel. One of the bristles from the upper part of the ventral series is represented in Pl. LXXIII. fig. 16.

This form appears to diverge from every species hitherto mentioned; but, owing to the want of precision in the published descriptions and figures, there is reason for doubt. In *Psammolyce arenosa*, Delle Chiaje, the four eyes are so closely arranged that they appear as a single pair, and the pinnate processes on the scales cannot be confounded with the tufted eminences of the present form; M. Claparède, moreover, describes the bristles of the first foot as of one kind. The *Psammolyce herminiæ*, Aud. & Ed., as originally described by the authors, and subsequently by M. de Quatrefages, has not been furnished with eyes; but they notice that the scales have their external and posterior margin " valde fimbriata et cristata," or, as in the original account, supplied with " petites crêtes membraneuses :" it shows very close resemblances. With such indefinite materials for forming a judgment, I have decided to place the species under the name of Audouin and M. Edwards: those having the original and other closely allied forms will easily discriminate. It is distinguished from Claparède's *Lepidopleurus* by the fact, amongst others, that the latter has no eyes, and every foot is supplied with scales, whereas in this the scales are chiefly alternate. No other species of *Psammolyce* seems to approach it.

DESCRIPTION OF THE PLATES.

PLATE LXXI.

Fig. 1. Portion of branchial process of *Euphrosyne lanceolata*, n. s. Magnified 350 diameters.

Fig. 2. One of the radiating brittle dorsal bristles of *Chloëia fucata*, De Quatrefages? Magn. 350 diam.

Fig. 3. Upper ventral bristle of the same species. Magn. 350 diam.

Fig. 4. Lower ventral bristle. Magn. 350 diam.

Fig. 5. Dorsal bristle of *Eunoa hispanica*, n. s. Magn. 90 diam.

Fig. 6. Tip of the same. Magn. 210 diam.

Fig. 7. Ventral bristle of the same species (intermediate form). Magn. 210 diam.

Fig. 8. Edge of a scale of *Lagisca jeffreysi*, n. s. Magn. 350 diam.

Fig. 9. Dorsal bristle of the same. Magn. 90 diam.

Fig. 10. The same bristle. Magn. 350 diam.

Fig. 11. One of the longer (not longest) ventral bristles. Magn. 210 diam.

Fig. 12. Tip of another ventral bristle, showing secondary process. Magn. 350 diam.

Fig. 13. One of the stronger dorsal bristles of *Evarne johnstoni*, n. s. Magn. 350 diam.

Fig. 14. Tip of a dorsal bristle. Magn. 700 diam.

Fig. 15. Superior ventral bristle. Magn. 350 diam.

Fig. 16. A bristle from the middle of the ventral group. Magn. 350 diam.

Fig. 17. Tip of one of the superior ventral bristles. Magn. 700 diam.

Fig. 18. Tip of a bristle from the middle of the ventral series. Magn. 700 diam.

PLATE LXXII.

Fig. 1. A nearly straight dorsal bristle of *Antinoë finmarchica*, Mgrn. Magn. 210 diam.

Fig. 2. A stouter slightly curved bristle from the same group. Magn. 210 diam.

Fig. 3. Ventral bristle of *Antinoë mollis*, M. Sars, from the middle of the foot. Magn. 210 diam.

Fig. 4. The same. Magn. 700 diam.

Fig. 5. Dorsal bristle of *Phyllantinoë mollis*, n. s. Magn. 350 diam.

Fig. 6. Ventral bristle of the same. Magn. 350 diam.

Fig. 7. Superior (ventral) bristle of *Lepidasthenia blainvillii*, Aud. & Ed. Magn. 350 diam.

Fig. 8. One of the inferior series. Magn. 350 diam.

Fig. 9. Superior (ventral) bristle of *Lepidasthenia longissima*, Blainville. Magn. 350 diam.

Fig. 10. One of the lower series. Magn. 350 diam.

Fig. 11. Bristle from the ventral edge of foot. Magn. 350 diam.

Fig. 12. Superior bristle of *Eupanthalis kinbergi*. Magn. 350 diam.

Fig. 13. Strong bristle of the same form. Magn. 350 diam.

Fig. 14. Bristle from the ventral edge of the foot. Magn. 350 diam.

Fig. 15. One of the same, seen in profile. Magn. 350 diam.

Fig. 16. Edge of a scale of *Sthenelais atlantica*, n. s. Magn. 350 diam.

Fig. 17. Superior ventral bristle of the same. Magn. 350 diam.

Fig. 18. Papillæ on the edge of a scale of *Sthenelais jeffreysi*, n. s. Magn. 350 diam.

Fig. 19. Papillæ of the corresponding scale of *Sthenelais boa*, Johnst., from St. Andrews. Magn. 350 diam.

PLATE LXXIII.

Fig. 1. Superior ventral bristle of *Sthenelais jeffreysi*. Magn. 350 diam.

Fig. 2. Bristle from the inferior lobule of the same species, showing two divisions in the terminal process. Magn. 350 diam.

Fig. 3. Bristle from the ventral edge of the group. Magn. 350 diam.

Fig. 4. Superior ventral bristle of *Eusthenelais hibernica*, n. s. Magn. 350 diam.

Fig. 5. One of the slender group of bristles at the ventral border of the foot. Magn. 350 diam.

Fig. 6. Dorsal bristle of *Leanira hystricis*, Ehlers. Magn. 350 diam.

Fig. 7. Ventral bristle (anterior) of the same. Magn. 350 diam.

Fig. 8. Ventral bristle from the posterior region. Magn. 350 diam.

Fig. 9. Bristle of the ventral lobe of *Leanira yhleni*, Mgrn.? Magn. 350 diam.

Fig. 10. Group of eminences bearing papillæ, from the outer edge of the second scale of *Psammolyce herminiæ*, Aud. & Ed.? Magn. 90 diam.

Fig. 11. Superior ventral bristle of the first foot of the same. Magn. 90 diam.

Fig. 12. Superior ventral bristle of the second foot. Magn. 210 diam.

Fig. 13. Smooth bristle near the spine in the same foot. Magn. 210 diam.

Fig. 14. One of the inferior group of the ventral division of the same foot. Magn. 210 diam.

Fig. 15. Superior ventral bristle from the third foot of the same specimen. Magn. 90 diam.

Fig. 16. One of the upper ventral bristles from the tenth foot of the same example. Magn. 350 diam.

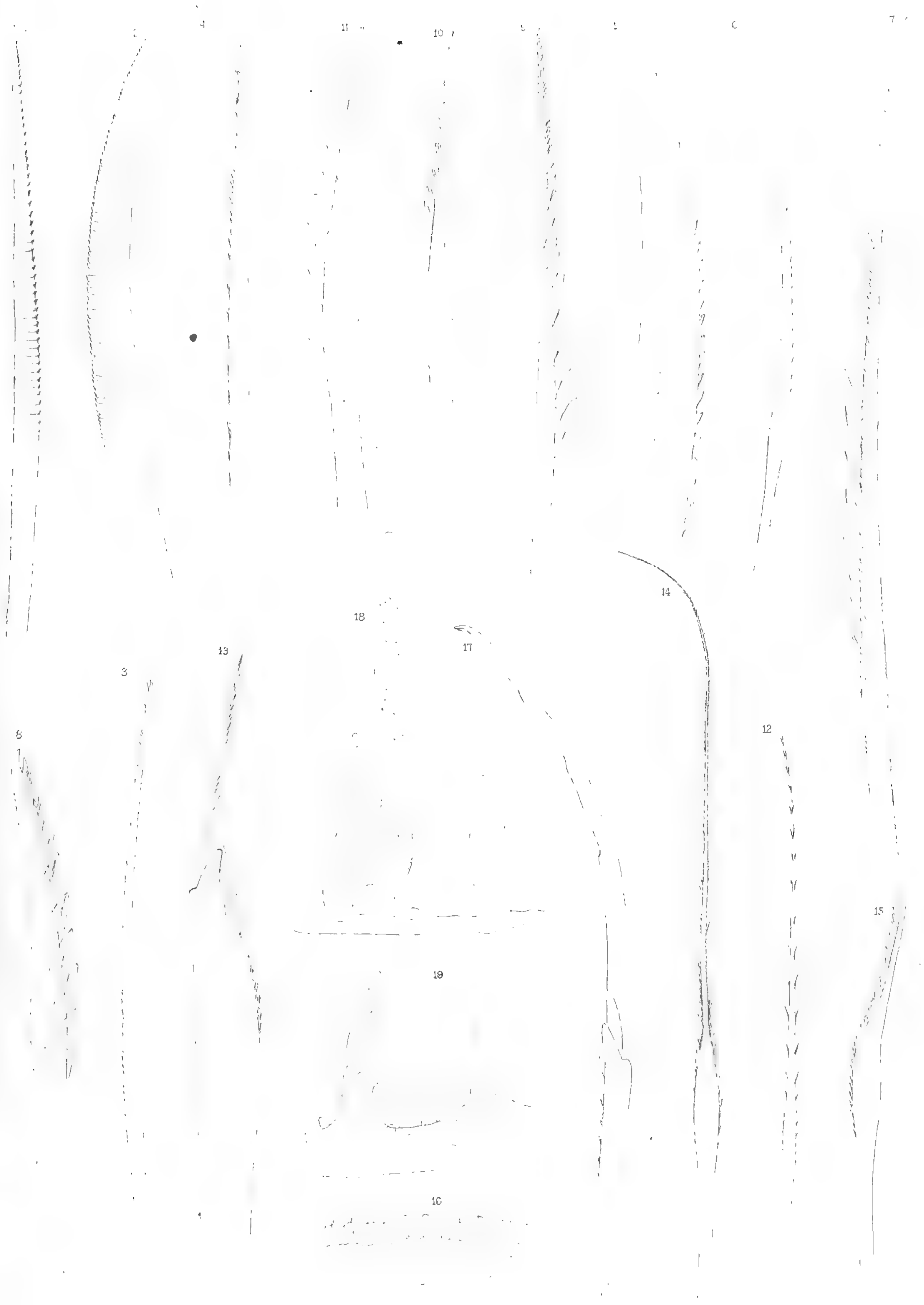
Fig. 17. Dorsal bristle of *Lagisca jeffreysi*, with a pointed tip. Magn. 210 diam.

Fig. 18. Dorsal bristle from near the body-line of the same form, with filiform or developing tip. Magn. 350 diam.

W.C.M. del. G.H.Ford lith.

ANNELIDA OF THE 'PORCUPINE.'

Mintern Bros imp.



W. J. M. del. lith.

ANNELIDA OF THE "PORCUPINE"

Mintern Bros imp.

IX. *On the Osteology of the Marsupialia.*—(Part V.) *Fam.* Poephaga, *Genus* Macropus.

By Professor OWEN, *C.B.*, *F.R.S.*, *F.Z.S.*, *&c.*

Read June 2nd, 1874.

[PLATES LXXIV.–LXXXIII.]

§ 1. *Introduction.*

THE combination of the marsupial economy with herbivorous diet, and of unguiculate fore paws having the requisite extent and variety of movements for the manipulation of the pouch with a power of swift and extensive locomotion for attaining fresh pastures and escaping enemies, results in one of the most singular modifications of the terrestrial mammalian form; and one cannot be surprised that a passing glimpse of the first Kangaroo by Banks and his fellow voyagers on their landing at Botany Bay left the impression that they had seen hopping away from them some strange, large, new, wingless bird.

In fact, the work of ordinary locomotion on land, in the poephagous Marsupials, is transferred to and concentrated upon the hinder end and members, the fore limbs being reserved, as in birds, for other functions. This involves modifications of the whole frame, and especially of the proportions and structure of the caudal vertebræ and pelvic limbs.

Pander and D'Alton, in their elegant work on the skeletons of the Mammalia[1], have given in the Part devoted to the Marsupialia[2] reduced views of the skeletons of *Macropus major*, Shaw, and *M.* (*Halmaturus*) *elegans*, F. Cuvier, with full-sized figures of those of *Hypsiprymnus murinus*, Illig., and of some species of *Didelphys.* In the same Part the skull and atlas of *Macropus major* are figured of the natural size, and a somewhat reduced view is given of the carpus and tarsus in that Kangaroo. A front view of the pelvis of a young Kangaroo, in relation to its osteogeny, is given in my article "Marsupialia"[3]; and the bony palate, with the dentition and part of the base of the skull of *Macropus bennettii*, is figured, of the natural size, in the first of the present series of papers[4]. I may also refer to a sketch, by Pallas, of a skull of a young *Macropus major*, and to a reduced figure of a section of the skull of the Thylacine (No. 1905, Mus. of the Royal College of Surgeons, Catalogue of the Osteology, 4to,

[1] In oblong folio, 1821–31.

[2] 'Die Skelete der Beutelthiere,' Bonn, 1828.

[3] Cyclopædia of Anatomy, vol. iii. (1847) p. 284, fig. 110.

[4] Trans. Zool. Soc. vol. ii. (1838) p. 406, pl. 71. fig. 5.

1853, p. 349) in Prof. Flower's 'Introduction to the Osteology of the Mammalia,' 12mo, 1870, p. 209.

For the purpose of palæontological comparison, however, there is the same need of illustrations of the osteology of existing species of Macropodidæ as led to my submitting to the Zoological Society those of the Phascolomyidæ, which they have done me the honour to publish in the eighth volume of their useful and valuable 'Transactions.'

To illustrate the characters of the bones in the larger Kangaroos, I have selected those of a species of which I am not aware of any figures having been previously given, viz. of the great Rufous Wallaroo (*Macropus rufus*, Desm.[1], *M. laniger*, Gaimard[2] and Gould, subsequently referred by the latter eminent explorer of the natural history of Australia to his subgenus *Osphranter*[3]).

§ 2. *The Skull.*

I may premise that the skull in Kangaroos (Macropodidæ, Ow.[4]) is characterized by the great length of the diastema, or toothless tract, between the molars and incisors in both jaws. A minute rudiment of a canine, or a minute depression where such rudiments may have been lodged, is present in some small kinds of Kangaroo, but is inconstant in them.

The skull (Plate LXXIV.) is long, through the extension of the facial or maxillary part in front of the orbits (fig. 1, *o*); and these cavities, interposed between the facial and cerebral part, are large; they widely communicate, as in the rest of the order, with the temporal fossæ (ib. *t*).

The paroccipital (ib. figs. 1 & 4, 4) and masseteric (ib. 21, *x*) processes are produced downwards—the former to an extreme degree, to which *Phascolarctos*, perhaps, affords the nearest approach in the marsupial order.

A sagittal crest may be indicated in old males of some of the larger Kangaroos, but is never elevated. The zygomatic arch is deep, with the malar (26) element, suspended between the maxillary (21) and squamosal (27) piers. The malar contributes a small but definite share (ib. fig. 3, 26 *x*) to the outer part of the joint for the mandible, the entire articular surface (27 *x*) being subquadrate, feebly convex transversely, partially

[1] 'Mammalogie,' Supplément, p. 541 (1822).

[2] Bulletin des Sciences par la Société Philomatique (1823), p. 138.

[3] 'Mammals of Australia,' fol. part v.

[4] Not the Macropidæ of J. E. Gray, nor the Macropodidæ of Waterhouse. The former term, like the Didelphidæ of De Blainville, is equivalent to the ordinal term "Marsupialia," see 'Catalogue of the Bones of Mammalia in the collection of the British Museum,' 8vo, 1862, pp. 119–140. The latter term includes the Potoroos (Hypsiprymnidæ) with the Kangaroos. The species, however, which have the dental formula $i.\ \frac{3-3}{1-1}$, $c.\ \frac{0\ 0}{0\ 0}$, $p.\ \frac{1-1}{1-1}$, $m.\ \frac{4-4}{4-4}$, manifest, in the series of extinct with recent forms, so many generic modifications, that a name for the canineless family of Poëphaga is requisite.

concave lengthwise, through the descent of a postglenoid process (ib. figs. 1, 3, *pg*), internal to which is a perforation.

The alisphenoid (ib. fig. 3, *tr*) sends down a process (ib. fig. 1, 6′) abutting against the paroccipital (4). The three compartments of the cranial cavity—epencephalic, prosencephalic, and rhinencephalic—succeed each other lengthwise[1]; and the olfactory cavity extends backward both above and beneath the rhinencephalic fossa. The "sella turcica" is indicated by the entocarotid foramina[2], not by clinoid processes. The basioccipital (ib. fig. 3, 1) is hexagonal, the hind border emarginate, forming the lower fourth of that of the foramen magnum (ib. fig. 4, *o*) and contributing a very small part to each condyle (*g*). The exoccipital (ib. fig. 4, 2) develops the rest of that joint-surface (*g*), which is oblong-convex, with an upper or back portion bent at a right angle to the rest of the convexity. In young Macropodidæ the superoccipital (ib. fig. 4, 3) contributes a small share to the upper border of the foramen, which extends thereto by a fissure-like prolongation upward, between the then separate occipitals. These, however, by subsequent growth contract the fissure, and in adults of some large species obliterate it and complete the foramen by the exclusion of the superoccipital. There are two or more precondyloid foramina (ib. fig. 3, *p*), anterior to which is the vagal foramen (*v*), and next the larger single jugular notch (*u*), through which may be seen the hind end of the petrosal (16); this notch is usually completed, as a foramen, by the paroccipital process of the alisphenoid 6′, anterior to which the fore part of the petrosal is visible; but in some the union with the exoccipital (ib. 2–6) does not take place, and the whole extent of the basal part of the petrosal is seen; the junction of the alisphenoid (ib. fig. 1, 6′) with the paroccipital (ib. 4) is constant and extensive. A smooth channel curves round the upper part of the condyle (ib. fig. 4, *g*) between it and the base of the paroccipital (4). The superoccipital (ib. fig. 4, 3) is octagonal, the upper and lower borders being the shortest; the lateral ones next these above and below are the longest; the two outer sides are of intermediate extent. There are two rough oblong depressions (ib. 3, *x*) near the upper lateral borders, for tendinous attachments. Superiorly the superoccipital joins the interparietal (ib. fig. 2, 3), varying in shape and composition; laterally it joins the parietal (7) and mastoid (8), and in some species

[1] The relative positions of the rhinencephalic, prosencephalic, and epencephalic compartments of the cranium are the same in lissencephalous (see Osteol. Collection, Mus. Coll. Chir. Sections nos. 2165, 2292, 2337, 2391, 2407) as in lyencephalous Mammals; the compartment for the rhinencephala ("olfactory ganglions" or "bulbs" of anthropotomy), which compartment Prof. Flower terms "olfactory fossa," is as much in front of the prosencephalic compartment or "cerebral fossa" in the Beaver and Agouti (no. 2051) as in the Wombat or Kangaroo. "The 'olfactory chambers' attain their maximum of development in some of the Porcupines (*Hystrix*):" Flower, Osteol. of Mammalia, 12mo, p. 153. Here the author means the fossæ appropriated to the olfactory sense-organ. Those which lodge the divisions of the brain supplying the nerves of that organ, I had termed, to avoid confusion, "rhinencephalic."

[2] Osteol. Catal. 4to, 1853, p. 323, no. 1735; this character is common to the order, see Art. "Marsupialia," Cycl. of Anat. (1847), p. 274.

also a small intervening bit of the squamosal (Pl. LXXIV. fig. 4, 27); inferiorly it unites by its longest borders with the exoccipitals (ib. 2, 2′) by straight sutures, slightly descending as they converge to the foramen magnum (ib. *o*), to which the shortest and lowest border originally contributes.

The exoccipitals and their paroccipital productions unite laterally with the mastoids (ib. 8), below which the paroccipitals receive the alisphenoid abutments (ib. fig. 1, 6′). The basioccipital unites by its postlateral borders with the exoccipitals, by its prelateral borders with the petrosal and alisphenoids, with more or less interruption through the intervening postlacerate fissures (ib. fig. 3, *q*), and by its fore border with the basisphenoid. The contiguous or conjoined borders of these elements usually swell out so as to produce same convexity at this part of the base of the skull.

The basisphenoid (ib. fig. 3, 5) loses breadth as it extends from the basioccipital forward; its sides are pierced or deeply grooved obliquely by the entocarotids which have impressed the contiguous part of the basioccipital; the entocarotid canal, commencing at the fore part of the postlacerate fissure, is completed by the base of the alisphenoid. The pair of canals converge upward and forward, and terminate within the cranium at the hind part of the "sella," separated there by a bony tract not exceeding the diameter of the arterial canal.

The basisphenoid is longer than the basioccipital; it unites with the third cranial centrum (9) beneath the vacuity common to the prelacerate and optic foramina.

The alisphenoid (6) forms a large outward swelling for the lodgment of the natiform protuberance of the cerebrum, the pressure of which reduces the neurapophysial plate to almost transparent thinness. Below the convexity as large a concavity is formed, with an irregular surface, for the attachment of the pterygoid muscles, the cavity being completed by the proper pterygoid bone (ib. fig. 3, 24). The base of the alisphenoid articulates with the side of the basisphenoid, leaving a small hind part of that element clear for the entry of the entocarotid, and as small a fore part for the exit of the optic nerve. From this attachment it extends backward and forward, attaining an antero-posterior extent equalling that of the parietal. The alisphenoid is pierced by the "foramen ovale" (*tr*) opposite the fore end of the petrosal, and by the "foramen rotundum" (*tn*) near the fore part of its attachment to the basisphenoid. The alisphenoid gains thickness and loses breadth as it extends backwards outside the cranial walls to articulate with the squamosal (27), tympanic (28), mastoid (8), and paroccipitals (4), and contributes to form the tympanic cavity[1]. The thinner cranial plate ascends anterior to the squamosal to join the parietal, frontal, and orbito-sphenoid.

The sagittal suture (ib. fig. 2, 7′) persists until maturity, its obliteration beginning behind. Here the parietals (7) join the interparietal (3 *x*) and superoccipital (3′), an intervening "fontanelle" long remaining, reduced to a fissure which is continued between the mastoid and parietal; it is usually obliterated in aged Kangaroos.

[1] Art. "Marsupialia," op. cit. tom. iii. p. 271.

The mastoid shows externally a narrow roughish vertical tract (Pl. LXXIV fig. 1, 8) between the exoccipital (2) and post-tympanic base of the squamosal (27″), which forms the lateral border of the occipital plane (ib. fig. 4, 27), but not so broad a one as in *Phascolomys* (Trans. Zool. Soc. vol. viii. pl. 50. figs. 2, 3, 4, 6, 7, 27). The upper end of the mastoid has a persistent round venous aperture behind the masto-parietal fissure (Pl. LXXIV. fig. 1, 7*f*). In front of that fissure is the suprazygomatic venous foramen (ib. fig. 1, *m*).

Each parietal (ib. fig. 2, 7) extends forward in a pointed form into a corresponding notch of the frontal, the apex ending at the usual place of a postorbital process (ib. fig. 2, 12), which is rarely developed in the Kangaroos, and is never large.

The presphenoid (ib. fig. 3, 9) extends forward to coalesce with the "septum narium;" its hind portion contributes to the optico-prelacerate foramen; its fore part supports the small orbito-sphenoid which completes that foramen, overarching it to join the alisphenoid, 6.

The interfrontal suture (ib. fig. 2, 11) is persistent; even very old males of *Macropus major* show a trace of it. Each frontal begins behind, narrow or pointed, expands as it advances, and bends down more or less abruptly to form the inner wall of the orbit, where it unites with the orbito-sphenoid (10), palatine (ib. fig. 1, 20*x*), maxillary (21*xx*), and lacrymal (73); anteriorly the broad end or base of the frontal joins that of the nasal (15), and is wedged between the nasal (fig. 1, 15) and facial plate (21) of the maxillary. The frontals contribute a small share to the anterior walls of the cranial cavity; their chief expansion is subservient to the development of the large and complex sinuses in connexion with the olfactory cavity. This expansion is such in *Macropus antilopinus*, Gd., as to have suggested for it the subgeneric term *Osphranter*[1]; it is somewhat less developed in the present nearly allied species.

The vomer forms the basis of the "septum narium," and speedily coalesces with the plates which the prefrontals (14) contribute thereto.

The nasals (ib. figs. 1 & 2, 15) are long and narrow; their bases, less expanded than in most other Marsupials, are subangular or rounded, and enter an emargination of the frontals between the fronto-maxillary sutures; the sides of the nasals articulate in two thirds of their length with the maxillaries (21), in the remainder with the premaxillaries (22), anterior to which the ends of the nasals are bevelled off to points, freely overhanging the external bony nostril, but not extending so far forward as the dentary part of the premaxillary. The external nostril (ib. fig. 5) is vertically oval, narrower than deep; the aspect of the aperture is forward and slightly upward.

The upper turbinal sense-capsules (ib. fig. 5, 18) coalescing with the compressed centrum called "vomer," and with the neurapophyses called "prefrontals," compose the bone which anthropotomy terms "ethmoid."

The palatines, descending from the pre- and orbito-sphenoids, the ethmoid, and

[1] Gr. ὀσφραντήριος, sharp-smelling.

frontal (at 20*x*, fig. 1), internal to the hind part and entorbital plate of the maxillaries (21*x'*), bend inwards at right angles to unite together at the bony palate (ib. fig. 3, 20), of which they form the hind portion from the penultimate molars backwards. From the sockets of these and of the last molars the palatal plates of the palatines are separated by a narrow strip of the maxillaries (ib. 21''), behind which the palatines (20'') extend and expand to join the pterygoids (24).

The hind border of the bony palate is feebly concave. The postpalatal apertures pierce the outer angles of the palato-maxillary sutures; they are small oval foramina in some (usually the larger) species of Kangaroo (as at *b*, fig. 3), but extend into both bones to form wide vacuities in other species[1], the bony palate being one of the seats of variety in the present family. The proper palatine plates may show one or more foramina behind the normal postpalatal or maxillo-palatine vacuities.

The orbital plate (ib. fig. 1, 20*x*) of the palatine is pierced by the orbito-palatal foramen, and is notched to contribute, behind, to the spheno-palatal foramen, and, in front, to the palato-maxillary foramen.

The maxillary is a large and complex bone. Articulating with the fore and outer parts of the palatine, it develops the alveolar tract for the grinders, also the part of the bony palate between the palatines and premaxillaries, and the main part of the floor of the orbits, where it is pierced by the entorbital canal (*e*) and notched by the palato-maxillary foramen (*f*). Then, these extending from the orbit forward, beneath, or internal to the lacrymal and malar bones, the maxillary forms the side wall of the face (fig. 1, 21) as far forward as the premaxillary (ib. 22). This facial wall of the maxillary is sinuous, convex vertically at its upper part, concave at its lower part, the concavity being deeper in the larger kinds of Kangaroo: it articulates behind with the frontal (11), lacrymal (73), and malar (26), above with the nasal (15), in front with the premaxillary (22). At the lower part of the maxillo-premaxillary suture the maxillary usually sends forward a sharp narrow process to be wedged into the premaxillary, receiving into a notch below a similar process from that bone. The suborbital canal divides into a dental and an antorbital canal. The anterior outlet (ib. fig. 1, 21') of the antorbital canal, usually vertically oval in shape, varies in its relative positions to the orbit in different species of Kangaroo. A ridge near the maxillo-malar suture leads to the zygomatic process, of which it forms the outer border. This process (21×) is the seat of variety, as to shape and size, in different species of Macropodidæ.

The premaxillaries unite by a rhomboid facial plate (ib. fig. 1, 22) with, usually, the terminal third of the nasals (15) and with the maxillaries (21). They develop sockets for three pairs of incisors (*i* 1, 2, 3), and form the anterior end of the bony palate, which is pierced by the "incisive foramina" (ib. fig. 3, 22') in the form of oblong slits, closed behind by the pointed ends of the palatal plates of the maxillaries. External to these foramina the premaxillaries usually show a smaller foramen (ib. *a'*).

[1] Trans. Zool. Soc. vol. ii. pl. 71. fig. 5 (*Halmaturus bennettii*).

The malar contributes the outer half of the floor of the orbit, articulating there with the lacrymal and maxillary; the zygomatic part of the malar (ib. fig. 1, 26) is deep or vertically extended; it articulates by an oblique suture with the maxillary pier of the arch (21 *x*), and diverges to receive, by a large and deep notch, the pointed fore part of the squamosal zygoma (27). The malar is excavated, as it were, below the orbital rim, from which a ridge extends backward nearly parallel with the horizontal part of the malo-squamosal suture; the hind end of the malar expands horizontally or is produced inward to form the fore part of the glenoid cavity (ib. fig. 3, 26*x*) or mandibular articulation. The zygomatic part of the squamosal (27′) rather exceeds in depth that of the malar, rising abruptly behind from its attachment to the cranial part (27′). Close to this attachment is the squamosal venous foramen (*m*); below this is a larger vacuity (tympano-zygomatic cell, *n*) between the squamosal and tympanic; and behind this is the shallower "tympano-squamosal" cell. The cranial plate of the squamosal (27′) unites with the parietal and alisphenoid, with the superoccipital and mastoid, and with the tympanic.

The tympanic (Pl. LXXIV. fig. 1, 28) is a cylinder, expanding toward the brain-case into an irregular triedral bone. The upper and fore side receives the postglenoid process; the under and outer part (ib. fig. 1, 28) articulates with the alisphenoid (6), the inner part with the petrosal (ib. fig. 3, 16), the hinder part with the mastoid (8). The tympanic long retains its individuality. The auditory canal is directed outward and a little upward and backward; its outlet is circular; but the canal loses vertical and gains transverse extent as it passes inward, and the greater extension of its lower wall gives an oblique position to the inner end supporting the "membrana tympani."

The pterygoid (ib. fig. 3, 24) has an antero-posteriorly extended base, which articulates with the basi- and alisphenoids, completing externally or extending below the large concavity of the pterygoid process of the alisphenoid, and extending internally the hinder aperture of the nasal passage. The lower end of the pterygoid articulates with the inner side of the pterygoid process of the palatine (20″), and develops a short compressed "hamular" process (24′) slightly bent outward.

The petrosal (ib. fig. 3, 10)[1] has two free surfaces—the "cranial" and "basilar." The former is the most extensive, is bifurcate anteriorly and impressed near its hind part by a deep cerebellar pit, below and a little in advance of which is the "meatus auditorius internus;" a sharp ridge overhangs the cerebellar or appendicular pit[2]. The exposed basilar surface is small and narrow, pointed anteriorly, grooved externally for a venous canal, and, in most Kangaroos, crossed by a slender bar of the exoccipital

[1] I have failed to appreciate the gain to anatomy by the change of this name to "periotic;" the petrosal surrounds only one part of the "organ of hearing" in the Thylacine as in other Mammals. The mastoid is developed from a separate ossific centre in all Vertebrates, and remains distinct from the petrosal in most Hæmatocrya.

[2] The cerebellar appendage which occupies this pit is not the homologue of the "flocculus" of Reil.

uniting with the paroccipital process of the alisphenoid. The lacrymal has a small "facial" (ib. fig. 1, 73′) and a large "orbital" plate (73); the angle between the two shows two foramina with an intervening tubercle; and in some species of Kangaroo there is a second tubercle above the upper foramen. These lacrymal foramina (ib. fig. 2, *l*, *l*′) are rather ectorbital than entorbital; both lead to a canal descending and bending forward to terminate in the nasal meatus.

The angle of the lower jaw (ib. fig. 1, *a*) is tumid, strongly inflected and upbent into a ridge bounding a wide and deep concavity, indicated by as strong a convexity (*k*) externally. The fore part of the cavity communicates with the external crotaphyte fossa (*f*) by a perforation, in front of which is the entry of the dental canal. The symphysis is long, narrow, and usually rather loose, permitting movements of the rami on each other[1]. There are no subsymphysial foramina as in *Phascolomys.*

The vertical extent of the ramus increases from behind the last molar (*m* 3) to the antepenultimate one (*m* 1); it suddenly decreases in front of the molar series, and is continued forward along an extensive diasteme (*l*, *l*), chiefly devoted to the motion of the socket of the long procumbent incisor (*i*′). The external orifice of the dental canal (*v*) is a little in advance of the molar series.

The skull which forms the subject of Pl. LXXIV. is from a male of a Great Rufous Walleroo, which was killed by the eminent ornithologist, Mr. John Gould, F.R.S., in a locality explored by him between the rivers Murray and Adelaide, Australia. The animal measured 8 feet 2 inches from the nose to the extremity of the tail, and was the largest Kangaroo which Mr. Gould saw in Australia.

This animal had the last molar in place and use, and still retained, though much worn down and probably soon to be shed, the tooth answering to the last of the deciduous series in Diphyodont Mammals (ib. fig. 6, *d* 4); the phase of dentition answers to that marked F in my article "Odontology," in the 'Encylopædia Britannica' (vol. xvi. p. 484)—the teeth, according to the symbols there adopted and explained, being *d* 4, *m* 1, *m* 2, *m* 3; consequently three of the molar series, viz. *p* 3, *d* 3, and *d* 2, had been shed.

The four retained molars on the left side of the upper jaw present the two chief transverse ridges as in the lower jaw; but they are broader in proportion to their length than in that jaw, and the curve of the ridges (as shown in *m* 3, fig. 3) where they are least worn is slightly concave backward, instead of forward as in the lower jaw

[1] "The *Mus maritimus*, or African Rat, has the singular property of separating at pleasure to a considerable distance the two front teeth of the lower jaw, which are not less than an inch and a quarter long. That elegant and extraordinary creature, the Kangaroo, which, from the increase that has lately taken place in his Majesty's Gardens at Kew, we may soon hope to see naturalized in our own country, is possessed of a similar faculty."—Mason Good, *The Book of Nature,* 8vo, 1826, vol. i. p. 285. This power of divaricating the lower incisors, or rather their sockets, through laxity of the ligamentous symphysial joint, has since been noticed by Waterhouse (Nat. Hist. of the Mammalia, 8vo, 1845, vol. i. p. 52), and by myself and others.

(fig. 6: in this figure the grinding-surface of *d* 4, pushed out of line in the lower jaw, is added in front of the figure of the tooth so displaced).

The first, perhaps chief, difference between *Macropus rufus*, Dsm., and *M. major*, Shaw, is the smaller relative extent of the crown of the upper and outer incisor, 3 i^1, which shows only one shallow vertical impression along the middle of the outer surface. On this mainly would rest its claim to a subgeneric distinction, such as Gould has indicated by the term *Osphranter*; but the incisor-character is not repeated in other species of *Osphranter* (*M. robustus*, *M. antilopinus*, e. g.). The above dental distinction of *M. rufus*, however, is associated with several cranial ones. In the skull of a full-sized male, with teeth more worn than in that of a *M. major* compared with it, the temporal ridges have not met along the sagittal suture, but are separated by a tract half an inch in breadth, along the middle of which the sagittal suture persists. The anterior angles of the parietals give better indications of postorbital tubercles. These, however, are not more shown in *M. rufus* than in *M. major*. In a skull of the *M.* (*Osphranter*) *robustus* compared, which retains the premolar (*p* 3) with four fully developed molars behind, the sagittal crest is better marked than in *M. major* and *M. rufus*, in which that premolar is shed.

The Great Red Kangaroo is one of the largest[2] of the tribe; and the skull here described equals in length that of the largest in the Table of Measurements of *M. major*[3], yet it indicates a less powerful animal. The paroccipitals are more slender. The zygomatic arches have less span and depth; the masseteric process is much shorter; the ridge above the fore part of its base is due to the malar more than to the maxillary. The mandible is more slender; the coronoid process is shorter and narrower from before backward; the depth of the ramus behind the molar series is notably less in *M. rufus*; yet the last molar, with the same fore-and-aft extent as in *M. major*, is broader.

The basioccipital ridge in *M. rufus* is sharper. The upper border of the foramen magnum is notched. The condyles are narrower, and the ectocondylar grooves deeper and wider. The superoccipital is less elevated and more truncate atop; the base of the occiput is narrower. The facial plate of the lacrymal is broader, and the lower and larger foramen is more external. The antorbital foramen is further from the orbit. The premolar part of the skull is shorter and deeper; the maxillary outswelling is less definite. The facial plate of the premaxillary is broader anteroposteriorly. The incisive foramina are longer and further from the third incisors. The postpalatal apertures are larger, especially the right one; but this may be a variety: the bony palate behind them shows more and larger irregular perforations, the hamular process of the pterygoid is less defined, than in *Macropus major*.

Such are the chief differences observable in the skulls of *M. rufus* and *M. major*; and they are here noted as guides in the comparison of fossil cranial parts of Macropodidæ.

[1] As indicated by Waterhouse, *op. cit.* p. 107, and illustrated in his plate v. fig. 3. [2] Ib. p. 104. [3] Ib.

§ 3. *Vertebræ.*

The atlas (Pl. LXXV. figs. 1–4) is remarkable for the low, broad, flat roof of the neural arch (ib. fig. 4, *n*, *n*,), which extends almost transversely across from the upper ends of the articular cups (fig. 2, *z*, *z*) for the condyles of the occiput. A small tubercle (ib. fig. 2, *ns*) at the fore margin of the arch (the origin of the "rectus capitis posticus minor") is the sole indication of a neural spine. The ossification of the neurapophyses (*n*, *n*) below the condylar cups (*z*, *z*) does not extend, as in *Halmaturus thetis*, so as to complete the arch. An interspace of a line and a half intervenes, in *M. rufus* as in *M. major*[1], between the obtuse ends of those elements, above which the centrum of the atlas projects (as an "odontoid process," ib. figs. 5, 6, *c*, *a*) with an articular lower surface, which rested on the ligament (indicated by dotted lines in fig. 2, *h*) and rotated upon corresponding facets at the ends of the neurapophyses (ib. *np*, *np*). This retention of the typical relations ought not to be overlooked in homologizing the sclerous basis (ib. fig. 2, *h*) beneath the centrum of the atlas, which unites, when ossified, with the inferiorly produced ends of the neurapophyses in the Bandicoots[2] and Opossums. The atlantal hypophysis in *Thylacinus* is produced backward as a spine. The diapophyses (*d*, *d*) are continued outwards from the upper and hind part of the neurapophyses, and expand to their free end, which is produced forward and backward, most so and more pointedly forward. The neurapophysis is perforate above the fore part of the base of the diapophysis, at *f*, fig. 1, by the first spinal nerve; posteriorly it is deeply grooved above the postzygapophysis (fig. 3, *z′*) by the vertebral artery[3].

The atlas in *Macropus* has a less vertical diameter in proportion to its breadth, and a lower and antero-posteriorly broader arch above the diapophyses (2′, 2′) than in *Phascolomys*[4].

The centrum of the axis (Pl. LXXV. fig. 5, *c*, *x*) is subcarinate below and shows a pair of venous foramina (fig. 6, *c*, *x*) near its posterior third. The pleurapophysis (ib. *pl*) is half an inch long, slender and obtuse; a vertebrarterial foramen (fig. 8, *v*) is completed by the confluence of the riblet (fig. 5, *pl*) with the par-(*p*) and di-(*d*) apophyses. The neural spine (ib. fig. 5, *n. s*) is coextensive with the arch, and is produced anteriorly so as to overhang the base of the odontoid (ib. fig. 5, *c*, *a*); its hind border is vertical; a pair of tubercles project at the sides of the angle formed between the hinder and the upper almost straight border. The præzygapophyses (figs. 5 & 6, *z*) cover the fore part of the centrum on each side of its confluence with that of the atlas (*ca*): the postzygapophyses (fig. 5, *z*) extend a little beyond the hind border of the neural spine.

[1] Pander and D'Alton, *op. cit.* tab. vii. fig. *c*.

[2] Art 'Marsupialia,' *tom. cit.* p. 277, fig. 98, *Perameles lagotis*.

[3] Cuvier notes this character in "les didelphes and les kangaroos," in which "l'artère ne traverse point du tout l'apophyse transverse, elle passe dessous et contourne son bord antérieur" (Leçons d'Anat. Comp. 8vo, 1835, tom. i. p. 189).

[4] Comp. figs. 1–4, pl. lxix. vol. viii. of Zool. Trans. 1873.

The transverse processes of the other five cervical vertebræ are perforated. The spine of the third is compressed, laminate, truncate, coextensive with the neural arch; in the fourth (ib. fig. 7, *ns*) it contracts antero-posteriorly, loses height, but gains in breadth at its summit; this character of the spine increases in the fifth; the spine lengthens and becomes obtusely pointed in the sixth, is still longer and more merits the name of spine in the seventh cervical (ib. fig. 9, *c*, *ns*).

The parapophysis projects as an angular plate in the fourth (ib. fig. 7, *p*) and fifth, and more so with increased thickening in the sixth (ib. fig. 8, *p*); it is reduced to a mere tubercle in the seventh cervical, in which the pleurapophysis is longest and strongest.

The neural arch is perforated vertically on one or both sides by epineural canals (fig. 7, *en*, *en*) between the fore (*z*) and the hind (*z'*) zygapophyses in the third to the seventh vertebræ; each neurapophysis is also perforated lengthwise near the inner surface by "entoneural canals" (fig. 8, *in*), the orifices being within the neural arch; they are largest in the sixth and seventh cervicals, but coexist here with the vertebro-arterial canals (ib. figs. 8 & 9 *c*, *v*) in their usual position external to the arch. The anterior surface of the centrum is transversely concave (figs. 7, 8, *c*), the posterior one convex in all the cervicals following the axis.

The entoneural canals are repeated in the first dorsal, which shows a sudden increase in the length of the neural spine (Pl. LXXV. fig. 9, D 1, *ns*). The transverse concavity of the fore part of the centrum, as in the cervicals, is retained in the first dorsal vertebra. There is one large cup for the head of the first thoracic rib on each side of the anterior half of the centrum and contiguous part of the neurapophysis. This element (ib. *n*) articulates and has coalesced with the corresponding part of the centrum, leaving the hinder half free. The half-cup for the second rib impresses the angle between the hinder concave articular surface and the free lateral surface of the centrum.

The strong diapophysis is impressed below its outer end by the large and deep cup (ib. *d*) for the tubercle of the first rib. The right side of the neural arch has an epineural canal.

The second dorsal (ib. fig. 9, D 2) has a longer and more slender spine (*ns*). The neural arch shows the vertical perforation on the left side. The intraneural canals are reduced to two minute posterior perforations. The anterior articular surface of the centrum is convex. In the third dorsal (ib. fig. 9, D 3) the centrum lengthens and the sides are defined by an angle from the under surface. There are neither ento- nor epineural foramina.

The anterior costal pit in this and succeeding dorsals seems to be a mere folding-back of the outer ends (fig. 9, D 3) of the anterior convex articular surface of the centrum. In like manner the half-surface for the head of the next rib seems to form the outer end of the posterior transverse surface of the centrum.

The diapophyses (ib. *d*) increase in antero-posterior extent and become more depressed. After the third dorsal the neural spines gradually become shorter and gain in fore-and-aft breadth to the eleventh dorsal (fig. 10, D 11, *ns*). In this vertebra a short broad metapophysis (*m*) rises above the base of the præzygapophysis, and clasps the end of the postzygapophysis of the tenth dorsal. The neural spine (*ns*) becomes vertical in the eleventh dorsal, indicating the centre of motion of this part of the vertebral column. In the twelfth dorsal (ib. D 12), the metapophysis (*m*) suddenly gains in size; it is compressed, truncate, and exceeds the diapophysis (*d*) in length. The præzygapophyses are represented by nearly vertical articular surfaces on the inner and fore part of the base of the metapophysis. An anapophysial ridge (*a*) is developed from the upper and back part of the diapophysis (*d*). In the thirteenth dorsal the anapophysis (ib. fig. 10, D 13, *a*) projects backwards from the hind part of the neurapophysis as a distinct process, five lines in length: it clamps externally the base of the metapophysis of the first lumbar. The convexity of the fore part and concavity of the hind part of the centrum is retained in the second to the last of the dorsal series; and in the large hinder vertebræ of the present subject the articular surface is still supported by an epiphysis, although the individual was fully mature, with completed and worn dentition (Pl. LXXIV.). The intraneural and epineural canals are present on one or both sides in the hinder dorsals. In the last dorsal the diapophysial pits (Pl. LXXV. fig. 10, D 13, *d*) are the sole articulations retained for the last pair of ribs.

Of the thirteen costal pairs, the first rib (Pl. LXXVI. fig. 1) is the shortest and thickest, and has the longest neck (*c*) in proportion to the body (*d*). The head (*a*) is divided into two surfaces meeting at an acute angle; the tuberosity (*b*) is large and convex. From that prominence to the distal end the outer border describes almost a straight line; the inner border curves from the head to the distal expansion; the body is slightly twisted.

The second rib (ib. fig. 2) is the most bent; its outer border near the tuberosity (*b*) inclines backward and makes the inner side of that part of the body concave.

The remaining pairs are long and slender, especially so and with a strong curve proximally in the middle pairs (ib. fig. 4), shorter and less curved in the hinder pairs (ib. fig. 5). The "head" and "tubercle" are developed in all. In the third rib (ib. fig. 3) there is a depression on the upper part of the neck (*c*), not shown in the rest. The seven anterior pairs of ribs articulate by cartilaginous hæmapophyses with the sternum, which consists of six bones (sternebers, or hæmal spines).

The manubrium (ib. fig. 6) is subcarinate on the outer surface, broadest where it gives attachment to the cartilages of the first pair of ribs, narrowing thence forward to a point, and developing a pair of rough convexities (*b*, *b*) over the converging borders for the clavicles; it slightly expands at the narrower end (fig. 7), which has two half-surfaces (*b b*) for the cartilages of the second pair of ribs, and a middle square surface (*a*) for the second sterneber. A long and expanded "xiphoid cartilage" succeeds the sixth sterneber.

The first lumbar vertebra (Pl. LXXV. fig. 11) is marked by the reduction of the diapophysis (d) to a small rudiment. The metapophyses (m) have usurped the place of the præzygapophyses in all the lumbars. The anapophyses (a) become shorter, broader, and compressed; they diminish in the fourth and fifth (fig. 13, a), and disappear in the sixth lumbar. The diapophysis increases to the fifth, with a forward production in the second and third (fig. 12, d), together with a hinder production in the fourth and fifth (fig. 13, d, d'), the whole plate being depressed; in the last lumbar it is shortened, but thickened.

The centrums increase from a length of 1 inch 3 lines in the first lumbar (ib. fig. 11) to that of 1 inch 9 lines in the fifth lumbar (fig. 13). The sixth again becomes shorter, but broader. The neural spine (*ns*) becomes narrower antero-posteriorly and longer in the third lumbar; then again shortens in the fifth and sixth. The vertical "epineural," perforations are present on both sides of the neural arch in all the lumbars. The intraneural canals communicate with the epineural ones, and in the last lumbar are their direct continuations downward and forward. One or two outlets of veins excavate the lower surface of the centrum in each lumbar vertebra.

The sacrum (Pl. LXXVI. figs. 8 & 9) consists of two coalesced vertebræ. The first, with a broad subconvex articular surface (ib. fig. 8, c) for the last lumbar vertebra, contracts to two thirds that breadth where it joins the second sacral; the body of this again slightly expands to form the surface for the first caudal. The pair of venous canals opening on the upper surface of the centrum, within the neural canal, unite into one, which perforates the under surface. The pair of vertical epineural canals (ib. fig. 9, *en*, *en*) open near the fore part of the neural arch as "intraneural canals" (ib. fig. 8, *in*, *in*). The metapophyses (ib. ib. m, m) have oblique shallow facets (ib. fig. 9, z, z) at the lower part of their inner surfaces for junction with the postzygapophyses of the last lumbar vertebra. The pleurapophysial part (fig. 8, *pl*) of the transverse process expands as it recedes from the centrum and neural arch to form the large reniform articular surface (fig. 9, pl') for the iliac bone, to which the second sacral contributes only the hinder angle (ib. pl''). This articular surface equals half the length of the entire sacrum. Above or behind the flat syndesmotic surface (pl') is a smooth depression. The hæmal surface of both centrums is concave lengthwise, convex transversely. A wide circular intervertebral canal (fig. 9, j) perforates the sacrum vertically on each side of the confluence of the centrums; the dorsal or neural opening is partially overhung by a rudiment of the postzygapophysis (ib. z') of the first sacral. The postzygapophyses (z'' z'') of the second sacral are normally developed, and diverge from the upper and hinder part of the neural arch; their articular surface is flat and looks downward and outward. The neural spines of the two sacrals are confluent as a thin compressed crest of bone (ib. fig. 9, *n s*) one inch and a half in extent, and half an inch in height. The transverse process of the second sacral is continued from the hind angle of the articular pleurapophysis (ib. ib. pl'') as a thin depressed plate to the hind end of the base of the neurapophysis, beyond which the centrum (fig. 9, c) extends about three lines.

The chief vertebral characteristic of the Macropodidæ is the strength and length of caudal region, and the number of vertebræ composing it. In *Macropus rufus* there are twenty-two caudals, fourteen of which, after the second, have the hæmal arch. The metapophyses (Pl. LXXVI. fig. 10, *m, m*) resume a considerable size in the first caudal, in the form of quadrate plates an inch in length by eight lines across the truncate ends; the lower half of the fore border is slightly produced as a zygapophysis (*z*), the surface of which is continued back upon the base of the metapophysis. The neural spine is represented as a pair of low ridges (*ns*) diverging to the postzygapophyses (z', z'). These, in the first caudal, resemble those of the second sacral. The diapophyses, developed in both first and second caudals from the hinder half of the confluence of centrum with neurapophysis, are depressed plates, extending horizontally outward and backward, where they end in obtuse rather thickened points (ib. fig. 10, *d, d*).

The second caudal chiefly differs from the first in the smaller postzygapophyses. The hæmal arch (fig. 11) is small, with a longish slender spine (*h s*).

The third and following caudals have no zygapophysial junctions, but coarticulate by their centrums only. The diapophyses are much diminished in the fourth caudal, and are reduced to tuberosities terminating the sharp lateral longitudinal ridges of the centrum in the fifth caudal. In this vertebra the prædiapophyses (ib. fig. 12, *pd*), are developed; they are thence continued along a great part of the caudal region.

The hæmal arch is strengthened; its spine shortened, but extended lengthwise (fig. 13, *h s*). A pair of hypapophysial ridges, beginning in the third caudal, form the sides of a canal at the fore part of the fifth and following caudals (fig. 12, *hy*).

The hæmapophyses articulate with the tubercular expansions of the hypapophyses by almost flat subcircular surfaces (figs. 14–16, *h, h*), which coalesce in the fifth and succeeding vertebræ, circumscribing the hæmal arch or canal exclusively of the centrum. These hæmal arches develop ectapophyses (ib. figs. 15, 16, *e, e*), which are vertical homotypes of the diapophyses of the neural arch. The fore-and-aft extension of the hæmal spine is greatest in the seventh caudal (fig. 13, *h s*, $h\,s'$). Beyond this the hæmal spines gradually decrease (ib. figs. 15 & 16), and the arch is finally reduced to simple lozenge-shaped plates overlying the joint between two caudals. I find the last of these at the antepenultimate of such caudal joints in *Macropus rufus*.

§ 4. *Bones of the Fore Limbs.*

The scapula (Pl. LXXVIII. fig. 1) is broad in proportion to its length; the supraspinal plate (*i*) extends so as to describe a bold convexity (g') along the major part of the upper border or "costa;" and the infraspinal plate (*j*) expands to the rounded post-inferior angle of the bone (*h*); both tracts are almost flat, and the supra- and infraspinal fossæ are comparatively shallow.

The glenoid cavity (ib. fig. 2, *d*) has the usual ovate form, with the small end next the coracoid (*c*). The outer border, or that next the acromion (*e*), is sharp and rather produced. The coracoid (fig. 1, *c*) is represented by a mere tuberosity. The spine (ib. *f*) begins by an elevation (*f'*) of the dorsal surface near the upper rounded angle of the base (*b*), and contracts as it rises to form a thin plate, slightly bent toward the infraspinal surface (*j*); and as it continues to rise, inclining to the supraspinal surface, it is continued at the neck of the scapula into an acromial process (*e*) which extends 1 inch, 4 lines from the fore part of the spine, and measures 3 lines across at its free end. This slender acromion is associated with a diminutive clavicle.

There is a low tuberosity (*a*) below the glenoid cavity, but no trace of that singular production of the fore part of the inferior costa which distinguishes the scapula of *Diprotodon*[1]. A shallow depression extends along the almost even subscapular surface parallel with the origin of the spine from the opposite surface of the bladebone.

The clavicle (Pl. LXXVIII. fig. 3) is three inches in length, with a large reniform syndesmotic articular surface (fig. 4, *a*) at the sternal end, which is expanded accordingly; the shaft contracts, becomes compressed, then slightly broadens at the acromial end, where a narrow ridge on the under surface of the hind border gives attachment to the short ligaments tying it to that part of the scapula. The non-articular surface (fig. 4, *b*) of the sternal end is excavated. The bone is bent, with the convexity forward.

The humerus (Pl. LXXVII.) of the Rufous, as of other Kangaroos, is slightly bent, with the concavity ulnad; the tuberosities and ridges are strongly developed, and the entepicondyle is perforated.

The articular head is large and subhemispheric (ib. fig. 4); it is produced anconad, so as to overhang that side of the shaft. The thenal third of the proximal end of the bone is occupied by the two tuberosities and their intervening (bicipital) groove. The ectotuberosity (ib. *c*) has the form of a long thick ridge; the entotuberosity (ib. *b*) is shorter and thicker, strongly convex, and better bears the name of tuberosity; both rise above the level of the head (ib. fig. 2). The proximal end, showing the above three parts, is still in the state of an epiphysis.

The proximal third of the shaft is four-sided; the two broader sides (ib. fig. 2, *l*, *r*) are on the anconal aspect, and meet at the round or obtuse ridge (ib. *h*) continued from below the overhanging head one third down the bone. The facet on the ulnar side (*l*) of the ridge is bounded at its lower half by the ridge (*e*) for the insertion of the "pectoralis." The two facets on the thenal side of the proximal part of the shaft are of unequal breadth; the broader one (ib. fig. 1, *g*) is flat, and is bounded below by the ridge *e* and the stronger deltoid ridge (ib. *d*), which is continued below the middle of the shaft. The fourth facet (ib. *f*) is the narrowest; it is bounded on the outer (radial) side by the deltoid ridge, which is continued from the ectotuberosity downwards; a thicker ridge from the entotuberosity (ib. *t*) subsides upon a roughish surface (ib. fig. 3, *v*) about one third down the bone. The shaft contracts below the deltoid region, assumes the cylindrical form for a short extent, and sends off the supinator ridge (ib. figs. 1 & 2, *k'*).

[1] Phil. Trans. vol. clx. p. 549, pl. xlv.

A strong bony column (ib. figs. 1 & 3, *s*) rises more gradually, at a lower part of the shaft, from the fore and inner part of the distal expansion, then springs from the surface and extends freely downward and inward for about half an inch, and again unites with the bone, subsiding above the entepicondyle (ib. fig. 1, *i*). The column (*s*) bridges over a canal, 5 lines in long diameter, for the passage of the median nerve and an artery. The supinator ridge (ib. *k*, *k'*) commences abruptly at the outer side of the distal third of the shaft: its rough thin border is slightly bent forward, and thickens a little before it is lost in the ectepicondyle (*k*). The distal end (ib. fig. 5) is subcompressed antero-posteriorly; the transversely extended articular surface is divided into two parts by a broad groove, shallow anteriorly, deeper behind, and is slightly produced forward or "thenad," and more so at its outer or radial end. This articular surface presents a convexity broadest in front (fig. 1, *n*), contracting to a point or ridge behind (fig. 2, *n*); it is the "radial" condyle, and articulates with the shallow circular cavity (Pl. LXXVIII. fig. 7) at the proximal end of the radius. The inner or ulnar surface is slightly convex transversely at its fore part (Pl. LXXVII. fig. 1, *o*), but is mostly concave transversely, and convex from before backward, forming a trochlear surface, as in Man, having two parallel borders, the inner of which is the most prominent (ib. fig. 2, *o*).

The fore part of the articular surface (fig. 1, *n*, *o*) is undulated transversely, a feeble convexity intervening between those of the ulnar (*o*) and radial (*n*) divisions. There is no coronoid depression, and only a shallow olecranal one (ib. fig. 2, *m*).

The term "condyle" is properly applied to the articular surface, usually convex, at the end of a long bone, as *e. g.*, in anthropotomy, to the two at the lower end of the femur. The prominent non-articular parts of the same expanded end, projecting laterally beyond the condyles, are called "tuberosities" on the femur, and are "outer" and "inner" (Gray's 'Anatomy,' 8vo, 1858, p. 128, fig. 88). But, with regard to the humerus, the term "condyle" is applied, in anthropotomy, not to the terminal articular surfaces, but to the non-articular projections above and beyond them, one of which is called "external condyle," the other "internal condyle" (*op. cit.* p. 92). These contribute nothing to the articulation between the bones of the arm and forearm, like the condyles of the femur for the articulation of the bones of the thigh and leg, but add to the advantageous attachment of ligaments and muscles, like the projections termed "tuberosities" in the human femur.

I call, therefore, the articular surfaces (figs. 1, 2, 3, 5, *n*, *o*) at the distal end of the humerus "condyles," distinguishing one as "ectocondyle" (the external or radial condyle, *n*), the other as "entocondyle" (the internal or ulnar condyle, *o*), which is trochlear in the human subject. But as the term "tuberosity" is given to prominences for muscular attachment on the inner and outer side of the proximal "condyle" or head of the humerus, I have called the corresponding processes at the distal end "epicondylar processes;" they may be distinguished as "entepicondyle" (*i*) and "ectepicondyle," (*k*) according as they project above the "inner" or the "outer" condyle.

In the Kangaroo, as in all Mammals charged with the manipulation of a nursing-pouch, the elbow-joint is fashioned to facilitate the movements of pronation and supination of the fore paw[1], as well as those of flexion and extension of the forearm. The proximal articular surface of the radius (Pl. LXXVIII. fig. 7) is circular, very shallow, at right angles to the shaft or length of the bone. The articular smoothness continued upon the periphery of the head is a little broader (ib. fig. 5, *b*) where it rotates upon the lesser sigmoid cavity (ib. fig. 8, *b*) of the ulna, but is narrow where it plays upon the "orbicular ligament."

The so-called neck (ib. fig. 5, *c*) is long, and equals the shaft in thickness. The tuberosity (ib. *d*) rises an inch below the head and is obliquely elongate; a ridge divides the raised rough surface next the ulna, for the insertion of the biceps tendon, from the smoother tract occupied by the "bursa," intervening between the tendon and the bone. The shaft is slender in proportion to its length; subtriedral at the proximal third, subquadrate at the distal one (ib. fig. 6). The interosseous line is scarcely developed into a border: it is traceable from behind the tuberosity, along the ulnar side of the shaft, to the distal end, which expands to a little beyond the breadth of the upper part of the shaft at the tuberosity (fig. 5, *d*). The distal articulation is in a state of epiphysis (fig. 6, *e*), and forms the broadest part of the bone.

The ulna (Pl. LXXVIII. figs. 8 & 9) presents at its proximal end the two continuous articular surfaces known in anthropotomy as the "greater" (*a*) and "lesser" (*b*) sigmoid cavities. The "greater" is oblong and concave vertically, transversely convex, save at the "ulnar" part of the lower and broader end; it is slightly emarginate on each side. The "lesser" cavity is semioval, bent down at right angles with the "greater" from its lower and radial side; it is moderately concave; it receives the head of the radius, as the greater cavity does the trochlear part of the distal joint of the humerus. The rather prominent angle between the "radial" (*b*) and "humeral" (*a*) articular surfaces represents the "coronoid" process (*c*). Below this is an oblique ridge and roughness (*d'*) for the insertion of the "brachialis anticus." The olecranon (*e*) extends about an inch above the joint; it is subcompressed and tuberous terminally. The shaft is more compressed and develops a sharp "interosseous ridge" (Pl. LXXVIII. fig. 9, *f*) from its middle third.

The length of the ulna is 1 foot 3 lines; its greatest breadth is 1 inch 2 lines; its distal end, like that of the radius, was in the epiphysial state (ib. fig. 10, 55); it terminates by a "styloid process" which works in a pit of the "os cuneiforme" (ib. *c*).

The fore paw is pentadactyle, with divergent and freely movable unguiculate digits.

The carpus (ib. fig. 10) consists of a scapho-lunar (*l s*), cuneiform (*c*), and pisiform (*p*) in the proximal row, and of the usual four bones in the distal row, of which the unciform (*u*) is the largest, is interposed between the lunar part of the scaphoid and

[1] These movements are least free in *Chœropus*, in which the functional digits of the fore paw are reduced to two (II. & III.).

the cuneiform, and supports part of the middle as well as the fourth and fifth digits.

The scapho-lunar (ib. fig. 10, *s*, *l*) presents to the radius (ib. 54) a convexity transversely elongate, broadest ulnad, the breadth there being one third the length; narrowing radiad almost to a point (*s*): the curve of the convexity is bold in both directions, but greatest across or in the short diameter of the surface. The major part plainly answers to the convex radial articular surface of the lunar bone in Man and the Orang[1]. A non-articular surface, with irregular elevations and depressions on the anconal (dorsal) surface of the bone, of a subtriangular form, exceeding in breadth that of the radial convexity, intervenes between this and the two distal concave articular surfaces for the trapezoides (ib. *z*) and magnum (ib. *m*) respectively; whence the non-articular tract is continued upon the radial extension of the bone, which terminates in the convexity for the trapezium (ib. *t*), such articular surface being very small and forming the apex of the scaphoid. This part of the scapho-lunar is similar to the scaphoid in the Orang[2]. Between the radial convexity and the magnal concavity there is a narrow smooth tract adapted to the hinder and upper border of the unciform (*u*). Behind and below the ulnar end of the radial convexity is a slightly convex surface for the cuneiform: in the front or anconal view of the carpus this articulation is not seen.

The cuneiform (ib. ib. *c*) is a comparatively small bone, with a concavity on its proximal surface for the "styloid process" of the ulna (ib. 55), and a smaller and less deep articular surface for the "head" of the pisiform (ib. *p*). The distal surface of the cuneiform presents a large undulate articular surface for the unciform; and its backward extension just reaches the scapho-lunar.

The pisiform (ib. ib. *p*) is clavate, articulated by a sort of condyle to the outer proximal cup of the cuneiform; it then loses thickness and gains breadth, and expands to a broad subtruncate end. The bone projects backward and is twisted out of place to show its form in figure 10.

The trapezium (ib. *t*) is small, just touches the tips of the scapho-lunar, and offers a small surface for part of the base of the broad metacarpal of the pollex (I.).

The trapezium (ib. *z*) is still smaller, is wedged between the scaphoid (*s*) and magnum (*m*), and offers a surface to the outer (radial) part of the proximal articular surface of the second metacarpal (II.)

The "magnum" (ib. *m*) is the next carpal of the distal row in point of size: it is wedged between the scapho-lunar and unciform, and articulates with the ulnar half of the proximal surface of the second metacarpal (II.), and with a larger portion of that of the third metacarpal (III.).

The unciform, equalling in size the scapho-lunar, here occupies the position in the wrist held by the unciform and intermedium[3] in the Orang. It accordingly articulates

[1] See 'Anat. of Vertebrates,' vol. ii. p. 541, fig. 361, *b*. [2] Ib. ib. *a*. [3] *g* & *h* in fig. 361, *op. cit.*

by its proximal surface with the scapho-lunar and cuneiform, and by its distal surface with the magnum and the fourth and fifth metacarpals. But in the Kangaroo it also offers a surface to the ulnar angle of the base of the third metacarpal.

§ 5. *Pelvis.*

The pelvis in Kangaroos is remarkable for its size, especially its length, and for the strength of the long prismatic columnar ilia. The length from the "crista ilii" (Pl. LXXIX. fig. 1, *c*) to the distal end of the ischio-pubic symphysis (ib. *h'*), in *Macropus rufus*, is 1 foot; from the crista (*c*) to the fore part of the acetabulum (*t'*) is 5 inches 4 lines: this gives the length of the ectiliac surface (ib. 62)[1], which has an oblique hæmal and outer aspect, and is concave both lengthwise and transversely; but it does not exceed an inch in breadth.

The neural surface (Pl. LXXX. fig. 1, 62')[2], also concave, both lengthwise and across, especially in the latter direction, has its breadth increased by the hinder extension, *u*, of the sacro-iliac syndesmosis to 1 inch 5 lines.

The inner ("median" or "sacral") surface (Pl. LXXX. fig. 3, 62 *x*) is slightly convex lengthwise, almost flat across; and at 3 inches from the tuberous "crista" (*c*) begins the reniform surface (*p* 1, *p* 2) adapted to the sacrum.

The "crista ilii" (*c*) is reduced to a subtriangular, roughish, convex tuberosity (Pl. LXXIX. fig. 2), 1 inch 3 lines in length, by 9 lines in greatest breadth. The base forms the homologue of the "antero-superior spine" of the ilium (*a*); the apex (*b*) answers to the "postero-superior spine" of anthropotomy.

The ridge between the free facets (62 and 62') terminates in a rough raised oval surface (Pl. LXXX. fig. 2, *d*) called "precotylar tuberosity," representing the "antero-inferior spine" of anthropotomy. At the beginning of the ilio-pubic ridge is a strong rough subquadrate "ilio-pubic" process (ib. *e*), to which the pubis contributes (Pl. LXXIX. fig. 3, *s*). The hinder and neural production (Pl. LXXX. fig. 2, *u*) of the ilio-sacral articulation answers to the "postero-inferior spine," and marks the fore part of the feeble concavity (*m*) representing, or indicative of, the "great sacro-ischiadic notch."

The ischium, like the ilium, is a long, straight, triedral column; its inner or median side (Pls. LXXIX. & LXXX. fig. 1, 63') is broadest; the outer and upper side (Pl. LXXX. fig. 1, 63*) has less breadth; the outer and under side (ib. 63) is the narrowest: this is continued upward, and sinks, near the acetabulum, to form the deep cotylar notch (*y*). Here the bone seems to bifurcate, the anterior pillar swelling to join the pubis at the pubic cotylar tuberosity (64'), the hinder one expanding to form the ischio-cotylar tuberosity (63*). A low and long slightly roughened convexity of the hind or neural border of the ischium (*l*) represents its "spine." The thick tuberosity (*h*, *h'*) is of great extent, and runs almost straight and at right angles with the body of the ischium from the hind

[1] Answering to the "internal iliac fossa" of anthropotomy.

[2] Answering to the "dorsum ilii" of anthropotomy.

prominence (h) to that which, bending forward, at h', terminates the long ischio-pubic symphysis (k 64** 63**). The hinder end of this symphysis is formed by a triangular epiphysis, which coalesces ultimately with both ischia. Each ischium rapidly expands as it advances forward, or "hæmad," to form the hinder half of the ischio-pubic symphysis and of the foramen ovale (o). The outer surface of this expansion is traversed by an oblique rough ridge (63″); the inner surface is smooth. The concave border between l and h (Pl. LXXX. fig. 2) represents the "lesser ischiadic notch" of anthropotomy. The position of the union and ultimate coalescence of the symphysial branch of the ischium (63**) with that of the pubis (64**) is indicated, in the adult, by a low angle (fig. 1, v) projecting into the "foramen ovale" (o).

The pubis (64) contributes one half to the ilio-pubic process (e) by a projection answering to the pectineal process of the pubis in Monotremes and many Reptiles; and the lower and outer part of that expanded end of the bone forms the pubo-cotylar tuberosity (64*) and a small contiguous part of the acetabulum. Contracting to a narrow plate of bone, the pubis inclines downward and forward, slightly expanding, to join its fellow at the fore half (64**) of the ischio-pubic symphysis, where it extends backward and contributes to the same proportion, and to the anterior part of the circumference, of the "foramen ovale" (o).

The acetabulum (Pl. LXXIX. t, t'; Pl. LXXX. fig. 2, x) has a subtriangular brim, the angles rounded off and swollen to form the ilio-cotylar (t'), the pubo-cotylar (64*), and the ischio-cotylar (63*) tuberosities. The margin subsides between the two last-named prominences, and becomes thinner between the two first. The cotylar pit (x) and notch (y) are deep.

In the development of the Macropodal pelvis (Pl. LXXIX. fig. 3) three epiphyses, or distinct centres of ossification, are superadded; but they have as little segmental or general homological signification as the basisphenoid epiphyses in the cranium of the Bird. One of these epiphyses (ib. 64′) belongs to the acetabular end of the pubis, and becomes the pubo-cotylar tuberosity (ib. fig. 1, 64*); a second belongs to the symphysial ends of the pubis, and forms the hæmal projection at the fore part of the ischio-pubic symphysis; a third epiphysis (ib. fig. 3, h') belongs to the symphysial ends of the ischia, and forms the hæmal prominence at that end of the symphysis.

The epiphysis (k) gives attachment to the entobasilar articular ends (ib. fig. 1, r, r) of its marsupial bones. Each of these bones is 2 inches 7 lines in length, 6 lines in breadth at the ectobasilar process (s), decreasing in breadth from that part to both the attached (t) and the free (t) extremities: the former is slightly thickened and expanded where it is bound by ligaments to the pubic epiphysis (k). An oblique low ridge runs along the outer surface of the pelvic end of the bone; the rest is a thin plate with a sharp edge at the outer or lateral border.

In the figure of "the pelvis of a female Kangaroo," most probably of *M. major*, apparently of the natural size, given by Home (Lectures on Comparative Anatomy, 4to, 1814, vol. ii. tab. v.), the entire length is 8 inches 8 lines, that of the marsupial bone being 2 inches 7 lines, as in the pelvis of the male *M. rufus*, which measures in length 12 inches.

§ 6. *Bones of the Hind Limbs.*

The characteristics of the femur in the Kangaroos (Macropodidæ) are:—1, the height of the great trochanter, which seems due to a superimposed additional and anchylosed tuberosity (Pl. LXXXI. figs. 1, 2, 3, *f*), divided by an antero-internal constriction from the part below; 2, the length and strength of the small trochanter (ib. *n*); 3, a rough, well-defined tract (*p*) from the middle of the hind surface (fig. 2) of the shaft, outstanding, in large species, like a "third trochanter;" 4, the rough depression (ib. figs. 2, 3, *y*) above the outer condyle (ib. *v*); 5, the great transverse extent of the articular surface of that condyle by the production of its outer part, changing there the convexity into a concavity transversely (fig. 2, *v*). With these may be noted the length and depth of the post-trochanterian fossa (fig. 2, *l*).

In *M. rufus* there is a small tuberosity (fig. 3. *g*) a few lines below the pointed termination of the ectotrochanterian ridge (ib. *h*). The medullarterial hole is at the inner side of the hind tuberosity (*p*): the canal leads downward and inward. A "linea aspera" is continued from the small trochanter (*e*) two thirds of the way down the inner side of the shaft. The convex fore part of the outer condyle (fig. 1, *s*) is prominent; the rotular (*r*) and condylar (*s*, *t*) surfaces are continuous.

In most Macropodidæ the bones of the leg are remarkable for their superiority of length as compared with that of the thigh. In *M. rufus*, as in *M. major*, the tibia is nearly twice the length of the femur. Its head (Pl. LXXXII. fig. 4) is peculiar for the excess of antero-posterior over transverse diameter; the outer facet of the triedral shaft (ib. fig. 1, *k*) is more remarkable for its deep excavation, and the sharpness and production of the ridges dividing it from the inner and hinder facets: but these characters are limited to the proximal half of the bone; at the distal half the surfaces are more or less flattened and the dividing angles rounded; the anterior one, a continuation of the proximal procnemial ridge (*h*), is least so; and the hind facet of the distal half (ib. fig. 6) is feebly concave across.

The outer articular surface (ib. fig. 4, *a*) is feebly convex across at its outer half, becoming concave where it rises upon the side of the "spine" (*c*). The inner articular surface (*b*), convex at its outer third, is then slightly concave, and becomes more so as it ascends upon the "spine." The latter part, so called in anthropotomy, is an oblong tuberosity (*c*) rising behind, 3 lines in advance of the intercondylar notch (*y*), to a height of 5 lines, and subsiding a little in advance of the inner articular surface (*b*); the fore-and-aft extent of its base is 11 lines. The fore part of the head of the tibia, in advance of the condyles, gradually contracts to an anterior tuberosity (ib. fig. 4, *g*), the non-articular surface behind which is less rough, is moderately convex and undulated by a transverse rising and shallow groove (ib. *d*): there is a slight depression in front of each articular surface.

The procnemial ridge (ib. fig. 1, *h*) extends from the tuberosity (*g*) downward, retaining a sharpish margin, slightly bent outward, for an extent of 3 inches, then becomes thicker, smoothly rounded, and subsides; it seems to be resumed as a low angle between the outer and inner surfaces of the lower half of the shaft (ib. fig. 5, *h*).

The ectocnemial ridge (ib. figs. 2 and 3, *i*) is sharper and less produced superiorly than the preceding (*h*); but it becomes rather more prominent as it descends, and begins to thicken and subside near the lower half of the shaft. At 5 inches distance from it its origin it is grooved behind by the tibial medullary artery, which enters the bone an inch lower down: the canal runs distad.

The proximal third of the inner surface (ib. fig. 2, *r*) is smooth and flat, below which it gradually becomes convex, and is again rather flattened at the distal third of the shaft.

The hind facet (ib. fig. 3, *l*) is the narrowest: it is slightly concave across at its outer half, and convex at its inner half: the concavity deepens as the surface is extended by the outgrowth of the ectocnemial ridge, where the medullary artery enters the bone. The hind part of the outer condyle or articular surface (*a*) is produced to give depth to the transverse fibular groove (ib. figs. 1 & 3, *e*), which becomes continuous by the hind facet (fig. 3, *f*) with the surface for the external femoral condyle.

The distal end of the tibia (ib. fig. 7) is more expanded transversely than from before backward. The inner malleolus (*m*) has greater fore-and-aft breadth than vertical extent: its outer surface is bituberculate; the opposite or articular surface (ib. fig. 6, *n*) is convex transversely, but extended vertically to join the horizontal terminal articular surface; this is feebly trochlear and bounded externally by the outer malleolus, due to the distal epiphysis of the fibula.

The likeness of the Kangaroo's tibia to that of a large Struthious bird is striking and instructive, and is much closer than that offered by the tibia of *Megalosaurus* or any other Dinosaur.

The narrow posterior surface (ib. fig. 3, *l*) is bounded above by the convex prominences of the two proximal articular surfaces and their intervening notch; and, as in the Bird, the posterior is the narrowest of the three surfaces. The summit of the procnemial ridge is formed by an epicnemial tuberosity, which long retains, in both the Bird and the Marsupial, its epiphysial distinctness.

The "outer facet" of the shaft (ib. fig. 1, *k*) which the procnemial ridge bounds and mainly forms, at the proximal part of the bone, is deeply concave across. The inner surface, owing, in both, its proximal breadth mainly to the procnemial production, is smooth and flat or but feebly convex across.

The distal articular surface is supported on an epiphysis; and this sends upward at its fore part a process (ib. fig. 5, *p*) wedged, as in the Bird, into a groove of the corresponding part of the diaphysis: the epiphysis is later in its confluence than in the Bird. The inner articular part of the distal trochlea in the Bird, shows its homology with that of the inner malleolus in the Marsupial, by its greater production. This production is exaggerated in the distal articular epiphysis of the Mammal, as the antero-ascending process of the epiphysis, homologized by some with the astragalus, is exaggerated in the Bird. The length of the tibia in the male Wallaroo affording the bone here described is 1 foot 8 inches; that of the fibula is half an inch shorter.

The fibula (Pl. LXXXII. figs. 8–11) has its proximal end expanded antero-posteriorly, with a corresponding elongate angular articular tract (ib. fig. 10, *a*) fitting the angular groove (ib. fig. 1, *e*) of the outer tibial condyle; a tuberous production (ib. figs. 8, 10, *b*) of the hinder part, which does not rise above the level of the tibial condyle, and to which is ligamentously attached the "fabella" in the tendon of the "gastrocnemius externus," plays upon the hinder facet of continuity (ib. fig. 3, *f*) between the femoral and fibular articular surfaces of the tibial condyle (*a*). The fibula rapidly contracts below its proximal and articular epiphysial end, joins the ectocnemial ridge (ib. figs. 2 & 3, *i*) about one fourth of the way down the shaft, becomes concave as that ridge subsides into the rounded angle between the adjoining tibial facets, and is closely applied thereto to near the distal end of the tibia. In this course the fibula is reduced to a mere channelled plate, as shown in the transverse section (11 *a*). It needs only here to terminate in a point to complete the correspondence with the fibula of the Moa or Emu; but in the Marsupial the distal end of the fibula again slightly expands, and contributes by its epiphysis an outer malleolar buttress (ib. figs. 9, 11, *b*) to the mammalian ossifications in the tarsal segment of the foot. Had the fibula of the Bird been so continued, it would have had its terminal epiphysis; and this, like the tibial one, would have supplied Gegenbaur and his followers with a tarsal ossicle.

The ossified tarsal segment is singularly modified in Macropodidæ (Pl. LXXXIII.), in relation to the concentration of the powers of the hind feet, as saltatory locomotive instruments, upon the outermost pair of toes, and mainly upon one of these, answering to the fourth in the pentadactyle foot.

The narrowness of the hind foot as compared with the fore foot, which leads to the displacement of the tarsal homotype of the carpal scaphoid to a more distal position in its segment, is extreme in the Kangaroos—and being associated with atrophy of the inner or tibial side of the metatarsus, renders still more obscure the true character of the "naviculare" (Pl. LXXXIII. fig. 1, N): it will therefore be described in the order followed in anthropotomy.

The homotype of the carpal "lunare" almost monopolizes the distal articulation of the leg-bones. In the tarsus it is the *astragalus* (ib. figs. 3, 4, 5), and, in the Kangaroos, is subdepressed, triangular, with the base turned forward (figs. 3 & 4): viewed from the inner or tibial side (ib. fig. 5) it is arched, with the convexity towards the leg.

The upper surface (fig. 3) is chiefly formed by the trochlear articulation (1) for the tibia, convex from behind forward, concave transversely, passing into a convex outer or fibular border (2), but more definitely bounded by a ridge (3) on the inner side, over which the articular surface passes, at almost a right angle, to form the flattened one (ib. *d*, & fig. 5, *d* A) adapted to the inner malleolus. Beyond this surface a depressed non-articular part of the bone (fig. 3, *e*) extends a short way inward and forward, where it is terminated by the narrow anterior oblong convexity (fig. 5, *f*) for the naviculare. The inner non-articular part of the astragalus terminates in a tuberosity (ib. *g*). The posterior non-articular part, forming the apex of the triangle (ib. *h*), applies itself to the hind part of the inner articular expansion of the calcaneum, to which it is ligamentously attached.

On the under surface of the astragalus (fig. 4) is the antero-posteriorly concave surface (*i*), articulating with the convex one on the outer half of the upper expanded articular part of the calcaneum (fig. 6, *i*). Internal to this, at the middle of the under surface of the astragalus, is the oblong flattened articulation (fig. 4, *k*) for the flattened surface on the inner division of the upper articular part of the calcaneum (fig. 6, *k*). Anterior and internal to this is a smaller facet (fig. 4, *l*), continuous with the navicular one (*f*), but articulating with the inner side of the anterior calcaneal surface for the cuboid. No part of the surface (*f, l*) is extended to the tibio-malleolar articulation as in *Phascolomys*.

The astragalar characters are well marked, and could not fail to be recognized in a fossil bone of the Macropodal family.

The calcaneum of a Kangaroo is equally well characterized (Pl. LXXXIII. figs. 1 & 2, *c*, *b*, figs. 6 & 7). The fulcral portion (*a b*, *a c*) is long and triedral, the narrowest, roughest, flattened side, or "sole," being below (fig. 7 *c*); the two broader, smoother, concave sides converge to the superior or anterior rounded angle (fig. 6, *b*): the free end is due to a tuberous epiphysis (*a*) with an upper smooth bursal surface on the terminal facet.

The upper angle (fig. 6, *b*) expands to the anterior articular or tarsal portion of the bone, which is more abruptly enlarged, and especially to the outer side: this supports the subconvex articular surface (*d*) for the external malleolus formed by the distal epiphysis of the fibula (Pl. LXXXII. fig. 8, *b*). The upper surface of the expansion supports the convex surface (*i*) for the articulation (*i*) of the astragalus (fig. 4). The upper and inner rising is divided into a small anterior smooth articular surface (fig. 6, *k*) for that marked *k* in the astragalus (fig. 4), and a posterior, chiefly roughened, surface (*h*) for syndesmosis with the apical part of the astragalus (fig. 4, *h*). In advance of the astragalar expansion the calcaneum, somewhat contracted, extends, and terminates in the large subtriangular vertical surface for the "cuboïdes." The outer half of this surface (fig. 8, *e*) is more produced than the inner one (ib. *f*), and is continued into the lower or apical part (ib. *g*) of the cuboidal facet. The astragalar expansion (figs. 6, 7, *d*, *n*, *e*) overhangs the lateral concave surface on both sides of the bone, but most so on the outer one (fig. 2), which develops two tuberosities (fig. 7, *n*, *n*′).

The inner production has more vertical extent, and is impressed by a longitudinal channel: it supports the surface (fig. 6, *l*) for that so marked on the navicular part of the astragalus (fig. 4). The ridges, so formed (figs. 1 & 2, *m*, *n'*), afford fulcral resistance to the strong tendons gliding along the concave channels (ib. *b*, *b'*) from the leg to the foot beneath them. A well-marked groove (fig. 7, *o*) divides the fore part of the "sole" of the calcaneum from the apical part of the cuboidal articular facet (*e*, *f*).

The navicular (fig. 1, N) is a small, oblong, subquadrate, compressed bone, presenting a narrow concavity to the facet (*f*) of the astragalus (figs. 4, 5), and an oblong undulate surface divided between the proximal ones of the ento- (*c i*) and the ecto- (*c e*) cuneiform bones.

The ectocuneiform (ib. fig. 9) expands posteriorly into a distally bent tuberosity (fig. 9, *t*). The outer side of the articular part of the bone is applied to the cuboïdes (figs. 1 & 2, c *b*) and to part of the proximal surface of the fourth or great metatarsal (ib. IV); the distal articular border supports the proximal ends of the ento- (*c i*) and meso- (*cm*) cuneiform bones. The small compressed mesocuneiform has coalesced with the proximal end of the metatarsal, II, in the skeleton of *Macropus rufus* here described.

In *M. major* the inner slender metatarsal (cut, fig. 1, II) answering to the second in the pentadactyle foot, articulates at its proximal end with both the ento- (*c i*) and the meso- (*cm*) cuneiform bones.

The entocuneiform (*c i*) is an oblong flattened bone $10\frac{1}{2}$ lines long, $4\frac{1}{2}$ lines broad, notched at its hind margin. It is pushed inward and backward, articulates by its upper (proximal) end or surface with the scaphoid, by the inner surface of its proximal part with the ectocuneiform (*ce*) which it overlaps, by its anterior border and contiguous inner surface of its distal half with the mesocuneiform (*cm*), and by its distal end with the major part of the proximal articular end of the metatarsal (II). From the lower part of the posterior notch a ligament or tendon extends along the back part of the articulation between *m* IV and the cuboid.

The mesocuneiform (*cm*) is also a compressed ossicle, of smaller size, wedged between the entocuneiform, the proximal ends of the two small metatarsals (*m* II, *m* III) and the ectocuneiform (*ce*). The back part of the proximal ends of *m* III for an extent of five lines, is ligamentously and closely connected with the mesocuneiform; but the proximal articular surface of *m* III joins the fore part of the distal surface of the ectocuneïform (*ce*).

FIG I

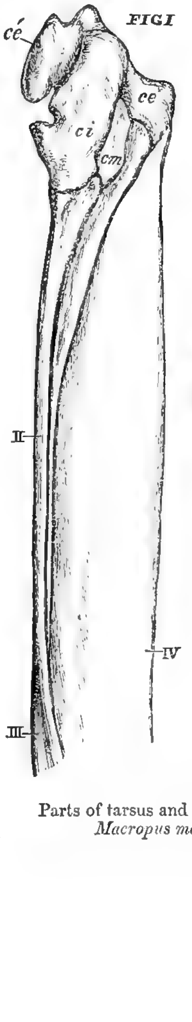
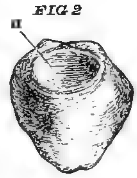


FIG 2



Parts of tarsus and metatarsus, *Macropus major*.

This (*ce*) is the largest of the three cuneiform bones, extends backward beyond the overlapping entocuneiform, and swells out into an expanded *quasi*-calcaneal process (*ce'*), which is closely united to a similar process of the cuboid.

There is a large plantar sesamoid (cut, fig. 2), which has a smooth oval flat or feebly concave articular surface (ib. *a*), adapted to the surface, below the grooved process, upon the back of the fourth metatarsal (IV.).

The above description is from a dissection of a full-grown male *M. major*.

The cuboides (Pl. LXXXIII. figs. 1, *s b* & 2, c *b*, and figs. 10, 11, 12) equals the astragalus in the longest diameter, and exceeds it in thickness and massiveness. It is moderately smooth and flat from behind forward, on its upper (rotular) part, but is convex across. At the hind proximal part the surface (fig. 11, *f*), concave in both directions but chiefly vertically, is more produced proximally than is the less-concave surface (ib. *e*); these positions correspond to the different levels of the distal calcaneal surfaces (ib. figs. 6, 7, 8, *e*, *f*) to which they are adapted. The surface *e* (fig. 11) is produced downward and inward (at *g*) coextensively with the surface *g* of the calcaneum (fig. 8). On the inner tibial side of the bone a narrow strip (fig. 11, *h*) is extended from the surface *f* to articulate with the naviculare. The lower (plantar) part of the cuboid (fig. 12) is developed into three prominences: the inner one (*i*), in the form of an oval tuberosity, articulates with the neck of the similar tuberosity (*t*) of the ectocuneiform (fig. 9); the middle tuberosity (fig. 12, *k*) is coextensive with the length of the cuboid, but is deeply grooved at the outer and under part of its origin; the outer prominence (*l*) supports the flat articular surface for the fifth metatarsal. The main part of the anterior surface of the cuboid is articulated, but immovably, with the base of the great (fourth) metatarsal (IV). The outer side of the cuboid (fig. 2, *cb*) extends downward and backward beyond the metatarsal IV, so far as was required to offer an articular surface (fig. 12, *l*) to the proximal end of the fifth metatarsal (fig. 14).

Of the metatarsal series of foot-bones the first (or that of the hallux, I) is suppressed; the second (fig. 1, II) and third (ib. III) are filamentary, but almost as long as the fourth (IV), which constitutes the chief part of this segment of the foot.

The second metatarsal (cut, fig. 1, II) has a proximal expansion of 2 lines diameter, with a flat articular surface 1 line in breadth for the corresponding facet at the distal end of the entocuneiform (*c i*). The shaft of the metatarsal soon shrinks to less than a line in thickness, but gains slightly in this dimension at its distal half. This rather abruptly expands into the convex joint for the first phalanx of the small toe, Pl. LXXXII. fig. 1, II.

The third metatarsal (III) differs in having a longer and more compressed proximal end, which articulates with both meso- (*cm*) and ecto- (*ce*) cuneiform bones, and syndesmotically with a rough facet on the great metatarsal (IV), which has been the seat of confluent ossification in my present subject. In the slenderness of the shaft and shape of the distal articulation it agrees with the second metatarsal (II); each of these bones is upwards of 5 inches in length.

The fourth metatarsal (Pl. LXXXIII. figs. 1 & 2, IV) is $6\frac{1}{2}$ inches in length, 1 inch 2 lines in breadth at the proximal end, 1 inch at the distal end (ib. fig. 13), 13 lines in depth near the proximal end, decreasing to 5 lines near the distal trochlea. The upper or anterior surface is convex across, and most so at the proximal half of the shaft, rising to a low ridge near the joint with the tarsus. The lower or under surface is slightly concave transversely at the distal two thirds, prominent and rugged at the proximal third, where, toward the inner or tibial side it is developed into a low, thick, rough ridge about an inch in length. It has coalesced with the proximal end of the third metatarsal on the inner side, and presents a shallow channel with some rough surfaces for the attachment of the proximal third of the fifth metatarsal on the outer side. Above this attachment the fourth metatarsal sends backward a process presenting an articular surface for the tarsal sesamoid (cut, fig. 2), above which is a grooved impress of a peroneal tendon. The distal joint (Pl. LXXXIII. fig. 13) at its upper half is simply convex vertically, almost flat across; but at the lower half there is a median rising, or ridge (*a*), causing two lateral surfaces concave across, and affording a firm trochlear joint to the proximal phalanx of the fourth toe (figs. 16, 17). Lengthwise the bone is almost straight, with a feeble downbending of the distal articulation.

The fifth metatarsal (ib. fig. 2, V, fig. 14) is compressed, or lamelliform, to near its distal end, having a sigmoid flexure vertically, through an upbending of the proximal expansion, while the rest and major part of the bone is bent in the opposite direction, viz. downward, or backward (plantad). The proximal articulation (Pl. LXXXIII. fig. 14) is an oblique flat triangular surface for that marked *l* on the cuboïdes (ib. fig. 12). The lower border of the compressed shaft is thicker than the upper one, which is almost trenchant along the proximal half. The outer surface has a shallow longitudinal channel; the inner one shows three rough facets, at its proximal fourth part, for ligamentous attachment to the fourth metatarsal. The distal articulation is simply convex, and chiefly so vertically.

The digits correspond in size with their supporting metatarsals. The two diminutive inner ones terminate each in an unguiculate phalanx, and are enveloped as far as this joint in a common sheath of tegument, from which the two small claws protrude; they are applied to dressing the hairy integument of the Kangaroo.

Of the first phalanx of the fourth toe an upper (ib. fig. 16), an under (fig. 17), and a proximal-end view (fig. 18) are given. An upper view of the second phalanx is given at fig. 19.

The last phalanx of the chief toe (*iv*) is elongate and conforms to the long, sharp-pointed, straight, three-sided, bayonet-like claw, which forms the chief weapon of the Kangaroo. The broad underside of this claw rests, like a hoof, on the ground; the smaller sheath of the ungual phalanx of the fifth toe has a similar quasi-ungulate character.

DESCRIPTION OF THE PLATES.

PLATE LXXIV.

Fig. 1. Skull of *Macropus rufus*, side view.
Fig. 2. Skull of *Macropus rufus*, half of upper surface.
Fig. 3. Skull of *Macropus rufus*, half of under surface.
Fig. 4. Skull of *Macropus rufus*, hind or occipital end.
Fig. 5. Skull of *Macropus rufus*, fore or nasal end.
Fig. 6. Lower molars, left side, grinding-surface.

PLATE LXXV.

Fig. 1. Atlas vertebra, side view.
Fig. 2. Atlas vertebra, front view.
Fig. 3. Atlas vertebra, back view.
Fig. 4. Atlas vertebra, upper view.
Fig. 5. Axis vertebra, side view.
Fig. 6. Axis vertebra, under view.
Fig. 7. Fourth cervical, upper view.
Fig. 8. Sixth cervical, front view.
Fig. 9. Seventh cervical and first three dorsal vertebræ, side view.
Fig. 10. Last three dorsal vertebræ (D 11, 12, 13), side view.
Fig. 11. First lumbar vertebra, side view.
Fig. 12. Third lumbar vertebra, side view.
Fig. 13. Fifth lumbar vertebra, side view.

PLATE LXXVI.

Fig. 1. First rib, outside view.
Fig. 2. Second rib, inside view.
Fig. 3. Third rib, inside view.
Fig. 4. Fifth rib, outside view.
Fig. 5. Tenth rib, outside view.
Fig. 6. Manubrium sterni, outer or under surface.
Fig. 7. Manubrium sterni, distal end.
Fig. 8. First sacral vertebra, front articular view.
Fig. 9. First and second sacral vertebræ, upper or neural surface.
Fig. 10. Second caudal vertebra, upper or neural surface.
Fig. 11. Second caudal vertebra, hæmal arch.
Fig. 12. Fifth caudal vertebra, under or hæmal surface.
Fig. 13. Fifth caudal vertebra, hæmal arch, side view.

Fig. 14. Hæmal arch of sixth caudal vertebra, upper or neural surface.
Fig. 15. Hæmal arch of tenth caudal vertebra, upper or neural surface.
Fig. 16. Hæmal arch of thirteenth caudal vertebra, upper or caudal surface.

PLATE LXXVII.

Fig. 1. Right humerus, thenal surface.
Fig. 2. Right humerus, anconal surface.
Fig. 3. Right humerus, radial side.
Fig. 4. Proximal articular end.
Fig. 5. Distal articular end.

PLATE LXXVIII.

Fig. 1. Left scapula, dorsal or outer surface.
Fig. 2. Left scapula, glenoid cavity.
Fig. 3. Left clavicle.
Fig. 4. Left clavicle, sternal articular end.
Fig. 5. Right radius, radial-side view of proximal portion.
Fig. 6. Right radius, distal portion.
Fig. 7. Right radius, proximal articular end.
Fig. 8. Right ulna, radial side view, proximal portion; *d*, distal portion.
Fig. 9. Right ulna, thenal surface; *g*, distal portion.
Fig. 10. Right carpus, anconal surface.

PLATE LXXIX.

Fig. 1. Pelvis, under or hæmal view.
Fig. 2. Crista ilii.
Fig. 3. Pelvis of young Kangaroo, side view.

PLATE LXXX.

Fig. 1. Left os innominatum and marsupial bone, dorsal or neural side.
Fig. 2. Left os innominatum and marsupial bone, outer-side view.
Fig. 3. Left ilium, inner-side view.

PLATE LXXXI.

Fig. 1. Right femur, front view.
Fig. 2. Right femur, back view.
Fig. 3. Right femur, outer-side view.
Fig. 4. Proximal end, inner-side view.
Fig. 5. Distal end, inner-side view.

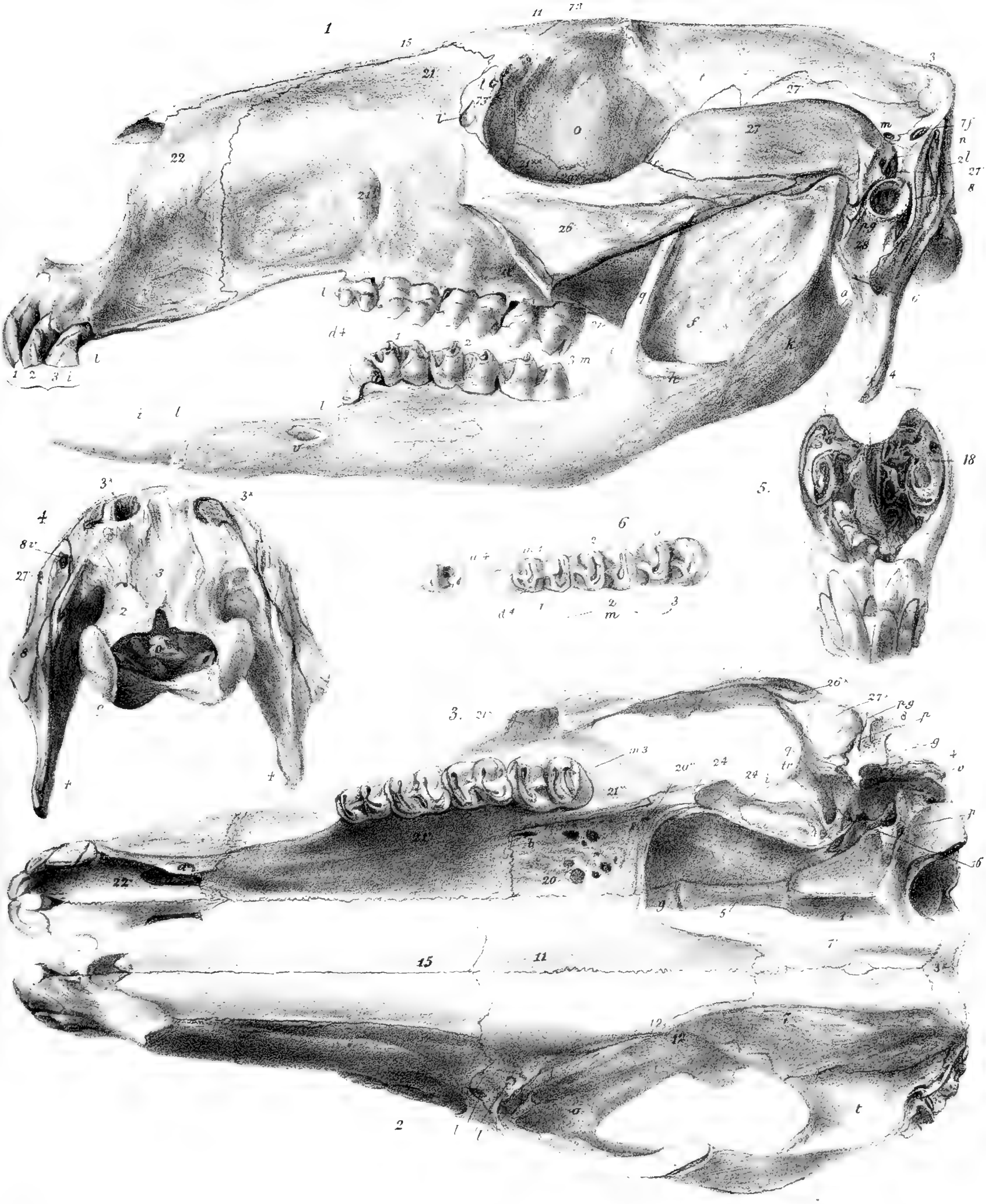
PLATE LXXXII.

Fig. 1. Left tibia, proximal portion, outer- or fibular-side view.
Fig. 2. Left tibia, proximal portion, front view.
Fig. 3. Left tibia, proximal portion, back view.
Fig. 4. Left tibia, proximal articular end.
Fig. 5. Left tibia, distal end, front view.
Fig. 6. Left tibia, distal end, back view.
Fig. 7. Left tibia, distal articular end.
Fig. 8. Left fibula, proximal portion, outer-side view.
Fig. 9. Left fibula, distal portion, outer-side view.
Fig. 10. Left fibula, proximal portion, inner-side view.
Fig. 11. Left fibula, distal portion, inner-side view.

PLATE LXXXIII.

Fig. 1. Right tarsus and metatarsus, inner- or tibial-side view.
Fig. 2. Right tarsus and metatarsus, outer- or fibular-side view.
Fig. 3. Astragalus, upper view.
Fig. 4. Astragalus, under view.
Fig. 5. Astragalus, inner- or tibial-side view.
Fig. 6. Calcaneum, upper view.
Fig. 7. Calcaneum, under view.
Fig. 8. Calcaneum, front view.
Fig. 9. Ectocuneiform, inner- or tibial-side view.
Fig. 10. Cuboid, outer- or fibular-side view.
Fig. 11. Cuboid, back view.
Fig. 12. Cuboid, under view.
Fig. 13. Distal articular end of fourth metatarsal (figs. 1 & 2, IV).
Fig. 14. Fifth metatarsal, upper view.
Fig. 15. Fifth mtataersal, distal end.
Fig. 16. First phalanx of fourth toe, upper surface.
Fig. 17. First phalanx of fourth toe, under surface.
Fig. 18. First phalanx of fourth toe, proximal end.
Fig. 19. Second phalanx of fourth toe, upper surface.

All the figures are of the natural size.



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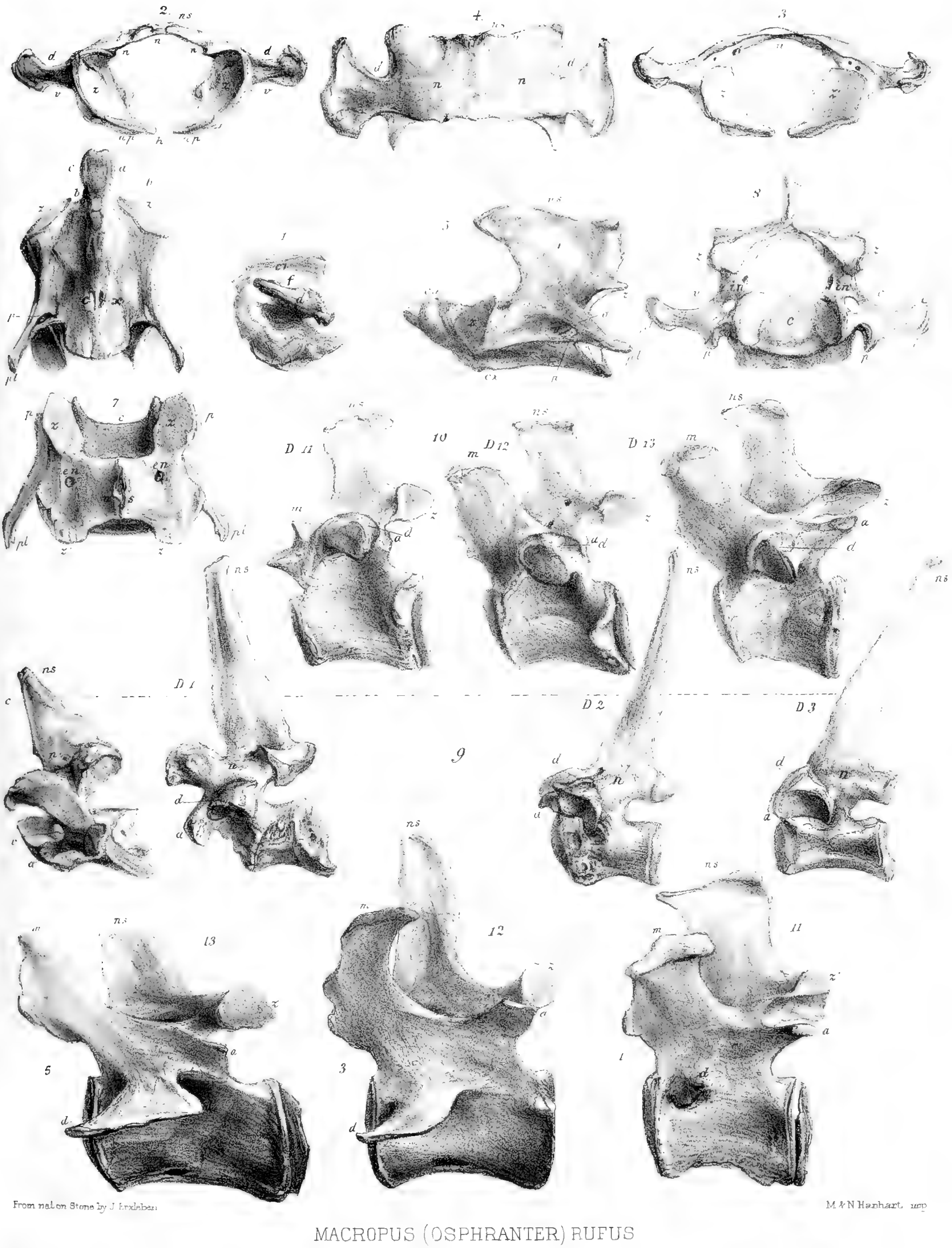
M & N Hanhart, imp.

MACROPUS (OSPHRANTER) RUFUS.



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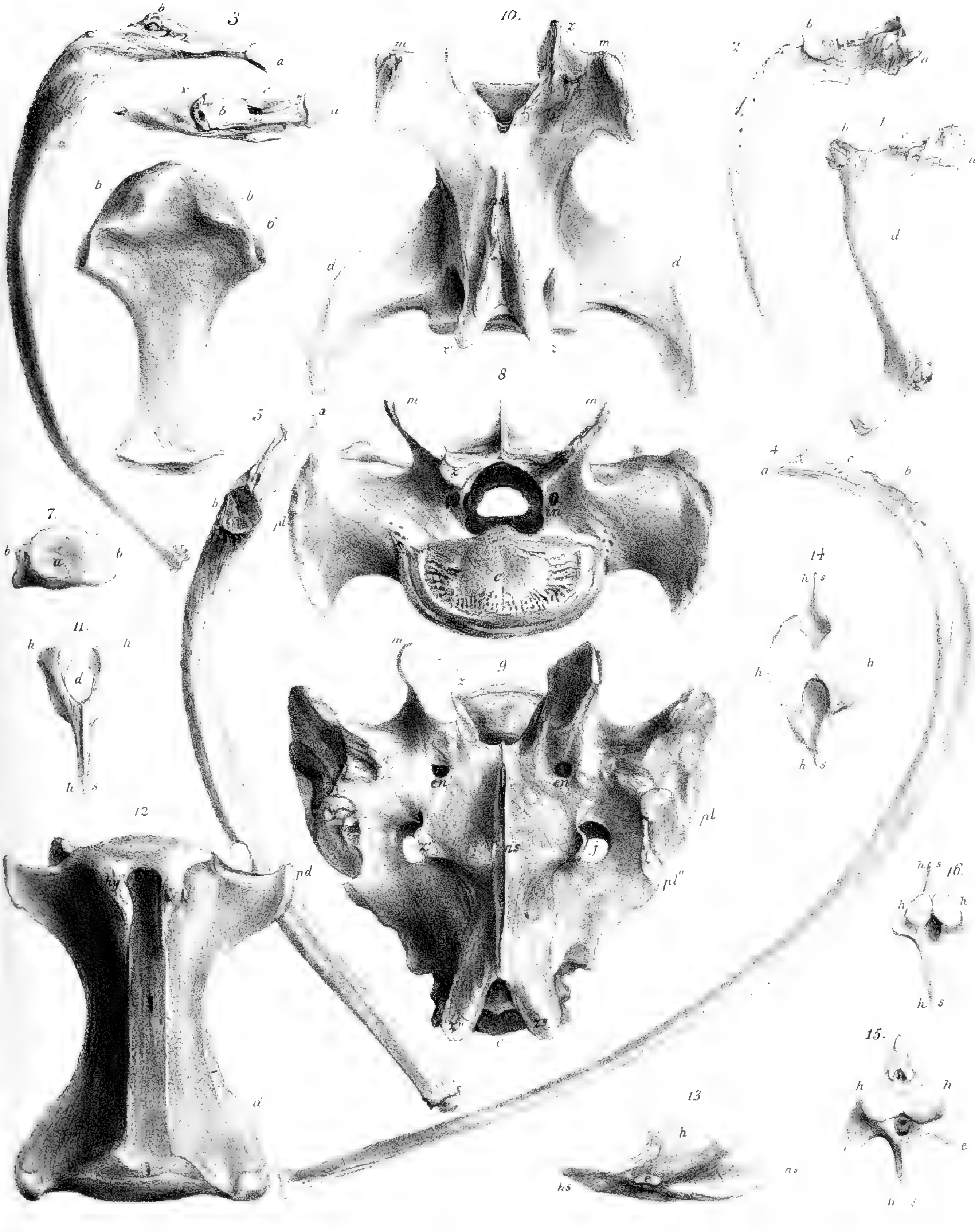

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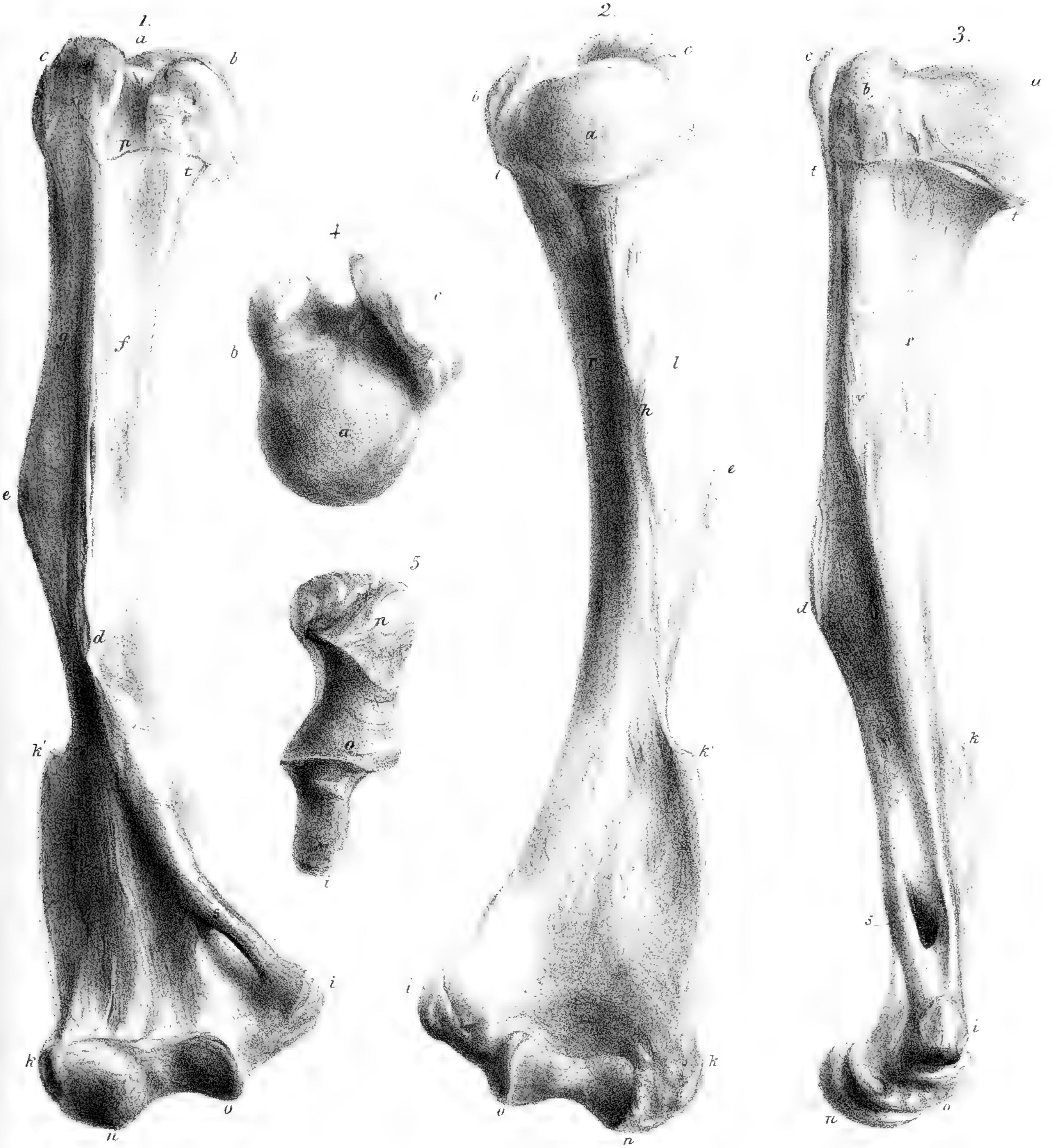

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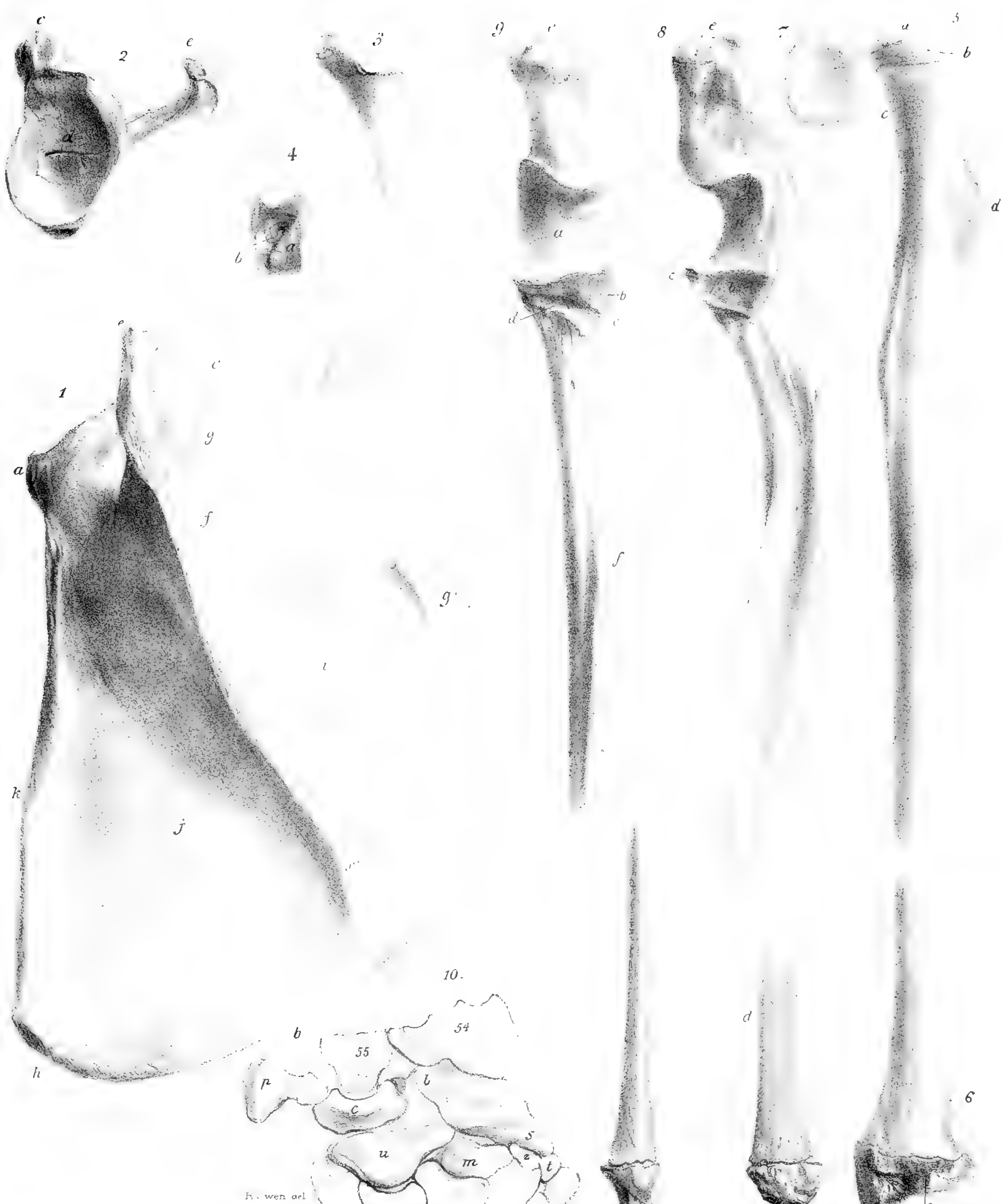

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MACROPUS (OSPHRANTER) RUFUS.

On stone by J. Erxleben.

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MACROPUS (OSPHRANTER) RUFUS


62
64'
64
63
64''
63
63''

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MACROPUS (OSPHRANTER) RUFUS

MACROPUS (OSPHRANTER) RUFUS

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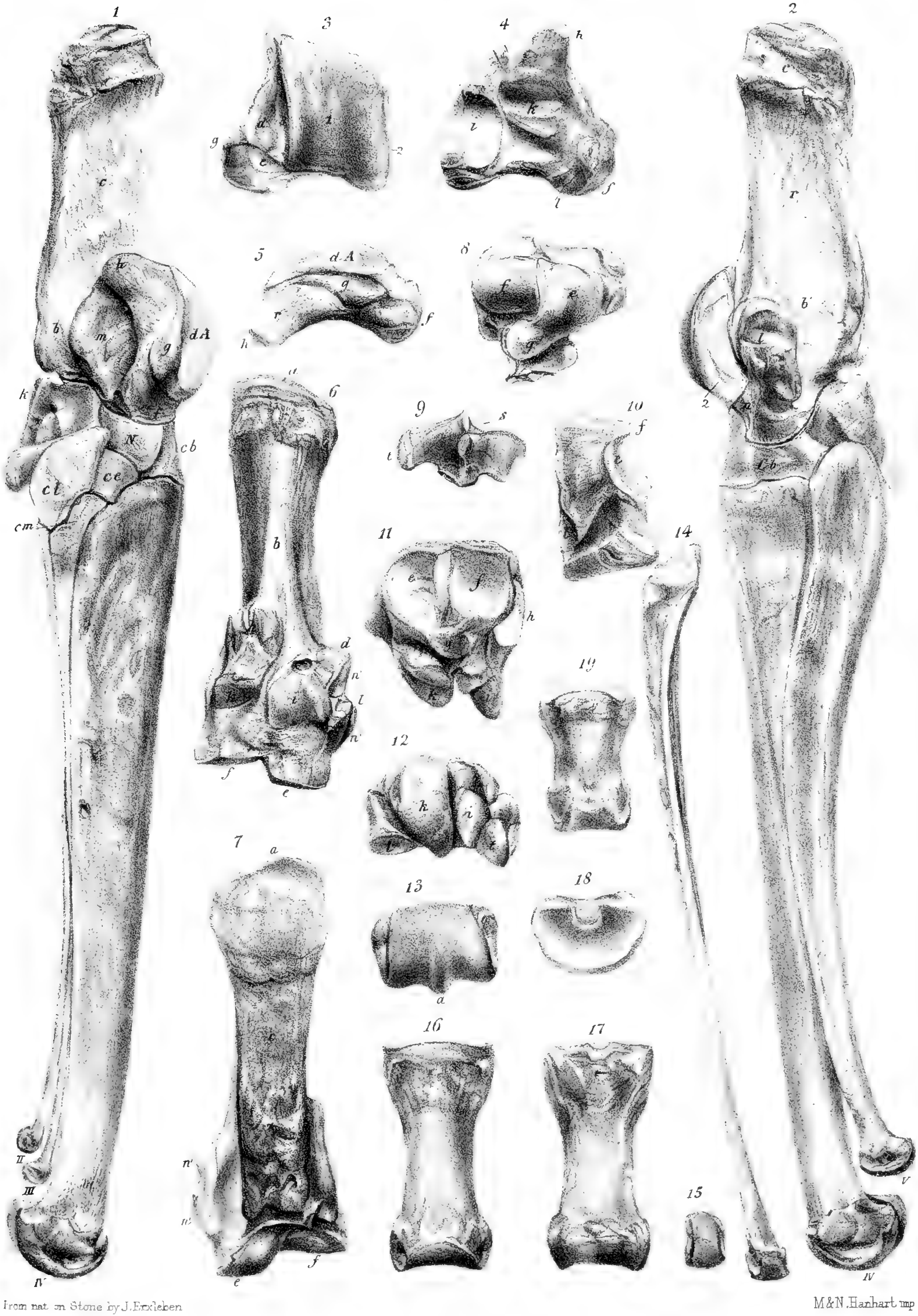

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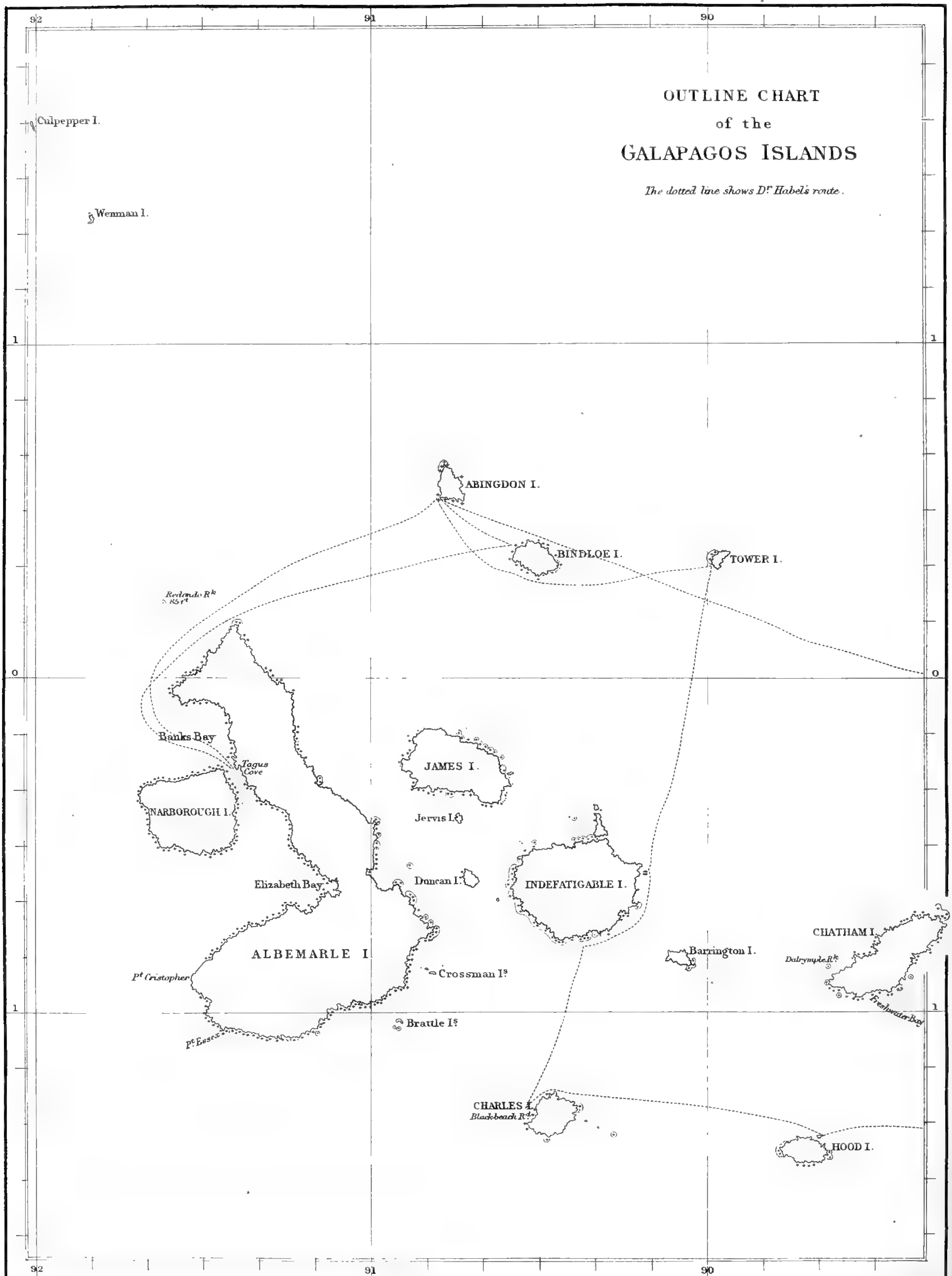
OUTLINE CHART
of the
GALAPAGOS ISLANDS
The dotted line shows Dr. Habel's route.
92
91
90
1
0
1
Culpepper I.
Wenman I.
ABINGDON I.
BINDLOE I.
TOWER I.
Redondo Rk.
JAMES I.
Banks Bay
Tagus Cove
NARBOROUGH I.
Jervis I.
Duncan I.
INDEFATIGABLE I.
Elizabeth Bay
ALBEMARLE I.
Pt. Cristopher
Crossman Is.
Barrington I.
CHATHAM I.
Dalrymple Rk.
Freshwater Bay
Brattle Is.
Pt. Essex
CHARLES I.
Black-beach Rd.
HOOD I.

Edwd. Weller

X. *On the Avifauna of the Galapagos Archipelago.*

By OSBERT SALVIN, *M.A.*, *F.R.S.*, *&c.*

Read April 6th, 1875.

[PLATES LXXXIV. to LXXXIX.]

CONTENTS.

I. INTRODUCTORY REMARKS.

IN the volume of the Society's 'Proceedings' for 1870 Mr. Sclater and I published a brief summary of an important collection of birds made by Dr. Habel in the Galapagos Islands[1]. The object of the present memoir is to give the particulars of that collection in greater detail, to incorporate the notes on the habits and other peculiarities of the birds drawn up by Dr. Habel himself, and to treat generally of the avifauna of this singular group of islands.

To make my paper more complete I have added a short account of the history, structure, and physical features of the islands with regard to their bearing on the indigenous products. This account is drawn from the writings of various travellers; and to it I have added an account of his visit, furnished by Dr. Habel himself.

The Galapagos archipelago (Pl. LXXXIV.) comprises a group of fifteen islands, together with a number of outlying rocks, which, situated under the equator, and, extending a degree and a half on either side of it, cover about three degrees of longitude (from 89° to 92° W. of Greenwich). They are about 600 miles to the westward of the coast of South America, and belong to the Republic of Ecuador.

One island, Albemarle[2], is considerably larger than the rest; four others, Narborough,

[1] P. Z. S. 1870, pp. 322–327.

[2] *Nomenclature of the Islands.*—The names I have used throughout this paper are derived from the Admiralty chart (No. 1375), compiled from the surveys of Captain Fitz-Roy and the officers of H.M.S. 'Beagle.' It may,

James, Indefatigable, and Chatham, are the next in point of dimensions; Charles, Hood, Bindloe, and Abingdon make up the nine chief islands of the archipelago. Barrington, Tower, Duncan, and Jervis are small, unimportant islands; whilst the two northernmost, Wenman and Culpepper, are little more than isolated rocks. The highest mountain in Albemarle reaches 4700 feet; and in most of the other islands the mountains attain a height of from 1000 to 1700 feet. The whole of the group is of volcanic origin; and some of the islands present surfaces little else than masses of scoriæ and vast fields of lava. The most ancient signs of volcanic action are to be found in the more eastern islands of the group, whilst the western are still the scene of occasional outbursts of volcanic energy. Narborough, the most western island of all, is frequently in a state of violent eruption, the island itself being little more than one vast furnace, from which lava has issued over the entire surface. Mr. Darwin estimates that in the whole archipelago there are as many as 2000 craters. Travellers within the last century speak of having observed various eruptions on the westernmost islands.

Delano witnessed an outbreak of one of the volcanos of Albemarle in 1800, and speaks of another which occurred in 1797. Captain Porter describes an eruption which took place on the same island on the 6th June, 1813. He also says that on his return to the islands after a visit to the continent, he remarked great changes on the south side of Narborough and the southern part of Albemarle, and observed four craters smoking on the former island and one on the latter. He also remarks that a volcano burst out with great fury a few hours after he left Charles Island. Captain Morrell, when anchored in Tagus Cove in 1825, between Narborough and Albemarle, witnessed a terrific eruption from Narborough. He was obliged to run from his anchorage and make his way southward, the temperature of the air being sometimes as high as 147°, that of the water 150° from the molten lava flowing into it! During the short visit of Lord Byron in H.M.S. 'Blonde,' in 1825, one of the volcanos of Albemarle was observed to be in eruption; and Captain Fitz-Roy states that the south-

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however, not be out of place to say a word respecting the different names which have been applied to some of the islands of the group.

The original Spanish name for the Archipelago is so apt that no other seems ever to have been suggested for it. The Spaniards also bestowed names on the particular islands; but they have never become established or even recognized, except Redonda Rock. The names applied by Captain Cowley in 1684 are those by which they are chiefly known; and most of them have been adopted in the Admiralty chart. Thus Narborough Island, Albemarle, James, Bindloe, Abingdon, Wenman, and Culpepper have all been recognized from Cowley's map. Norfolk Island of Cowley is, I have no doubt, Indefatigable Island of the present day, Porter's Island being another name for it. The Charles Island of Cowley is probably the same as Chatham Island of Colnett, not the Charles Island of the chart, and is perhaps the Santa Maria de la Aguada of the Spaniards. Cowley's Eures Island is probably Tower Island; Cowley's Crossman's Island and Brattle's Island are perhaps Hood and Charles Islands, though these names have been applied to two clusters of rocks off the south-eastern shore of Albemarle. Dean's Island may be Duncan Island of Colnett, Downes Island of Porter.

eastern volcano of the same island emitted smoke, but no flame, during his visit in 1835.

Owing doubtless to the severity of the volcanic action in the westernmost islands, the vegetation is described as very scanty. Narborough appears to be quite barren, except a few mangroves growing along its eastern shore. The northern end of Albemarle is described by Darwin as miserably sterile; but the southern side, exposed as it is to the prevailing moisture-laden south-easterly wind, is thickly wooded, and very green. Most of the other islands bear a scanty vegetation, some, such as James Island, having trees two feet and even two feet nine inches in diameter. The contrast, however, between the vegetation of the whole archipelago and that of the adjoining coast is very great.

The climate of the Galapagos is described as mild for its situation under the equator, the surrounding water being of low temperature from the influence of the south polar current. Little rain falls, except during the months of November, December, and January; clouds, however, usually hang over the higher mountains, where the deposit of moisture is far greater than on the sea-shore; and consequently the vegetation of the upper portion of most of the islands is more luxuriant.

The ocean-currents which flow through the Galapagos are strong, varying from one mile to three miles an hour. They appear, judging from the Admiralty chart, and allowing for the obstruction opposed by the various islands, to be tolerably uniform in their direction, trending to the north-west. As light winds and calms are frequently experienced, these currents make the navigation difficult to sailing ships, and we read of vessels being days and even weeks in endeavouring to beat against their course.

The position of the Galapagos Islands appears to have been first indicated in the Spanish manuscript charts of the sixteenth century; but no record of the date of their discovery, nor yet of the discoverer, has been left.

In the Latin edition (the first) of De Bry's 'Grands Voyages' there is a map bearing the date 1592, in the "Americæ tertia Pars," where these islands are indicated a little to the northward of the equator, and are called "Ys de los Galopegos." The map itself is called "Americæ pars magis cognita." This is the earliest published reference I can find to the archipelago.

In the following year Hawkins, the contemporary of Drake, mentions the islands casually in his 'Observations in a Voiage into the South Seas, anno domini 1593.' In mentioning Cape Passaos, on the west coast of South America, he says (p. 122), "it lyeth directly under the Equinoctiall line: some fourescore leagues to the westwards of this cape lyeth a heape of Ilands, the Spaniards call Illas de los Galapagos; they are desert and beare no fruite."

The Spaniards established themselves on the shores of the Pacific at Panama about the year 1519; and in 1525 Pizzaro made his first expedition to Peru. It would be probably soon after this that the islands were discovered and named, as their existence appears to have been commonly known at the time of Hawkins's expedition.

Towards the end of the seventeenth century the Buccaneers, of whose exploits Dampier and others have left such admirable accounts, made the Galapagos Islands a place of frequent resort. In 1680 Captain Sharp, in the journal of his expedition, mentions that on the 6th June he sailed from the island of Quibo "with a design to visit the Isles of Gallapallo that are a parcel of islands lying under the equator." He does not appear to have carried out his intention; for the next place he mentions is the island of Gorgona. In 1684 Dampier himself describes his visit to these islands.

This is the earliest published account concerning them that I can find.

In May 1684 two Buccaneer ships were lying off the island of "Lobos de la Mar" meditating a descent upon the Spanish town of Truxillo, when three Spanish ships, laden with provisions for Panama, hove in sight. They were captured; and from information given them by their prisoners the Buccaneers determined to sail westward to the Galapagos Islands, of the existence of which they were aware from the Spaniards, in whose maps their position was indicated.

Of the two Buccaneer ships which formed the squadron in 1684, one was commanded by Captain Cook, in which Dampier sailed and also Captain Cowley; the other was commanded by Captain Eaton. Captain Cowley has also left an account of the voyage; and he it was who gave to most of the islands the names by which they are now known.

The object of the Buccaneers was to hide up a portion of their captured provisions for future use, and to lie by for five or six months until the alarm of the inhabitants of the adjoining coast had subsided, when they proposed to resume their depredations.

Cowley says that they came to anchor at the northernmost end of an island which he called the Duke of York's Island, but in his map King James's Island, the Duke of York having come to the throne of England as James II. during Cowley's absence. He says there was great plenty of provisions, fish, sea- and land-tortoises, and also an abundance of fowls, viz. Flamingoes and Turtle Doves, the latter whereof were so tame that they would often alight on their hats and arms. After landing some stores of provisions, they commenced searching the islands for water, when the strong current seized their ships; and failing to regain their anchorage off James's Island, they bore away to the mainland of Central America.

Dampier's account of the trip differs a little from Cowley's, as he says they first anchored at the eastern end of the easternmost island. Dampier says they stayed only twelve days amongst the islands, and then, trying to touch at Cocos Island, but failing, made straight for Cape Blanco, at the entrance of the Gulf of Nicoya.

Dampier incidentally mentioning the doings of some of the other Buccaneer ships with whom he often sailed in consort, says that Captain Davis spent three months in the Galapagos, living solely, himself and his crew, on tortoises, and that Captain Harris also visited the islands.

A short account of the islands, very similar to Dampier's, is given by Lionel Wafer, Dampier's "chirurgeon." He speaks of taking off some of the flour left during the former voyage, a great deal of which he said had been devoured by the turtledoves. The chief interest of Wafer's narrative is his description of the Darien Indians, with whom he resided some time. Being injured by an accident, he was left behind by his companions when crossing the isthmus to the south seas. The Indians treated him well; and he ultimately rejoined his fellow Buccaneers nearly naked and painted like a savage.

Captain Woods Rogers, the rescuer of Alexander Selkirk from the Island of Juan Fernandez, was the last of the Buccaneers who has left any account of the Galapagos. He visited them twice—once in May 1709, and again in September of the same year. As usual the Tortoises are the animals that came in for the chief share of attention; but Rogers also noticed the tameness of the Hawks "of several sorts," and of the Turtle Doves. He also says that most sorts of sea-birds are to be found about the islands.

For nearly a century no further notice is recorded of these islands, though doubtless they were frequently visited, first by the Buccaneers, and afterwards by the whale-ships, which commenced cruising in the Pacific towards the close of the 18th century.

To extend the knowledge of these seas by more accurate surveys, and thus to encourage and facilitate the Sperm-Whale fisheries, Captain James Colnett, R.N., was despatched by Messrs. Enderby & Sons in the ship 'Rattler,' which had been purchased of the English Government and fitted out as a whaler. The 'Rattler' came in sight of the Galapagos on 24th June, 1793, and left again early in July. A map of the islands accompanies Captain Colnett's relation of his voyage, which, though imperfect in many respects, is the first published approaching to accuracy, and the first in which the longitudes are given approximately.

Incidental mention is made of Turtle Doves and considerable flocks of Teal. He adds that he saw no great variety of land-birds, and what he did see were not remarkable for beauty or novelty. He mentions a "Flycatcher" and Creeper "like those of New Zealand," a "bird resembling a small mocking bird," "a Black Hawk," and a "bird of the size of our Blackbird," and "Ring Doves of a dusky plumage."

Colnett expresses himself perplexed to form a satisfactory conjecture how the small birds supported themselves without water, till some of his party observed an old bird in the act of feeding three young ones by squeezing a berry of a tree into their mouths. He adds that in dry seasons thousands of birds must perish for want of water, for he found numbers dead in their nests, some being almost fledged. Of sea-birds he mentions Flamingoes, Sea-Pies, Plovers, and Sand-Larks. Colnett returned again to Galapagos on his homeward voyage, and came in sight of Chatham Island on 12th March, 1794, where he refreshed some of his sick crew with a diet of Turtle and Teal soup. He then cruised about for some days, catching several Sperm Whales. Whilst cruising round the south point of James Island he mentions seeing great numbers of Penguins (p. 156). "There were also," he adds, "small birds with red breasts, and others resembling the Java Sparrow in shape and size, but of a black plumage; the male was darkest, and had a very delightful note." The 'Rattler' finally left the Galapagos on 16th May, 1794.

The next account we have is by Captain Amasa Delano, who visited the Galapagos in 1801, and in the account of his voyages devotes a chapter to the description of the islands. In this he adds considerably to the information concerning them given by Colnett; and his account is interesting in many particulars. Allusions are frequently made to the birds. He speaks of a small kind of Albatross on James Island (probably *Œstrelata phæopyga*) which he describes as not laying its eggs in "rookeries," but to be found sitting and hatching on the burnt stony ground. He also mentions on the same islands Pelicans laying their eggs in nests built in trees, Flamingos, Gulls, Teals, Rooks (what these can be I know not), a small kind of Heron, and two or three kinds of Sparrows. The habits of several of these species are fully described, as well as the method of killing Turtle Doves with sticks. An account is also given of an eruption of one of the volcanos of Albemarle seen during a former visit on 21st August, 1800; and he mentions another eruption as having taken place in 1797.

By this time the Sperm-Whale fishery seems to have become so much developed in the seas surrounding the Galapagos Islands that they were chosen as a rendezvous by Captain David Porter, of the U.S. Frigate 'Essex,' during the war between England and America in 1812–13. Here he lay in wait for the English whalers as they came to water their vessels and to catch tortoises, fresh food being very necessary for the maintenance of the health of their crews. The 'Essex' remained cruising about the islands, with one interval, when she visited the mainland, from 17th May to 2nd October, 1813.

Captain Basil Hall, in H.M.S. 'Conway,' in 1822 spent several days on Abingdon Island, when he was engaged measuring the length of a pendulum to beat seconds under the equator. In his journal he briefly describes the volcanic features of this island, but makes no allusion to the birds.

Lord Byron, in H.M.S. 'Blonde,' on his outward voyage to the Sandwich Islands in 1825, anchored in Tagus Cove. A short account of the visit is published in the 'Voyage of the 'Blonde.'' He speaks of the number of the aquatic birds, and the tameness of the small birds, which hopped upon their feet. During the few days the vessel remained in Banks's Bay one of the volcanos of Albemarle was in eruption. An ineffectual attempt was made to land on Abingdon Island to search for tortoises; but the current prevented this being accomplished, and the vessel bore away for the Sandwich Islands.

In the same year Captain Morrell also visited the same island, and, in the narrative of his voyage, describes an eruption of a volcano in Narborough so intense that he was obliged to slip from his anchorage to escape from the heat.

H.M.S. 'Beagle,' Captain Fitz-Roy, with Mr. Darwin as naturalist, spent part of September and part of October 1835 in surveying the Galapagos. Captain Fitz-Roy's 'Narrative' and Mr. Darwin's 'Journal' contain by far the most complete account ever published of the archipelago. Both these works, especially the latter, are so well known that it is needless for me to enter into any details respecting them. Mr. Darwin describes the islands he visited himself. Captain Fitz-Roy gives a short account of the chief islands of the group, partly gathered from his own observations, and partly from the officers employed in making the surveys.

Subsequently to Mr. Darwin's visit several surveying ships have called at the Galapagos; and in the narratives of the different voyages, accounts more or less complete have been drawn up. These are for the most part descriptive of the scenery and the physical features of the country, very little being contained in them having any special bearing upon my present subject. An excellent summary of the various accounts is given by Mr. A. G. Findlay in his 'Directory for the Navigation of the Pacific Ocean.' But for the benefit of those who may wish to consult the original works, I append a list of some of their titles, so far as I have been able to ascertain them. Other useful matter will be found in Mr. Findlay's volumes just mentioned.

In concluding this portion of my subject I may mention that an account of the flora of the Galapagos, as far as it was then known, has been given in two papers by Dr. J. D. Hooker in the 'Transactions' of the Linnean Society, vol. xx. pp. 163–262 (1847), and that a memoir on the large tortoises is in course of publication in the 'Philosophical Transactions,' by Dr. Günther.

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Various attempts to colonize the Galapagos.

At various times people have lived in the Galapagos; but these attempts at colonization do not seem to have been permanently successful. The first person who took up his abode there was an Irishman of the name of Patrick Watkins, who settled himself on Charles Island, living on tortoises and growing potatoes, with which he traded with the whalers. He went to Guayaquil in an open boat in 1809 to look for a wife, and was there killed.

In 1832 Don José Villamil bought two of the islands from the Government of Ecuador, to one of which (Charles Island) he brought over all the inmates of the prisons of Guayaquil. These he established in the centre of the island.

Mr. Darwin, at the time of his visit, estimated the number of these colonists at 200; and he met with a party of them on James Island, where they had gone to fish and catch tortoises. This colony in 1849 had diminished to about twenty-five persons, the stock of tortoises failing, and with them the inducement to whaling-ships to call. Whether any persons remain on Charles Island at the present time I have not been able to ascertain.

In 1838, Wreck Bay, in Chatham Island, was inhabited by a native of Guayaquil and an Englishman, who maintained themselves by supplying American whalers with tortoises and vegetables.

In 1872 the 'Hassler,' with Professor Agassiz on board, reported one or two little colonies on Indefatigable Island, leading a hard life, the prospect of any kind of agriculture being successfully carried on being very remote (see 'Nature,' 1872, p. 354).

The advent of man to islands previously uninhabited is of the highest importance to the existence of a peculiar indigenous fauna and flora; and this is my reason for having endeavoured to trace the date of the discovery of the Galapagos archipelago, and to sketch out the intercourse since maintained with the outer world. As will be seen above, I have been only partially successful; but it may be safely said that these islands have been visited from time to time for more than three centuries; so that during this period man's influence has been more or less felt by the indigenous products. This influence is manifested in all similar cases by the capture and destruction for food of all animals fit to eat; and in order to establish a supply of fresh food for vessels in need of it, pigs and goats are usually turned out in such places. The vegetation chiefly suffers from the latter, while upon such animals as easily fall a prey to the former, the effect is generally very speedily marked. Cats often abound on such islands, and rats and mice escaped from some vessel calling for wood and water. All these prove enemies to some previously unmolested species. Fires, too, either wantonly or carelessly lighted, sometimes work great destruction.

For many years the great tortoises of the Galapagos afforded abundance of fresh food to ships in want of it; and the small Dove of the islands seems to have been destroyed in large numbers for the same purpose. But these birds, if we except the Ducks, appear to have been the only ones molested in any numbers to supply food to passing ships.

Pigs and goats do not seem to have been turned out in the Galapagos so soon after their discovery as was usually the case in other islands. I find no mention of pigs in the writings of the earlier voyagers; but Mr. Darwin says that on Charles Island there were many wild pigs and goats. This was in 1835. In 1813 Captain Porter relates how some goats belonging to his ship, which had been tethered on shore in James Island, got loose and were not recovered.

Dr. Habel saw a wild cat on Albemarle, and says that there are dogs and asses on the same island, and that dogs and asses are also to be seen on Indefatigable and Chatham Islands, horses also existing on the latter. He also speaks of wild cattle and swine on Charles Island.

So far as the birds of the Galapagos Islands are concerned, the effect produced by the visits of ships, chiefly whalers, and the attempts at colonization do not seem to have lessened their numbers at present. Judging from the records of the various authors I have been able to consult, I should say that birds are about as numerous now as they were two centuries ago. How long this will remain so is uncertain. All the species are able to fly, and thus protect themselves from the wild pigs and cats, their most open enemies. The effect upon the vegetation produced by the cattle, horses, and goats may eventually lessen the number of birds, if not eradicate some of the species; but as so many species resort to the sea-shore for food, the destruction of the vegetation will be of less importance to them than it otherwise might. With a lessened vegetation, however, less rain would fall, and in consequence the increased difficulty in procuring water will operate against the birds maintaining their numbers.

On the whole it seems evident that the avifauna of these singular islands is menaced not only by open enemies, but also is in danger of serious injury should any further disturbance of the conditions of life supervene.

With the tortoises the mischief has all but been accomplished. The appearance of man on these islands has been to them simply fatal. They have not only been taken by hundreds as food; but pigs now roam in their haunts, destined to destroy their eggs and young whenever and wherever they can find them[1].

Dr. Habel's Account of his Visit.

"When I started on my travels in 1862 my plans did not include a visit either to South America or to the Galapagos archipelago, my intention being, after exploring Central America, to proceed westwards by way of the islands of the south seas to Japan, and thence continuing a westerly route finally to reach Europe. Circumstances, of which the chief was the high premium on gold during the war of secession in the United States, which prevented my drawing money deposited in a bank in New York, forced me to change my plans, and to direct my route first to South America and afterwards to the Galapagos archipelago as offering a rich field for investigation.

"The first obstacle I had to encounter was how to get to the islands, as they lie out of the route of all regular communication. By inquiries made in Panama in 1866, I found that my only chance of getting there was in one of the fishing-boats which occasionally sail from Guayaquil and Paita for the archipelago. On arriving at Lima in January 1868, I was told that vessels used to sail from Callao for the purpose of fishing. On making inquiries in Callao I heard that a schooner had arrived some weeks previously from the islands, but that, her enterprise having proved a failure, she would not return again. Her owner offered her to me for sale; but the means at my command did not admit of my purchasing her. I then wrote through the medium of the American Minister to the American Consul at Paita, asking him about the possibility of getting

[1] Since the above was written, H.M.S. 'Peterel' visited the Galapagos in July 1875; and in the Report furnished to the Admiralty some statistics are given respecting the population, trade, and produce of these islands. From this it would appear that there are living permanently on Charles, Chatham, and Albemarle Islands 43 men, 16 women, and 13 children, besides a roving band of some 80 Orchilla-pickers then working on Chatham Island. Of animals introduced, it was estimated that there existed 2500 head of cattle on Charles Island, 4000 on Chatham, none on James, and about 20 on Albermarle. Of horses, 150 existed on Charles Island, but none elsewhere. Of donkeys, 2000 on Charles, some on Chatham, large numbers on James, and 25 or thirty on Albermarle. Of goats, 300 or 400 on Charles, a few on Chatham, but none elsewhere. Pigs existed in large numbers on Charles, Chatham, and James, but none on Albemarle.

to the islands from that port. An English merchant in Lima, who owned some land near Paita, who was going there, promised to make similar inquiries. Both the answers were in the negative, that there was no chance of reaching the islands from that port. My only resource therefore lay in Guayaquil.

"On arriving there, to my great joy I heard that there were two parties engaged in collecting a kind of moss which grows on the islands, and which is sent to the English market under the name of "Orchilla," and that these parties sent a vessel from time to time to the islands with labourers and provisions to collect and bring away the moss.

"I also found that one of the parties was engaged repairing a sloop, with the intention of despatching her to the islands. Mr. Rubira, the head of the enterprise, told me that he was himself going there as soon as two vessels now refitting were ready for sea, which he thought would be in about a fortnight. He also expressed himself ready to take me there, thinking that my knowledge of mineralogy might lead to the discovery of some mineralogical wealth, of the existence of which he felt assured.

"The two weeks for the completion of the repairs turned out to be four, when the larger of the two, a sloop (the 'Calandra'), of about ten tons, was ready to sail. This was on the 28th of March. In this ship I had to go, while Mr. Rubira was to follow in a few days in the other vessel, a schooner-rigged craft of about two tons, which the owners called a pilot-boat. We were to meet in Ballenita, the nearest sea-port. On March 30th we met with a sloop coming from the islands, having made the passage in twenty-three days, in stormy, squally weather, and having on one occasion experienced a continuous downfall of rain of eighty-three hours' duration.

"We arrived at Ballenita on the afternoon of April 1st, 1868, and proceeded to the town of Santa Elena, two miles distant, where I was hospitably received by Don José Valdizan.

"For a year yellow fever had prevailed in Guayaquil, though of a mild form during my stay in that city. As I had long desired to study that disease, I visited the hospitals during my sojourn in order to observe the patients afflicted with that disease. Yellow fever also prevailed at Santa Elena and in the neighbouring country and towns; and the house of Mr. Valdizan seemed to have formed a focus of infection. For several weeks cases had occurred there; and at the moment of my arrival a gentleman was lying sick with it, and four weeks before the book-keeper of the house died of it. Now the very room which the book-keeper used to occupy, and in which he died, and which since his death had never been touched or cleaned, the very clothing of the deceased hanging on the walls, his coffee-pot and other utensils standing still on the table, his trunk with his garments on the floor—this very room was assigned to me as my lodging during my expected stay. Any one can imagine my feelings as I lay down to bed the first night I slept there.

"The night of the 5th April I was taken with yellow fever, which kept me invalided for more than a month. In the meantime Mr. Rubira arrived and sailed with his two vessels for the islands; and thus my much-cherished hope to visit the Galapagos, to realize which had cost me so much anxiety, trouble, and time, was at once thwarted, and caused me much mental dejection. One hopeful ray alone remained. Mr. Rubira had said that he would soon send back the sloop with a cargo of orchilla, and that I could go out in her on her return voyage.

"Mr. Rubira had another reason for wishing for my company; he trusted to my knowledge of practical astronomy to assist the gentleman to whom the command of the sloop had been intrusted in directing the navigation. Although the captain had before visited the islands as commander of one of two vessels once constituting the navy of the Republic of Ecuador, he had not been to sea since that time, now many years ago; and consequently his nautical skill had lost too much of its freshness to ensure his being a successful commander on the present occasion.

After an absence of six weeks the sloop arrived in Ballenita, never having reached the islands, and being obliged to put back owing to her leaky condition. This circumstance restored my mind to its accustomed vigour, and helped much towards restoring my health. The sloop having been repaired, Mr. Rubira would not trust himself to her again, but hired a schooner of about forty tons, in which we left Ballenita on the morning of the 18th July, the sloop leaving at the same time. A steady breeze led us to hope a good passage, which was realized; for on the 22nd July we reached Hood Island, the sloop arriving on the 26th.

"Whilst the schooner was loading the bales of orchilla, I daily visited the island; but I could not prepare any bird-skins for want of a suitable place for the operation, finding none either on land or on board; so, expecting to find the same species on the other islands, I confined myself to the study of the volcanic formations of the island, in collecting plants and such insects and animals as could be preserved in alcohol. I soon found my mistake in neglecting the birds; nor had I ever the opportunity of repairing my error.

"The species of birds I observed on Hood Island consisted of the two kinds of Hawk, the spotted as well as the dusky one (which Mr. Darwin considered to be individuals of different ages of the same species), the Dove (*Zenaida galapagensis*), and some of the smaller kinds of the genus *Geospiza*. But I saw no numbers of either *Camarhynchus* or *Cactornis*. There was a small Duck (*Dafila bahamensis*), an Owl (*Asio galapagensis*), and another night-bird larger than the *Asio*. The Thrushes on Hood Island were darker than those of the other islands, their bills longer and more curved, and their song of poorer quality. There was also a kind of yellowish Wren, less brilliant in tint than *Dendrœca aureola*, and without the rufous cap on the crown. Besides these there were two kinds of Albatrosses: one had a dark blackish breast and a white band crossing the head from one eye to the other; the breast of the other was grey, and the head black. Whether they were the sexes of one species, or two distinct ones, I am unable to decide.

"The flora of Hood Island is very variegated. It was only on this island that I found and collected the *Ipomœa habeliana.*

"At daybreak of the 27th we started for Charles Island (Floriana); and although the sloop left at midnight we overtook her by 10 A.M. We anchored about noon in the Puerto de las Cuevas, where we remained until the 3rd of August. As it was impossible to land without getting wet through by the surf, I only went on shore once, and then collected nothing but a few plants.

"The schooner having sailed with her cargo for Guayaquil, we started in the sloop on the 3rd August, and reached that part of the island called Black Beach the next day. Our craft was in most miserable condition: not only did she leak, but her pump was out of order, and she had to be baled out; the rudder, too, only hung by its lower hinge, a rope taking the place of the upper one. At Black Beach we took in some fresh meat, which a man, living on the island with a woman and another man, his assistant, supplied by shooting some of the wild cattle and swine. One day I visited the upper part of the island, where the penal colony which came to such a deplorable end formerly existed. After taking on board most of the labourers who had come from Hood Island from want of food, we left Charles Island on the 12th of August and sailed for Indefatigable, and anchored on the evening of 15th in the Puerto de la Aguada. After being fairly established I commenced to make my collection of birds.

"The most noticeable birds of this island which I did not collect were two species of Swallows. One, a large kind, kept to the perpendicular rocks which lined the estuary, and did not fly inland[1]; the other, smaller, flew about the island, but too rapidly to be shot by me. I also observed a Bat, but was not fortunate enough to secure one.

"We left our anchorage on September 4th, and sailed east by north to another landing-place, which promised to yield 'orchilla' in greater abundance, as a branch of a tree brought from there was literally covered with it. On the 18th September we left again, keeping the same course, and encamped on that part of the island known as Puerto Garrapatero. It was here that I obtained the only specimen of *Geospiza strenua* I saw on Indefatigable. It is a little smaller than those obtained on Bindloe and Abingdon. It was also in this island that I saw four birds, about the size of Storks, pass high over head. Their wings were of a rosy colour, the breast white, and the body white and cream-coloured. The men collecting the 'orchilla' called them Flamingoes[2], saying that they frequented the higher portions of Indefatigable and Charles Islands.

"We remained in this port till October 8th, and then passed on to another landing-place till October 20th, and from there moved to the part of the island called Puerto de las Platanas.

[1] Probably *Progne concolor*.

[2] *Phœnicopterus ruber*.

"Mr. Rubira now arrived from Ballenita, where he had been to complete the purchase of a sloop he had bought of a man at the second landing-place, who was occupied in fishing; so we all embarked in her and sailed in the evening of the 23rd on a reconnoitring cruise. We sailed first for Tower Island, which we reached the next day. Landing Mr. Rubira and his partner, we proceeded to anchor in another place, and there remained till the next day. I felt sorry not to visit Tower Island myself, as I consider it one of the most interesting of the group as regards its ornithology. This island, being very rarely disturbed by vessels, has become the breeding-place of many sea-birds, for example, the Man-of-war bird[1] and others; and consequently many species are found here not to be seen on the other islands.

"The Gannet of Tower Island has red legs and feet[2], while the feet and legs of that on Hood and Charles Islands are blue, the body being white and the wings blackish grey. On Tower Island also a small species is found with chocolate-coloured plumage. Of this species a specimen was caught on board the sloop, and secured by tying it by the leg until I had an opportunity of dissecting it. But on Bindloe it was liberated by somebody, and so I lost the specimen. The most interesting bird I observed was one with white plumage all over, except the wings, which had black bands. Its long tail resembled that of a Macaw, but its body was smaller, its bill being straight and of a red colour[3]. I have no doubt that a thorough exploration of Tower Island would repay the explorer by the discovery of many species not to be found elsewhere.

"During the night of October 25th we sailed for Bindloe, which island we reached the next forenoon. After anchoring, a boat went off to search for a suitable place for encamping; we reached the one selected next morning. I did not go on shore till the day after, when every thing had been arranged in the tent. As the sloop was despatched on the 19th November to get a supply of terrapin and water, I went in her to visit other islands. We sailed first for Abingdon; but finding neither terrapins nor water, we made sail November 21st for Albemarle Island, where we arrived in the evening of the 23rd, and anchored in Tagus Cove. The next morning we went on shore—a rather perilous task, the surf being very high. Leaving one man to fill the casks with water, which in several places oozed out of the rocks near the sea, most of it being not sweet enough to drink, the rest of the party went off to look for terrapins. At the spring I saw a wild cat come down to drink; and the men told me there were many wild cats, dogs, and also asses on Albemarle. The two latter are also to be seen on Indefatigable and Chatham Islands, wild horses being also found on the last named. Of birds I observed two kinds of Hawks, *Dendrœca aureola*, and some species of *Geospiza*, which appeared to differ from those I collected elsewhere, and which I consider to belong to species distinct from any in my collection. *Camarhynchus habeli* is also found on Albemarle, and also *Zenaida galapagensis*; but I saw no Mocking Thrushes.

"We left Albemarle on the last day of November for Bindloe, arriving at the northern

[1] *Fregata aquila.* [2] Probably *Sula piscator.* [3] *Phaeton æthereus.*

end on December 6th. Here we had to anchor, being unable to reach our camp, owing to the strong current prevailing. The next forenoon, however, we made our destination.

"Great difficulty was experienced in embarking the labourers, the surf running very high—so much so that the canoe was repeatedly upset, and the few necessaries the men brought with them lost. The embarcation accomplished on December 9th, we sailed for Abingdon the following morning, and reached this island in five hours. Abingdon was the last island I visited, remaining there until the 1st January, 1869, on which day the sloop sailed with a cargo of 'orchilla' for Ballenita, and I left in her Abingdon Island and the whole of the group for good.

"During my stay I only found two birds' nests; and I believe that the birds mostly retire into the more elevated, shady, and cooler parts of the interior of the islands to breed. One nest I found on Albemarle was shaped like a retort, and rested on the branch of a bush. The other, found on Bindloe, was shaped like a cradle, and was suspended from a branch."

II. Short Account of the Literature relating to the Birds of the Galapagos.

Prior to Mr. Darwin's visit to the Galapagos, but little notice had been taken of the indigenous birds. Many of the writers who have left records of their visits to the islands have made incidental observations of the birds they saw: these relate chiefly to the sea-birds. They are so brief that it is only by the light of the positive knowledge we now possess of the birds that these incidental notices can be interpreted.

The literature of the ornithology of the Galapagos, therefore, may be said to have commenced with Mr. Darwin's visit. During his celebrated voyage in H.M.S. 'Beagle,' thirty-four days were spent in the archipelago, the chief islands touched at being Chatham, Charles, Albemarle, and James. The birds collected by Mr. Darwin were briefly characterized by Mr. Gould in the 'Proceedings' of this Society for 1837, and were subsequently more fully described by Mr. Darwin himself in the third Part of the 'Zoology of the Voyage of the Beagle.' Unfortunately, at the time of his visit, Mr. Darwin did not fully appreciate the peculiar distribution of the bird-fauna throughout the different islands, and the particular island where each specimen was obtained was not always noted at the time. Enough, however, was recorded to form a basis for deductions, the importance of which in their bearing upon the study of natural science has never been equalled.

Subsequent observations tend to show that Mr. Darwin's views as to the exceedingly restricted range of many of the species must be considerably modified. On the other hand, the exploration of more of the islands has led to the discovery of other and highly interesting species which there is every ground for supposing are not generally distributed over all the islands of the archipelago. Mr. Darwin records having obtained thirty-seven species of birds during his stay.

Subsequently to Mr. Darwin's expedition, the archipelago was visited by the French ship 'Vénus' in 1836–39; and a small collection of birds appears to have been made by the Surgeon Néboux. One of these was characterized by the late Baron de la Fresnaye as *Camarhynchus cinereus*, in the 'Magasin de Zoologie' for 1843. Others are described by Prince Bonaparte as *Zonotrichia galapagoensis* (Conspectus Avium, i. p. 479), and *Procellaria tethys* (Notes Ornithologiques, p. 92). The last named was probably obtained during the visit of the 'Vénus' to the islands; but the locality ascribed to the former I show elsewhere to be erroneous.

"Dr. Habel's visit was made in 1868. Though he touched at Hood, Albemarle, and Tower Islands, no birds were collected. From Indefatigable Island, however, a large and important series of birds was obtained; and more important still are his collections from the more northern outlying islands of Bindloe and Abingdon. Neither of the last-named islands had before or since been visited by any naturalist. A brief summary of Dr. Habel's collection, with descriptions of the new species, was drawn up by Mr. Sclater and myself, and published in the Society's 'Proceedings' for 1870. The same collections, with the addition of Dr. Habel's notes, now form the main source whence the present Memoir is derived.

Since our paper was published, the veteran ornithologist Sundevall has communicated to the 'Proceedings' of this Society for 1871 a list of the collection of birds made by the officers of the Swedish Frigate 'Eugenie' as long ago as 1852. Two new species are described in this paper; and some careful notes are added on several of the species mentioned. The islands explored were Charles Island, Chatham Island, and James Island, which were also touched at by the 'Beagle.' Indefatigable Island was also visited, where Dr. Habel collected largely. Albemarle Island is alluded to as having been called at; but no species of birds are mentioned in the list as having been obtained there.

These papers include all that has been especially written on the birds of the Galapagos Islands; but allusions to Mr. Darwin's visit have been frequently made, not only by Mr. Darwin himself in the narrative of his voyage as well as in others of his well-known works, but also by Sir Charles Lyell, in his 'Principles of Geology,' and by other writers.

The ground is classic ground; and the natural products of the Galapagos Islands will ever be appealed to by those occupied in investigating the complicated problems involved in the doctrine of the derivative origin of species.

III. List of the Species of Birds found in the Archipelago, and Remarks on their Relationship to the Birds of other Countries.

[The specific names printed in italics indicate that the species occurs elsewhere than in the archipelago.]

	Chatham Island.	Charles Island.	Indefatigable Island.	James Island.	Bindloe Island.	Abingdon Island.	Albemarle Island.	
1. Mimus.								
1. trifasciatus		*						
2. melanotis	*	*	*	*				
3. parvulus							*	
2. Dendrœca.								
4. aureola	*	*	*	*	*	*		
3. Progne.								
5. concolor		*	?	*				
4. Certhidea.								
6. olivacea	*		*	*				
7. fusca					*	*		
5. Geospiza.								
8. magnirostris	*	*						
9. strenua	*		*	*	*	*		
10. dubia	*							
11. fortis	*	*	*	*	*	*		
12. nebulosa	*	*						
13. fuliginosa	*		*	*				
14. parvula	*			*	*	*		
15. dentirostris						*		Also on one of the islands visited by Mr. Darwin.
6. Cactornis.								
16. scandens		*	*	*				
17. assimilis					*			Also on one of the islands visited by Mr. Darwin.
18. abingdoni						*		
19. pallida			*					
7. Camarhynchus[1].								
20. psittaculus			*	*				
21. crassirostris		*?						
22. variegatus					*	*		
23. prosthemelas	*	*	*	*				
24. habeli					*	*		Seen on Albemarle Island.
8. Dolichonyx[2].								
25. *orizivorus*				*				
9. Pyrocephalus.								
26. nanus			*	*	*			
10. Myiarchus.								
27. magnirostris	*		*	*	*	*		
11. Asio.								
28. galapagensis			*	*				
12. Strix.								
29. punctatissima			*	*		*		
13. Buteo.								
30. galapagensis			*	*		*		
14. Pelecanus.								
31. *fuscus*								Voyage of 'Eugenie,' but no island [specified.

[1] *Camarhynchus cinereus* (Lafr.). This is apparently a distinct species; but as I have only seen the bad figure of it in the Mag. de Zool., I omit it from the present list.

[2] *Zonotrichia galapagensis*, Bp. The position of this species would be before *Dolichonyx*; but as I both doubt its distinctness from *Z. coronata* and also the origin of the specimen, I omit it from the list.

	Chatham Island.	Charles Island.	Indefatigable Island.	James Island.	Bindloe Island.	Abingdon Island.	Albemarle Island.	
15. Sula[1].								
32. *leucogastra*								Voyage of 'Eugenie,' but no island [specified.
33. *cyanops*								Do. Do.
16. Fregata.								
34. *aquila*								Tower Island (*Habel*), and voyage of 'Eugenie.'
17. Phaeton								
35. *æthereus*								Tower Island (*Habel*).
18. Ardea.								
36. *herodias*			*					Galapagos (*Darwin*).
19. Butorides.								
37. plumbeus			*	*				
20. Nycticorax.								
38. pauper			*					Galapagos (*Darwin*, *Sundevall*),
21. Phœnicopterus.								
39. *ruber*			*					Indefatigable Island (*Habel*), and voy. of 'Herald' and 'Pandora.'
22. Querquedula.								
40. *versicolor*								Voyage of 'Eugenie.'
23. Dafila.								
41. *bahamensis*			*					Galapagos (*Darwin*),
24. Zenaida.								
42. galapagensis			*	*	*			Observed on every island.
25. Porzana.								
43. spilonota			*	*				
26. Ægialitis.								
44. *semipalmata*			*					Galapagos (*Darwin*).
27. Hæmatopus.								
45. *palliatus*			*					Galapagos (*Sundevall*).
28. Himantopus.								
46. *nigricollis*			*					
29. Strepsilas.								
47. *interpres*			*		*			Galapagos (*Darwin*).
30. Calidris.								
48. *arenaria*					*			
31. Heteroscelus.								
49. *incanus*			*			*		Galapagos (*Darwin*).
32. Tringa.								
50. *minutilla*			*					Galapagos (*Darwin*),
33. Numenius.								
51. *hudsonicus*			*					
34. Anous.								
52. *stolidus*								Observed by Mr. Darwin, and voy. 'Eugenie.'
35. Larus.								
53. fuliginosus		*	*			*		Galapagos (*Darwin*).
36. Creagrus.								
54. furcatus	*							
37. Procellaria								
55. tethys								Galapagos (*Néboux*).
38. Œstrelata[2].								
56. phæopygia	*							
39. Spheniscus.								
57. mendiculus				*				No doubt found on more islands.

[1] Dr. Habel describes a bird he saw on Tower Island, which, I think, may have been *S. piscatrix*. As no specimens were obtained, I refrain from including the species in the list.

[2] A Petrel described above by Dr. Habel may, I think, belong to a species distinct from this. He obtained no specimens.

Of these 57 species 19 only have as yet been found outside the limits of the archipelago, leaving 38 species peculiar to the islands, or more than 66 per cent.

Putting aside 21 of the 57 species, being the sea- or shore-birds, we have a remainder of 36 land-birds; of these 36 species only four, with our present knowledge, can be said to inhabit exclusively one island. These are *Mimus parvulus* of Albemarle Island, *Geospiza dubia* of Chatham Island, *Cactornis abingdoni* of Abingdon Island, and *Cactornis pallida* of Indefatigable Island. Very little can be said to be known of any of these four species; so that it is quite probable that they too may occur in other islands. It will be seen, then, that Mr. Darwin's remarks on the internal distribution of the birds of the archipelago require modification, and that certain species have not the exceedingly restricted range that he supposed.

With regard to the 19 widely ranging species, we see that 9 of them are solely American, the remainder being American also but at the same time more extensively distributed.

Distribution of the Genera of Birds found in the Galapagos.

1. *Mimus*	North and S. America.	21. *Phœnicopterus*	Tropicopolitan.
2. *Dendrœca*	North and Central America and West Indies.	22. *Querquedula*	Cosmopolitan.
3. *Progne*	North and S. America.	23. *Dafila*	Cosmopolitan.
4. *Certhidea*	Galapagos.	24. *Zenaida*	South America.
5. *Geospiza*	Galapagos.	25. *Porzana*	Cosmopolitan.
6. *Cactornis*	Galapagos.	26. *Ægialitis*	Cosmopolitan.
7. *Camarhynchus*	Galapagos.	27. *Hæmatopus*	Cosmopolitan.
8. *Dolichonyx*	North America.	28. *Himantopus*	Cosmopolitan.
9. *Pyrocephalus*	South America.	29. *Strepsilas*	Cosmopolitan.
10. *Myiarchus*	North and S. America.	30. *Calidris*	Cosmopolitan.
11. *Asio*	Cosmopolitan.	31. *Heterosceles*	Shores of North and South Pacific Ocean.
12. *Strix*	Cosmopolitan.	32. *Tringa*	Cosmopolitan.
13. *Buteo*	Cosmopolitan.	33. *Numenius*	Cosmopolitan.
14. *Pelecanus*	Cosmopolitan.	34. *Anous*	Tropicopolitan.
15. *Sula*	Cosmopolitan.	35. *Larus*	Cosmopolitan.
16. *Fregata*	Tropicopolitan.	36. *Creagrus*	Galapagos[1].
17. *Phaeton*	Tropicopolitan.	37. *Œstrelata*	Cosmopolitan.
18. *Ardea*	Cosmopolitan.	38. *Procellaria*	Cosmopolitan.
19. *Butorides*	Tropicopolitan.	39. *Spheniscus*	Antarctic Seas.
20. *Nycticorax*	Cosmopolitan.		

It will be seen from this table that 27 out of the 39 genera of birds represented in the Galapagos Islands are of very wide distribution. Of the remaining 12, 7 are found in continental America, leaving 5 peculiar to the islands. It is the presence of these 7 genera therefore that demonstrate, beyond all doubt, the zoological affinity of these islands to the American continent, so far as the class *Aves* is concerned.

[1] Perhaps also California.

Families of Birds represented in the Galapagos, with their Distribution.

1. Turdidæ.	8. Strigidæ.	15. Rallidæ.
2. Mniotiltidæ.	9. Falconidæ.	16. Charadriidæ.
3. Hirundinidæ.	10. Pelecanidæ.	17. Scolopacidæ.
4. Cœrebidæ.	11. Ardeidæ.	18. Laridæ.
5. Fringillidæ.	12. Phœnicopteridæ.	19. Procellariidæ.
6. Icteridæ.	13. Anatidæ.	20. Spheniscidæ.
7. Tyrannidæ.	14. Columbidæ.	

Of these twenty families all but five are nearly universally distributed over the globe. Of the remainder, four, viz. Mniotiltidæ, Cœrebidæ, Icteridæ, and Tyrannidæ, are peculiar to the continent of North and South America, whilst the fifth, Spheniscidæ, is a product of the Antarctic seas.

IV. Summary of the Birds found in each Island.

Chatham Island.—Visited by Mr. Darwin and the officers of the 'Eugenie.' The common *Mimus melanotis* occurs here, as well as *Dendrœca aureola.* The peculiar genus *Certhidea* is represented by *C. olivacea.* Of *Geospiza* no less than seven species occur, in fact all the so-called species, except *G. dentirostris*, which may, and probably is, also found there, since Mr. Darwin's specimens have no locality recorded. *Cactornis* has not yet been detected; and of *Camarhynchus*, only *C. prosthemelas.* The widely ranging *Myiarchus magnirostris* completes the twelve species which are all that have as yet been noticed on Chatham Island. It probably harbours its share of some twenty other species, of which only a general range is given.

Charles Island.—Visited by Mr. Darwin and the officers of the 'Eugenie.' Two species of *Mimus* are found here—*M. trifasciatus* and, according to Sundevall, *M. melanotis*, the latter also ranging through several other islands. *Dendrœca aureola* is mentioned by Darwin as occurring throughout the islands; but no particular island is specified. Professor Sundevall, however, names Charles Island as one on which specimens were obtained by the officers of the Swedish vessel. *Progne concolor* was obtained by Néboux. Of *Geospiza* three species have been noticed—*G. magnirostris*, of which Mr. Darwin is the only naturalist who has obtained specimens, *G. fortis*, the most widely ranging species of the genus, and *G. nebulosa.* Of *Cactornis* only the common *C. scandens* has been noticed. *Camarhynchus* is represented by two species, one, however, doubtfully *C. crassirostris.* The other, *C. prosthemelas*, is found in several other islands. The only other species noticed in Charles Island is *Larus fuliginosus*, though several others may have been obtained there whose precise origin was not recorded by the collector.

James Island.—Visited by Mr. Darwin and the officers of the 'Eugenie.' *Mimus melanotis* is the Mocking-bird of this island, where *Dendrœca aureola* is also found. It and Charles Island are the sole recorded localities for *Progne concolor.* *Certhidea oli-*

vacea occurs, and four species of *Geospiza*. *Cactornis scandens* and two species of *Camarhynchus* (*C. psittaculus* and *C. prosthemelas*) make up a total of seven species of Finches. The two Tyrannidæ (*Pyrocephalus nanus* and *Myiarchus magnirostris*) are also met with, as well as the two Owls (*Asio galapagensis* and *Strix punctatissima*). *Butorides plumbeus* is found here, also the Pigeon (*Zenaida galapagensis*). Here, too, *Spheniscus mendiculus* occurs.

Indefatigable Island.—Visited by Dr. Habel and the officers of the 'Eugenie.' Dr. Habel obtained no less than 267 skins on this island, being more than half his whole collection. *Mimus melanotis* is the Mocking-bird of Indefatigable, as it is of Chatham and James. *Dendrœca aureola* occurs in abundance; *Certhidea olivacea* would also appear to be a common bird. Of Finches we find four species of *Geospiza*, *Cactornis scandens*, *Camarhynchus psittaculus*, and *C. prosthemelas*. Both the Tyrants (*Pyrocephalus nanus* and *Myiarchus magnirostris*), both Owls (*Asio galapagensis* and *Strix punctatissima*), also *Buteo galapagensis*. Three species of Heron (*Ardea herodias*, *Butorides plumbea*, and *Nycticorax pauper*), *Dafila bahamensis*, the Pigeon (*Zenaida galapagensis*), and the small Crake (*Porzana spilonota*). All the Limicolæ (Plovers and Sandpipers) that have been noticed in the archipelago are recorded by Dr. Habel as occurring here; he also found *Larus fuliginosus*. Altogether twenty-nine species have been obtained in Indefatigable Island; but this large number compared with those recorded in other islands is doubtless mainly due to Dr. Habel having noted the localities on all, or nearly all, his specimens.

Albemarle Island.—Visited by Mr. Darwin and the officers of the 'Eugenie.' Though the largest island of the whole archipelago, but one species (*Mimus parvulus*) has as yet been assigned to it; this was obtained by Mr. Darwin. Professor Sundevall includes this island in his list of those visited by the 'Eugenie;' but no specimens appear to have been collected; at least none are recorded in Sundevall's list.

Bindloe Island.—Visited by Dr. Habel. Bindloe Island does not seem to possess a Mocking-bird; but *Dendrœca aureola* occurs. Its *Certhidea* (*C. fusca*), which it shares with its neighbour Abingdon Island, seems to replace the *C. olivacea* of the other islands. Three *Geospizæ* are found. Its *Cactornis* is *C. assimilis*, which was also found on one or other of the islands visited by Mr. Darwin. With Abingdon it has two peculiar species of *Camarhynchus* (*C. habeli* and *C. variegatus*). *Pyrocephalus nanus* and *Myiarchus magnirostris* are both found, and also the Pigeon (*Zenaida galapagensis*). The widely ranging *Strepsilas interpres* and *Calidris arenaria* make up a total of 13 species, of which Dr. Habel collected 94 skins.

Abingdon Island.—Visited by Dr. Habel. Mocking-birds are also absent from Abingdon Island, but not *Dendrœca aureola*. *Certhidea fusca* occurs, as well as on Bindloe Island. Four species of *Geospiza* (including *G. dentirostris*) are found, and a peculiar *Cactornis* (*C. abingdoni*). *Camarhynchus* is represented by *C. habeli* and *C. variegatus*. *Myiarchus magnirostris*, *Strix punctatissima*, and the Buzzard (*Buteo* *galapagensis*) occur. The wide-ranging *Heterosceles incanus* appears here, and, lastly, *Larus fuliginosus*. The number of species obtained by Dr. Habel in Abingdon Island was 14, of which he made 84 skins.

The following islands remain as yet unexplored:—

Albemarle Island.—Though in area this island is perhaps as large as all the rest put together, we know positively of only one species of bird having been observed there, viz. *Mimus parvulus*. The northern part of the island is very sterile, and probably does not support many land-birds; but the south-eastern end is described as thickly wooded and very green. Colnett (p. 144) speaks of having seen Storm-Petrels in great numbers between Albemarle and Narborough. Captain Porter landed near Point Essex, and says he saw plenty of birds called "Shags," and other sea-birds; and between Point Essex and Point Christopher the rocks were everywhere covered with Seals, Penguins, "guanas," and Pelecans. Captain Porter subsequently visited a spot which, from his description, appears to be Tagus Cove; here, he says, he saw a "variety of birds."

Narborough Island.—No birds are recorded from this island; and, considering its extreme barrenness, it is quite possible that no land-birds exist upon it.

Hood Island.—Captain Porter incidentally remarks (p. 233) that there are few birds on this island, but that they are of the same description as those found on the others.

Tower Island.—Except Dr. Habel's brief notes, no account has been given of the birds of this island. It is said to be low and different from the other islands of the archipelago.

Barrington Island, Duncan Island, Jervis Island.—These small islands have not yet been visited by any collector. They are all situated in the central part of the archipelago. Barrington is described as rather woody, Duncan as barren on all sides, while Jervis is a convenient anchorage from which to visit the south side of James Island.

Wenman Island and *Culpepper Island.*—These two small islands are both described as barren. Sea-birds resort to them; but land-birds have not been reported. Captain Porter saw abundance of Man-of-War Hawks (*Fregata*), Gannets, and Gulls near Wenman Island. He also saw "Black Petrels," probably *Procellaria tethys*.

It will thus be seen that, so far as the ornithology of the Galapagos is concerned, Albemarle Island offers the best prospect of additional discoveries to a future explorer. The south-western part is the best worth working, being more wooded; but Tagus Cove and Banks's Bay should also be visited. The descriptions of Narborough are such as to preclude the likelihood of any land-birds being found on it; still it should not be altogether passed by. Hood Island offers a fresh field for investigation; and as it maintains a peculiar species of tortoise, peculiar land-birds may still be forthcoming. Still greater prospect of novelty is held out by the investigation of Tower Island, which, though small, is so situated as to be considerably detached from the rest of the archipelago. Barrington Island should not be overlooked, though the prospect of any species different from those found on Indefatigable is small. Duncan Island and

Jervis Island should also be visited, though they are little else but outlying rocks of the larger islands, James and Indefatigable.

Lastly, of unvisited islands there remain Wenman and Culpepper. The chance of finding any land-birds on either of these rocks is exceedingly small; but the fact of their non-existence should be ascertained.

All the islands that have already been investigated are worthy of further exploration. The species of *Mimus* require more working out. Several of the so-called species of *Geospiza* are but little known, such as *G. magnirostris*, *G. nebulosa*, and *G. dubia*; also more specimens of *Cactornis assimilis*, *C. abingdoni*, and *C. pallida* are required to complete our knowledge of these birds.

Camarhynchus psittaculus and *C. crassirostris* are but little known, and still less the bird described by Lafresnaye as *C. cinereus*. The two Herons (*Butorides plumbea* and *Nycticorax pauper*) are as yet only known from immature birds; more specimens of the Flamingo would be useful, and a good series of the Petrels. Lastly, and most important of all, a series of observations are required upon the attitude the different species of *Geospiza* maintain towards one another, tending to show how far the differences observable, or thought to be observable, in dried specimens indicate the actual grouping in species of living individuals.

From these remarks it will be seen that much useful work remains to be done in these islands in the birds alone. In other branches of biological science even more investigation is required.

V. On the Variation of the Species in certain Genera, and the consequent Difficulty in defining Specific Limits.

The acquisition of a large series of specimens of the different so-called species of *Geospiza* renders the question as to the definiteness of the points of specific distinction between them more difficult of solution than ever. Distinctions are plainly enough to be seen between such birds as *G. magnirostris* and *G. parvula*, where great disparity in size is obvious. But these differences are gradually erased by almost insensible steps by the interposition of *G. strenua*, *G. fortis*, and *G. fuliginosa*. The series before me includes specimens that can almost as well be referred to either of two contiguous species, so that their position can only be determined by assigning to each species what must be called arbitrary standards of measurements of the bill alone. The question follows, Do these birds, in their natural relations to one another, keep themselves to groups of individuals dependent upon the size of their bills? The answer is to be found rather by field-observation than by measuring skins. Were different species, though closely allied, found to inhabit different islands, the case would be much simplified. But what do we find? Charles Island possesses three out of eight so-called species, Chatham Island has no less than seven, James Island four, Indefatigable Island three, Bindloe three, and Abingdon four. Thus we see that in Chatham Island every gradation in size is represented.

Then as to coloration. The assumption of the black plumage by the old males seems to be a slow process, the fully black feathering being only arrived at in probably the third year; and it is probable, from the comparatively scanty numbers of the black individuals, that the cock birds breed in the mottled plumage long before the fully black dress is assumed. Observations on paired and nesting birds would here be invaluable.

It would seem, then, that with these singular birds the sexual selection displayed amongst them is such that it is almost a matter of indifference whether the cock birds are mottled or black, and also that the nature of their food and the general conditions of life are such that birds with huge bills as large as a Grosbeak's, as well as those with bills no bigger than a Bunting's, can equally find sustenance, variation as regards the length of wing, tail, and tarsi being equally unimportant. The members of this genus present a field where natural selection has acted with far less rigidity than is usually observable.

The gap between *Geospiza* and *Cactornis* is fairly defined—not but what we see in some specimens of the former more elongated bills than in others, showing a tendency in *Geospiza* to develop in the direction of *Cactornis*. But it would seem that the connecting links are gone; hence our ability to define the differences between these genera.

Camarhynchus belongs to a somewhat different type; and I am inclined to believe that it is not to be traced to the same origin as *Geospiza* and *Cactornis*, but to a common ancestor with, perhaps, *Spermophila*, the bill of the somewhat abnormal ally of that genus (*Neorhynchus nasesus*) recalling to some extent the peculiarities of the bill of *Camarhynchus*. So much for structural characters. In coloration *Camarhynchus* resembles both *Geospiza* and *Cactornis*; but the males of none of the species are so black as those of the adults of the other genera.

It seems worthy of notice that, though the different species of Finches are not restricted to any one particular island, there appears to be a prevalence of some one species in each. Dr. Habel's collection shows that in Indefatigable Island two dominant species occur—*Geospiza fortis* and *G. fuliginosa*. In Bindloe Island *G. strenua* abounds, whilst in Abingdon we find *G. parvula*. It may thus be argued that the tendency of each of these islands is to produce the form most prevalent in it; but, on the other hand, I am not able to say what attention Dr. Habel devoted to each species.

VI. Account of each Species.

Genus Mimus.

Mimus is a purely American genus of the family Turdidæ, the species composing it being very widely distributed over both the northern and southern continents as well as some of the West-Indian islands. The three closely allied species found in the Galapagos Islands have their nearest continental ally in *Mimus longicaudus*, a species found in Western Peru, and belonging to a section of the genus only found in the Neotropical Region. There can be no question that *Mimus trifasciatus* and its insular allies are strictly congeneric with the continental birds.

Mimus trifasciatus.

Orpheus trifasciatus, Gould, P. Z. S. 1837, p. 27.
Mimus trifasciatus, G. R. Gray, Zool. Voy. Beagle, iii. p. 62, t. xvi.; Sundev. P. Z. S. 1871, p. 127.

Supra obscure fuscus, pileo saturatiore, uropygio pallidiore: secundariis et alarum tectricibus albo terminatis: loris nigris albo supra marginatis, regionibus parotica et auriculari albis, plumis infra oculos nigro variegatis: subtus albus, pectore distincte fusco-nigro notato, hypochondriis nigro maculatis: rectricum trium externarum apicibus fusco-albido indistincte notatis: long. tota (circ.) 10·5, alæ 4·9, caudæ 4·4, tarsi 1·7, rostri a rictu 1·45 poll. angl.: rostro et pedibus obscure corylinis, mandibulæ basi pallido.

Hab. Charles Island (*Darwin*).

Mimus melanotis.

Orpheus melanotis, Gould, P. Z. S. 1837, p. 27.
Mimus melanotis, G. R. Gray, Zool. Voy. Beagle, iii. p. 62, t. xvii.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, pp. 124, 126.

♂ supra obscure fusco-brunneus plumis singulis pallidiore marginatis, uropygio pallidiore, pileo nigricantiore: primariis et secundariis albido stricte marginatis: tectricibus alarum majoribus albo terminatis fascias duas formantibus, minoribus quoque albo terminatis: superciliis et corpore subtus albis: loris et regione auriculari nigris: hypochondriis maculis fuscis punctatis: cauda fusco-nigra, rectricibus tribus utrinque externis albo gradatim terminatis: iride (ave viva) luteo: pedibus nigricantibus: rostro nigro: long. tota $9\frac{3}{8}$, alæ $4\frac{1}{2}$, caudæ 4·3, tarsi 1·4, rostri a rictu 1·1.

(♂ ad. ex ins. Indefatigable, 20th September, 1868.)

Hab. Chatham Island (*Darwin, Sundevall*); Charles Island (*Sundevall*); James Island (*Darwin, Sundevall*); Indefatigable Island (*Habel, Sundevall*).

Other notes on a fresh specimen taken by Dr. Habel are:—"Expanded wings from tip to tip $13\frac{1}{4}$ inches, inside of mouth flesh-colour, and contents of the stomach insects."

"From the observations I made on the Mocking-birds of the different islands of the

Galapagos archipelago I am inclined to think that Hood's Island is occupied by a species distinct from any yet described.

"Hood's was the first island of the archipelago that we landed upon; and I observed that the Mocking-bird was different from the common one of the mainland of Ecuador. In the latter country these Thrushes are great favourites with the natives, and I have seen birds reared in large open cages hanging in the garden enjoy full liberty, flying about during the day and being shut up only at night to protect them from being attacked by cats or other animals. It struck me that the beaks of the birds on Hood's Island were larger and more curved, that the birds were more sluggish in their habits, and their voices less melodious than those inhabiting the mainland. Unfortunately I neglected to collect specimens on Hood's Island, thinking I should meet with the species elsewhere, and that I should return to Hood's Island for a longer stay. On reaching Charles Island I found out my mistake, and that the Mocking Thrushes there differed in their livelier and more intelligent habits, and in their superior powers of song.

"The habits of the Mocking Thrushes of the archipelago are rather predatory. These birds devour insects of various kinds, grasshoppers, and butterflies, which they follow for a long distance, and catch on the wing. This may be the reason why insects of all kinds are so shy throughout the archipelago, whilst all other animals are tame. They readily consume any kind of flesh, whether fresh or putrefying. They are not only tame but bold and audacious. Many times birds have settled on my hat or gun, or keeping near me have driven away smaller birds I was in pursuit of. The birds of Indefatigable Island are excellent songsters; and their varied notes often led me to believe that I was listening to some unknown species of bird."—*H.*

MIMUS PARVULUS.

Orpheus parvulus, Gould, P. Z. S. 1837, p. 27.
Mimus parvulus, G. R. Gray, Zool. Voy. Beagle, iii. p. 63, t. xviii.; Sundev. P. Z. S. 1871, p. 127.

Supra obscure fuscus uropygio paulo rufescentiore: loris, regione parotica et tectricibus auricularibus nigris: secundariis stricte, et tectricibus alarum albo terminatis: subtus albus, hypochondriis fusco maculatis: rostro et pedibus obscure corylinis, illo ad basin mandibulæ macula pallida notato: long. tota 8·2, alæ 3·8, caudæ 3·5, tarsi 1·3, rostri a rictu 0·95.

Hab. Albemarle Island (*Darwin*).

Professor Sundevall suggests that *M. parvulus* is perhaps the young of *M. melanotis*, and that *M. trifasciatus* was described from a very old specimen, being unwilling to admit that three closely allied forms inhabit islands so near together. I have examined carefully Mr. Darwin's types in the British Museum; and the conclusion I have come to is that

M. trifasciatus is a species very distinct from the other two, the chief points of difference being its larger size, its having the chest marked with dark brown instead of being white, and in the white terminations to the wing-coverts and secondaries being more conspicuous.

M. parvulus is very closely related to *M. melanotis*; and I am inclined to believe that a larger series of specimens would show that the differences (in size alone) would gradually disappear. It must be observed that the specimen of the small bird (*M. parvulus*) came from the sterile part of Albemarle Island (probably Tagus Cove), and hence may represent a small starved race of the more robust *M. melanotis*.

Genus Dendrœca.

The species of this somewhat varied genus, so far as coloration is concerned, found in the Galapagos Islands belongs to the rather restricted section which is best known by the common *Dendrœca æstiva* of North America. This last-named bird is extremely abundant, and migrates from the northern continent in autumn to spend its winter in Central America and the northern provinces of South America. Other members of this section are found stationary in Central America and the West-Indian Islands. Closely allied races are to be found in Cuba, Jamaica, the Virgin Islands, and Barbadoes. The Central-American bird is rather more distinctly differentiated, being itself divisible into two very closely related races. Mr. Ridgway, the most recent writer on this genus, gives the following as the species and varieties of this section of the genus:—

Dendrœca æstiva. Entire continent of North America, migrating in winter to Central and South America as far as New Granada.

Dendrœca petechia. West Indies, except Trinidad and Barbadoes.
- Var. *gundlachi*. Cuba and the Bahamas.
- Var. *petechia*. Jamaica and Haiti.
- Var. *ruficapilla*. Porto Rico, St. Thomas, St. Croix, and St. Bartholomew.

Dendrœca aureola. Galapagos Islands.

Dendrœca capitalis. Barbadoes.

Dendrœca vieilloti. Central America and New Granada.
- Var. *vieilloti*. New Granada.
- Var. *rufigula*. Isthmus of Panama.
- Var. *bryanti*. Honduras and Yucatan to Mazatlan.

As it is very difficult to distinguish specifically between fully adult birds from the Galapagos Islands and Jamaica, the generic affinities between *D. aureola* and other members of *Dendrœca* are complete.

Dendrœca aureola.

Sylvicola aureola, Gould, Zool. Voy. Beagle, iii. p. 86, t. xvii.
Dendrœca aureola, Baird, Rev. Am. B. i. p. 194 (note); Ridgw. N.-Am. Birds, i. p. 217.
Dendrœca petechia, var., Sundev. P. Z. S. 1871, p. 124.
Mniotilte d'été, Prév. et Des Murs, Voy. Vénus, v. p. 197.

♂ *ad.* supra olivaceus: pileo antico castaneo: alis et cauda fusco-nigris extus olivaceo marginatis; tectricibus alarum conspicue luteo marginatis: rectricibus, nisi duabus mediis, in pogonio interno luteis, apicibus fuscis: subtus flavus, pectore et hypochondriis maculis elongatis castaneis notatis.

♂ *jun.* supra olivaceus, pileo antico concolori: alis et cauda fuscis plumarum marginibus dorso concoloribus: subtus sordide luteus, maculis castaneis adulti carens.

♀ *ad.* supra cinereo-olivacea, tectricibus alarum sordide albo marginatis: subtus alba vix luteo tincta: iride brunnea.

	Long. tot.	Alæ.	Caudæ.	Tarsi.	Rostri a rict.
♂ *ad.* . .	5·0	2·65	2·1	0·85	0·65
♂ *jun.* . .	4·75	2·5	1·9	0·8	0·6
♀ *ad.* . .	5·0	2·5	1·9	0·82	0·6

Hab. Galapagos generally (*Darwin*); Chatham Island, Charles Island, James Island (*Sundevall*); Indefatigable Island, Bindloe Island, Abingdon Island (*Habel*); Galapagos (*Néboux*).

Of this form of *Dendrœca æstiva* Dr. Habel has collected a large series of specimens of different ages and of both sexes. Fifty-four are from Indefatigable, two from Bindloe, and seven from Abingdon. Mr. Darwin does not particularize the islands on which he met with it, but says that it is "not uncommon on the islands." We may therefore assume that it is generally distributed over the group.

Professor Baird, in his 'Review of American Birds,' has given a careful résumé of the differences which may be detected in the various local forms of *D. æstiva.* With the present form he was only acquainted from the figure and description in the 'Voyage of the Beagle,' and says of it that it "appears to resemble *D. petechia* in coloration, but to differ in fewer and lesser stripes beneath, in the grey of the head, and the lightness of the abdomen." The original specimen thus spoken of appears not to have been quite adult; for in the full-plumaged birds of *D. aureola* the differences alluded to entirely vanish, and the general plumage becomes as nearly as possible that of *D. petechia.* The only differences I can detect are:—(1) the general size of *D. aureola* is slightly larger; (2) the second, third, and fourth primaries in most specimens of *D. aureola* are nearly equal, in *D. petechia* the second is generally rather shorter than the two following. But I do not believe that it would be always possible to separate a series of specimens of these two forms if mixed together.

Under these circumstances, regarding the two forms as virtually identical, we have the following singular state of affairs. The bird from the Galapagos is the same as that from Jamaica, whereas on the intervening continent two other (so-called) species occur—namely, *D. æstiva* as a winter migrant, and *D. vieilloti* as a resident—but never, as far as we know, *D. petechia.*

"During my stay in the archipelago I was strongly disposed to believe that the specimens I collected of this bird belonged to at least two, if not three, distinct species. I was led to this belief by the diversity of size, though of small extent, in my specimens; but more notable still were the three distinct styles of colour of their plumage, their different habits, and a difference in their song. I collected both sexes of these supposed species, and found differences, with the sole exception that the females of the yellow species were exactly like those of the spotted kind. The smallest species, with a greyish green plumage and whitish breast, frequented exclusively the lower bushes on the dry land away from the sea-coast, and in its flight would rise just enough to clear the bush it rose from, and alight immediately on the next adjoining. I never saw it in company with the two other species. It does not sing, but merely utters a chirping note. The two other species are of the same size, and differ only in the colour of their plumage. The breast and head of one species is of a uniformly bright yellow colour; the breast of the other is spotted, and it bears on its head a reddish chestnut cap. Both these varieties mingle together and associate in small flocks of five or six birds. I never observed one of the plain variety without seeing some of the spotted kind with it. The first specimen of the yellow variety I secured was in such company; and I considered it to be the female of the spotted one, especially as its cries when wounded were answered by a spotted male which approached me. However, on dissecting the specimen, I found, to my surprise, that it was a male. Both these varieties frequent trees (' palo salado ' of the natives of the mainland) growing on the sea-shore or the lagoons formed by the spring tides, the roots of which are washed by the sea-water at each tide. In their lively movements from branch to branch in search of insects they chant a pleasant tune. The males also sing when flying, as they do rapidly, from shore landward, or *vice versâ*, never remaining long in one locality.

"If all the specimens of these three varieties are but the individuals of one species in different stages of dress, it would show that the plumage of the young is distinct from that of the adult, and that two changes are undergone before maturity is attained. A similar feature is seen in the case of *Geospiza*, to which I allude below.

"On Hood's Island, where we first touched, the gentleman in whose company I visited the Galapagos archipelago and I observed some birds which seemed to us to belong to a species or variety distinct from the present bird. Their yellow plumage was of a less brilliant colour; and they did not possess the characteristic reddish chestnut cap."—*H.*

I have no doubt that there is but one species of this bird, and that the apparent differences noticed by Dr. Habel are to be attributed to different stages of plumage. Those as described above are the young birds in their earliest dress, the adult females (through which stage the maturing males pass), and the adult males.

Genus Progne.

A purely American genus of Hirundinidæ, one (or two members, recognizing Professor Baird's *P. cryptoleuca*) of which belong to North America, the rest being restricted to the Neotropical Region. The species inhabiting Central America and the northern portions of South America is *P. chalybea*, in which the abdomen in both sexes is white, as is the case in the Antillean *P. dominicensis*. The present bird, in its whole-coloured plumage, resembles *P. purpurea* of North America—a species which ranges into Brazil, but keeps always to the east coast of the southern continent.

Progne concolor.

Hirundo concolor, Gould, P. Z. S. 1837, p. 22.
Progne concolor, Baird, Rev. Am. B. p. 278.
Progne modesta, Voy. Beagle, iii. p. 39, t. 5; Prév. et Des Murs, Voy. Vénus, v. p. 182.
Hirundo modesta, Néboux, Rev. Zool. 1840, p. 291; Sundev. P. Z. S. 1871, p. 125.

Nitide purpurascens unicolor, alis et cauda obscurioribus: long. tota 6·6, alæ 5, caudæ rectr. ext. 2·5, rectr. med. 1·9, tarsi 0·5, rostri a rictu 0·75.

Hab. James Island (*Darwin, Sundevall*); Charles Island (*Néboux*).

Dr. Habel did not secure specimens of this Swallow, but appears to have seen it on Indefatigable Island. It has hitherto only been obtained on James Island and Charles Island.

Genus Certhidea.

This genus was placed by Mr. Gould in the family Fringillidæ, and in his opinion represented the extreme form of the group characterized by *Geospiza*. After a close examination Mr. Sclater and I convinced ourselves (Nomencl. Av. Neotr. p. 16) that this somewhat singular form was best placed near the genus *Conirostrum*, and in the Cœrebidæ, the attenuated and sharply pointed bill suggesting forcibly an affinity with that genus and family. From *Conirostrum Certhidea* differs in having much shorter wings and tail; but in the form of the nostril, the scutellation of the tarsi, and in the proportionate length of the toes it agrees closely with that genus.

The genus *Conirostrum* contains six species, all of which are restricted in their range to the Andes, and are found at a considerable elevation from Columbia to Bolivia, never descending into the hot lowlands.

Certhidea olivacea.

Certhidea olivacea, Gould, P. Z. S. 1837, p. 7; Darwin, Zool. Voy. Beagle, iii. p. 106, t. xliv.; Scl. & Salv. P. Z. S. 1870, p. 323.

♂ (Indefatigable Island) supra fusco-olivaceus, alis et cauda paulo obscurioribus, illarum tectricibus fusco-albido marginatis: subtus ochrascescenti-fuscus: abdomine dilutior: rostri maxilla brunnea: mandibula albida: pedibus flavicanti griseis: long. tota 3·85, alæ 2, caudæ 1·5, tarsi ·8.

♀ mari similis, sed paulo ochrascescentius tincta.

Hab. Chatham Island, James Island (*Darwin*); Indefatigable Island (*Habel*).

Dr. Habel gives the measurement of the outstretched wings of this species as 6¾ inches. He adds the following note:—"This species lives exclusively on insects, which it hunts through the thickest bushes in flocks, warbling its not unpleasing notes. It wanders from bush to bush by a short, low flight. The density of the thickets often renders it a difficult bird to secure."—*H.*

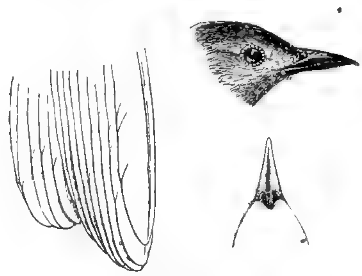
Certhidea fusca.

Certhidea fusca, Scl. & Salv. 1870, p. 324.

Supra fusca, subtus grisescenti-albida: subalaribus et remigum marginibus internis albis: rostro et pedibus nigris: long. tota 3·7, alæ 2·0, caudæ 1·5, rostri a rictu 0·5, tarsi 0·8.

Obs. Præcedenti similis sed rostro graciliore, colore, sicut pedum, nigro et veste magis fusca distinguenda.

Hab. Bindloe and Abingdon Islands (*Habel*).



Certhidea fusca.

"The morning after I landed on Abingdon Island I was pleasantly surprised on hearing a melodious song near the tent which I had never heard before in other islands of the archipelago, and which reminded me of the notes of a Central-American Wren. Hurrying out of the tent to look for the songster, I could hardly believe my eyes when I saw this bird, expecting to find a Wren. Only by repeated observations could I convince myself that it really was the owner of so sweet a voice.

"Its habits only differ from those of the preceding species inasmuch as it is found in smaller flocks. These keep flying from bush to bush, which on the arid volcanic soil of Bindloe and Abingdon Islands grow less densely and are more isolated. *Certhidea fusca* lives entirely on insects."—*H.*

Genus Geospiza.

This genus has been placed by Gray near *Coccothraustes*; but full regard being taken of the strongly angulated tomia of the upper and lower jaw, I think it will be seen that this is not its right position. In the formation of its bill it hardly differs at all from some species of *Guiraca*, such as *G. concreta* and its allies. The legs and feet, however, are much longer and stronger than in any species of *Guiraca*; and the tail, in proportion to the wings, is very short. The general coloration too is quite different. I feel satisfied, however, that, *Geospiza* has its nearest continental ally in *Guiraca*.

The different states of plumage, on which Dr. Habel remarks below, are to be attributed to the different ages of individuals. The younger birds are the lighest-coloured and present the most mottled appearance; as they get older they become darker, until at last in old males the plumage is almost uniform black. The colour of the bill appears to vary irrespective of age, as some black birds have light-coloured bills, though in the majority of birds in this dress it is black. Younger mottled birds have light-coloured bills, but in old females, just as in the males, the bill is usually black.

Dr. Habel has supplied me with the following general remarks on the birds of this genus:—

"The colouring of all the species of this genus exhibits three styles—a black, a brown, and a grey. This is the case both in male and female birds, except that the plumage of the females is of a dirty brownish colour, whereas in the males it is black. It would seem reasonable to divide each species into three varieties, as besides the plumage the colour of the feet, as well as of the beaks, is different in these three varieties. The colour of the feet varies from a light grey to black, and that of the beak from yellow to brownish black.

"Though the food of the *Geospizæ* consists chiefly of seeds of plants and trees, they also feed on insects. During the ebb of the tide these birds, especially the smaller species, visit the bare places, where they pick up different plants and animals of the sea from amongst the stones. The reason for their resorting to such localities for food is perhaps to be found in the scarcity of water more or less experienced by birds on these islands. On the Island of Abingdon, where no pools of water exist, the birds are dependent for water on the morning dew and the water condensed from the steam which issues from the crevices of the volcanic rocks. The feathers of the faces of these birds are often smeared with the gummy substance formed by the juice of the *Opuntia*, which stands to them in the place of water."—*H.*

Geospiza magnirostris.

Geospiza magnirostris, Gould, P. Z. S. 1837, p. 5; Darwin, Zool. Beagle, iii. p. 100, t. xxxvi.

♂ fuliginoso-niger, crisso albo nigro variegato: rostri maxilla nigra: mandibula flavo variegata: long. tota (cir.) 6·0, alæ 3·5, caudæ 2·0, tarsi 1·05, rostri a rictu 0·9.

♂ *juv.* fusco-niger, dorsi, gulæ et pectoris plumis pallide fusco marginatis, abdomine fere fusco unicolori: long. tot. cir. 5·7, alæ 3·3, caudæ 2·0, tarsi 1·0, rostri a rictu 1·85.

♀ fusca, corporis plumis omnibus pallide fusco late marginatis: abdomine fere fusco unicolori: long. tota cir. 5·7, alæ 3·35, caudæ 2·0, tarsi 1·0, rostri a rictu 0·9.

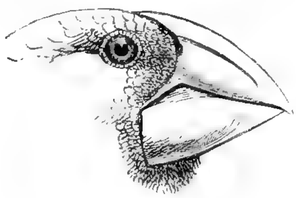
Hab. Charles Island and Chatham Island (*Darwin*).

Mus. Brit.

This species, the largest of the genus, did not come under Dr. Habel's notice. The only specimens I have seen are Mr. Darwin's types, now in the British Museum.

I have little doubt that a large series of the skins of this bird would show that the dimensions of the species graduate into those of *G. strenua.*

The accompanying woodcut shows the outline of the bill of *G. magnirostris.*



Geospiza magnirostris.

GEOSPIZA STRENUA.

Geospiza strenua, Gould, P. Z. S. 1837, p. 5; Darwin, Zool. Voy. Beagle, iii. p. 100, t. xxxvii.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 124.

♂ (Bindloe Island) niger unicolor, crisso albo marginato: rostro nigerrimo: long. tota 5·75, alæ 3·2, caudæ 2·0, tarsi 1·0, rostri a rictu 0·75.

♂ *junior* (Bindloe Island) fuliginoso-niger, dorsi et abdominis plumis fusco marginatis: rostro nigricanti-corneo, flavido variegato: long. tota 5·75, alæ 3·2, caudæ 1·9, tarsi 0·95, rostro a rictu 0·75.

♂ *hornot.* (Bindloe Island), ♀ omnino similis, dorso et pectore forsan paulo obscurioribus: long. tota 6·0, alæ 3·1, caudæ 1·8, tarsi 1·0, rostri a rictu 0·75.

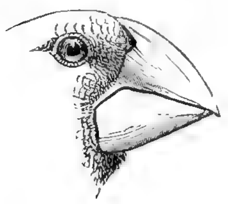
♀ (Bindloe Island) fusca, corporis plumis undique pallide fusco late marginatis: abdomine fere fusco-albido unicolori: long. tota 5·5, alæ 2·9, caudæ 1·9, tarsi 0·95, rostri a rictu 0·8.

Hab. James Island and Chatham Island (*Darwin*); Indefatigable Island, Bindloe Island, and Abingdon Island (*Habel*); James Island (*Sundevall*).

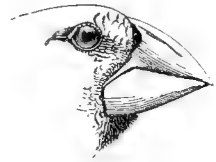
The greatest variation prevails in the coloration of the males of this species. The absolutely black birds, which are doubtless the oldest males, are very few in proportion to the mottled ones, numbering only nine out of sixty-three specimens (male and female) before me. Of these nine three have yellowish marks on their bills. Between the wholly black birds and the youngest males there is every gradation of plumage, until we come to birds that do not differ appreciably from the females.

As regards the variation in size, especially of the bill, I find that no set of dimensions is associated with any particular island, every gradation being observable in the large series from Abingdon Island. Dr. Habel had especially noted two birds as females of black males; and these two present almost the extremes as regards the size of their bills. Both are from Bindloe Island. The following table shows the extent to which this species varies in some of its dimensions. The woodcuts show the largest and smallest bills I have been able to select out of Dr. Habel's series.

The wing varies from	2·9 inches to 3·3 inches,	or 0·4 inch.
The tail varies from	1·8 inch to 2·1 inches,	or 0·3 inch.
The tarsus varies from . . .	0·9 inch to 1·0 inch,	or 0·1 inch.



Geospiza strenua ♂
(Abingdon Island).



Geospiza strenua
(Bindloe Island).

Dr. Habel notes that the colour of the iris is brown or dark brown, the tarsus black or grey, the underpart of the foot light brown or light grey, the bill brown, yellowish brown, or black, the gums straw-colour, and the food chiefly seeds.

"I felt disposed," Dr. Habel writes, "to separate two or three varieties of this species, not only on account of the colour of their plumage, but also because the black individuals keep apart from the others, are livelier in their movements, and quicker in their flight; they wander in small groups all over the island in which they live, uttering their short, not unpleasing song from the branch of a tree. The grey and the brown birds form a large flock, and search for their food in bushes or on the ground; they are slower in their movements, and utter a harsh, croaking note. Nearly all the specimens I obtained were from Bindloe and Abingdon Islands. On Indefatigable one only belonging to this species, and that the only one seen, was secured. It was found by the side of a small lagoon formed in the sand at high water. By filtering through the sand this water had lost its salt, and could be used for cooking. Hither the birds came to slake their thirst."—*H.*

GEOSPIZA DUBIA.

Geospiza dubia, Gould, P. Z. S. 1837, p. 6; Darwin, Zool. Voy. Beagle, iii. p. 103.

Hab. Chatham Island (*Darwin*).

Unrepresented in Dr. Habel's collection.

Mr. Darwin's type specimen has, since the dispersion of this Society's Museum, been lost sight of, as it is not to be found in the British Museum. With Bonaparte (Consp.

i. p. 543), I much doubt the possibility of maintaining *G. dubia* as a distinct species, based as it is on a female specimen whose dimensions are intermediate between *G. strenua* and *G. fortis*, both Chatham-Island species.

GEOSPIZA FORTIS.

Geospiza fortis, Gould, P. Z. S. 1837, p. 5; Darwin, Zool. Voy. Beagle, iii. p. 101, t. xxxviii.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 124.

Species *G. strenuæ* quoad colores omnino similis, magnitudine solum differens.

Hab. Charles Island (*Darwin, Sundevall*); Chatham Island (*Darwin*); Indefatigable Island, Bindloe Island, and Abingdon Island (*Habel*); James Island (*Sundevall*).

I am in much doubt whether to place a single female skin from Indefatigable Island with this species or with *G. strenua*; but as there seems to be a slight gap as regards its bill in the series between it and the specimens of that species where none exists on the side of *G. fortis*, I have placed it with the latter. Its wing measures 2·95 inches, and equals in this respect another specimen from Indefatigable; but in this the bill is a little smaller. In the length of its tail it exceeds by ·05 inch any of the other specimens attributed to *G. fortis*; but in the length of its tarsus several others equal it.

The extent to which individuals of this species vary as regards some of their dimensions is as follows:—

Wing varies from	2·5 inches	to 2·95 inches,	or 0·40 inch.
Tail varies from	1·5 inch	to 1·85 inch,	or 0·35 inch.
Tarsus varies from	0·8 inch	to 0·90 inch,	or 0·10 inch.

The extremes in the size of the bills is shown in the following woodcuts:—

Geospiza fortis ♀
(Indefatigable Island).

Geospiza fortis ♂
(Bindloe Island).

Dr. Habel's collection contains 23 specimens from Indefatigable Island, 16 from Bindloe Island, and 4 from Abingdon Island, the locality of one being unrecorded. The Indefatigable-Island specimens are of rather larger average dimensions than those from either Bindloe Island or Abingdon Island; and the females from Abingdon Island are darker than those from the other two islands.

Of *G. fortis* Dr. Habel writes as follows:—"A bold and destructive species, entering the tent in numbers, where, not content with picking up the rice that lay scattered about, they would make holes in the bag containing it to get at the grains. They paid no regard to the presence of man, and when chased away would instantly return again. Other allied species would also enter the tent in search of food; but *Geospiza fortis* surpassed all in boldness. In the woods they are to be found on the ground picking up the seeds of the 'Palo santo' (*Guayacum sanctum*), and are always to be seen in small flocks. Two females only were obtained in Indefatigable Island, the rest in Bindloe. It is also found on Abingdon Island."—*H.*

GEOSPIZA NEBULOSA.

Geospiza nebulosa, Gould, P. Z. S. 1837, p. 5; Darwin, Zool. Voy. Beagle, iii. p. 101; Sundev. P. Z. S. 1871, p. 125.

Supra fusca, plumarum marginibus pallidioribus, pileo obscuriore; alis et cauda fusco-nigris, fusco-ochraceo marginatis; subtus pallide fuscescens, pectore et hypochondriis fusco maculatis: rostro pallido: pedibus corylinis: long. tota (cir.) 4·7, alæ 2·8, caudæ 2·65, tarsi 0·9.

Hab. Charles Island (*Darwin, Sundevall*); Chatham Island (*Sundevall*).

Mus. Brit.

This species was not represented in Dr. Habel's collection. The British-Museum specimen is apparently a female; and I doubt the possibility of distinguishing it from *G. fortis.* Its dimensions agree with the average of those of that species.

GEOSPIZA FULIGINOSA.

Geospiza fuliginosa, Gould, P. Z. S. 1837, p. 5; Darwin, Zool. Voy. Beagle, iii. p. 101; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 125.

Geospiza fuligineux, Prévost et Des Murs, Voy. Vénus, Ois. p. 208.

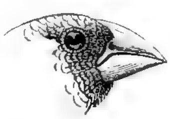
Species quoad colores *G. strenuæ* et *G. forti* omnino similis, sed statura minore differens.

Hab. Chatham Island and James Island (*Darwin, Sundevall*); Indefatigable Island (*Habel*).

As in the previous species, I have taken the measurements of the numerous specimens (33) of *G. fuliginosa* in Dr. Habel's collection with the view of ascertaining to what extent they vary. The following is the tabulated result:—

Wing varies from	2·25 inches	to 2·55 inches,	or 0·30 inch.
Tail varies from	1·40 inch	to 1·65 inch,	or 0·25 inch.
Tarsus varies from . . .	0·70 inch	to 0·85 inch,	or 0·15 inch.

The extent to which the bills vary is shown in the woodcuts:—



Geospiza fuliginosa ♂ (Indefatigable Island).

Geospiza fuliginosa (Indefatigable Island).

It will be noticed that this bird appears to be absent from both Bindloe and Abingdon Islands, the still smaller *G. parvula* being found there. The omission of this term in the series makes *Geospiza fortis* well defined, so far as these two islands are concerned, from *G. parvula*. But then we find *G. strenua*, the next larger in point of size to *G. fortis*; so that no rule can be traced showing that in each island the *Geospizæ* are well defined by the omission of some one or more intermediate species to be sought for in some other island.

Of this bird Dr. Habel says, "The members of this species, like the rest of the members of the genus *Geospiza*, associate in small flocks. Although seeds and other vegetable substances form their chief food, they resort at low tide to the sea-shore in search of sustenance."—*H.*

GEOSPIZA PARVULA.

Geospiza parvula, Gould, P. Z. S. 1837, p. 6; Darwin, Zool. Voy. Beagle, iii. p. 102, t. xxxix.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundevall, P. Z. S. 1871, p. 125.

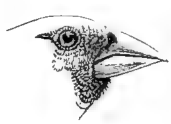
Species quoad colores *G. strenuæ* similis, sed totius generis minima.

Hab. James Island (*Darwin*); Chatham Island (*Sundevall*); Bindloe and Abingdon Islands (*Habel*).

Considerable variation is shown in the size of individuals of this species, as will be seen from the following table:—

Wing varies from	2·15 inches	to 2·40 inches,	or 0·25 inch.
Tail varies from	1·30 inch	to 1·50 inch,	or 0·20 inch.
Tarsus varies from . . .	0·63 inch	to 0·72 inch,	or 0·09 inch.

the variations in the bill being, as in the former cases, shown by the woodcuts:—



Geospiza parvula ♂
(Bindloe Island).

Geospiza parvula ♀
(Bindloe Island).

"In habits this species resembles the foregoing, with which it consorts."—*H.*

GEOSPIZA DENTIROSTRIS.

Geospiza dentirostris, Gould, P. Z. S. 1837, p. 6; Darwin, Zool. Voy. Beagle, iii. p. 102; Scl. & Salv. P. Z. S. 1870, p. 323.

♂ niger, crisso stricte albo marginato: rostro nigro, maxilla dentata: pedibus obscure corylinis: long. tota 4·5, alæ 2·4, caudæ 1·4, tarsi 0·8.

♀ fusco-nigra, subtus pallido fusco variegata: long. tota 4·3, alæ 2·35, caudæ 1·35, tarsi 0·8.

Hab. Galapagos (*Darwin*); Abingdon Island (*Habel*).

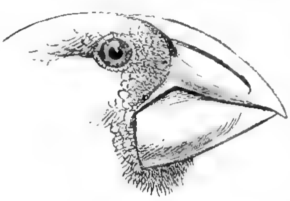
Dr. Habel obtained five specimens of this species in Abingdon Island, of which four are marked males and one female. One only of the males is in the black dress of the adult. In this the crissum is nearly pure black, the feathers being very narrowly edged with white. The bill, as pointed out by Mr. Gould, has a distinct tooth-like prominence in the middle of the cutting-edge of the mandible on either side. The female is darker than is usual in other *Geospizæ*.

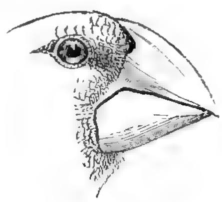
Of *G. dentirostris* Dr. Habel says:—“Usually seen in groups of families, frequenting low bushes in search of fruit, the members uttering a cheerful chirping note. In the morning they visit the bushes growing near the shore; later in the day they retire more inland. I only met with this bird on Abingdon Island, where it predominates over the other species in numbers.”—*H.*

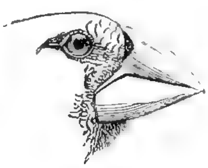
Before passing to the next genus I will recapitulate the measurements of all the above species of *Geospiza*, except *G. nebulosa* and *G. dubia*, of which our knowledge is as yet incomplete, and also *G. dentirostris*, which seems to have distinct characters of its own.

	G. magnirostris.	*G. strenua.*	*G. fortis.*	*G. fuliginosa.*	*G. parvula.*
	inches.	inches.	inches.	inches.	inches.
Wing . . .	3·5	3·3–2·9	2·95–2·5	2·55–2·25	2·40–2·15
Tail . . .	2·0	2·1–1·8	1·85–1·5	1·65–1·4	1·50–1·3
Tarsus . .	1·05	1·0–0·9	0·90–0·8	0·85–0·7	0·72–0·63

Of all except *G. magnirostris* the largest and smallest measurements are given. From this table it will be at once seen that the gradations from the largest to the smallest species are quite complete, and that the only grounds for separating them at all rests upon the dimensions of the bill, where the steps are not quite so gradual. But the dimensions of the bills furnish but slender specific characters, as will be seen by the accompanying cut.

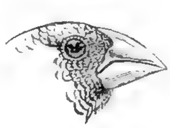

G. magnirostris.


G. strenua.

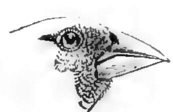

G. strenua.

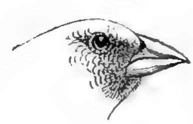

G. fortis.


G. fortis.


G. fuliginosa.


G. fuliginosa.


G. parvula.


G. parvula.

The important and indisputable fact remains that whether we treat *Geospiza* as including one highly variable species, or as comprising several in themselves variable species, we have in these islands an instance of instability as regards size not often met with in the class Aves. In some members, however, of the genus *Oryzoborus*, allied to *Guiraca*, considerable variation is to be found in size, especially of the bill; I refer to *O. crassirostris*, which has been divided into four or more so-called species, and to *O. torridus*, which has not, so far as I am aware, been divided at all.

Genus Cactornis.

In 1843 Mr. Gould described a bird from Bow or Harp Island, one of the Low archipelago, which he placed in the genus *Cactornis*, under the name *C. inornatus*. The specimen, which was obtained by Mr. Hinds, and subsequently figured in the 'Zoology of the Voyage of the Sulphur,' at the time it was described formed part of the collection of this Society, and afterwards passed into the British Museum. The type appears to be a specimen of an immature bird, but it belongs to a genus distinct from *Cactornis*, the tail being longer and somewhat forked, the bill more slender and curved, and the mandible slightly projecting, and shows some affinity to *Hemignathus*. G. R. Gray referred this bird to the Sandwich-Islands genus *Loxops*, calling it in his 'Hand-list' (i. p. 114) *Loxops inornata*; but it does not appear to be strictly congeneric with that bird, the nostrils being exposed and not covered with densely set feathers. The single specimen upon which Mr. Gould founded his *Cactornis inornata* is not sufficiently mature for me to pronounce decidedly upon its position, but it appears to belong to a distinct genus. Anyhow I feel justified in removing the bird from the genus *Cactornis*, where Mr. Gould placed it.

Omitting then *C. inornata* from *Cactornis*, this genus remains peculiar to the Galapagos Islands. Its relationship to *Geospiza* is evident, the chief difference being the great elongation of the bill compared with the stout bill of the latter genus.

Cactornis scandens.

Cactornis scandens, Gould, P. Z. S. 1837, p. 7; Darwin, Zool. Voy. Beagle, iii. p. 104, t. xlii.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 124.
Tisserin des Gallapagoes, Néboux, Rev. Zool. 1840, p. 291.
Cactornis grimpeur, Prévost et Des Murs, Voy. Vénus, Ois. p. 204.

♂ nigerrimus, crissi plumis albo marginatis: rostro nigro flavo variegato, pedibus corylino-nigris: long. tota 5·75, alæ 2·85, caudæ 1·75, tarsi 0·9, rostri a rictu 0·7.

♂ *juv.* fuliginoso-niger, pileo obscuriore; gula et pectoris plumis fusco marginatis; ventre imo et crisso sordide fuscis.

♀ fusca, pileo obscuriore; ventre imo et crisso multo pallidioribus: dorsi, gulæ et pectoris plumis pallido fusco marginatis: long. tota 5·25, alæ 2·7, caudæ 1·6, tarsi 0·83, rostri a rictu 0·65.

Hab. James Island (*Darwin, Sundevall*); Charles Island (*Néboux, Sundevall*); Indefatigable Island (*Habel*).

"I found seeds in the stomachs of almost all of the specimens of *Cactornis* obtained on Indefatigable, whilst fibres of *Opuntia* were found in those from Bindloe. The reason of this doubtless is to be found in the fact that in the former island are many ponds of brackish water, where all the birds resort to drink. No such ponds exist on Bindloe or Abingdon, still less springs of water. Consequently the birds are entirely restricted for water to the morning dew and the drops produced by steam which, issuing out of the crevices of the rocks, becomes condensed on the foliage of the surrounding herbage. On Bindloe and Abingdon these birds resort more to the juice of the succulent leaves and fruit of the different species of *Opuntia*. Thus feeding, the feathers of the face of these birds become matted together. Their food also includes some gravel and insects."—*H.*

CACTORNIS ASSIMILIS.

Cactornis assimilis, Gould, P. Z. S. 1837, p. 7; Darwin, Zool. Voy. Beagle, iii. p. 105; Scl. & Salv. P. Z. S. 1870, p. 323.

♂ *hornot.* fuliginosus, plumis singulis pallidiore fusco marginatis: subtus, præcipue in ventre imo et crisso, plumarum marginibus latioribus: rostro flavescenti-corneo, pedibus corylinis: long. tota 5·0, alæ 2·7, caudæ 1·65, tarsi 0·8, rostri a rictu 0·75.

♀ et ♂ juv. omnino similes sunt.

Hab. Galapagos (*Darwin*); Bindloe Island (*Habel*).

Obs. Sp. *C. scandenti* similis sed rostro robustiore forsan differt.

None of Dr. Habel's birds are adult; so that we have not yet seen that state of this species, which differs only slightly from *C. scandens*, and may ultimately prove to be not really distinct. Dr. Habel's note on it is as follows:—"All my specimens of this species were shot whilst feeding on the cactus plants. From the agglutinated state of the feathers of the face, which is more commonly seen in this than in other birds, it would appear that it feeds almost exclusively on the cactus. One of the females had very few feathers on the head and neck, and those badly trimmed in consequence of her rubbing and scratching her head. This I found to be occasioned by the presence of parasitic worms situated under the external covering of the skull."—*H.*

CACTORNIS ABINGDONI.

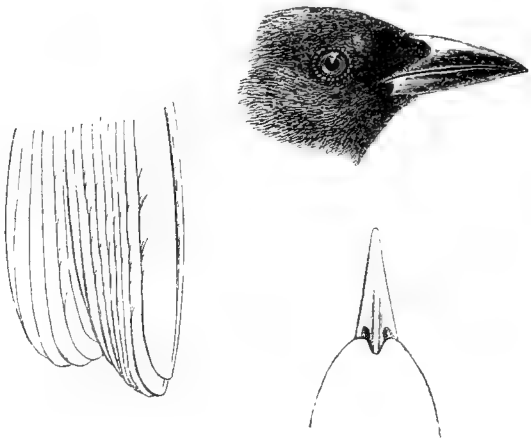
Cactornis abingdoni, Salv. P. Z. S. 1870, p. 326.

Fuscescenti-nigra, alis caudaque nigris fusco anguste limbatis: subtus nigra, ventre fuscescentiore et griseo variegato: tectricibus subalaribus nigricantibus: rostro elongato incurvo nigro: pedibus obscure fuscis: long. tota 5·0, alæ 2·8, caudæ 1·6, rostri a rictu 0·8, tarsi 0·9.

Hab. Abingdon Island (*Habel*).

Obs. Proxima *C. scandenti*, sed rostro elongato, magis compresso, nigro differt.

The narowness and the black colour of the bill seem to distinguish this bird from the commoner *G. scandens.* Neither of Dr. Habel's specimens is quite adult, when doubtless the plumage is of the same black colour as that of its congeners. Dr. Habel notes that he found vegetable substances in the stomachs of these birds, and that the

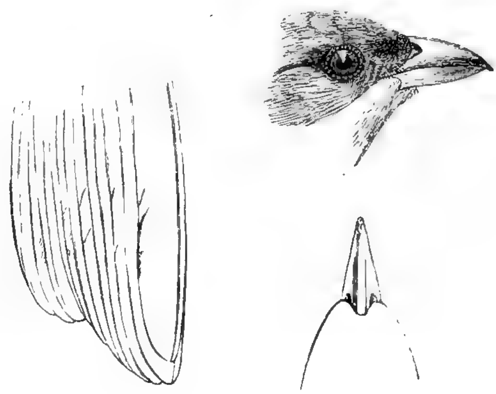


Cactornis abingdoni.

feathers of the head were sticky from the juice of the cactus they eat. He adds:—"*C. abingdoni* I found only on Abingdon. Its habits are quite similar to those of the other species of the genus."—*H.*

CACTORNIS PALLIDA.

Cactornis pallida, Scl. & Salv. P. Z. S. 1870, p. 327.



Cactornis pallida.

Supra olivaceo-fusca, alis caudaque obscure fuscis, dorsi colore anguste limbatis: subtus pallide ochracea: tectricibus subalaribus et remigum marginibus internis albis:

rostro pallide corneo, pedibus nigris: long. tota 4·7, alæ 2·7, caudæ 1·7, rostri a rictu 0·65, tarsi 0·9. *Fem.* mari similis.

Hab. Indefatigable Island (*Habel*).

Obs. Colore ab omnibus distincta, sed forsan avis haud adulta. Attamen mas et femina, specimina sola quæ nobis adsunt, vestitu omnino congruunt.

"Found with the various species of *Geospiza*, and with them frequenting the sea-shore at low water. In the stomachs of the specimens collected I found insects, besides vegetable substances."—*H.*

Genus Camarhynchus.

This genus, though stated by Mr. Gould to belong to the same group of Finches as *Geospiza*, differs considerably from that genus. It has, however, the same characteristically short tail and robust tarsi and feet; the coloration, too, is somewhat similar, except that instead of being in the adult male entirely black, the head and neck alone are black, the upper surface of the body being variegated and the under white or mottled. The chief point of difference between *Camarhynchus* and *Geospiza* lies in the form of the bill. The lower edge of the maxilla in *Camarhynchus* is not nearly so strongly angulated, but in some species is nearly straight and in others continuously curved. The bill, too, of the former is more compressed, being less tumid in the portion immediately anterior to the nostrils.

As regards its bill *Camarhynchus* has perhaps its nearest ally in *Neorhynchus*, a genus represented by one species, *N. nasesus*, which is found on the west coast of Peru. But *Neorhynchus* has a still more robust bill, and the edges of the mandible strongly arched; the tail, too, is of a length usual in *Spermophila*, and the feet of normal strength; in coloration *Neorhynchus* is decidedly Spermophiline.

Camarhynchus psittaculus.

Camarhynchus psittaculus, Gould, P. Z. S. 1837, p. 6; Darwin, Zool. Voy. Beagle. iii. p. 103, t. xl.

♀ (Indefatigable Island) fusca, uropygio paulo dilutiore, alis et cauda obscurioribus, plumarum marginibus dorso concoloribus: subtus pallide ochrascenti-fusca: rostro flavido, pedibus nigricantibus: long. tota 4·5, alæ 2·6, caudæ 1·6, tarsi 0·85, rostri a rictu 0·5.

Hab. James Island (*Darwin*); Indefatigable Island (*Habel*).

Obs. Of two specimens in the British Museum one appears to be a young male, being darker than the other on the upper plumage. Long. tota 4·6, alæ 2·75, caudæ 1·6, tarsi 0·9, rostri a rictu 5·5.

The other specimen is paler above, and is probably a female.

Dr. Habel only obtained a single specimen of this species, of which he remarks:—"The habits of this species resemble those of the *Geospizæ*."—*H.*

CAMARHYNCHUS CRASSIROSTRIS.

Camarhynchus crassirostris, Gould, P. Z. S. 1837, p. 6; Darwin, Zool. Voy. Beagle, iii. p. 103, t. xli.

Supra cinereus: capite fuliginoso-nigro: subtus albidus, gula et pectore superiore plumis singulis medialiter nigris; tectricibus alarum et rectricum apicibus fusco albido marginatis: long tota 5·2, alæ 3·0, caudæ 1·9, tarsi 0·85, rostri a rictu 0·5.

Hab. Charles Island (?) (*Darwin*).

The type specimen in the British Museum, from which the above description is taken, is probably an adult male.

CAMARHYNCHUS VARIEGATUS. (Plate LXXXV.)

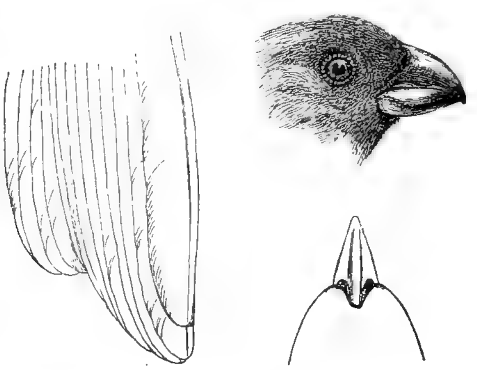
Camarhynchus variegatus, Scl. & Salv. P. Z. S. 1870, p. 324.

Supra sordide olivaceus fusco variegatus, alis caudaque nigricantibus, remigibus extus anguste fusco marginatis, capite toto undique et corpore subtus ad medium pectus nigris: ventre sordide ochraceo in summa parte nigro variegato: rostro et pedibus nigris: long. tota 5·5, alæ 3·3, caudæ 2·1, rostri a rictu 0·55, tarsi 1·1.

♀ supra fusca; subtus sordide ochracea, a mento usque ad ventrem nigricante frequenter variegata: rostro pallide corylino, pedibus nigris.

Hab. Bindloe and Abingdon Islands (*Habel*).

Obs. major quam *C. psittaculus* et capite nigro insignis, sed rostro, quoad formam, fere simili. Remiges secundus tertius et quartus fere æquales et longissimi.



Camarhynchus variegatus.

" In habits this bird resembles the members of the genus *Geospiza.* It utters a song which, however, is not so harmonious as that of the species next mentioned, with which it bears some affinity. *C. habeli* I met with singly, but this species in families of several individuals, gaily chirping, and eagerly selecting the swelling fruits of the Euphorbia bushes."—*H.*

Camarhynchus prosthemelas.

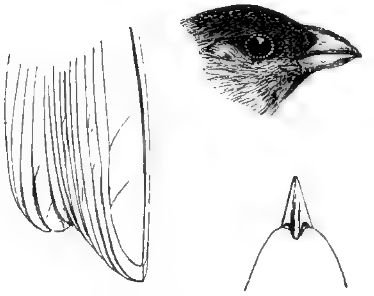
Camarhynchus prosthemelas, Scl. & Salv. P. Z. S. 1870, p. 325; Sundev. P. Z. S. 1871, p. 125.

Supra niger, dorso olivaceo tincto: alis extus et cauda fuscis colore pallidiore limbatis: subtus niger, ventre toto pallide olivaceo: rostro rubello, pedibus fuscis.

♀ supra olivaceo-fusca, alis caudaque saturate fuscis, illarum marginibus dilute fuscis: subtus ochraceo-albida: long. tota 3·7, alæ 2·4, caudæ 1·5, rostri a rictu 0·4, tarsi 0·8.

Hab. Indefatigable Island (*Habel*); Chatham, Charles, and James Islands (*Sundevall*).

The smallest of the species of *Camarhynchus.* Our description of the male was taken from a specimen in the British Museum, brought by Mr. Darwin, but never described.



Camarhynchus prosthemelas.

"Associates with *Geospiza* in visiting the rocks uncovered at low water. The stomachs of some specimens contained insects. This species and *C. psittaculus* I only found on Indefatigable Island, whilst *C. variegatus* and *C. habeli* inhabit Bindloe and Abingdon."—*H.*

Camarhynchus habeli. (Plate LXXXVI.)

Camarhynchus habeli, Scl. & Salv. P. Z. S. 1870, p. 325.

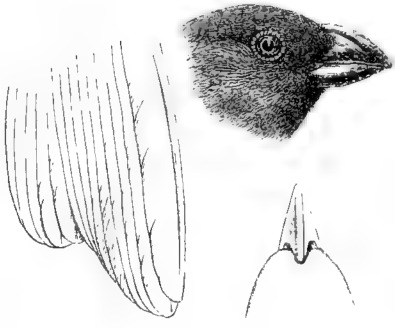
Supra olivaceo-griseus: alis caudaque fuscis griseo marginatis: capite undique cum pectore toto nigris: ventre lactescenti-albo, subalaribus et remigum marginibus internis albis: rostro valde compresso, culmine utrinque sulcato, colore sicut pedum nigro: long. tota 5·6, alæ 2·8, caudæ 1·8, rostri a rictu 0·5, tarsi 0·9.

♀ grisea, subtus albida, capite nigro omnino carens.

Hab. Bindloe and Abingdon Islands (*Habel*).

Obs. Præcedenti similis, sed minor et rostro magis compresso et maculis abdominis nullis.

"A melodious song, strange to my ear, led me to look for a new bird, as this one proved to be. I never saw it associating in flocks like the *Geospizæ*, but always solitary individuals. From this fact I infer that it is not very numerous, which it certainly is not on Bindloe, where I was unable to secure a female. It is more numerous on Abingdon, the only other island on which it is found except Albemarle. It not only



Camarhynchus habeli.

picks the Opuntia bushes to get at the juice, which serves it for water, but it also swallows the pulp as food. Its song is harmonious, and the bird one of the best songsters of these islands."—*H.*

[CAMARHYNCHUS CINEREUS.

Guiraca cinerea, Lafr. Mag. de Zool. 1843, pl. 30.
Camarhynchus cinereus, Bp. Consp. i. p. 542.
Guiraca cendré, Prév. et Des Murs, Voy. Vénus, Ois. p. 209.

Hab. Galapagos (*Léchlancher*).

I have not seen this species, and am unable to recognize it in Dr. Habel's collection. Judging from the figure (a bad one), the bird would appear to be quite distinct from any other of the known Galapagan birds. Lafresnaye considered it to belong to a distinct subgenus, which he called *Piezorhina*[1].]

Genus DOLICHONYX.

A widely ranging North-American genus of the family Icteridæ, migrating in winter to the northern portions of South America. *D. oryzivorus* is the only land-bird found in the Galapagos specifically identical with that found on the mainland.

DOLICHONYX ORYZIVORUS.

Emberiza oryzivora, Linn. Syst. Nat. i. p. 311.
Dolichonyx oryzivora, Sw. Zool. Journ. iii. p. 351; Darwin, Voy. Beagle, iii. p. 106.

Hab. James Island (*Darwin*).

[1] In his 'Conspectus Avium' (i. p. 479) Prince Bonaparte described a Fringilline bird from the Galapagos as *Zonotrichia galapagoensis.* From an examination of this type in the Paris Museum it appears to me to be only a specimen of the Californian *Z. coronata,* to which a wrong locality has been assigned.

Genus Pyrocephalus.

This genus is of purely Neotropical range, its most northern range extending in *P. mexicanus* to Mexico. In *P. rubineus* it is found in imperfectly segregated races all over the greater part of the southern continent, including the shores of Ecuador opposite the Galapagos Islands. *P. nanus* is closely allied to the other species of the genus, and strictly congeneric with them.

Pyrocephalus nanus.

Pyrocephalus nanus, Gould, Zool. Voy. Beagle, iii. p. 45, t. vii.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 125.

Pyrocephalus dubius, Gould, Zool. Voy. Beagle, iii. p. 46.

♂ (Indefatigable Island) fusco-niger: pileo toto et corpore subtus coccineis: tectricibus subalaribus rosaceis: rostro et pedibus nigris: long. tota 4·25, alæ 2·5, caudæ 2·5, tarsi 0·7, rostri a rictu 0·7.

♀ (Indefatigable Island) fusca, alis caudaque paulo obscurioribus: loris et corpore subtus albis, abdomine luteo induto: rostro et pedibus nigris: long. tota 4·5, alæ 2·5, caudæ 2·1, tarsi 0·75, rostri a rictu 0·7.

♂ *juv.* feminæ omnino similis, sed pectore striis fuscis indistincte notato.

Hab. "Several islands of the Galapagos" (*Darwin*); Indefatigable and Bindloe Islands (*Habel*); Indefatigable and James Islands (*Sundevall*).

Having examined the types of *P. dubius* in the British Museum, I believe them to be young males of *P. nanus*. This may account for their different appearance in life from *P. nanus*, to which Mr. Darwin alludes. It also accounts for the slightly smaller dimensions compared with the adults to which I believe them to belong.

"Nearly related to a common and favourite species of the mainland of Ecuador, which is known by the name of 'Chocoterin.' The female is tamer than the male, and frequents shady spots under the trees. The male seeks a solitary bush, from which he darts upon his prey. The plumage of the young male resembles that of the female. This species was found on all the islands visited."—*H.*

Genus Myiarchus.

This, too, is a member of a Neogean family, the species of which are distributed over the greater part of the two continents, as well as the West Indies. Its nearest allies are perhaps the island races of the Antilles rather than those of the continent; and in this respect the affinities of *Dendrœca aureola* are, to some extent, repeated; but in the present case the specific differences of *M. magnirostris* are well defined.

MYIARCHUS MAGNIROSTRIS.

Tyrannula magnirostris, Gould, MS.
Myiobius magnirostris, G. R. Gray, Zool. Voy. Beagle, iii. p. 48, tab. viii.
Myiarchus magnirostris, Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, pp. 125, 127.

♂ (Indefatigable Island) supra fuscescens, capite paulo obscuriore ac rufescentiore, uropygio dilutiore: alis interne fuscis, remigibus rufescente marginatis, tectricibus pallido fusco limbatis: cauda fusca, rectricibus internis in pogonio interno rufescentibus, extimis fusco albidis: subtus, gula cinerea, abdomine pallide flavo, pectore paulo grisescentiore: rostro et pedibus nigris: long. tota 5·25, alæ 2·65, caudæ 2·45, tarsi 0·9, rostri a rictu 0·75.

♀ mari omnino similis.

Hab. Chatham Island (*Darwin*, *Sundevall*); James Island (*Sundevall*); Indefatigable, Bindloe, and Abingdon Islands (*Habel*).

"This Tyrant-bird was found on all the islands visited. It utters a feeble cry like that of the preceding species. It brings its mandibles together with an audible snap as they close upon its insect prey."—*H.*

Genus ASIO.

Asio galapagensis is barely separable from the widely spread *A. brachyotus*, which extends not only over the greater part of the Old World, except Australia, but also is found in North America and as far south as the Falkland Islands. *Asio* is also an inhabitant of the Sandwich Islands.

ASIO GALAPAGENSIS.

Brachyotus galapagoensis, Gould, P. Z. S. 1837, p. 10.
Otus galapagoensis, Darwin, Zool. Voy. Beagle, iii. p. 32, t. iii.; Scl. & Salv. P. Z. S. 1870, p. 323.
Asio galapagoensis, Strickl. Orn. Syn. p. 211.

Asioni brachyoto similis, sed minor, coloribus obscurioribus, hypochondriorum fasciis transversis fuscis et tarsis plumatis striis longitudinalibus ornatis distinguendus: long. tota 14, alæ 11·25, caudæ 5·6, tarsi 2·1. (♂.)

Hab. James Island (*Darwin*); Indefatigable Island (*Habel*).

Dr. Habel's six specimens of this Owl agree closely with one another, and with the plate in the 'Zoology of the Voyage of the Beagle.' They confirm the differences pointed out by Mr. Darwin between it and the well-known Short-eared Owl, to which I have alluded above. This being the case, I think the species must stand under a distinct title, though these differences are but slight.

Of this bird Dr. Habel writes:—"A common species on Indefatigable, but not observed by me either on Bindloe or Abingdon. I saw it on Hood's Island. Specimens were covered with lice, which ran over my hands and arms as I took off the skins. Under the skin, near the throat, of a male I found twenty-six parasitic worms."—*H.*

Genus Strix.

The most recent views unite the Barn-Owl of America with the European *Strix flammea*, which ranges, under various names, over the whole of Asia and Australia. *Strix punctatissima* is a distinct and peculiar species, well differentiated from the widely ranging bird.

Strix punctatissima.

Strix punctatissima, G. R. Gray, Zool. Voy. Beagle, iii. p. 34, tab. iv.; Scl. & Salv. P. Z. S. 1870, p. 323.

♂ (Indefatigable Island) supra griseo-nigricans, albo minutissime irroratus: plumis singulis (remigibus et rectricibus inclusis) macula subapicali nigra, apicibus ipsis albis nigro circumdatis: subtus ochrascenti-albus, nigro vermiculatus, plumis singulis macula subapicali nigra, deinde macula subrotundata alba terminatis: disco faciali extus rufo, gulam versus multo obscuriore, intus nigro irrorato; facie rosaceo-alba: loris et oculorum ambitu fuscis: alis et cauda ochraceo-fulvis fusco vermiculatis, illis fasciis latis fuscis transfasciatis: hac fasciis quatuor transversis angustis fuscis notata: tarsorum dimidio antico plumato, dimidio postico et digitis plumis sparsis capilliformibus vestitis: long. tota 12·0, alæ 9·0, caudæ 4·1, tarsi 2·4.

Hab. James Island (*Darwin*); Indefatigable Island and Abingdon Island (*Habel*).

Strix punctatissima is, I believe, restricted in its range to the Galapagos, though its presence elsewhere has been asserted more than once. In Strickland's 'Ornithological Synonyms' (p. 182) it is stated to be found at Para; but having recently examined Strickland's bird I find it identical with the Australian *S. castanops*, an erroneous locality having been doubtless attached to the specimen. Professor Orton, in his notes on some birds in the Museum of Vassar College (Am. Nat. iv. p. 711), says that *S. punctatissima* is rather abundant in the valley of Quito. I omitted to examine his specimens when visiting Vassar College last year (1874), but am inclined to believe that they should rather be referred to the ordinary South-American form of *S. flammea.*

Dr. Habel says:—"I only obtained two specimens of this Owl, both on Indefatigable, and did not observe it on either Bindloe or Abingdon or the other islands touched at. From this I gather that it is not an abundant species, unless its habit of not stirring until nightfall is the reason I did not observe it oftener. *Asio galapagensis* came near our tent soon after sundown. The food of *Strix punctatissima* appears to consist chiefly of insects, as I found the remains of grasshoppers in their stomachs."—*H.*

Genus Buteo.

Most recent authorities place the large accipitrine bird of the Galapagos in the genus *Buteo*, though Mr. Gould instituted a genus *Craxirex*[1] to receive it. Under this name a wide-ranging species of the American continent, *C unicinctus*, has been classed. In

[1] Changed by Sundevall to *Dromolestes*, Œfvers. af K. Vet. Ak. Förh. 1874, p. 27.

certain respects, especially in the relationship as to colour between young and old, *B. galapagensis* has some affinity to this bird; but structurally *B. galapagensis* is a *Buteo*, and its divergence from the ordinary typical form is too slight to warrant generic separation.

BUTEO GALAPAGENSIS.

Polyborus galapagoensis, Gould, P. Z. S. 1837, p. 9.

Craxirex galapagoensis, Gould; Darwin, Zool. Voy. Beagle, iii. p. 23, t. ii.; Scl. & Salv. P. Z. S. 1870, p. 323.

Buteo galapagensis, Sundev. P. Z. S. 1871, p. 125; Scl. & Salv. Nomencl. p. 119; Sharpe, Cat. Acc. p. 170.

Buteo leucops, G. R. Gray, Hand-list, i. p. 36 (descr. nulla).

♂ *ad.* (Abingdon Island) fuliginosus unicolor: remigum pogoniis internis grisescenti-albidis fusco variegatis, fascias irregulares formantibus: cauda fuliginoso-nigra, rectricibus mediis griseo, externis, præcipue in pogonio interno, albido transfasciatis: tectricibus caudæ superioribus griseo et fusco transfasciatis: inferioribus rufescente tinctis: iride obscure fulva, pedibus flavis: long. tota 20·0, alæ 16·0, caudæ 8, tarsi 2·9, rostri a rictu 1·7. ♀ mari similis sed major: long. tota 22·0, alæ 17·0, caudæ 9·0, tarsi 3·1.

Jun. supra fuliginosus, fulvo variegatus, dorsi plumis ad basin albis medialiter fusco transfasciatis, capitis et colli plumis ad basin albis, medialiter fulvis, fuliginoso terminatis: subtus fulvus, fusco præcipue in pectore variegatus, ventre et tibiis rufescente magis lavatis: alis et cauda sicut in ave adulta.

Hab. Galapagos Islands (*Darwin*); Indefatigable and Abingdon Islands (*Habel*).

Dr. Habel gives the following remarks respecting this species, which he observed in all the islands which he visited.

"Having obtained both male and female birds in the ochre-coloured plumage with dark spots, and also birds of both sexes in plumage of a uniform dusky colour, I imagined that they belonged to two distinct species. I was still more confirmed in my impression by the different habits observable in the two. The lighter-coloured birds are very numerous and form large flocks. The birds are so tame that they cannot be frightened away. If you throw a stone at one it avoids it by bending its head or lifting up a leg. If hit, it flies but a short way and alights again. They are so tame that one can hit them with a stick, and even catch them with the hand. When flying they only rise high enough to clear the tops of the bushes and trees. The dark-coloured birds are rare, and keep separate from the lighter variety, and far from human intruders.

"I examined the stomachs of all the specimens obtained: some I found empty; and others contained insects, mostly grasshoppers. In the œsophagus of a male of the dark variety I found a large *Scolopendra*, of a species common in the islands. It would appear therefore that this bird lives chiefly on insects."—*H.*

Genus PELECANUS.

Pelicans are found in all tropical seas; and *P. fuscus*, the species of the Galapagos, is common along the western shores of Central America. A second species (*P. molinæ*) occurs further to the southward; but its presence in these islands has not yet been noticed.

PELECANUS FUSCUS.

Pelecanus fuscus, Gm. Syst. Nat. i. p. 570; Sundev. P. Z. S. 1871, p. 125.

Hab. Galapagos (*Sundevall*).

Genus SULA.

Gannets are also abundant on the coasts of America, both species found in the islands lying off the shores of Central America. On the Peruvian coast a third species (*S. variegata*) is found; but its range seems to be much more restricted than that of either of the following birds.

SULA LEUCOGASTRA.

Petit Fou, Buff. Pl. Enl. 973.
Pelecanus leucogaster, Bodd. Tabl. Pl. Enl. p. 57.
Dysporus leucogaster, Sundev. P. Z. S. 1871, p. 125.
"*Sula fiber*, Linn." Scl. & Salv. Nomencl. p. 124.

Hab. Galapagos (*Sundevall*).

In our 'Nomenclator' Mr. Sclater and I adopted Linnæus's name *fiber* for this species; but on reconsidering the question I think it very doubtful whether this name is really applicable to it; as Sundevall suggests (Ann. & Mag. N. H. xix. p. 237, 1847), it more probably belongs to the immature of *S. piscator*. Boddaert's name, *leucogaster*, founded on Buffon's Plate 973, seems to be the first certainly bestowed upon the brown-and-white *Sula* of tropical seas. I therefore follow Sundevall in adopting it.

SULA CYANOPS.

Dysporus cyanops, Sundev. Phys. Tidskr. Lund, 1837, pt. 5; Ann. & Mag. N. H. 1847, xix. p. 236; et P. Z. S. 1871, p. 125.

Hab. Galapagos (*Sundevall*).

Accidentally omitted from our 'Nomenclator Avium Neotropicalium.' This species was noticed off the island of Socorro by Grayson. (*Cf.* Lawr. Proc. Bost. Soc. N. H. xiv. p. 302.)

Genus FREGATA.

Abundant along the western shores of America within the tropics. *Fregata aquila* swarms in the Bay of Panama, and breeds in vast numbers on Pajaros Island, in the Gulf of Fonseca.

FREGATA AQUILA.

Pelecanus aquilus, Linn. Syst. Nat. i. p. 216.
Fregetta aquila, Darwin, Zool. Voy. Beagle, iii. p. 146.
Tachypetes aquilus, Sundev. P. Z. S. 1871, p. 125.

Hab. Galapagos (*Darwin, Sundevall*).

Dr. Habel observed this bird breeding on Tower Island, but he did not secure any specimens.

Genus PHAETON.

Universally distributed throughout the tropics.

PHAETON ÆTHEREUS.

Phaeton æthereus, Linn. Syst. Nat. i. p. 219.

Hab. Tower Island (*Habel*).

Genus ARDEA.

A genus universally distributed. The species found in the Galapagos is the North- and Central-American bird, not the *Ardea cocoi* of the southern continent.

ARDEA HERODIAS.

Ardea herodias, Linn., Baird, B. N. Am. p. 668; Darwin, Voy. Beagle, iii. p. 128; Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Galapagos (*Darwin*); Indefatigable Island (*Habel*).

"This Heron is the largest bird I collected on the islands, though I saw flying high in the air larger birds with white and cream-coloured bodies and pink wings. They were called Flamingoes by our men[1]. I always saw solitary birds of the Heron visiting the ebb tide, the exposed reefs, and the rocky shore, seeking small fish left in the rocky pools. At high tide it will pathetically, with bent head, wade the swamps in pursuit of fish. When flying it utters a hoarse cry. It is somewhat shy, perhaps from being hunted by the visitors from the mainland, to whom it is known as the 'Garza real,' and by whom it is esteemed good to eat."—*H.*

Genus BUTORIDES.

A widely ranging genus, represented by different species in North and South America. The Galapagos bird more closely resembles *B. javanicus*, a species widely ranging over Australia and the Indian and Australian Islands.

BUTORIDES PLUMBEUS.

Ardea plumbea, Sundev. P. Z. S. 1871, pp. 125, 127.
Butorides javanicus, Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Indefatigable Island (*Habel*); James Island (*Sundevall*).

[1] Doubtless *Phœnicopterus ruber.*

"This Heron cowers motionless and solitary in the daytime in dark shady places, either on cliffs or amongst the mangrove roots on the sea-shore, or else in a decaying tree in a swamp. The neck and head being drawn in, the bird does not look half its real size. At night time its movements are livelier. It utters a kind of shrieking call. It is so tame that it may be caught by the hand or struck with a short stick. It is considered good eating by the inhabitants of the mainland, by whom it is called 'Quague.' It feeds on crabs and other crustaceans."—*H.*

Genus Nycticorax.

A genus of wide range, occurring in both continents of America, as well as in the Old World. The species found in the islands is most nearly related to the North-American *N. violaceus.*

Nycticorax pauper.

Nycticorax violaceus, Darwin, Zool. Voy. Beagle, iii. p. 128 (nec Linn.).
Ardea violacea, L. (var.), Sundev. P. Z. S. 1871, pp. 125, 127.
Nycticorax pauper, Scl. & Salv. P. Z. S. 1870, pp. 323, 327.

Similis *N. violaceo,* sed omnino minor, et præcipue in dorso multo obscurior: dorsi plumis elongatis, non, sicut in *N. violaceo,* griseo marginatis, sed saturate cinereo-nigris unicoloribus: long. tot. 16, alæ 2·2, caudæ 4, rostri a rictu 3·2, tarsi 3·3.

Obs. Hujus *Nycticoracis* specimina duo tantum, quorum neutrum adultum, habemus, sed ad speciem Americæ meridionalis vulgarem vix referenda esse censemus.

Hab. Galapagos (*Darwin, Sundevall*); Indefatigable Island (*Habel*).

"The two birds included under this name in my collection did not seem to me to belong to the same species. There is, however, little discrepancy in their colour, and none in their dimensions. It feeds on crabs. Both my specimens were obtained on Indefatigable Island; but I also saw it on Bindloe."—*H.*

Genus Phœnicopterus.

Flamingoes occur both in the Old and the New World. Three species, including the following, are found in America.

Phœnicopterus ruber.

Phœnicopterus ruber, Linn. Syst. Nat. i. p. 230.
Phœnicopterus glyphorhynchus, Gray, Ibis, 1869, p. 442, pl. xiv. f. 5.

Having examined the type specimen of the species described by Mr. Gray as *P. glyphorhynchus,* and also a specimen living in the Zoological Gardens, which appears to be undoubtedly *P. ruber* of N. America, as well as a mounted specimen in the British Museum doubtless belonging to the same species, I am unable to see any grounds for separating the Galapagos bird from *P. ruber,* though Gray places them in different subgenera! I may add that Gray did not recognize the British-Museum specimen as

P. ruber when compiling his paper, and that, so far as I can see, the plates accompanying his paper are of little assistance in differentiating the species.

Genus Querquedula.

The group of Teals to which the following species belongs is peculiar to South America. If Professor Sundevall's determination of its specific name is correct, the bird is the same as a common Chilian and Patagonian Teal.

Querquedula versicolor.

Anas versicolor, Vieill. N. Dict. d'Hist. Nat. v. p. 109 (1816).
Anas maculirostris, Licht. Sundev. P. Z. S. 1871, p. 126.

Hab. Galapagos (*Sundevall*).

Genus Dafila.

A genus of wide range. The species, too, found in the islands is pretty generally distributed over the whole South-American continent.

Dafila bahamensis.

Anas bahamensis, Linn., Sundev. P. Z. S. 1871, p. 126.
Pœcilonetta bahamensis, Darwin, Zool. Vog. Beagle, iii. p. 135.
Dafila bahamensis, Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Galapagos (*Darwin*); Indefatigable Island (*Habel*).

"This Duck is found in small flocks on the estuaries and small lagoons in the islands, and then in company with other water-birds. It feeds on insects, and probably on other food found at the bottom of the lagoons. It is tame enough to be killed by a blow of a long switch or a stone. On the approach of a person it will not fly, but paddle away a short distance; and when scared will not leave the lagoon entirely, but retire to another part of it. This tameness would indicate that the bird is indigenous to the islands, Ducks, as a rule, being extremely shy. I saw the species on Hood Island, and am convinced of its presence on Charles Island, though I did not see any birds. On Bindloe and Abingdon it is not found."—*H.*

Genus Zenaida.

Zenaida has a wide range in South America, five species (from all of which, however, *Z. galapagensis* is distinct) being found within the limits of that continent. Sundevall places this bird in a separate genus, *Nesopelia*, but its distinctness from *Zenaida* seems to me to be slight.

Zenaida galapagensis.

Zenaida galapagoensis, Gould, Zool. Voy. Beagle, iii. p. 115, t. xlvi.; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 125.

Columbi-galline des Gallapagoes, Néboux, Rev. Zool. 1840, p. 290; Prév. et Des Murs, Voy. Vénus, Ois. p. 270, Atlas, t. 8.

Nesopelia galapagensis, Sundev. Meth. Nat. Av. Disp. Tent. p. 99.

♂ (Indefatigable Island) vinaceo-chocolatino-cinnamomeus, subtus, præcipue in pectore, clarior: colli lateribus nitente æneo et rosaceo decoratis: oculorum ambitu nudo (in ave viva læte cæruleo) plumis circumdatis nigricantibus: stria utrinque sub oculis albida nigro marginata: dorso medio et tectricibus alarum albo nigroque variis, harum externis in pogonio externo nisi apicibus fere albis, remigibus nigris angustissime albo marginatis: rectricum apicibus cinereis fascia subapicali nigra, in rectricibus mediis angustiore: subcaudalibus et tectricibus subalaribus griseis: rostro nigro: pedibus rubris: long. tota 8·5, alæ 5·3, caudæ 3·0, tarsi 0·9 , rostri a rictu 0·95.

♀ mari similis, coloribus paulo dilutioribus.

Hab. Galapagos Islands (*Darwin*); Charles Island (*Néboux*); Indefatigable and Bindloe Island (*Habel*); James Island (*Sundevall*).

This species was also noticed by Dr. Habel in Albemarle, Tower, and Hood Islands, where, however, no specimens were secured.

"The female of this species appears to be a little smaller than the male. The iris in both sexes is dark brown, rather darker in the female, and the feet of a pink colour. The eyelids are a beautiful pale blue. Having been accustomed to find the skins of Central-American Doves very tender and difficult to remove, I was surprised at the toughness of the skin of this species, it being even stronger than the rest of the land-birds of these islands.

"For some years parties have visited these islands to collect the orchilla (*Rocella tinctoria*), a kind of moss growing on the bushes, trees, and even rocks on the windward side of the islands. This Dove being considered by these men a delicate morsel, is caught by them in numbers. It is therefore neither so abundant nor so tame as in former years; nevertheless many were knocked down with switches every morning by our men, as many as three dozen sometimes falling to one man before breakfast, all of which he would devour at one meal! I met with the species on all the islands I visited."—*H.*

Genus Porzana.

The section of this genus to which *P. spilonota* belongs has a wide range throughout the continents of America, being found in *P. jamaicensis* from the West Indies and Central America to Chili. The present bird has some resemblance in colour to *P. tabuensis*, a species ranging extensively over the islands of the South Pacific and Australia. *P. tabuensis*, however, may easily be recognized by its much longer tail and red legs.

Porzana spilonota.

Zapornia spilonota, Gould, Zool. Voy. Beagle, iii. p. 132, t. xlix.

Porzana spilonota, Scl. & Salv. P. Z. S. 1868, p. 456; 1871, p. 323.

♂ (Indefatigable Island) nigricanti-cinereus, fere unicolor, dorso et alis extus rufescente oleagineo perfusis, hypochondriis imis et tectricibus caudæ inferioribus obsolete albo notatis, alis extus, dorso postico et uropygio interdum eodem modo ornatis: iride coccinea: pedibus olivaceo-brunneis: rostro nigro: long. tota 5·0, alæ 2·6, caudæ 1·0, tarsi 0·9, rostri a rictu 0·75.

Obs. Sp. *P. jamaicensi* similis, sed nucha omnino nigricanti-cinerea et maculis dorsi fere obsoletis diversa: *P. tabuensi* quoad colores affinis, sed cauda brevi primo visu distinguenda.

Hab. James Island (*Darwin*); Indefatigable Island (*Habel*).

A specimen in Dr. Habel's collection has no spots on the wings and lower back, but does not otherwise differ from the rest of his examples. These spots are somewhat variable, being well defined in some, obsolete in others, and entirely wanting in a few. In none, however, are they so well developed as in *P. jamaicensis*, the nearest ally to the present bird.

"I found this bird only amongst low bushes which sometimes formed the undergrowth of taller trees, in the swampy ground formed by the spring-tide floods in the lower parts of the islands. It has rather a dismal note, like other members of the family. In all the males I examined I observed that the left testicle was grey, while the right one was yellow. All my specimens were collected on Indefatigable Island. I did not meet with it on either Abingdon or Bindloe, where there are no swamps suitable for it."—*H.*

Genus Ægialitis.

A world-wide genus of Plovers. The species mentioned below is found nearly everywhere in both North and South America.

Ægialitis semipalmata.

Charadrius semipalmatus, Bp. Journ. Ac. Sc. Phil. v. p. 98 (1825).
Ægialitis semipalmata, Baird, Birds N. Am. p. 694; Scl. & Salv. P. Z. S. 1870, p. 323.
Hiaticula semipalmata, G. R. Gray, Zool. Voy. Beagle, iii. p. 128.

Hab. Galapagos (*Darwin*); Indefatigable Island (*Habel*),

"This Plover frequents the sandy beach or the shallow depressions of inland lagoons. On the beach it watches each receding wave, and after its retreat it thrusts its bill into the little holes in the sand, out of which water bubbles, to seize the crustacean hidden therein. It is not so shy as some other wading birds found in these islands; still it is not so tame as to be approached closely. In flying it utters some shrill note of alarm. Its eyelids are of a dark yellow colour"—*H.*

Genus Hæmatopus.

Another universally distributed genus, *H. palliatus* being common throughout the shores of the two continents of America.

HÆMATOPUS PALLIATUS.

Hæmatopus palliatus, Temm. Man. d'Orn. ii. p. 532; Scl. & Salv. P. Z. S. 1870, p. 323; Sundev. P. Z. S. 1871, p. 125.

Hab. Galapagos (*Sundevall*); Indefatigable Island (*Habel*).

"This bird is either found in solitary individuals or three or four a short distance apart. They remain perched motionless on the rocks along the shore, or, moving slowly, watch for crabs. They are shy birds, not permitting a near approach. They run a short distance before rising to fly, and in doing so utter the cry *tira, tira,* as the inhabitants of the mainland pronounce it; and from this cry they take their name. They feed on crabs. The eyelid is of a scarlet colour."—*H.*

Genus HIMANTOPUS.

Also widely distributed. *H. nigricollis* is abundant in North America, and southward along the northern parts of South America.

HIMANTOPUS NIGRICOLLIS.

Himantopus nigricollis, Vieill. N. Dict. d'Hist. Nat. x. p. 41; Scl. & Salv. P. Z. S. 1870, p. 323, et 1873, p. 453.

Hab. Indefatigable Island (*Habel*).

As already mentioned in the last reference given above, it is this species, and not the more southern *H. brasiliensis,* that occurs in the Galapagos.

Concerning it Dr. Habel says, "the Black-necked Stilt is to be met with in flocks of four or five, always in company with other wading birds, frequenting the lagoons in search of its food, which consists of crabs and other crustaceans. Next to *Numenius hudsonicus,* it is the shyest bird on the islands, not permitting one to approach. Its red legs, white breast, and black wings give it a very neat appearance."—*H.*

Genus STREPSILAS.

One of the most widely distributed genera of birds, *S. interpres* being probably found on the shores of all parts of the world.

STREPSILAS INTERPRES.

Tringa interpres, Linn. Syst. Nat. i. p. 248.

Strepsilas interpres, Darwin, Zool. Voy. Beagle, iii. p. 132; Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Galapagos (*Darwin*); Indefatigable and Bindloe Islands (*Habel*).

"This bird is found in flocks of varying numbers either on the rocks, on the beach, or in company with other waders in the lagoons. Like the other aquatic birds it is somewhat shy, and, not allowing of a close approach, is very vigilant. Crabs and small crustaceans seem to be its chief food."—*H.*

Genus CALIDRIS.

Like *Strepsilas*, to be found on almost every shore.

CALIDRIS ARENARIA.

Scolopax calidris, Linn. Syst. Nat. i. p. 245.
Calidris arenaria, Cuv.; Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Bindloe Island (*Habel*).

"The only specimen of the Sanderling secured on these islands was shot on Bindloe sand-beach, where it was found associating with other wading birds. From these its lighter colour distinguished it, as well as its smaller size. Our tents being pitched on the shore, these birds soon became shy; and this one was killed by a long shot."—*H.*

Genus HETEROSCELUS.

This genus, as restricted, comprises one or two species which are found on the coasts and islands of the Pacific Ocean and along the western shores of the continent of North America.

HETEROSCELUS INCANUS.

Ash-coloured Snipe, Lath. Syn. iii. p. 154 (Eimeo and Palmerston Islands); undè
Scolopax incana, Gm. S. N. i. p. 658.
Heteroscelus brevipes, Baird, Birds N. Am. p. 734.
Totanus fuliginosus, Gould, Zool. Voy. Beagle, iii. p. 130; Gray & Mitch. Gen. B. iii. t. 154.
Totanus brevipes, Scl. & Salv. P. Z. S. 1870, p. 323 (ex Vieill.).
Actitis incanus, Finsch & Hartl. Orn. Centr.-Polyn. p. 182.

Hab. Galapagos (*Darwin*); Indefatigable and Abingdon Islands (*Habel*).

There can be no doubt, I think, that G. R. Gray (Hand-l. iii. p. 45) was right in referring this species to the Ash-coloured Snipe of Latham's Synopsis. The bird has a wide range, being found throughout the Pacific. The particulars of its distribution are fully given in Finsch and Hartlaub's work quoted above.

"This bird was obtained with difficulty, partly because of its shyness, partly because it seeks the outlying reefs, seldom coming inshore. On the rocks it remains stationary, moving but little in search of its food, which consists of crabs, which are seized with a sudden dart of its beak. One of my two specimens was secured on Indefatigable Island, the other on Abingdon, thus showing its wide distribution."—*H.*

Genus TRINGA.

This genus is found on the sea-coasts of all parts of the world. The species occurring in the Galapagos is identical with a common North-American bird, which in winter migrates into South America, reaching far beyond the equator.

Tringa minutilla.

Tringa minutilla, Vieill.; Darwin, Zool. Voy. Beagle, iii. p. 131; Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Galapagos (*Darwin*); Indefatigable Island (*Habel*).

"I only obtained two females of this species, indicating its scarcity on these islands. I noticed that the legs of one of these specimens were grey, while those of the other were green. One bird I shot in a lagoon that was drying up. It remained alone after all the other waders had departed, thus proving to be less shy than the others. The food of this species appears to consist of insects as well as crabs; for in one I found the former, and in the other the latter food."—*H.*

Genus Numenius.

Also a world-wide genus, *N. hudsonicus* ranging from the arctic regions of North America to Cape Horn.

Numenius hudsonicus.

Numenius hudsonicus, Lath. Ind. Orn. ii. p. 712; Scl. & Salv. P. Z. S. 1870, p. 323.

Hab. Indefatigable Island (*Habel*).

"This Curlew is the shiest bird on the islands, permitting of no near approach. No sooner does it get sight of a person, which it does at a great distance, and far out of reach of a gun, than it utters its shrill call and flies away. It thus alarms the other waders frequenting the beach or drying lagoons, inducing them to take flight also. It can only be approached under cover of bushes. Its food consists of crabs and other crustaceans. On the mainland it is known as el Piloto (the Pilot), and is supposed to indicate by its call a change of weather. I found it on all the islands I visited."—*H.*

Genus Anous.

Anous is found in all tropical seas, *A. stolidus*, by far the commonest of its species, ranging wherever the genus is found.

Anous stolidus.

Sterna stolida, Linn. Syst. Nat. i. p. 227.
Megalopterus stolidus, Darwin, Voy. Beagle, iii. p. 145.
Anous stolidus, Sundev. P. Z. S. 1871, p. 125.

Hab. Galapagos (*Darwin, Sundevall*); Dalrymple Rock, Chatham Island (*Kellett & Wood*).

Genus Larus.

Larus is found throughout the world, frequenting the sea-coast. The species found in the Galapagos is peculiar to those islands, and belongs to a section of the genus called *Blasipus* by Bonaparte. Its nearest allies are found on the western coasts of North and South America.

LARUS FULIGINOSUS. (Plate LXXXVII.)

Larus fuliginosus, Gould, Zool. Voy. Beagle, iii. p. 141; Scl. & Salv. P. Z. S. 1870, p. 323, et 1871, p. 574; Sundev. P. Z. S. 1871, p. 125.

Obscure cinereus, capite undique obscuriore; subtus pallidior, abdomine imo albicanti-griseo: secundariorum apicibus et tectricibus supracaudalibus albidis, his griseo tinctis: remigibus 1°, 2°, 3° omnino nigris, 4°, 5°, 6° griseo terminatis; reliquis griseo-nigricantibus, apicibus paulo pallidioribus: cauda dorso concolori, rectricibus duabus utrinque externis albidis: macula supra et infra oculos alba, ciliis rubris, iride brunnea: rostro et pedibus rufescenti-nigris: ore ruberrimo: long. tota 18·0, alæ 13·8, caudæ 5·9, tarsi 2·3, rostri a rictu 2·5.

♀ *juv.* fuliginosa, subtus paulo dilutiore: alarum tectricibus pallide fusco marginatis: remigibus et tectricibus nigris: rostro et pedibus nigris: iride obscure brunnea.

Hab. Galapagos (*Darwin*); Indefatigable and Abingdon Islands (*Habel*); Charles and Indefatigable Islands (*Sundevall*).

The nearest allied species to *Larus fuliginosus* is *L. modestus* of the coasts of Peru and Chili. We have already pointed out the differences between these birds in our paper on South-American Laridæ (P. Z. S. 1871, p. 573). They consist in the Galapagos bird having a stouter hill and a well-marked blackish hood. The figure now given, compared with the plate of *Larus modestus* in Fraser's 'Zoologia Typica' (t. 69), will, I trust, prevent further confusion respecting these species.

"A pleasing bird, which does not fly away, but on the contrary approaches one with a friendly greeting call-note. They sometimes become troublesome, as they feed on meat hung up to dry, and are driven off only to return again. They take little notice of stones thrown at them, unless actually hit. They appear to be always quarrelling and chattering with each other over their food, each one trying to take the morsels from another. When I shot a bird the others all circled round me, whether in grief or rage I could not say. They form more or less numerous groups, chiefly frequenting the sea-shore, and in smaller numbers they visit the lagoons. This Gull feeds on crabs and any dead animal substance. Amongst a large flock of slaty-coloured birds some few of a brown colour will be seen. I was inclined to look upon these as varieties, being at a loss how else to account for them. These Gulls fly but a short way, and do not appear to pass from island to island. I did not observe any on Hood's island."—*H.*

Genus CREAGRUS.

This genus seems to have been suggested by Bonaparte in his criticism of Herr Bruch's first paper on Laridæ, published in the 'Journal für Ornithologie' in 1853. Bonaparte writes, "Le sixieme genre de M. Bruch est coupé par moi en deux: chacune de ces espèces formant le type d'un genre séparé, *Xema* restant à *sabini*, Leach, pour laquelle il fut créé, et *furcatus*, Néboux (non Lesson), étant celui de *Creagrus*, Bp."

(Rev. Zool. 1855[1], p. 14). *Creagrus*, as a genus, differs but slightly from *Xema*, both having a deeply forked tail. The former, however, is a more robust form, and has the nostril situated rather nearer the point of the bill. In coloration *Creagrus* wants the black ring which encircles the hood of *Xema*. I doubt whether, in a well-considered classification of the Laridæ, the two genera could be maintained as distinct.

CREAGRUS FURCATUS.

Mouette à queue fourchue, Néboux, Rev. Zool. 1840, p. 290.
Larus furcatus (Néboux), Prév. et Des Murs, Voy. Vénus, v. Ois. p. 277, Atlas, t. x.
Xema furcatus, Bruch, J. f. Orn. 1853, p. 103.
Creagrus furcatus, Bp. Rev. Zool. 1855, p. 14.

Supra cinereus: capite toto et colli dimidio antico undique fuliginoso-nigris: plaga frontali, scapularium margine externo, tectricibus alarum internis, cauda et corpore subtús albis: remigum 1^{i}, 2^{i}, 3^{i}, 4^{i} pogoniis externis cum pogoniorum internorum parte interiore et apicibus nigris: rem. 3° et 4° ad basin griseis; 5° et 6° extus griseis, parte apicali nigra; 4°, 5°, 6° plaga apicali alba præditis: rostro et pedibus rubris: long. tota 23·0, alæ 16·0; caudæ rectr. med. 4·7, rectr. ext. 8·0; tarsi 1·9, digit. med. cum ung. 2·0.

Hab. Dalrymple Rock, Chatham Island (*Kellett & Wood*).

The above locality is assigned to a single adult specimen of this rare species in the British Museum. It was obtained with other Galapagos birds during the voyage of H.M.SS. 'Herald' and 'Pandora.' This locality is given with such precision that I think there can be little doubt as to its correctness. The original example of this Gull, the only other known, was obtained by Néboux, the surgeon of the French frigate 'Vénus,' but is said to have been shot at Monterey, in California. Though it is possible that the species may occur both in the Galapagos and on the mainland, it is also possible an error has been made as regards one of the localities assigned to it. Now as the species has never been seen by any of the many collectors of the United States, and as several of the birds obtained during the voyage of the 'Vénus' have wrong localities assigned to them, such as *Calliste ruficervix* from Guatemala instead of Columbia, and, I believe, *Zonotrichia coronata* from the Galapagos (described under the name *Z. galapagoensis*) instead of California, I am inclined to think the Californian locality an erroneous one, and that this well-marked species must be added to the peculiar fauna of the Galapagos archipelago.

The British-Museum specimen has the division between the dark hood of the head and neck more clearly defined from the white of the breast than is shown in the plate above quoted, where the lower neck is suffused with a pale shade of grey. I have, however, no doubt as to the identity of the specimen, and believe this difference is to

[1] Separate copies of this paper are dated 1854; but the paper itself was published, with different pagination, in January 1855. Gray gives the former date for the introduction of the genus; but the latter must be considered correct.

be attributed to age, or perhaps to the not too accurate colouring of the plate. There is shown too, in the latter, a white spot near the eye, which I have not been able to trace in the Museum example.

Genus PROCELLARIA.

An oceanic genus of nearly universal range.

PROCELLARIA TETHYS. (Plate LXXXVIII. fig. 2.)

Procellaria tethys, Bp. Notes Orn. p. 92, et Consp. ii. p. 197.

Fuliginoso-nigra: tectricibus alarum mediis et corpore subtus brunnescentioribus: tectricibus subalaribus fuliginoso-brunneis, tectricibus caudæ superioribus elongatis, omnino albis; uropygio dorso concolori; rostro et pedibus nigerrimis: long. tota 6·0, alæ 5·2, caudæ rectr. ext. 2·4, rectr. med. 2·2, tarsi 0·85, dig. med. ·70, rostri a rictu ·65.

Obs. P. pelagicæ affinis, sed tectricibus caudæ magis elongatis et apicibus omnino albis, alarum tectricibus mediis brunnescentioribus, cauda sensim furcata, tectricibus subalaribus et axillaribus omnino fuliginosis distinguenda.

There is a specimen of this species in the British Museum, marked in Bonaparte's handwriting "*P. tethys,* Bon.", and referred to by him in the 'Conspectus.' It bears the mark 193 *a*; but no record of its origin or locality is extant.

As it answers to Bonaparte's description, and agrees with the type in the Paris Museum (which I have lately examined), I have no doubt it belongs to the species obtained by Néboux in the Galapagos Islands. The species seems to be little known, no specimen having come under Dr. Coues's observation when engaged in compiling his monograph of this family.

Mr. Gray refers this species to *P. pelagica* in his 'Hand-list' (iii. p. 103), having apparently overlooked the differences which distinguish it. The plate taken from the British-Museum specimen, will, I trust, tend to establish *Procellaria tethys* in its rightful position.

Genus ŒSTRELATA.

This genus of Procellariidæ has a wide range in both the Atlantic and Pacific Oceans, the species being most numerous in the southern temperate zone. In the Atlantic a single species ranges as far north as the Canaries, where *Œ. mollis* is found. In the Pacific the Galapagos Islands appear to be the limit of the northern range. The species there found, which I describe below, has its nearest ally in a West-Indian Petrel which has strayed to the coasts of Europe.

ŒSTRELATA PHÆOPYGIA, sp. n. (Plate LXXXVIII. fig. 1.)

Supra brunnescenti-nigra fere unicolor, dorsi plumis cinereo stricte marginatis; fronte, loris, corpore subtus, pagina alarum inferiore (nisi in margine), et crisso albis: remige primo omnino nigro, remigibus reliquis in dimidio basali pogonii interni albis: rectricibus dorso concoloribus, in pogonio interno basin versus albis; tarsis et pedum dimidio antico carneis; harum dimidio postico et rostro nigris: long. tota 16·0, alæ 12, caudæ 5·5, tarsi 1·5, rostri a rictu 1·65.

Obs. Œ. hæsitatæ affinis, sed tectricibus supracaudalibus dorso concoloribus nec albis distinguenda.

There are two specimens of this species in the British Museum, both obtained by Captain Kellett and Lieut. Wood in the Galapagos, one of them being labelled as coming from Chatham Island. These skins differ from a mounted specimen of *Œ. hæsitata* in the British Museum, from Haiti, in having the upper tail-coverts of the same colour as the back, and in the dark colour of the crown being connected with that of the back by the feathers of the hind neck being tipped with the same dark colour. There is no other species to which, so far as I am aware, this bird is at all nearly allied. I have little doubt but this Petrel is the small "Albatross" spoken of by some of the early visitors to these islands.

Genus Spheniscus.

The Penguins are restricted in their range to the southern hemisphere. The peculiar species of the Galapagos has probably the most northern habitat of any member of the family. Its nearest ally is *S. magellanicus*, from the Straits of Magellan and the Falkland Islands.

Spheniscus mendiculus. (Plate LXXXIX.)

Spheniscus mendiculus, Sundev. P. Z. S. 1871, pp. 126, 129.

Niger, subtus albus: capitis latera cum gula nigro-fusca, mento albo: linea superciliaris angusta, alba, a macula lori majore incepta, aurem cingens, in jugulo supremo cum pari conjuncta: cervix et colli latera nigricantia: color nigricans jugulum ambit ibique torquem format albedinem juguli in fascias duas separantem: linea infra lateralis nigra ut in *S. demerso* linea laterali interjecta alba a nigridine dorsali separata et in jugulo medio cum pari arcuatim conjuncta: ala subtus nigra cum vitta longitudinali minus definita, albida, in carpo abbreviata: rostrum nigrum, maxilla inferiore lutea (vel aurantia) apice ante nares nigra, limite definito: pedes (sicci) fusci (*Sundevall*): long. tota 17·5, alæ (humero excluso) 4·5, tarsi 1·4, dig. med. cum ung. 2·4, rostri a rictu 2·6.

Hab. James Island (*Sundevall*).

The above description is the original one given by Professor Sundevall in the 'Proceedings' for 1871. He there compares the species to *S. demersus* of South Africa; but its relationship, so far as is indicated by the distribution and number of the dark and white bands on the neck are concerned, show that it has greater affinity with *S. magellanicus* of the Straits of Magellan and the Falkland Islands, where these marks, in a more decided form, are quite similarly distributed, except that in the Galapagos bird the chin is white. From *S. magellanicus S. mendiculus* differs in its longer and more slender bill, three fourths of the base of which is yellow instead of black, and in its generally smaller size, as well as in the colour of the chin, already mentioned. On the west coast of South America another species is found, *S. humboldti*, which differs both from *S. magellanicus* and *S. mendiculus* in having only one white band crossing the throat instead of two. In this respect the Chilian bird agrees closely with the true *S. demersus* of the Cape of Good Hope, from which it only differs in having the superciliary white line narrower.

Dr. Elliott Coues, in his monograph of the Spheniscidæ, published in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' (1872, p. 211), unites the Chilian bird with the true *S. demersus* of the Cape of Good Hope, and treats *S. magellanicus* as a variety of the same species. This view does not, in my opinion, give the real relationship these birds bear to one another. *S. magellanicus* in its adult dress can at once be distinguished from either *S. demersus* or *S. humboldti* by the additional black band which crosses the throat; and this also forms a distinctive character in *S. mendiculus*. Dr. Coues likewise says that *S. magellanicus* is found in the same localities as *S. demersus* (in which he includes *S. humboldti*). My experience, however, shows that *S. megallanicus* is entirely replaced on the west coast of America by *S. humboldti*, and is restricted in its range to the Falklands and the extreme south of South America.

As regards the retention of the name *humboldti* (given by Meyen to the Chilian Penguin), I may say that I do so in preference to adopting the name *chilensis*, supposed to have been bestowed by Molina on the same species. Molina's species are too inadequately described to warrant his names being substituted for others about which no doubts hang. Moreover I question the propriety of any deduction which might be made from the signification of the name *chilensis* standing in the place of a good description.

The figure is taken from a typical specimen brought to Europe by the Swedish frigate 'Eugenie,' and now in our collection.

VII. Concluding Remarks.

Before concluding this paper a few conjectural remarks on the process by which these islands have become tenanted with bird-life may not be out of place.

Considering their purely volcanic nature, it cannot reasonably be doubted that these islands have always been islands since they emerged from the sea. Such is Mr. Darwin's view; and it is fully indorsed by Dr. Hooker and others. The birds that are now found, being related to American birds, must have emigrated thence and become modified by the different circumstances with which they became surrounded. The oldest immigrants seem to be indicated by their generic difference from their continental allies, the more modern comers by their merely specific distinctness, and the most recent by their identity with birds now found on the adjoining continent. On this view the islands were first taken possession of by individuals of the parent stock of *Certhidea* and *Conirostrum*, *Geospiza* and *Guiraca*, *Camarhynchus* and *Neorhynchus*. Then came perhaps the ancestors of *Buteo*; after these followed those of *Mimus*, *Pyrocephalus*, and *Myiarchus*, *Strix* and *Asio*, *Zenaida*, *Larus*, and *Spheniscus*. Then those of *Dendrœca*, *Progne*, *Butorides*, *Nycticorax* and *Porzana*, and, finally, *Dolichonyx orizivora*, *Ardea herodias*, and the Ducks, Flamingo, Gannets, Plovers, and Sandpipers, though of these last a constant stream of immigrants may have been maintained from the earliest times. It must be remembered, however, that no precise order of immigration can be absolutely laid down, even approximately; for one term in the proposition is an absolutely unknown quantity. We know nothing of the rate of change that has taken place in any one species. Outward circumstances may have acted upon one species so as to leave it little changed in a given time, whilst in the same time another species may have assumed distinctive generic characters. Viewing the very peculiar physical characters possessed by these islands when contrasted with the neighbouring American shores, it would seem reasonable to consider that the rate of change demanded of an immigrant species would be high; consequently the origin of the islands need not be dated back to a more distant period than seems indicated by their volcanic origin. But I am writing of the Birds alone; other forms of life found in these islands present far more complex problems for solution, into which I am not prepared to enter.

DESCRIPTION OF THE PLATES.

PLATE LXXXIV.

Outline Chart of the Galapagos Islands, taken from the Admiralty Chart, No. 1375. The dotted line shows Dr. Habel's route.

PLATE LXXXV.

Camarhynchus variegatus, p. 489: fig. 1, ♂; fig. 2, ♀.

PLATE LXXXVI.

Camarhynchus habeli, p. 490: fig. 1, ♂; fig. 2, ♀.

PLATE LXXXVII.

Larus fuliginosus, p. 505: fig. 1, adult; fig. 2, immature.

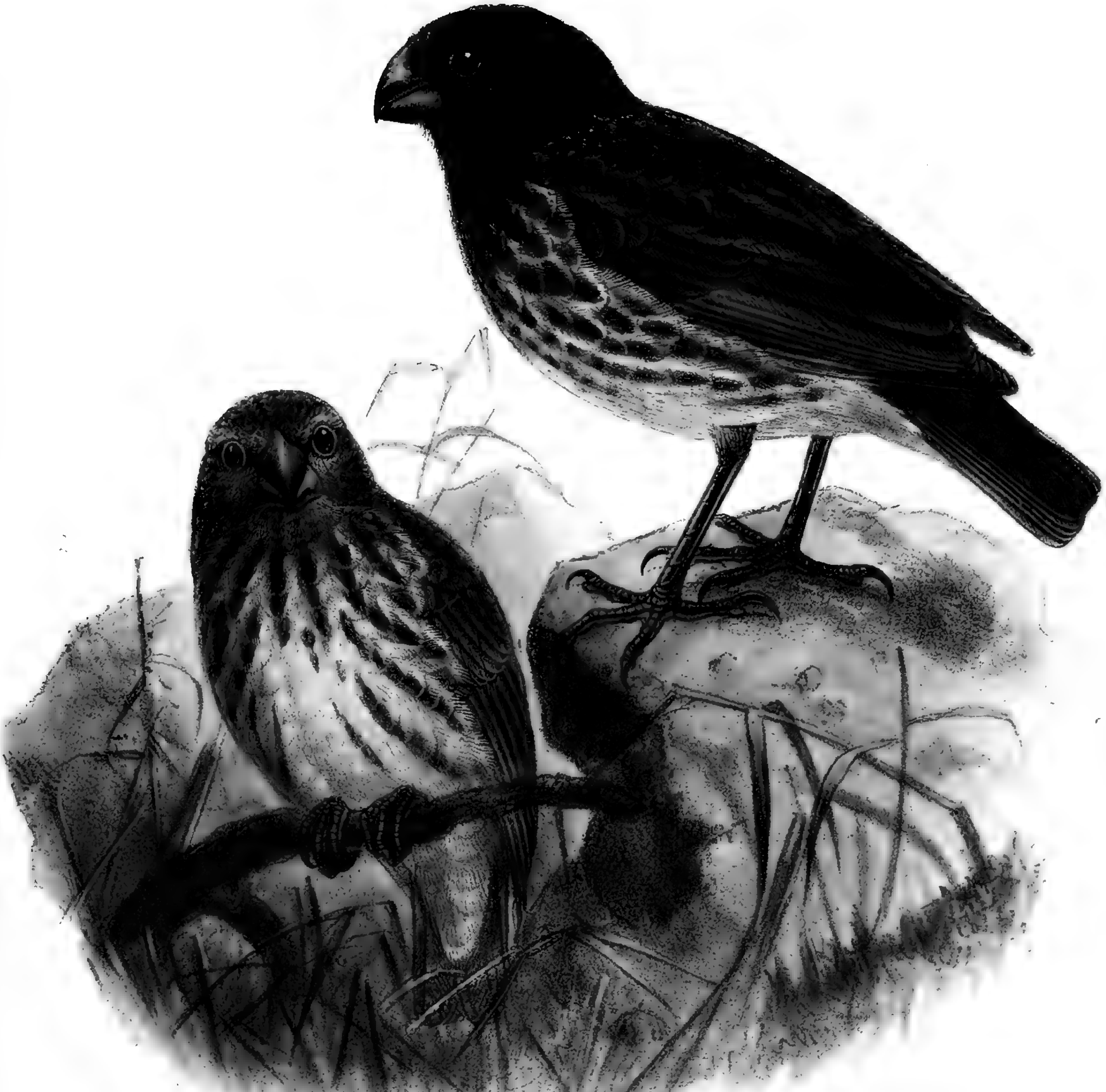
PLATE LXXXVIII.

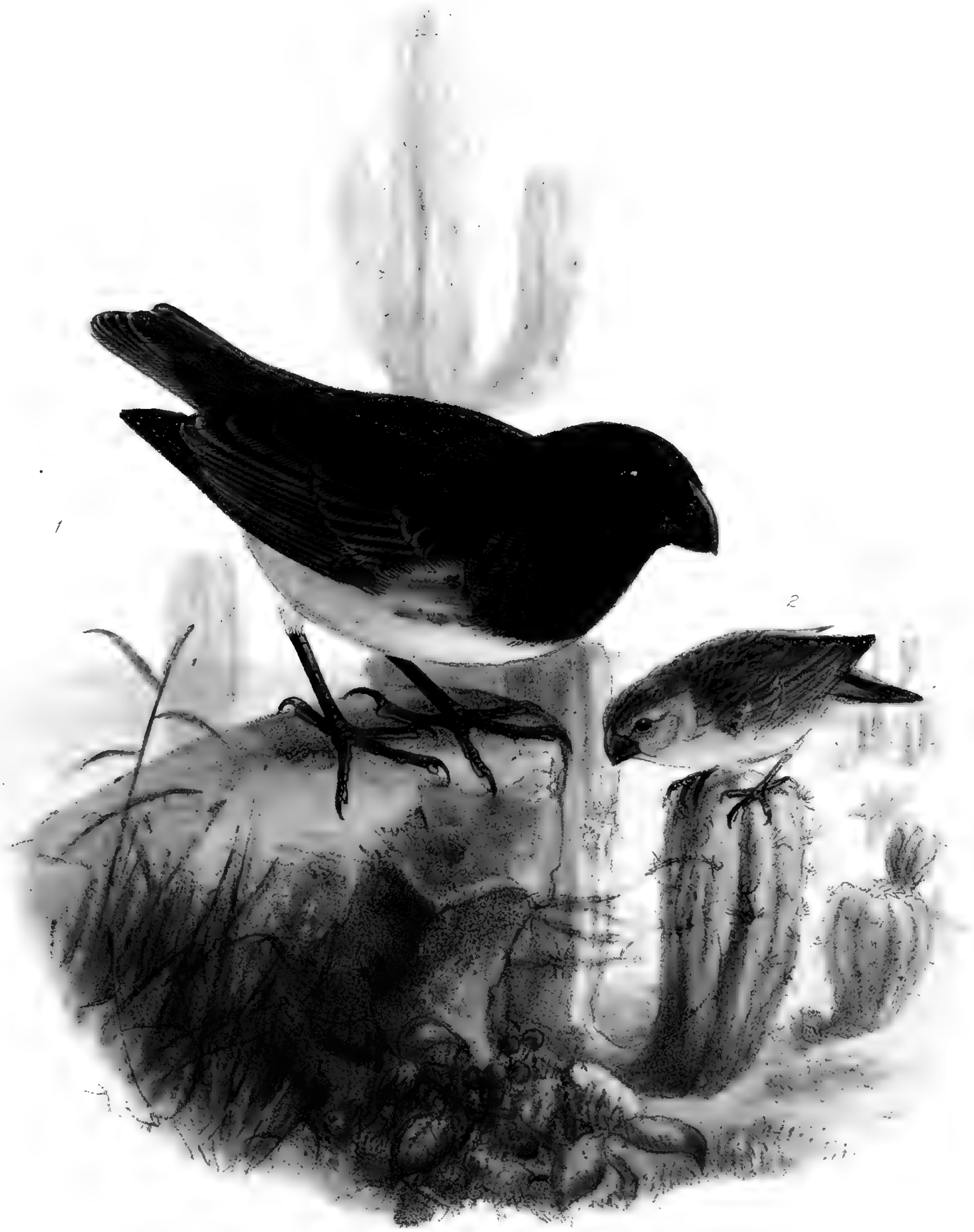
Figs. 1 & 3. *Œstrelata phæopygia*, p. 507. Fig. 2. *Procellaria tethys*, 507.

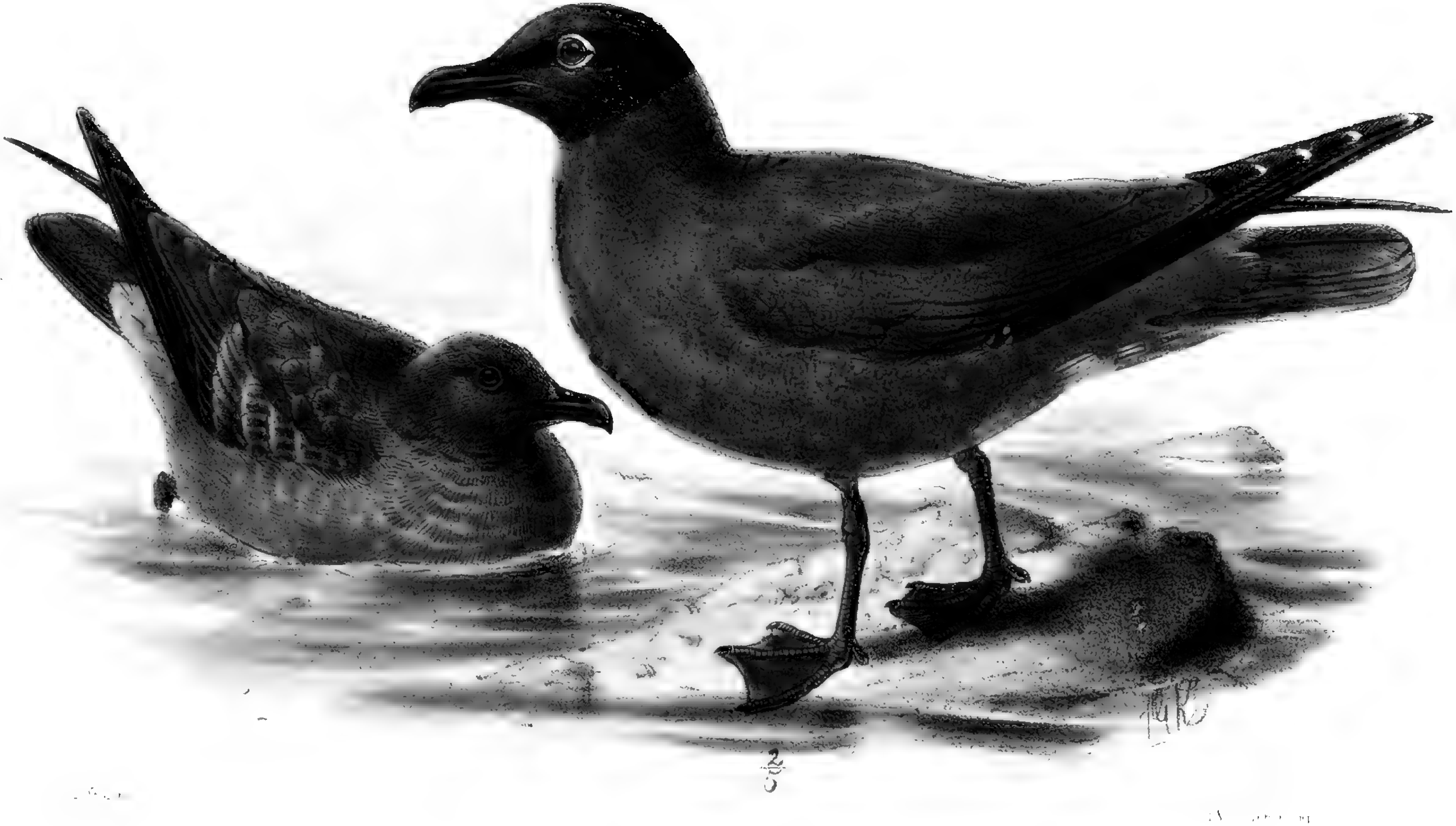
PLATE LXXXIX.

Spheniscus mendiculus, p. 508.

All the figures are taken from specimens in the collection of Mr. Godman and myself, except those of *Œstrelata phæopygia* and *Procellaria tethys*, the originals of which are in the British Museum.

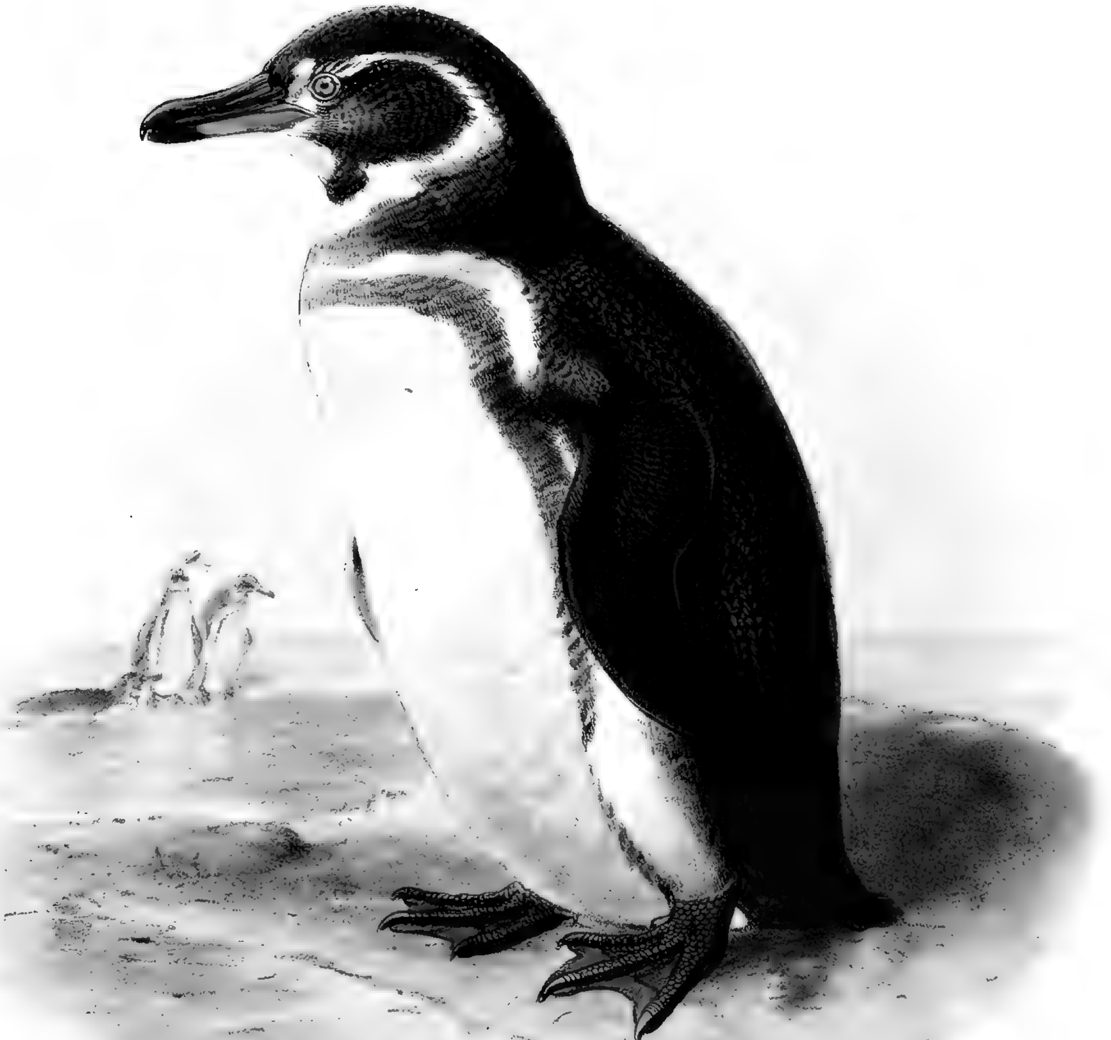






LARUS FULIGINOSUS. Fig. 1 ad. 2 Jr.

1. ŒSTRELATA PHÆOPYGIA 2. PROCELLARIA TETHYS



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SPHENISCUS MENDICULUS

XI. *Revision of the Heterocerous Lepidoptera of the family* Sphingidæ. *By* Arthur Gardiner Butler, *F.L.S., F.Z.S., &c., Senior Assistant, Z.ological Department, British Museum.*

Read April 6th, 1875.

[Plates XC.–XCIV.]

THE extensive group of moths composing the family *Sphingidæ* has always been a favourite one, not only with Lepidopterists, but with all lovers of nature; its representatives surpass most of the other families of Heterocera in size, whilst in their speed and long-sustained flights they are equalled by no other group with which I am acquainted.

The highly specialized condition of some of the structural characters in this family has from time to time aroused a special interest in them: thus the complete resemblance which most of the *Macroglossinæ* bear to humming-birds, owing to the remarkable expanded anal tuft and their habit of poising over a flower whilst sucking the nectar through their long outstretched proboscides, have rendered them objects of peculiar attraction to the uninitiated, many of whom fancy them to be true humming-birds, and refuse to be convinced of their error. In the 'Naturalist on the Amazons' (vol. i. pp. 181–183), Mr. Bates tells us that the natives firmly believe that the moth changes into the bird just as the caterpillar into the moth; the resemblance between *Aellopus titan* and a humming-bird is so complete when upon the wing that he himself on several occasions shot the former in mistake for the latter. The *Chærocampinæ* are chiefly remarkable for their power of long sustained flight; there is, however, nothing extraordinary in their appearance in the perfect state; the *Ambulicinæ* and some genera of the *Chærocampinæ* have the anal segment of the abdomen in the males expanded at the sides, giving them somewhat the aspect of *Macroglossinæ* in this respect; the *Smerinthinæ* are often brilliantly coloured, and the antennæ of the males are pectinated, much as in some genera of the *Bombycidæ*. The remarkable genus of *Smerinthinæ*, *Lophostethus*, has the spines on the tibiæ marvellously developed. The object of these spines has yet to be discovered; I can only suppose that the larva undergoes its change to the pupa-state in very hard earth, and thus it becomes necessary for the moth to be provided with powerful weapons in order to effect its escape.

The *Acherontiinæ* have attracted much attention on account of their peculiar coloration, which has given rise to their popular name of Death's-head Moths; they possess the power of emitting sounds much resembling the creaking of a boot. The manner in which these sounds are produced has been the subject of discussion amongst naturalists since the year 1742; this point, however, has been satisfactorily settled by Mr. Moseley ('Nature,' vol. vi. pp. 151–153), who has demonstrated the existence of a cavity in the head, which by the alternate action of elevating and depressing muscles is caused to serve as a pair of bellows, by means of which air is forced through the exceedingly short proboscis; this organ is thus converted into a small trumpet. The *Sphinginæ* are remarkable for the length of their proboscides, in which respect they offer a striking contrast to the preceding subfamily. *Amphonyx cluentius*, as mentioned by Mr. A. R. Wallace in the 'Quarterly Journal of Science' for 1867 (p. 477), has this organ developed to the extraordinary length of $9\frac{1}{4}$ inches; and Mr. Wallace confidently looks forward to the discovery of a *Sphinx* in Madagascar with a proboscis 11 to 12 inches in length; his anticipation is based upon the fact that the nectaries of *Angræcum sesquipedale* vary in length from 10 to 14 inches, and must therefore in all probability be fertilized by some such hitherto undiscovered agent.

The first attempt at any thing like a comprehensive paper on the *Sphingidæ* was published in 1855 by Burmeister in the 'Abhandlungen der naturforschenden Gesellschaft zu Halle,' and was entitled "Systematische Uebersicht der Sphingiden Brasiliens;" it contained descriptions of new genera and species, and gave a list of the then known *Sphingidæ* of South America. This paper was followed in the succeeding year by the seventh volume of Mr. Walker's 'Lepidoptera Heterocera,' in which an endeavour was made to bring together the recorded species from all parts of the world; and, considering how little was then known respecting the family, there can be no doubt that this catalogue was the best that Mr. Walker ever produced. No attempt was made at classification; therefore it is not surprising that nearly allied species appeared in widely sundered genera. Still the omissions are not many, and, but for that indefatigable Lepidopterist Mr. W. F. Kirby, would probably, with a few exceptions, have still remained undiscovered. The next list of species appeared in 1857, in Horsfield and Moore's Catalogue of the Lepidoptera in the Museum of the East-India Company,' and added a few descriptions; it was followed two years later by a very careful paper by Dr. Clemens in the 'Journal of the Academy of Natural Sciences of Philadelphia' (2nd ser. vol. iv.), entitled "Synopsis of North-American *Sphingidæ*." This communication was full of valuable information; and for the first time an effort was made to classify the genera and species; it was superseded, however, a few years afterwards by "A Synonymical Catalogue of North-American *Sphingidæ*, with Notes and Descriptions," in the fifth volume of the 'Proceedings of the Entomological Society of Philadelphia,' from the pens of those well-known and able Lepidopterists Messrs. Grote and Robinson. This was a most important paper, inasmuch as it revised most of the New-World genera, throwing them into natural subfamilies. In the same volume of the 'Proceedings' appeared several of Mr. Grote's papers on the *Sphingidæ* of Cuba, abounding with critical and interesting notes on synonymy. In the volume for 1867 Mr. Grote gave a list of the *Sphingidæ* of Cuba; and, lastly, in 1873 he again appeared as the author of a "Catalogue of the *Sphingidæ* of North America," in the first volume of the 'Bulletin of the Buffalo Society of Natural Sciences.'

Dr. Boisduval's long expected work on the *Sphingidæ* has recently appeared, bearing date 1874; that it was not, however, procurable earlier than February 22nd, 1875, I have evidence in a letter from the author, dated 18th of February, 1875, in which he says "Le spécies des Sphingides, Sésiides et Castniides sera mis au vente *Lundi prochain*, chez M. Roret, éditeur, Rue Hautefeuille, à Paris." The entire work is full of errors; and scores of species are omitted; but the author's worst fault is a too great appreciation of his own MS. names, for which he does not scruple to sacrifice both genera and species long described by other authors. The arrangement of the genera is most unnatural; and many of the species described as new are only individually distinct. The new species described by M. Boisduval, excepting those which clash with my own, will be added in an appendix; the genera and species which are identical with new forms described in the present paper will be substituted, in their proper places, for the names which I had proposed to employ.

It will be seen by the foregoing remarks that the only synonymic (and that not a systematic) list of the *Sphingidæ* of the world is that published by Mr. Walker in 1856; this has now necessarily become very incomplete, not only on account of the numerous species subsequently described, but from our present much more perfect knowledge of the limits and affinities of the genera, which renders a revision of the whole family an absolute necessity.

I have to thank Mr. F. Moore for lending me his fine collection of Asiatic *Sphingidæ*, enabling me to add considerably to our knowledge of the species of India, as also for lending me some exquisite drawings of larvæ and pupæ by native Indian artists. I am also greatly indebted to Mr. G. Lewis for the loan of his valuable drawings of Japanese *Sphingidæ* in all stages, and for the residuum of his collection of these moths; also to Mr. W. F. Kirby for calling my attention to descriptions of species by Mr. Newman, to species described by Palisot de Beauvais, Van der Hoeven and Bertoloni, and to several species described during the last year or two, which I might otherwise have overlooked.

The following rough Table will give some idea of the geographical range of the various subfamilies and genera.

Subfamily 1. MACROGLOSSINÆ. (Cosmopolitan.)

Genus.	Range.	Number of Species.
1. *Lepisesia*	Confined to British North America	2
2. *Sataspes*	Silhet to China	4
3. *Hemaris*	Ranges from Texas, through Europe, Asia, and Africa	26

Genus.	Range.	Number of Species.
4. *Rhopalopsyche*	Silhet to South India	2
5. *Macroglossa*	Throughout the Old World	41
6. *Aëllopus*	Tropical America and Africa	6
7. *Stenolophia*	South Tropical America	1
8. *Eupyrrhoglossum.*	Pará to Mexico	2
9. *Perigonia*	Tropical America	9
10. *Pachygonia*	Tropical America	4
11. *Rhodosoma*	North India	1
12. *Thyreus*	United States	1
13. *Amphion*	United States	1
14. *Deidamia*	North America	1
15. *Unzela*	Tropical America	1
16. *Proserpinus*	Ranges from Europe, through Russia, into North America	4
17. *Euproserpinus*	California	1
18. *Temnora*	Natal and (possibly) China	2
19. *Lophura*	South America, Asia, and Africa	11
20. *Calliomma*	Confined to Tropical America	8
21. *Enyo*	Tropical America and (possibly) Australia	5
22. *Aleuron*	Tropical America	3
23. *Tylognathus*	South Tropical America	2
24. *Gonenyo*	Tropical America	1
25. *Hemeroplanes*	Tropical America	4

Subfamily 2. CHÆROCAMPINÆ. (Cosmopolitan.)

1. *Acosmeryx*	North India to Queensland	5
2. *Otus*	From Siberia, through North America, to the West Indies	5
3. *Ampelophaga*	China and Japan	1
4. *Elibia*	North India	2
5. *Pergesa*	From Europe, through Asia and Africa	15
6. *Panacra*	Asia and Africa	17
7. *Cizara*	Australia	1
8. *Microlophia*	South India	1
9. *Basiothea*	Africa	1
10. *Gnathostypsis*	Caffraria	1
11. *Diodosida*	Africa	4
12. *Cypa*	Ceylon	1
13. *Chærocampa*	Cosmopolitan	78
14. *Darapsa*	Haiti	1
15. *Deilephila*	From America, through Europe, Asia, and Africa	22
16. *Daphnis*	Europe, Asia, Moluccas, and Australia	9
17. *Philampelus*	Tropical America and Africa	19
18. *Pachylia*	Tropical America	5

Subfamily 3. AMBULICINÆ. (America and Asia.)

1. *Ambulyx*	Tropical America and Asia, from Darjeeling to Java	23

Subfamily 4. Smerinthinæ. (Cosmopolitan.)

Genus.	Range.	Number of Species.
1. *Metamimas*	Amboina and Australia	2
2. *Mimas*	Europe, Asia, and South Africa	3
3. *Polyptychus*	Asia and Africa	7
4. *Lophostethus*	Natal	1
5. *Sphingonœpiopsis.*	Caffraria	1
6. *Langia*	India	2
7. *Triptogon*	America, and from Mantchuria, through Japan and China, into Java and India, and thence into Persia	23
8. *Laothoë*	Europe	2
9. *Cressonia*	North America to Texas	3
10. *Paonias*	United States	2
11. *Calasymbolus*	North America and Amur	5
12. *Smerinthus*	Mexico to California and China, through Japan and Amur to Europe	5
13. *Pseudosmerinthus.*	South-west Africa	2
14. *Daphnusa*	China to Borneo	3
15. *Leucophlebia*	Java to Bengal	4
16. *Basiana*	Asia and Africa	9
17. *Cæquosa*	Australia	1

Subfamily 5. Acherontiinæ. (Europe, Asia, and Africa.)

1. *Acherontia*	From Europe into Africa, and through Persia into Asia	4

Subfamily 6. Sphinginæ. (Cosmopolitan.)

1. *Tatoglossum*	South America	1
2. *Amphonyx*	Tropical America	6
3. *Anceryx*	Tropical America	2
4. *Isognathus*	Tropical America	9
5. *Cautethia*	Haiti and (possibly) "East India"	? 2
6. *Dilophonota*	Tropical America	11
7. *Oryba*	South America	1
8. *Macrosila*	South America	2
9. *Protoparce*	Cosmopolitan	23
10. *Pseudosphinx*	Tropical America, Moluccas, and India	6
11. *Daremma*	United States	1
12. *Syzygia*	Central America	1
13. *Dolba*	North India, and Massachusetts to Mexico	3
14. *Euryglottis*	Colombia	1
15. *Diludia*	Asia, Australia, Africa, and Tropical America	21
16. *Hyloicus*	From America, through Europe, Asia, and Africa	9
17. *Sphinx*	America and Europe	17

Genus.	Range.	Number of Species.
18. *Lintneria*	United States	3
19. *Ceratomia*	Massachusetts to Mexico	2
20. *Nephele*	Australia, Asia, and Africa	18
21. *Calymnia*	North India to Java	1
22. *Ellema*	United States	3
23. *Lapara*	Canada	1

The remaining genera, being doubtful *Sphingidæ*, need not be considered.

The species which has the greatest range is *Chærocampa celerio.* This insect is found throughout the Old World; it is very rapid and indefatigable on the wing, and is not unfrequently caught on board ship out of sight of land. Its food-plant is the vine.

Characters of the Subfamilies.

1. Macroglossinæ.

Larva with the anterior segments tapering towards the head, retractile; horn long and curved; head rather small.

Imago generally with externally angulated palpi; the antennæ often gradually thicker from the base to the apex; thorax large and prominent; abdomen of the male always with a more or less developed anal tuft of hair-scales.

2. Chærocampinæ

Larva with the anterior segments retractile, the fifth somewhat abruptly broader; the fifth, and sometimes all the segments laterally ocellated; horn variable; head rather larger.

Imago generally with externally rounded palpi, the antennæ generally rather slender; eyes salient; thorax large and prominent; abdomen without an anal tuft.

3. Ambulicinæ.

Larva with the anterior segments non-retractile, tapering slightly towards the head, which is abruptly rather larger and rounded; horn oblique, not curved, but slightly pointing upwards at the tip; a series of lateral oblique stripes.

Imago with externally rounded palpi, the antennæ slender in both sexes; eyes salient; thorax rather short; abdomen of the male produced behind, with lateral angular expansion.

4. Smerinthinæ.

Larva rugose, with the anterior segments tapering towards the head, which is abruptly and decidedly larger, flattened in front, and angular above; horn straight.

Imago with the head and thorax short and broad; palpi small, antennæ of male more or less pectinated.

5. Acherontiinæ.

Larva thick, clumsy, *Sphinx*-like, but with the horn always more or less recurved at the tip, and tuberculated or granulose.

Imago clumsy; legs, antennæ, and proboscis thick, the latter very short; head, thorax, and abdomen short and broad.

6. Sphinginæ.

Larva with the anterior segments very slightly smaller than the posterior, generally marked with oblique lateral stripes; horn (when present) rather long; head tolerably large; position of the larva in repose almost sigmoidal.

Pupa frequently with an external sheath for the proboscis.

Imago *Chærocampine* in form, but with the head generally smaller, the thorax variable in length; proboscis very long.

Subfamily I. MACROGLOSSINÆ.

Genus 1. Lepisesia, Grote.

1. Lepisesia flavofasciata.

Macroglossa flavofasciata, Walker, Lep. Het. viii. p. 87. no. 3 (1856).
Lepisesia flavofasciata, Grote, Proc. Ent. Soc. Phil. vol. v. p. 39 (1865).

St. Martin's Falls, Albany River, Hudson's Bay (*Barnston*). Type, B.M.

The above is certainly more nearly allied to *Hemaris* than to *Macroglossa*, and appears to be a well-marked genus.

2. Lepisesia victoria.

Lepisesia victoria, Grote, Bull. Buff. Soc. Nat. Sci. ii. p. 147 (1874).

British Columbia (*Crotch*).

Genus 2. Sataspes, Moore.

Sataspes, Moore, Cat. Lep. East-Ind. Comp. i. p. 261 (1857).

1. Sataspes infernalis.

Sesia infernalis, Westwood, Cab. Orient. Ent. p. 61, pl. 30. fig. 3 (1848).
Macroglossa infernalis, Walker, Lep. Het. viii. p. 95. no. 19 (1856).
Sataspes infernalis, Moore, Cat. Lep. E.I. Comp. i. p. 261. no. 597 (1857).

Silhet (*Stainsforth*), Nepal (*Whitely*), Coimbatoor (*Walhouse*). B.M.

2. SATASPES UNIFORMIS.

Sataspes uniformis, Butler, P. Z. S. 1875, p. 3. n. 1.
Var. *Sataspes infernalis,* Boisduval, Sp. Gén. Lép. i. pl. 10. figs. 1, 2 (1875).

Silhet (*Stainsforth*). Type, B.M.

3. SATASPES VENTRALIS.

Sataspes ventralis, Butler, P. Z. S. 1875, p. 3. n. 2.
Sataspes tagalica, Boisduval, Sp. Gén. Lép. p. 278, pl. 10. figs. 3, 4 (1875).

Hong-Kong (*Bowring*), Silhet (*Stainsforth*). Type, B.M.

4. SATASPES XYLOCOPARIS.

Sataspes xylocoparis, Butler, P. Z. S. 1875, p. 239, pl. xxxvi. fig. 1.

Shanghai, China. Type, coll. F. Moore.

Genus 3. HEMARIS[1], Dalman.

Hemaris, Dalman, Vet. Akad. Handl. p. 207 (1816).

1. HEMARIS BOMBYLIFORMIS.

Sphinx bombyliformis, Ochsenheimer, Schmett. von Eur. ii. p. 182. no. 2 (1810).
Cephonodes bombyliformis, Hübner, Verz. bek. Schmett. p. 131. no. 1403 (1816).
Sesia bombyliformis, Stephens, Ill. Brit. Ent. Haust. i. p. 135. no. 2 (1828).
Macroglossa bombyliformis, Boisduval, Ind. Meth. p. 45. no. 369 (1840).
Sphinx fuciformis, Denis (nec Linnæus), Wien. Verz. p. 44. no. 1 (1775).
Sesia fuciformis, Fabricius, Ent. Syst. iii. 1, p. 381. no 11 (1793).
Var. *Sesia milesiformis,* Treitschke, Schmett. von Eur. x. 1, p. 125 (1834).
Sphinx variegata, Manip. Ins. Taurin. p. 193.

Europe (*Becker*). B.M.

2. HEMARIS FUMOSA.

Macroglossa fumosa, Strecker, Lep. Rhop. et Het. p. 93 (1874).

Albany.

Allied to *H. diffinis*; Grote believes it to be = *H. tenuis*, in which the scales on the pellucid area of the wings are still adherent.

[1] After wading through the long description of *Hæmorrhagia*, Grote and Robinson, I am still unable to distinguish it *structurally* from *Hemaris*; indeed the authors themselves seem doubtful as to the generic position of one species, *Sesia radians.*

3. Hemaris palpalis.

Hemaris palpalis, Grote, Bull. Buff. Soc. Nat. Sci. ii. p. 145 (1874).

British Colombia (*Crotch*).
Allied to *H. tenuis.*

4. Hemaris diffinis.

Macroglossa diffinis, Boisduval, Sp. Gén. Lép. pl. 15. fig. 2 (1836).
Sesia diffinis, Harris, Cat. N. Am. Sph., Sill. Journ. vol. xxxvi. p. 308 (1839).
Hemaris diffinis, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 5, pl. 1. fig. 8 (1873).
Sphinx fuciformis, Smith and Abbot (nec Linnæus), Lep. Ins. Georg. vol. i. p. 85, pl. 43 (1797).

Canada West (*Bush*), United States (*Doubleday*), East Florida, Vancouver's Island (*Lyall*). B.M.

Allied to *H. fuciformis*; the larva is described by Mead (Canad. Ent. ii. pp. 157, 158, 1870).

5. Hemaris tenuis.

Hemaris tenuis, Grote, Bull, Buff. Soc. Nat. Sci. i. p. 4, pl. 1. fig. 6 (1873).

New York and Pennsylvania (*Strecker*).

6. Hemaris thetis.

Sesia thetis, Grote and Robinson, Trans. Am. Ent. Soc. vol. i. p. 3, pl. 6. fig. 36 (Jan. 1868).
Macroglossa thetis, Boisduval, Comp. Zool. Réc. p. 326 (1868).
Hemaris thetis, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 5, pl. 1. fig. 7 (1873).

California (*Lorquin*).
Closely allied to *S. diffinis.*

7. Hemaris metathetis, n. sp.

Sesia axillaris, Butler (nec Grote), Ann. & Mag. Nat. Hist. ser. 4, vol. xiv. p. 366 (1874).

Texas (*Belfrage*). Type, B.M.

This species was sent by Belfrage, labelled "*S. axillaris*, Grote and Robinson," which has led to my error; it differs in its smaller size, narrower and not dentated border, with other minor characters.

8. Hemaris sieboldi.

Macroglossa sieboldi, Boisduval in De l'Orza's Lép. Japon. p. 35. no. 76 (1869).
Sesia whitelyi, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xiv. p. 367 (Nov. 1874).

♂ ♀, Hakodadi (*Stephens*); ♂, Japan (*Fortune*). Type, B.M.

The Japanese representative of *H. fuciformis*. M. Boisduval having described it as a *Macroglossa*, I unfortunately overlooked his description.

9. HEMARIS MANDARINA.

Hemaris mandarina, Butler, P. Z. S. 1875, p. 239, pl. xxxvi. fig. 2.

Shanghai. Type, coll. F. Moore.

10. HEMARIS FUCIFORMIS.

Sphinx fuciformis, Linnæus, Syst. Nat. i. 2, p. 803. no. 28 (1766).
Sesia fuciformis, Schæffer, Icon. Ins. p. 21 (1766–79).
Cephonodes fuciformis, Hübner, Verz. bek. Schmett. p. 131. no. 1404 (1816).
Macroglossa fuciformis, Children, Abstr. Gen. Lep. Eur. p. 29. no. 1 (1829).
Sphinx bombyliformis, Esper (nec Ochsenheimer), Eur. Schmett. ii. p. 180, pl. 23 (1777).
Sesia bombyliformis, Fabricius, Ent. Syst. iii. 1, p. 382. no. 12 (1793).

Europe (*Becker*). B.M.

11. HEMARIS AFFINIS.

Sesia affinis, Bremer, Lep. Ost-Sib. p. 85, pl. iii. fig. 13 (1864).

Amur (*Druce*). B.M.

Closely allied to the preceding species, but rather darker.

12. HEMARIS SAUNDERSII.

Sesia saundersii, Walker, Lep. Het. viii. p. 83. no. 7 (1856).

North India (*Stevens, Doubleday*). Type, B.M.

This species is a complete link between the *H. fuciformis* group and *H. hylas*; the latter though different in aspect (owing to the narrow-scaled border of primaries), does not, so far as I can see, differ structurally from the other species of *Hemaris*.

13. HEMARIS VENATA.

♂, *Macroglossa venata*, Felder, Sitz. Akad. Wiss. Wien, xliii. p. 29. no 61; Reise der Novara, Lep. iv. tab. 75. fig. 6 (Nov. 1874).

Amboina.

Allied to *H. fuciformis*, but one third larger, the body longer, different in character.

14. HEMARIS RADIANS.

Sesia radians, Walker, Lep. Het. viii. p. 84. no. 8 (1856).

Shanghai (*Fortune*). Type, B.M.

Approaching *H. thysbe* in character.

15. HEMARIS ALTERNATA.

Sesia alternata, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xiv. p. 366 (Nov. 1874).

Hakodadi (*Whitely*). Type, B.M.

16. HEMARIS AXILLARIS.

Sesia axillaris, Grote and Robinson, Trans. Am. Ent. Soc. ii. p. 180 (1868).
Hemaris axillaris, Grote, Bull. Buff. Soc. Nat. Sci. p. 6, pl. 1. fig. 9 (1873).
Sesia grotei, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xiv. p. 365 (1874).

Texas (*Belfrage*). B.M.

17. HEMARIS MARGINALIS.

♂, *Hemaris marginalis,* Grote, Bull. Buff. Soc. Nat. Sci. p. 6, pl. 1. fig. 10 (1873).
Michigan (*Strecker*).

Section HÆMORRHAGIA, Grote[1].

18. HEMARIS THYSBE.

Sphinx thysbe, Fabricius, Syst. Ent. p. 548 (1775).
Sesia thysbe, Fabricius, Mant. Ins. i. p. 99 (1787).
Hæmorrhagia thysbe, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 174 (1865).
Sphinx pelasgus, Cramer, Pap. Exot. iii. p. 93, pl. 248. fig. B (1782).
Sesia pelasgus, Harris, Cat. N.A. Sphing., Sill. Journ. xxxvi. p. 308 (1839).
Sesia cimbiciformis, Stephens, Ill. Brit. Ent. Haust. vol. i. p. 135 (1828).

Massachusetts (*Doubleday*); United States (*Milne*). B.M.

19. HEMARIS RUFICAUDIS.

Sesia ruficaudis, Kirby, Faun. Bor.-Am. vol. iv. p. 303 (1837).
Hæmorrhagia ruficaudis, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 175 (1865).

Canada West (*Bush*); United States. B.M.

This species has been much discussed by Messrs. Grote and Robinson, who make the following statement (Proc. Ent. Soc. Phil. v. p. 175):—"Kirby's description presents too many points of difference with *H. gracilis* to allow us to refer that species as intended, while Mr. Walker evidently describes our species as intended by Kirby." Now although Walker included one example of *H. gracilis* with our examples of *H. ruficaudis*, it is impossible to say that he "evidently describes" that specimen. I believe myself that the Walkerian type (registered "United States") is referable to the present species. It might be considered the American representative of *H. fuciformis*; but it is in some respects more nearly allied to *Hæmorrhagia floridensis* of Grote and Robinson.

[1] This may, perhaps, be a genus, the species being more densely scaled than in *Hemaris*, and having consequently a somewhat different aspect; on the whole, however, I prefer to regard it for the present as a section.

20. Hemaris buffaloënsis.

Hæmorrhagia buffaloënsis, Grote & Robinson, Ann. Lyc. Nat. Hist. New York, vol. viii. p. 437, pl. 16. figs. 18, 19 (1867).

Buffalo.

Very closely allied to, if not identical with *H. ruficaudis* of Walker (? Kirby); the body, however, seems greener in colouring, and the cell of primaries less open.

21. Hemaris gracilis.

Hæmorrhagia gracilis, Grote & Robinson, Proc. Ent. Soc. Phil. vol. v. p. 174, pl. 3. figs. 1, 2 (1865).

Trenton Falls, New York (*E. Doubleday*). B.M.

This may at once be distinguished from even the most similar examples of *H. ruficaudis* (Kirby ?) Walker, by the straight inner edge of the external brown border of primaries, the more heavily scaled discocellulars, and the smaller hyaline patch on secondaries. Grote separates it as a distinct group under the name of *Chamæsesia* (Bull. Buff. Soc. Nat. Sci. i. p. 8, 1873).

22. Hemaris floridensis.

Hæmorrhagia floridensis, Grote & Robinson, Ann. Lyc. Nat. Hist. New York, vol. viii. p. 439, pl. 16. fig. 20 (1867).

Florida.

Allied to *H. fuscicaudis,* but with the external margin narrower and not dentated; in *H. fuscicaudis* it is much more strongly dentated than in *H. thysbe.*

23. Hemaris fuscicaudis.

Sesia fuscicaudis, Walker, Lep. Het. viii. p. 83. no. 6 (1856).
Hæmorrhagia fuscicaudis, Grote & Robinson, Proc. Ent. Soc. Phil. vol. v. p. 174 (1865).

Georgia (*Abbot*). Type, B.M.

Unquestionably the finest species in the genus.

Section Cephonodes, Hübner.

(*Potidæa,* Wallengren.)

24. Hemaris hylas. (Plate XC. figs. 4, 5.)

Sphinx hylas, Linnæus, Mantissa, i. p. 539 (1771).
Sesia hylas, Fabricius, Ent. Syst. iii. 1, p. 379. no. 3 (1793).
Cephonodes hylas, Hübner, Verz. bek. Schmett. p. 131. no. 1402 (1816).
Sphinx picus, Cramer, Pap. Exot. ii. p. 83, pl. 148. fig. B (1779).
Macroglossa kingi, Macleay, King's 'Survey of Australia,' App. p. 465. no. 167 (1827).
Sesia cunninghami, Walker, Lep. Het. viii. p. 85. no. 10 (1856).
Macroglossa cunninghami, Schaufuss, Nunquam Otiosus, i. p. 22 (1870).
Var. *Macroglossa apus,* Boisduval, Faun. Ent. de Madag. p. 79. no. 2, pl. 10. fig. 4 (1833).

China (*Bowring, Harrington, Reeves*); Japan (*Whitely*); Moulmein (*Clerck*); Ceylon (*Wenham*); North India (*James*); Nepal (*Ramsay*); Moreton Bay (*Gibbons*); Australia (*Hunter*); Congo (*Curror*); West Africa (*Argent*); South Africa (*Angas*); Natal (*Gueinzius, Trimen*). B.M.

One of our Natal examples agrees very fairly with the figure of *M. apus*; it is, however, rather less like typical *H. hylas*. Mr. Lewis tells me that when *H. hylas* first leaves the pupa the primaries are covered with yellow scales; he found the larva feeding on *Gardenia*.

25. HEMARIS VIRESCENS.

Potidæa virescens, Wallengren, Kongl. Svenska Vetensk. Akad. Handl. v. no. 4, p. 17. no. 1 (1865).

East Caffraria.

Allied to *H. hylas*.

26. HEMARIS CROATICA.

Sphinx croatica, Esper, Eur. Schmett. p. 33, pl. 45. fig. 2 (1777).
Cephonodes croatica, Hübner, Verz. bek. Schmett. p. 131. no. 1406 (1816).
Macroglossa croatica, Boisduval, Ind. Meth. p. 32 (1840).
Sphinx sesia, Hübner, Eur. Schmett. ii. figs. 89 & 136 (1793–1827).

South-east Europe, Asia Minor, Armenia.

Judging from Hübner's figures alone, I should be satisfied that this was not a *Macroglossa*. The form of the antennæ in the figure seems to indicate a distinction from *Hemaris*; but I have recently examined two specimens in the collection of Mr. Herbert Sharpe, and I now feel convinced that Hübner rightly referred it to his ? genus *Cephonodes*.

Genus 4. RHOPALOPSYCHE, Butler.

Rhopalopsyche, Butler, P. Z. S. 1875, p. 239 (1875).

1. RHOPALOPSYCHE BIFASCIATA.

Rhopalopsyche bifasciata, Butler, P. Z. S. p. 239, pl. xxxvi. fig. 4 (1875).

South India (*Ward*). Type, coll. F. Moore.

2. RHOPALOPSYCHE NYCTERIS.

Macroglossa nycteris, Kollar, Hügel's Kaschmir, iv. 2, p. 458, pl. 19. fig. 5.
Macroglossa volucris, Walker, Lep. Het. viii. p. 94. no. 16 (1856).

Silhet (*Doubleday*); North India (*Argent, Stevens*); Barrackpore (*Hearsay*). B.M.

Genus 5. Macroglossa, Ochsenheimer.

Macroglossa, Ochsenheimer, Eur. Schmett. iv. p. 41 (1816).

1. Macroglossa stellatarum.

Sphinx stellatarum, Linnæus, Syst. Nat. i. 2, p. 803. no. 27 (1766).
Sesia stellatarum, Fabricius, Ent. Syst. iii. 1, p. 380. no. 5 (1793).
Psithyros stellatarum, Hübner, Verz. bek. Schmett. p. 132. no. 1409 (1816).
Macroglossa stellatarum, Stephens, Ill. Brit. Ent. Haust. i. p. 133. no. 1 (1828).

Europe (*Becker*); Tripoli; Teneriffe; Turkey (*Loftus*); Syria (*Lowne*); North China (*Fortune*). B.M.

Mr. Moore has an example of this species from Scinde; I can find no constant character whereby to separate it from the European form.

2. Macroglossa vacillans.

Macroglossa vacillans, Walker, Lep. Het. Suppl. i. p. 27 (1864).

Timor.

3. Macroglossa affictitia.

Macroglossa afictitia, Butler, P. Z. S. 1875, p. 240, pl. xxxvi. fig. 7.

Canara. Type, coll. F. Moore.

4. Macroglossa vialis.

Macroglossa vialis, Butler, P. Z. S. 1875, p. 240, pl. xxxvi. fig. 5.

Canara. Type, coll. F. Moore.

5. Macroglossa gyrans.

Macroglossa gyrans, Walker, Lep. Het. viii. p. 91. no. 11 (1856).

North India (*Stevens*); Madras (*Elliot*); Ceylon (*Templeton*). Type, B.M.
In Mr. Moore's collection from Kurnool, Neilgherries; also from Bengal and Ceylon.

6. Macroglossa approximata.

Macroglossa approximata, Walker, Lep. Het. Suppl. i. p. 27 (1864).

North Australia (*Elsey*). Type, B.M.

Differs from the preceding species in the better-defined tawny spots on each side of the abdomen, the absence of the interrupted white band on preanal segment, and the less-defined transverse lines on primaries.

7. Macroglossa milvus.

Macroglossa milvus, Boisduval, Faune Ent. de Madag. p. 78. no. 1, pl. 10. fig. 3 (1833).

Bourbon and Mauritius; Madagascar (*Peckover*). B.M.

8. Macroglossa fervens.

Macroglossa fervens, Butler, P. Z. S. 1875, p. 4, pl. i. fig. 3.

Canara (*Ward*). Type, B.M.

9. Macroglossa avicula.

Macroglossa avicula, Boisduval, Sp. Gén. Lép. p. 334 (1875).
Macroglossa avicula, Butler, P. Z. S. 1875, p. 240.

Java (*Argent*). Type, B.M.

10. Macroglossa bombylans.

Macroglossa bombylans, Boisduval, Sp. Gén. Lép. p. 334 (1875).
Macroglossa gilia, Walker, Lep. Het. viii. p. 93. no. 15 (1856).

North India (*Stevens*); Hong-Kong (*Bowring*). B.M.
In Mr. Moore's collection labelled "Deyra Doon."

11. Macroglossa pylene.

Macroglossa pylene, Felder, Sitz. Akad. Wiss. Wien, xliii. p. 29.

Amboina.

12. Macroglossa tristis.

Macroglossa tristis, Schaufuss, Nunquam Otiosus, i. p. 22 (1870).

China.
I believe this to be *M. bombylans* faded; if so, the name will take priority.

13. Macroglossa trochilus.

Psithyros trochilus, Hübner, Samml. exot. Schmett. ii. pl. 158. figs. 1–4 (1806).
Macroglossa trochilus, Walker, Lep. Het. viii. p. 90. no. 8 (1856).
Rhamphoschisma trochilus, Wallengren, Svensk. Vetensk. Akad. Handl. vol. v. p. 17 (1863).
Rhamphoschisma fasciatum, Wallengren, Kongl. Vet. Akad. Förhandl. p. 139 (1858).

Natal (*Gueinzius*); South Africa (*Smith*); Cape (*Drège*). B.M.

14. Macroglossa trochiloides.

Macroglossa trochiloides, Butler, P. Z. S. 1875, p. 5. no. 6.

Sierra Leone (*Foxcroft*). Type, B.M.

15. Macroglossa glaucoptera.

Macroglossa glaucoptera, Butler, P. Z. S. 1875, p. 241, pl. xxxvi. fig. 9.

Ceylon (*T. Skinner*). Type, coll. F. Moore.

16. MACROGLOSSA NIGRIFASCIATA.

Macroglossa nigrifasciata, Butler, P. Z. S. 1875, p. 241, pl. xxxvii. fig. 3.

Ceylon. Type, coll. F. Moore

17. MACROGLOSSA BELIS. (Pl. XC. figs. 6, 7.)

Sphinx belis, Cramer, Pap. Exot. i. p. 147, pl. 94. fig. C (1779).
Macroglossu assimilis (*sic*), Swainson, Zool. Ill. 2nd ser. vol. i. pl. 64 (1820).

North India (*Stevens*); Canara (*Ward*). B.M.

In my recent paper on new species of *Sphingidæ* I have regarded this merely as a variety of *M. passalus,* allied to my *M. proxima*; I am now, however, convinced that it is a distinct species. I hesitated to separate it at first, on account of Cramer's locality for *M. belis* being "China;" it is, however, quite possible that both species occur in China, and still retain their distinctive characteristics. They are not more nearly allied than other *Sphingidæ* inhabiting far more restricted regions; and in a revision of any group of animals I am satisfied that it is far safer to err on the side of too much subdivision than of too little, much mischief having arisen as regards the multiplication of synonyms through the incautious association of different-looking forms together; Mr. Moore recived *M. belis* from the Himalayas.

18. MACROGLOSSA LUTEATA.

Macroglossa luteata, Butler, P. Z. S. 1875, p. 241, pl. xxxvii. fig. 5.

Silhet. Type, coll. F. Moore.

19. MACROGLOSSA ALCEDO.

Macroglossa alcedo, Boisduval, Voy. de l'Astrolabe, Ent. p. 188. no. 2 (1832–1835).

Dorey (*Wallace*). B.M.

Nearly allied to *M. proxima.* It is badly described, inasmuch as the primaries have two indistinct broad shining lilacine fasciæ across them which are not mentioned; they are also chocolate-brown rather than black-brown; the orange band of secondaries is also dusky in the centre (a character not mentioned); and the anal tuft of abdomen is not varied with yellow, but terminates in a broad tawny band. The description is not quoted by Walker.

20. MACROGLOSSA PROXIMA.

Macroglossa proxima, Butler, P. Z. S. 1875, p. 4, pl. i. fig. 1.

Ceylon (*Templeton*); Canara (*Ward*); Silhet. Type, B.M.; Cambogia, coll. Moore.

21. MACROGLOSSA INTERRUPTA.

Macroglossa interrupta, Butler, P. Z. S. 1875, p. 242, pl. xxxvii. fig. 2.

Darjeeling. Type, coll. F. Moore.

22. Macroglossa passalus.

Sphinx passalus, Drury, Exot. Ins. ii. p. 52, pl. 29. fig. 2 (1773).
Macroglossa passalus, Walker, Lep. Het. viii. p. 92. no. 12 (1856).

Shanghai (*Fortune*); Hong-Kong (*Bowring*). B.M.

Mr. Moore has an example of what I believe to be a variety of this species from Penang.

23. Macroglossa sitiene.

Macroglossa sitiene, Walker, Lep. Het. viii. p. 92. no. 13 (1856).

Silhet? Type, B.M.

Under this species Mr. Walker placed several examples of *M. belis,* several of a small species near *M. divergens,* and one specimen of *M. trochilus*; fortunately the type was marked.

24. Macroglossa pyrrhosticta. (Plate XC. fig. 8.)

Macroglossa pyrrhosticta, Butler, P. Z. S. 1875, p. 242, pl. xxxvi. fig. 8.

Shanghai. Type, coll. F. Moore.

Bred in Japan by Mr. George Lewis.

25. Macroglossa insipida.

Macroglossa insipida, Butler, P. Z. S. 1875, p. 242. no. 12.

Ceylon (*Skinner*). Type, coll. F. Moore.

26. Macroglossa corythus.

Macroglossa corythus, Walker, Lep. Het. viii. p. 92. no. 14 (1856).

Java (*Horsfield*). Type, B.M.

A constant and tolerably well-marked species strictly confined to Java. Several other species were placed with it by Mr. Walker; and the labels to *M. corythus* and *M. gilia* were transposed in the cabinet.

27. Macroglossa gilia. (Plate XC. figs. 9, 10.)

Macroglossa gilia, Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 23. fig. 107 (1850–1858).

Nearly allied to *M. corythus,* but all the markings of primaries darker and better-defined, the inner transverse bar filled in with blackish towards internal margin; secondaries with subcostal area (uniting with transverse band) orange; body rather darker; under surface of wings redder. Expanse of wings 2 inches.

Silhet (*Stainsforth*). Type, B.M.

A local representative of *M. corythus.* We have two examples in the collection of the British Museum; it is in Mr. Moore's collection from Darjeeling.

The larva of *M. gilia* is white, speckled with green; the anterior segments, horn, a lateral longitudinal line, and seven oblique streaks between the spiracles (which are minute and orange) green. It feeds upon *Pæderia fœtida*.

28. MACROGLOSSA CATAPYRRHA.

Macroglossa catapyrrha, Butler, P. Z. S. 1875, p. 243, pl. xxxvi. fig. 6.

North India (*coll. Moore*); Ceylon (*Templeton*). B.M.

29. MACROGLOSSA OBSCURA.

Macroglossa obscura, Butler, P. Z. S. 1875, p. 5, pl. i. fig. 2.

Java (*Horsfield*). Type, B.M.

30. MACROGLOSSA ORIENTALIS, n. sp.

Allied to the preceding and to *M. sitiene*; primaries as in *M. fervens*, but larger and rather paler; secondaries as in *M. passalus*, but with the yellow band rather broader, clearer, and more sharply defined; body as in *M. belis*; wings and body below almost precisely as in *M. corythus*. Expanse of wings 2 inches 1 line.

Moulmein (*Clerck*). Type, B.M.

31. MACROGLOSSA DIVERGENS.

Macroglossa divergens, Walker, Lep. Het. viii. p. 94. no. 17 (1856).

Ceylon (*Templeton*). Type, B.M.

This species is intermediate in character between *M. sitiene* and *M. proxima*; it is in Mr. Moore's collection from Canara.

32. MACROGLOSSA FARO.

Sphinx faro, Cramer, Pap. Exot. iii. p. 165, pl. 285. fig. C (1782).
Macroglossa faro, Walker, Lep. Het. Suppl. i. p. 27 (1864).

Java (*Horsfield*). B.M.

33. MACROGLOSSA HEMICHROMA.

Macroglossa hemichroma, Butler, P. Z. S. 1875, p. 243, pl. xxxvii. fig. 1.

Silhet. Type, coll. F. Moore.

34. MACROGLOSSA RECTIFASCIA.

Rhamphoschisma rectifascia, Felder, Reise der Nov. Lep. iv. tab. 75. fig. 7 (Nov. 1874).

——— ?

Allied to *M. sitiene* and *M imperator*; it more nearly approaches the latter.

I can see no reason why this species should be separated from *Macroglossa*.

35. Macroglossa scottiarum.

Rhamphoschisma scottiarum, Felder, Reise der Nov. Lep. iv. tab. 75. fig. 8 (Nov. 1874).

——— ?

36. Macroglossa imperator.

Macroglossa imperator, Butler, P. Z. S. 1875, p. 243, pl. xxxvii. fig. 4.

Ceylon (*T. Skinner*). Type, coll. F. Moore.

37. Macroglossa hirundo.

Macroglossa hirundo, Boisduval, Voy. de l'Astrolabe, Ent. p. 188. no. 1 (1832–35).

Taiti.

Possibly the variety of *M. errans* in which the transverse white band is interrupted; the description of *M. hirundo* was overlooked by Walker.

38. Macroglossa errans.

Macroglossa errans, Walker, Lep. Het. viii. p. 96. no. 20 (1856).

Moreton Bay (*Gibbons*); Australia (*Strange*). Type, B.M.

The type is from Moreton Bay, and has the transverse band of primaries distinct and white.

39. Macroglossa micacea.

Macroglossa micacea, Walker, Lep. Het. viii. p. 96. no. 21 (1856).

Moreton Bay (*Gibbons*); Australia (*Strange*). Type, B.M.

The example described as the female of this species is quite distinct.

40. Macroglossa nox.

Macroglossa nox, Newman, Trans. Ent. Soc. 2nd ser. vol. iv. p. 54 (1857); Butler, P. Z. S. 1875, p. 5, pl. i. fig. 6.

Rockingham Bay (*Macgillivray*). Type, B.M.

41. Macroglossa erato.

Macroglossa erato, Boisduval, Lép. de la Californie, in Ann. Soc. Ent. Belge, xii. p. 65. no. 67 (1868).

Los Angelos (*Lorquin*).

Not like any other species; the primaries ashy grey, with a broad black border; several little transverse black lines at the base; secondaries white, with a very broad black border; fringes whitish; body black; pectus greyish white; palpi white.

Genus 6. Aëllopus, Hübner.

Aëllopus, Hübner, Verz. bek. Schmett. p. 131 (1816).

1. Aëllopus tantalus.

Sphinx tantalus, Linnæus, Mus. Lud. Ulr. p. 21 (1764).
Sesia tantalus, Fabricius, Ent. Syst. iii. 1, p. 379. no. 1 (1793).
Aëllopus tantalus, Hübner, Samml. exot. Schmett. ii. pl. 157. figs. 1–4 (1806).
Macroglossa tantalus, Walker, Lep. Het. viii. p. 88. no. 4 (1856).
Sphinx ixion, Linnæus, Syst. Nat. ii. p. 803. no. 26 (1766).
Sphinx zonata, Drury, Ins. Exot. i. p. 57, pl. 26. fig. 5 (1770).
Sphinx tripunctata, Goeze, Beytr. iii. 2, p. 216. no. 43 (1780).

Jamaica (*Gosse*); Haiti (*Tweedie*); St. Thomas. B.M.

Mr. Walker confounded this with the next species in his Catalogue.

2. Aëllopus fadus.

Sphinx fadus, Cramer, Pap. Exot. i. p. 95, pl. 61. fig. C (1779).
Sesia fadus, Fabricius, Ent. Syst. iii. 1, p. 378 (1793).
Macroglossa fadus, Walker, Lep. Het. viii. p. 89. no. 7 (1856).
Sphinx titan, Cramer, Pap. Exot. ii. p. 73, pl. 142. fig. F (1779).
Aëllopus titan, Grote, Proc. Ent. Soc. Phil. v. p. 41 (1865).
Macroglossum annulosum, Swainson, Ill. iii. pl. 132. fig. 1 (1823).

Venezuela (*Dyson*); Mexico (*Hartweg*); Brazil. B.M.

3. Aëllopus blaini.

Aëllopus blaini, Herrich-Schäffer, Samml. auss. Schm. ii. fig. 553 (1869); Grote, Trans. Am. Ent. Soc. iii. p. 184 (1871).

Cuba.

4. Aëllopus sisyphus.

Macroglossa sisyphus, Burmeister, Sph. Bras., Abhandl. naturf. Gesellsch. Halle, p. 74 (1855).
Aëllopus sisyphus, Grote, Proc. Ent. Soc. Phil. v. p. 42 (1865).

Rio Janeiro.

5. Aëllopus commasiæ.

Macroglossa commasiæ, Walker, Lep. Het. viii. p. 90. no. 9 (1856).

Sierra Leone (*Morgan*). Type, B.M.

This species at first sight looks very like *M. tantalus*; but the primaries are destitute of hyaline spots, and the body has two segments blue-white instead of one segment snow-white.

6. Aëllopus hirundo.

Macroglossa hirundo, Gerstäcker, Arch. Nat. xxxvii. p. 360 (1871); Von der Decken's Reisen in Ost-Africa, Gliederthiere, p. 375, no. 30. Taf. xv. fig. 7 (1873).

September, 1862, Mombas (*Gerstäcker*).

Allied to *A. commasiæ*, but constantly differing in the clothing of the upper surface of the head, thorax, base of abdomen, and of the wings, which are greyish mouse-brown; the bands of the primaries are also not arranged in pairs, but are wide apart; the dorsal region of the abdomen has the third and fourth (not the second and third) segments banded with blue-white.

This species is also said to occur at the Cape.

Genus 7. Stenolophia, Felder.

Stenolophia, Felder, Reise der Nov., Lep. v. (1874).

Stenolophia tenebrosa.

Stenolophia tenebrosa, Felder, Reise der Nov., Lep. iv. tab. lxxxii. fig. 3 (Nov. 1874).

——— ?

Very like *Perigonia glaucescens*, Walker; and (not having seen the insect) I am rather inclined to think it is a nearly allied *Perigonia* with the anal tuft rubbed off.

Genus 8. Eupyrrhoglossum, Grote.

Eupyrrhoglossum, Grote, Proc. Ent. Soc. Philad. vol. v. p. 42 (1865).

1. Eupyrrhoglossum sagra.

Macroglossum sagra, Poey, Cent. Lepid. Decade 2 (1832).
Macroglossa sagra, Walker, Lep. Het. viii. p. 89. no. 6 (1856).
Eupyrrhoglossum sagra, Grote, Proc. Ent. Soc. Phil. v. p. 43 (1865).
Macroglossa harpygia, Schaufuss, Nunquam Otiosus, i. p. 22 (1870).

Brazil (*Doubleday*); Colombia (*Becker*). B.M.

2. Eupyrrhoglossum ? ceculus.

Sphinx ceculus, Cramer, Pap. Exot. ii. p. 80, pl. 146. fig. G (1779).
Psithyros ceculus, Hübner, Verz. bek. Schmett. p. 132. no. 1411 (1816).
Macroglossa ceculus, Walker, Lep. Het. viii. p. 88. no. 5 (1856).
Eupyrrhoglossum ceculus, Grote, Proc. Ent. Soc. Phil. v. p. 43 (1865).
Macroglossum fasciatum, Swainson, Ill. iii. pl. 132. fig. 2 (1823).
? *Macroglossa corvus,* Boisduval, Lép. Guat. p. 66 (1870).

Pará (*Smith*); Brazil (*Doubleday* and *Mornay*); Mexico (*Argent*). B.M.

Genus 9. Perigonia (Herrich-Schäffer), Walker.

Perigonia (Herrich-Schäffer), Walker, Lep. Het. viii. p. 100. gen. 5 (1856).

1. Perigonia glaucescens.

Perigonia glaucescens, Walker, Lep. Het. viii. p. 103. no. 5 (1856).

Haiti (*Tweedie*). Type, B.M.

Somewhat similar to *Macroglossa tantalus.*

2. Perigonia divisa.

Perigonia divisa, Grote, Lyc. Nat. Hist. New York, vol. viii. p. 199 (1867).

Cuba (*Gundlach* and *Poey*).

3. Perigonia restituta.

Panacra restituta, Walker, Lep. Het. Suppl. i. p. 32 (1864).

Perigonia lusca (part.), Walker, Lep. Het. viii. p. 101. no. 1 (1856).

Mexico (*Hartweg*); Venezuela (*Dyson*); Pará (*Smith*). Type, B.M.

In the 'Supplement' Mr. Walker retained the name of *P. lusca* for this species, renaming the typical form *P. interrupta.*

4. Perigonia ilus.

Perigonia ilus, Boisduval, Lép. Guat. p. 66 (1870).

"Honduras and Mexico" (*Boisduval*); ——— ? B.M.

I should hardly call the primaries of *Perigonia* "sinueuses;" they are rather waved, but only slightly so. The present species may, I think, be a variety of *P. lusca*; I must confess my inability to discover its resemblance to *Thyreus abbotii*; it would even have been better to have compared it with *Lophura continua.*

5. Perigonia lusca.

Sphinx lusca, Fabricius, Sp. Ins. iii. p. 140. no. 5 (1781).

Perigonia lusca (part.), Walker, Lep. Het. viii. p. 101. no. 1 (1856).

Perigonia interrupta, Walker, Lep. Het. Suppl. i. p. 29 (1864).

Guatemala (*Sallé*); Haiti (*Tweedie*); Mexico (*Argent*). Type, B.M.

There can be no doubt about the identification of this species; for Fabricius says, "Posticæ supra atræ, fascia *magna* fulva, quæ tamen marginem tenuiorem haud attingit. *Angulus ani cinereus, litura fulva.* Habitat in Americæ meridionalis insulis."[1]

6. Perigonia lefebvrei.

Macroglossa lefebvrei, Herrich-Schäffer, Corr.-Blatt, 1863, p. 147.

Perigonia lefebvrei, id. Corr.-Blatt, 1865, p. 56.

Cuba (*Poey*).

Smaller than the preceding, with no orange spot at anal angle.

[1] The italics are mine

7. Perigonia stulta.

Perigonia stulta, Herrich-Schäffer, Samml. aussereurop. Schmett. fig. 106 (1850–1858).

Cuba (*Poey*).

In this species the orange band of secondaries absorbs the entire base of the wing.

8. Perigonia ? doto.

Macroglossa doto, Schaufuss, Nunquam Otiosus, i. p. 21 (1870).

"Africa ?"

If this is a *Perigonia* the locality is unquestionably wrong, as Dr. Schaufuss suspects (believing that Dr. Kaden, in the dark, labelled it with a blue ticket instead of a green one). The species is said to be allied to *P. stulta.*

9. Perigonia ? affinis.

Macroglossa affinis, Schaufuss, Nunquam Otiosus, i. p. 21 (1870).

Venezuela.

Described as a variety of the preceding, and (according to what Dr. Schaufuss says) scarcely differing from it.

Genus 10. Pachygonia, Felder.

Pachygonia, Felder, Reise der Nov., Lep. v. (1875).

Allied to *Eupyrrhoglossum.* Primaries with the apex produced and excavated; inner margin deeply excavated below external angle (rendering the angle very acute). Palpi less strongly angulated. Antennæ comparatively rather shorter. Anal tuft of abdomen very broad, short, and dense.

Type *P. subhamata.*

1. Pachygonia subhamata.

Perigonia subhamata, Walker, Lep. Het. viii. p. 102. no. 4 (1856).
Perigonia caliginosa, Boisduval, Lép. Guat. p. 66 (1870).
Pachygonia caliginosa, Felder, Reise der Nov., Lep. iv. tab. 75. fig. 10 (1874).
Macroglossa gigantea, Schaufuss, Nunquam Otiosus, i. p. 20 (1870).

♀, Mexico (*Argent*); ♂, Venezuela (*Dyson*); Pará (*Bates*). Type, B.M.

Boisduval's descriptions will of course take priority over Felder's figures, excepting (as in the present case) when they are forestalled by those of other authors.

2. Pachygonia coffeæ.

Perigonia coffææ, Walker, Lep. Het. viii. p. 101. no. 2 (1856).

Brazil (*Stevens*) Type, B.M.

3. Pachygonia abboti.

Macroglossa abboti, Schaufuss, Nunquam Otiosus, i. p. 21 (1870).

Colombia.

Seems to be nearly allied to *P. coffeæ*.

4. Pachygonia magna.

Perigonia magna, Felder, Reise der Nov., Lep. iv. tab. 75. fig. 12 (Nov. 1874).

——— ?

Possibly identical with the preceding; it comes better with *Pachygonia* than with *Perigonia*, although it may eventually have to be placed with *P. coffeæ* in a new genus.

Genus 11. Rhodosoma, n. gen.

Allied to *Perigonia*. Primaries elongate, triangular. Secondaries subtriangular, rounded at apex, subangulated at anal angle. Discocellulars of all the wings convex. Discoidal cell of secondaries very short. Head small. Palpi obtuse, conical in front. Antennæ long and slender. Thorax and abdomen very robust; the latter compressed, truncate behind, with small lateral and terminal tufts. Tibiæ of second and third pairs of legs terminating in two strong diverging spines.

Type *R. triopus*.

Rhodosoma triopus.

Macroglossa triopus, Westwood, Cab. Orient. Ent. p. 14, pl. 6. fig. 4 (1848).

Silhet (*Stainsforth*). B.M.

The type was described as from Assam.

Genus 12. Thyreus, Swainson.

Thyreus, Swainson, Zool. Ill. vol. i. pl. 60 (1821).

Thyreus abboti.

Thyreus abbotii, Swainson, Zool. Ill. vol. i. pl. 60 (1821).
Brachynota abbotii, Boisduval, Lép. Guat. p. 66 (1870).

Georgia (*Abbot*); New York (*Doubleday*). B.M.

Transformations described and larva and imago figured, Am. Ent. ii. p. 123, 1870; the larva is also figured by Scudder in Harris's 'Correspondence,' pl. iii. fig. 1 (1869), and by Packard in his 'Guide,' p. 276. fig. 203.

Genus 13. Amphion, Hübner.

Amphion, Hübner, Verz. bek. Schmett. p. 135 (1816).

Amphion nessus.

Sphinx nessus, Cramer, Pap. Exot. vol. ii. p. 16, pl. 107. fig. D (1779).
Amphion nessus, Hübner, Verz. bek. Schmett. p. 135. no. 1444 (1816).
Thyreus? nessus, Harris, Cat. N.-Am. Sph., Sill. Journ. vol. xxxvi. p. 308 (1839).

Trenton Falls (*Doubleday*); Orilla, Canada West (*Bush*). B.M.

Genus 14. Deidamia, Clemens.

Deidamia, Clemens, Syn. N.-Am. Sph. p. 137 (1859).

Deidamia inscripta.

Pterogon? inscriptum, Harris, Cat. N.-Am. Sph., Sill. Journ. vol. xxxvi. p. 306 (1838).
Thyreus? inscriptus, Walker, Lep. Het. viii. p. 100. no. 4 (1856).
Deidamia inscripta, Clemens, Syn. N.-Am. Sph., Journ. A. N. S. Phil. p. 137 (1859); Grote, Bull. Buff. Soc. p. 20 (1873).

"Atlantic district" (*Grote*).

Mr. Grote queries this as the *Sphinx japix* of Cramer. I can hardly believe it to be that species; but if so, Mr. Walker's genus *Unzela* will take priority.

Genus 15. Unzela, Walker.

Unzela, Walker, Lep. Het. viii. p. 161. gen. 18 (1856).

Unzela japix.

Sphinx japix, Cramer, Pap. Exot. i. p. 137, pl. 87. fig. C (1779).
Enyo japix, Hübner, Verz. bek. Schmett. p. 132. no. 1416 (1816).
Unzela japyx (sic), Walker, Lep. Het. viii. p. 162. no. 2 (1856).
Unzela discrepans, Walker, *l. c.* no. 1 (1856).
Cornipalpus succinctus, Felder, Reise der Nov., Lep. iv. tab. 82. fig. 6 (Nov. 1874).

Rio Janeiro (*Stevens*). B.M.

For information respecting Cramer's locality for this species see Proc. Ent. Soc. Phil. vol. v. p. 192 (1865).

Genus 16. Proserpinus, Hübner.

Proserpinus, Hübner, Verz. bek. Schmett. p. 132 (1816).

1. Proserpinus œnotheræ.

Sphinx œnotheræ, Fabricius, Sp. Ins. ii. p. 141. no. 10 (1781).
Proserpinus œnotheræ, Hübner, Verz. bek. Schmett. p. 132. no. 1413 (1816).

Pterogon œnotheræ, Boisduval, Ind. Meth. p. 46. no. 372.
Sphinx proserpina, Pallas, Spic. Zool. ix. p. 26, pl. 2. fig. 7 (1772).
Europe (*Becker*). B.M.

2. PROSERPINUS CLARKIÆ.

Pterogon clarkiæ, Boisduval, Ann. Soc. Ent. Fr. 2e sér. x. p. 319 (1852).
Thyreus? clarkiæ, Walker, Lep. Het. viii. p. 262 (1856).
Proserpinus clarkiæ, Clemens, Syn. N.-Am. Sph., Journ. A. N. S. Phil. 1859, p. 134.
California (*Lord Walsingham*). B.M.

3. PROSERPINUS GAURÆ.

Sphinx gauræ, Smith and Abbot, Ins. Georgia, vol. i. p. 61, pl. 31 (1797).
Proserpinus gauræ, Hübner, Verz. bek. Schmett. p. 132 (1816).
Thyreus gauræ, Walker, Lep. Het. viii. p. 100. no. 3 (1856).
Georgia (*Abbot*); ? Texas (*Clemens*).

4. PROSERPINUS GORGON.

Sphinx gorgon, Esper, Eur. Schmett. ii. Cont. 22, pl. 47. fig. 5 (1777).
Macroglossa gorgon, Ochsenheimer, Eur. Schmett. ii. p. 199 (1808).
Pterogon gorgon, Duponchel, Hist. Nat. Lép. Fr., Suppl. ii. p. 23, pl. 3. fig. 2 (1832).
Pterogon gorgoniades, Boisduval, Ind. Meth. p. 32.
Proserpinus gorgoniades, Walker, Lep. Het. viii. p. 98. no. 2 (1856).
South Russia.

Genus 17. EUPROSERPINUS, Grote and Robinson.

Euproserpinus, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 177 (1865).

EUPROSERPINUS PHAËTON.

Euproserpinus phaëton, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 178 (1865).
California (*Weidemeyer*).

Genus 18. TEMNORA, Walker.

Temnora, Walker, Lep. Het. viii. p. 104. gen. 6 (1856).

1. TEMNORA NATALIS.

Temnora natalis, Walker, Lep. Het. viii. p. 104. no. 1 (1856).
Natal (*Gueinzius*). Type, B.M.

2. TEMNORA (??) CAUDATA.

Thyreus caudatus, Bremer and Grey, Beitr. z. Schmett.-Faun. Nordl. China's, p. 56.
Temnora? caudata, Walker, Lep. Het. viii. p. 105. no. 3 (1856).

North China.

I do not believe this to be either a *Thyreus* or a *Temnora*; but not having seen it, I am unable to refer it to its right genus.

Genus 19. LOPHURA, Walker.

Lophura, Walker, Lep. Het. viii. p. 105. gen. 7 (1856).

1. LOPHURA PLAGIATA.

Temnora plagiata, Walker, Lep. Het. viii. p. 105. no. 2 (1856).
Panacra confusa, Walker, *t. c.* p. 161. no. 10 (1856).

Port Natal (*Gueinzius*). Types, B.M.

2. LOPHURA SARDANUS.

Enyo sardanus, Walker, Lep. Het. viii. p. 116. no. 7 (1856).

Sierra Leone (*Morgan*). Type, B.M.

3. LOPHURA ? EXCISA.

Enyo excisa, Walker, Lep. Het. viii. p. 119. no. 13 (1856).

Port Natal.

4. LOPHURA MASURIENSIS.

Lophura masuriensis, Butler, P. Z. S. 1875, p. 244, pl. xxxvi. fig. 3.

Masuri, North-west Himalayas. Type, coll. F. Moore.

5. LOPHURA PUSILLA.

Lophura pusilla, Butler, P. Z. S. 1875, p. 244. n. 17.

Silhet. Type, coll. F. Moore.

6. LOPHURA NANA.

Lophura nana, Walker, Lep. Het. viii. p. 107. no. 4 (1856).

Port Natal (*Gueinzius*). Type, B.M.

7. LOPHURA ZANTHUS.

Lophura zanthus (sic), Herrich-Schäffer, Exot. Schmett. pl. 23. fig. 105 (1850–1858).

Cape of Good Hope.

A large species having the form of *L. hyas*.

8. LOPHURA HYAS. (Plate XC. figs. 1–3.)

Lophura hyas, Walker, Lep. Het. viii. p. 107. no. 3 (1856).

Hong-Kong (*Champion*); Silhet (*Doubleday*); Java (*Horsfield*). Type, B.M.

The larva of this species is green, varied with red-brown; or red-brown, with lateral oblique whitish lines and greenish anterior segments; the horn always very long and hair-like. The horn of one larva is frequently devoured by another.

9. LOPHURA? ASILIFORMIS.

Sphinx asiliformis, Fabricius, Ent. Syst. iii. 1, p. 357. no 7 (1793).

India.

The secondaries of this species are described as "red, with a black margin."

10. LOPHURA CONTINUA.

Lophura continua, Walker, Lep. Het. viii. p. 108. no. 5 (1856).

Espirito Sancto (*Stevens*); Brazil (*Becker*). Type, B.M.

11. LOPHURA PYLAS.

Sphinx pylas, Cramer, Pap. Exot. iii. p. 23, pl. 206. fig. A (1782).
Enyo pylas, Hübner, Verz. bek. Schmett. p. 132. no. 1417 (1816).
Lophura pylas, Walker, Lep. Het. viii. p. 106. no. 1 (1856).
Lophura brisæus, Walker, *l. c.* no. 2 (1856).
Lophura brisæus, Boisduval, Voy. de Delagorgue, ii. p. 594. no. 100 (1847); Wallengren. Kongl. Vetensk. Akad. Handl. v. p. 17 (1863).

Caffraria (*Becker*); South Africa (*Smith*); Cape (*Drège*); Port Natal (*Gueinzius* and *Plant*). B.M.

Genus 20. CALLIOMMA, Walker.

Calliomma, Walker, Lep. Het. viii. p. 108. gen. 8 (1856).

1. CALLIOMMA? PLUTO.

Sphinx pluto, Linnæus, Mus. Lesk. p. 95. no. 184; Cramer, Pap. Exot. iii. p. 40, pl. 216. fig. E (1782).
Calliomma pluto, Walker, Lep. Het. viii. p. 111. no. 3 (1856).
Hemeroplanes pluto, Grote, Proc. Ent. Soc. Phil. v. p. 47 (1865).
Hemeroplanes plutonius, Hübner, Verz. bek. Schmett. p. 133. no. 1427 (1816).

Brazil (*Stevens*). B.M.

I cannot agree with Mr. Grote in placing this insect with *Hemeroplanes*; it is much nearer in form to *Calliomma*, but seems in some respects to approach *Zonilia*; Cramer's figure exaggerates the angulation of the primaries, which in reality is very slight.

2. Calliomma nomius.

Calliomma nomius, Walker, Lep. Het. viii. p. 109. no. 1 (1856).

Brazil (*Becker*). Type, B.M.

3. Calliomma licastus.

Sphinx licastus, Cramer, Pap. Exot. vol. iv. p. 180, pl. 381. fig. A (1782).
Oreus licastus, Hübner, Verz. bek. Schmett. p. 136 (1816).
Calliomma lycastus (part.), Walker, Lep. Het. viii. p. 110. no. 2 (1856).
Calliomme parce, Ramon de la Sagra, Hist. Cuba, tab. 17. fig. 2.
Calliomma galianna, Grote, Proc. Ent. Soc. Phil. vol. v. p. 49 (1865).

Santa Cruz, St. Vincent (*Doubleday*); St. Thomas (*Hornbeck*); Haiti (*Tweedie*). B.M.

4. Calliomma parce.

Sphinx parce, Fabricius, Sp. Ins. ii. p. 148. no. 42 (1781).

West coast of South America (*Kellett & Wood*). B.M.

We have two examples of this species in the collection; I have compared them with the Banksian type, and have no doubt of their identity; they differ from *C. licastus* as follows:—Above and below altogether paler; the lilac marginal area of primaries replaced by buff; the bright multilunulate ochreous patch beyond cell of primaries obsolete; the silver marking smaller and more oblique; the spots on body obsolete. In form it differs also as follows:—wings longer; primaries narrower, outer margin less convex.

5. Calliomma galianna.

Sphinx galianna, Burmeister, Sph. Bras. p. 6. (1856).
Calliomma galianna, Grote, Proc. Ent. Soc. Phil. vol. v. p. 49 (1865).
Calliomma lycastus (part), Walker, Lep. Het. viii. p. 110. no. 2 (1856).

Altogether darker in tint than *C. licastus*; the primaries with the lilac area more diffused, the pale line from it to apex straight instead of inarched, and not edged outwardly with black; the multilunulate postcellular patch deeper in colour, distinctly interrupted, its outer edge curving outwards instead of slanting inwards; a dark discal nebula between it and the external angle; all the transverse grey lines better defined; secondaries less uniform in colouring, the external area dusky; the dark patch on anal border quite black, but interrupted as usual; body more purplish in tint; abdomen with three increasing dark brown cordiform spots.

In form:—wings shorter; primaries with outer margin far less convex, inner margin more distinctly waved, the external angle consequently more prominent; outer margin scalloped; abdominal margin longer. Expanse of wings 75 millims.

Rio Janeiro (*Stevens*). B.M.

This species is probably confined to Southern South America; I have no doubt that it is quite distinct from *C. licastus*.

6. Calliomma calliomenæ.

Philampelus calliomenæ, Schaufuss, Nunquam Otiosus, i. p. 19 (1870).

Venezuela.

Unquestionably a *Calliomma* allied to *C. lutescens*.

7. Calliomma lutescens.

Calliomma lutescens, Butler, P. Z. S. 1875, p. 5, pl. i. fig. 6.

Haiti (*Tweedie*). Type, B.M.

I found this insect associated with *C. thorates* in the genus *Pergesa*.

8. Calliomma thorates.

Oreus thorates, Hübner, Zuträge, figs. 525, 526 (1825).
Pergesa thorates, Walker, Lep. Het. viii. p. 151. no. 2 (1856).

Haiti (*Tweedie*); St. Thomas (*Hornbeck*); St. Vincent (*Doubleday*); Oaxaca (*Hartweg*); New Granada. B.M.

Mr. Walker has been followed by Messrs. Clemens, Morris, and Grote in his reference of this species to the genus *Pergesa*; the latter appears, however, to be an exclusively Old-World group, with much less waved margins to the wings, and generally more prominent vertex to the head; the coloration of the primaries also shows a different character, whilst there is much in common between those of *C. thorates* and *C. licastus*. So far as I can see, the principal reason for the exclusion of *C. thorates* from *Calliomma* was the absence of the silver spot on the primaries; yet its position is indicated by a pale spot on the under surface.

Genus 21. Enyo, Hübner.

Enyo, Hübner, Verz. bek. Schmett. p. 132 (1816).

1. Enyo lugubris.

Sphinx lugubris, Linnæus, Mantissa, ii. p. 537; Drury, Ill. Exot. vol. i. p. 61, pl. 28. fig. 2 (1770).
Thyreus lugubris, Harris, Cat. N.-Am. Sph., Sill. Journ. vol. xxxvi. p. 306 (1839).
♀, *Enyo lugubris*, Hübner, Zuträge, figs. 595, 596 (1825).
Pterogon lugubris, Burmeister, Syst. Ueb. Sph. Bras. p. 16 (1856).
Sphinx fegeus, Cramer, Pap. Exot. vol. iii. p. 56, pl. 225. fig. E (1782).
Enyo phegeus, Hübner, Verz. bek. Schmett. p. 132 (1816).

Haiti (*Tweedie*); Venezuela (*Dyson*); Mexico (*Hartweg*); St. Thomas (*Hornbeck*); Honduras (*Dyson*); Santarem (*Bates*); Rio (*Stevens*); Brazil (*Doubleday*). B.M.

On account, probably, of the difference in the sexes, and the difficulty of at once recognizing them, Mr. Walker confounded this species with *E. camertus*, *gorgon*, and *danum*.

2. Enyo camertus.

Sphinx camertus, Cramer, Pap. Exot. iii. p. 53, pl. 225. fig. A (1782).
Enyo camertus, Hübner, Verz. bek. Schmett. p. 132 (1816).
Pterogon camertus, Burmeister, Sph. Bras. p. 16.

♂, ——— ? (*Doubleday*); ♀, Oaxaca (*Hartweg*). B.M.

Excepting in its usually slightly shorter wings, redder tint, and the pale subapical border, I see nothing to separate this from the preceding species; and as our female of *E. lugubris* from Haiti is of a redder tint still, and has the wings as short as *E. camertus* ♂, whilst a female from St. Thomas has the wings even shorter than *E. camertus* ♀, I have very little doubt that the two forms are variations of one species (see also Wallengren, Œf. Vet. Akad. 1871, p. 913); no doubt it would be easy to render it in appearance quite distinct were we to pick out all the small and pale females of *E. lugubris* (as it seems to me that my friend Grote must have done[1]); but as in our case the sexes arrived together from Haiti, this would be impossible.

3. Enyo danum.

Sphinx danum, Cramer, Pap. Exot. vol. iii. p. 53, pl. 225. fig. B (1782).
Enyo danum, Hübner, Verz. bek. Schmett. p. 132. no. 1421 (1816).
Pterogon danum, Burmeister, Syst. Ueb. Sph. Bras. p. 16 (1856?).
Thyreus danum, Boisduval, Lép. Guat. p. 67 (1870).
? *Sphinx ozypete,* Linnæus, Mus. Lud. Ulr. p. 344. no. 4 (1764).

Tabatinga, Peru (*Degand*); Bolivia (*Buckley*); Haiti (*Tweedie*). B.M.

This is a well-marked species, at once recognized by the fusiform sulphur-yellow patch on the abdominal margin of secondaries; I believe this to be the *Sph. ozypete* of Linnæus.

4. Enyo gorgon.

♀, *Sphinx gorgon,* Cramer, Pap. Exot. ii. p. 73, pl. 142. fig. E (1779).
Enyo gorgon, Hübner, Verz. bek. Schmett. p. 132. no. 1418 (1816).
♂, *Sphinx lyctus,* Cramer, Pap. Exot. iii. p. 56, pl. 225. fig. F (1782).
Enyo lyctus, Hübner, Verz. bek. Schmett. p. 132. no. 1419 (1816).
Thyreus lyctus, Herrich-Schäffer, Aussereur. Schmett. i. pl. 23. fig. 108 (1850–1858).
Thyreus lyctus, Boisduval, Lép. Guat. p. 68 (1870).

♂, Brazil, ♀, Rio (*Stevens*); ♂ ♀, Venezuela (*Dyson*). B.M.

Hübner's *E. lugubris* is unquestionably the typical female of that species; it has the same scalloped outer margin, which, however, is wanting in this species.

[1] If I have done Mr. Grote an injustice in this supposition, I know he will forgive me; but he mentions only "three female specimens" in his comparative description.

5. ENYO ? CINNAMOMEA.

Enyo cinnamomea, Herrich-Schäffer, Samml. auss. Schmett. ii. p. 3, fig. 558 (1869).

North Australia.

I very much doubt this being a true *Enyo.*

Genus 22. ALEURON, Boisduval.

Aleuron, Boisduval, Lép. Guat. p. 71 (1870).
Callenyo, Grote (1873).
Tylognathus, Felder (1874), ex parte.

1. ALEURON CHLOROPTERA.

Sphinx chloroptera, Perty, Del. Anim. Artic. Bras. pl. 31. fig. 3.
Enyo chloroptera, Walker, Lep. Het. viii. p. 118. no. 10 (1856).
Aleuron chloroptera, Boisduval, Lép. Guat. p. 71 (1870).
Callenyo chloroptera, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 279 (1873).

Honduras. B.M.

The form of the palpi at once separates the above species from *Enyo.*

2. ALEURON IPHIS.

Enyo iphis, Walker, Lep. Het. viii. p. 116. no. 8 (1856).
Tylognathus scriptor, Felder, Reise der Nov., Lep. iv. tab. 82. fig. 4 (1874).

Brazil (*Stevens*). Type, B.M.

This differs a little from the type of the genus in the outline of the primaries.

3. ALEURON PROMINENS.

Enyo prominens, Walker, Lep. Het. viii. p. 115. no. 4 (1856).

Brazil.

Possibly a variation of the preceding species.

Genus 23. TYLOGNATHUS, Felder.

Tylognathus, Felder, Reise der Nov., Lep. v. (1874).

1. TYLOGNATHUS SMERINTHOIDES.

Tylognathus smerinthoides, Felder, Reise der Nov., Lep. iv. tab. 82. fig. 5 (Nov. 1874).

——— ?

If the palpi of this species are correctly figured, it has a right to be considered distinct from *Aleuron,* although in general pattern it nearly approaches *A. chloroptera*; moreover in the form of the primaries it agrees with *Gonenyo carinata.*

2. TYLOGNATHUS PHILAMPELOIDES.

Tylognathus philampeloides, Felder, Reise der Nov., Lep. iv. tab. 75. fig. 11 (Nov. 1874).

——— ?

But for the palpi I should have supposed this to be the female of *Gonenyo carinata.*

Genus 24. GONENYO, n. gen.

Callenyo (part.), Grote.

GONENYO CARINATA.

Enyo carinata, Walker, Lep. Het. viii. p. 117. no. 9 (1856).

Pará (*Smith* and *Bates*). Type, B.M.

At once distinguishable from *Enyo* by the form of the palpi, it differs also from *Callenyo* in the more highly developed palpi, the length of the abdomen, the undulation of the outer margin of primaries, &c.; whether it can be separated from *Tylognathus* can only be decided when we see examples of Felder's species.

Genus 25. HEMEROPLANES, Hübner.

Hemeroplanes, Hübner, Verz. bek. Schmett. p. 133 (1816).

1. HEMEROPLANES TRIPTOLEMUS.

Sphinx triptolemus, Cramer, Pap. Exot. iii. p. 40, pl. 216. fig. F (1782).
Hemeroplanes triptolemus, Hübner, Verz. bek. Schmett. p. 133. no. 1426 (1816).
Calliomma triptolemus, Walker, Lep. Het. viii. p. 111. no. 4 (1856).

Brazil (*Stevens*); Pará (*Bates*); Ega (*Bates*). B.M.

Our example from Ega is rather paler than the type, and slightly redder in tint, the brown streak on the head and thorax obsolete, the abdomen more uniformly dark brown and distinctly annulated with yellow; it is probably only an individual variation.

2. HEMEROPLANES OICLUS.

Sphinx oiclus, Cramer, Pap. Exot. iii. p. 39, pl. 216. fig. C. (1782).
Hemeroplanes oiclus, Hübner, Verz. bek. Schmett. p. 133. no. 1428 (1816).
Enyo oiclus, Walker, Lep. Het. viii. p. 115. no. 6 (1856).

Surinam.

3. HEMEROPLANES ? PSEUDOTHYREUS.

Calliomma oiclus ?, Herrich-Schäffer, nec Cramer, Corr.-Blatt. (1865), p. 57.
Hemeroplanes pseudothyreus, Grote, Proc. Ent. Soc. Phil. p. 46, pl. 1. fig. 1 (1865); Herrich-Schäffer, Samml. auss. Schm. ii. fig. 554 (1869).

"Tropical Insular District!"

The figure of this species seems hardly to agree with *Hemeroplanes*, the antennæ being represented as thicker than in *H. triptolemus*, and without the terminal curvature common to that species and represented by Cramer in his species of this genus; in the form of the primaries also it seems almost to approach *Philampelus*.

4. HEMEROPLANES? PAN.

Sphinx pan, Cramer, Pap. Exot. iii. p. 39, pl. 216. fig. D (1782).
Hemeroplanes pan, Hübner, Verz. bek. Schmett. p. 133. no. 1425 (1816).
Enyo pan, Walker, Lep. Het. viii. p. 118. no. 11 (1856).

Surinam.

I am inclined to think that this is an exaggerated *Calliomma*.

Subfamily II. CHÆROCAMPINÆ.

Genus 1. ACOSMERYX[1], Boisduval.

Acosmeryx, Boisduval, Sp. Gén. Lép. p. 214 (1875); Butler, P. Z. S. 1875, p. 245.

1. ACOSMERYX CINEREA.

Acosmeryx cinerea, Butler, P. Z. S. p. 245 (1875).

Silhet (*Argent*). Type, B.M.

2. ACOSMERYX SERICEUS.

Philampelus sericeus, Walker, Lep. Het. viii. p. 181. no. 13 (1856).

♂ ♀, Silhet (*Stainsforth* and *Argent*); North India. Type, B.M.

Two species were confounded under this name by Mr. Walker.

3. ACOSMERYX ANCEUS. (Plate XC. figs. 11, 12.)

Sphinx anceus, Cramer, Pap. Exot. iv. p. 124, pl. 355. fig. A (1782).
Enyo anceus, Hübner, Verz. bek. Schmett. p. 132. no. 1423 (1816).
Philampelus anceus, Moore, Cat. Lep. E.I. Comp. i. p. 270. no. 624 (1857).

"Amboina" (*Cramer*); ♂, ♀, Java (*Horsfield*). B.M.

Mr. Moore has specimens from Silhet and South India.

4. ACOSMERYX MISKINI.

♀, *Daphnusa miskini*, R. P. Murray, Cist. Ent. i. pt. 7, p. 178 (Oct. 1873).

Queensland (*Miskin*). Type, B.M

[1] This genus has the aspect of the genus *Triptogon* (*Smerinthinæ*); but the structure of the larva proves it to belong to the Chærocampinæ.

The type of this species was presented to the collection by the Rev. R. P. Murray. It is exceedingly closely allied to *A. anceus* of Cramer, from the female of which it scarcely differs, excepting in its superior size, slightly broader and less angular primaries, and a dark brown longitudinal streak on the thorax; it may, I think, be the female of *Zonilia mixtura* of Walker.

5. ACOSMERYX MIXTURA.

♂, *Zonilia mixtura*, Walker, Lep. Het. Suppl. i. p. 34 (1864).

Aru.

Not having seen the type, I can only judge by the description that *Z. mixtura* is referable to this genus.

Genus 2. OTUS, Hübner.

Otus, Hübner, Verz. bek. Schmett. p. 142. gen. 1 (1816).

1. OTUS SYRIACUS.

Deilephila syriaca, Lederer, Ver. zool.-botan. Vereins Wien, Band v. p. 195, Taf. 2. figs. 9, 12 (1855).
Pergesa syriaca, Walker, Lep. Het. Suppl. i. p. 32 (1864).

Siberia (*Lederer*).

Allied to *O. chærilus* of Cramer.

The genus *Otus* was restored to the first three species of Walker's *Darapsa* in 1865, thus restricting the group to nos. 4–10. But, as I have shown, all the species excepting no. 4 are referable to other genera previously formed; so that Mr. Grote, to all intents and purposes, fixed *D. rhodocera* as Walker's type. I find, however, that in the first vol. Bull. Buffalo Soc. Nat. Sci. p. 22 he has restored Walker's name to *Otus* of Hübner, a genus which is structurally distinct from the type already fixed; I am therefore unable to follow this later decision of his. He does not state his reasons for the alteration in the Bulletin, nor am I aware that he has done so elsewhere; still I am satisfied that so sound an entomologist has not acted capriciously.

2. OTUS CHÆRILUS.

Sphinx chærilus, Cramer, Pap. Exot. iii. p. 91, pl. 247. fig. A (1782).
Otus chærilus, Hübner, Verz. bek. Schmett. p. 142 (1816).
Chærocampa chærilus, Harris, Sill. Journ. vol. xxxvi. p. 302 (1839).
Darapsa chærilus, Walker, Lep. Het. viii. p. 182 (1856).
Sphinx azaleæ, Smith and Abbot, Ins. Georg. vol. i. p. 53, pl. 27 (1797).
Sphinx clorinda, Martyn, Psyche, pl. 25. figs. 66, 67 (1797).

United States (*Doubleday*); West Canada (*Bush*). B.M.

3. Otus myron.

Sphinx myron, Cramer, Pap. Exot. iii. p. 91, pl. 247. fig. C (1782).
Otus myron, Hübner, Verz. bek. Schmett. p. 142 (1816).
Darapsa myron, Walker, Lep. Het. viii. p. 183. no. 2 (1856).
Sphinx pampinatrix, Smith & Abbot, Ins. Georg. vol. i. p. 55, pl. 28 (1797).
Chærocampa pampinatrix, Harris, Sill. Journ. vol. xxxvi. p. 301 (1839); Scudder, Harris's Correspondence, p. 283, pl. 1. fig. 10 (1869).
Otus cnotus, Hübner, Samml. exot. Schmett. Zuträge, figs. 321, 322 (1823).

United States (*Doubleday*). B.M.

The transformations of *O. myron* are figured and described in the 'American Entomologist,' vol. ii. pp. 22–24.

4. Otus versicolor.

Chærocampa versicolor, Harris, Sill. Journ. vol. xxxvi. p. 303 (1839).
Darapsa versicolor, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 148.
Otus versicolor, Grote, Proc. Ent. Soc. Phil. 1865, p. 81.

"Atlantic District!" (*Grote*).

The larva feeds on *Cephalanthus occidentalis* (see W. H. Edwards, Canad. Ent. ii. p. 134).

5. Otus pholus.

Sphinx pholus, Cramer, Pap. Exot. i. p. 137, pl. 87. fig. B (1779).
Darapsa pholus, Walker, Lep. Het. viii. p. 184 (1856).
Otus pholus, Grote, Proc. Ent. Soc. Phil. p. 81 (1865).

"West Indies" (*Cramer*).

Genus 3. Ampelophaga, Bremer & Grey.

Ampelophaga, Bremer & Grey, Beitr. Schmett.-Fauna nördlichen China's, p. 11 (1853).

1. Ampelophaga rubiginosa. (Plate XCI. figs. 4, 5.)

Ampelophaga rubiginosa, Bremer & Grey, Beitr. zur Schmett.-Fauna nördl. China's, p. 11. no. 52 (1853).
Deilephila rubiginosa, Walker, Lep. Het. viii. p. 173. no. 18 (1856).
Chærocampa rubiginosa, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 91. no. 1513, pl. xii. fig. 2 (1857).

Pekin; Japan (*Lewis*). B.M.

I have examined a specimen of this species taken by Mr. Lewis in Japan. It appears to be more nearly allied to the genus *Otus* of Hübner than to any thing else. I have also seen an example with a doubtful locality in Mr. Moore's collection. The larva, which feeds on a very common large-leaved creeping plant, is dark green at the sides, irrorated and laterally striped with white; anterior segments and dorsal region sap-green, golden green in front of each segment; prolegs reddish; spiracles orange; the pupa is rather pale, red-brown, with the pectus and wing-covers whity brown.

Genus 4. Elibia, Walker.

Elibia, Walker, Lep. Het. viii. p. 148. gen. 15 (1856).

1. Elibia dolichus.

Chærocampa dolichus, Westwood, Cab. Orient. Ent. p. 61, pl. 30. fig. 1 (1848).
Elibia dolichus, Walker, Lep. Het. viii. p. 149. no. 1 (1856).

Silhet (*Sowerby*, *Doubleday*). Type, B.M.

2. Elibia dolichoides.

Philampelus dolichoides, Felder, Reise der Nov., Lep. iv. tab. 76. fig. 8 (Nov. 1874).
Pergesa dolichoides, Moore, P. Z. S. 1874, p. 577.

Sikkim (*Jerdon*). Coll. F. Moore.

This species has the same general pattern (with the exception of the whitish dorsal line) as the Smerinthine *Polyptychus dentatus*.

Genus 5. Pergesa, Walker.

Pergesa, Walker, Lep. Het. viii. p. 149. gen. 16 (1856).

1. Pergesa porcellus.

Sphinx porcellus, Linnæus, Syst. Nat. i. 2, p. 801. no. 18 (1766).
Theretra porcellus, Hübner, Verz. bek. Schmett. p. 135. no. 1448 (1816).
Deilephila porcellus, Stephens, Ill. Brit. Ent. Haust. i. p. 131. no. 8 (1828).
Chærocampa porcellus, Westwood & Humphrey, Brit. Moths, i. p. 23, pl. 23. figs. 9, 10 (1843–5).
Pergesa porcellus, Walker, Lep. Het. viii. p. 150. no. 1 (1856).
Sphinx bombyliformis, Linnæus, Syst. Nat. ed. 10, p. 493.

England (*British Collection*); Germany (*Becker*). B.M.

2. Pergesa? acuta.

Zonilia acuta, Walker, Lep. Het. viii. p. 195. no. 7 (1856).
? *Pergesa castor* (part.), Walker, Lep. Het. viii. p. 153. no. 5 (1856).

Silhet (*Doubleday*). B.M.

Our two examples of this species differ much from one another in detail; but between them they perfectly answer (except in being rather larger) to Walker's description of *Z. acuta*. That his species is not a *Zonilia* I feel satisfied, not only from the name which he applies to it, but from the following points in his description:—" Abdomen with two dorsal rows of black dots. Fore wings glaucous along the exterior border, and with several oblique rows of black dots. Hind wings brown, with an incomplete tawny stripe."

3. PERGESA ACTEUS.

Sphinx acteus, Cramer, Pap. Exot. iii. p. 93, pl. 248. fig. A (1782).
Oreus acteus, Hübner, Verz. bek. Schmett. p. 136. no. 1464 (1816).
Pergesa acteus, Walker, Lep. Het. viii. p. 153. no. 6 (1856).

Silhet (*Stainsforth*); North India (*James*); East India, Bengal, Moulmein (*Clerck*); Ceylon (*Templeton*); Borneo (*Lowe*); Java (*Horsfield*). B.M.

4. PERGESA IRREGULARIS.

Pergesa irregularis, Walker, Lep. Het. viii. p. 152. no. 4 (1856).

West Africa (*Doubleday*). Type, B.M.

5. PERGESA VELATA.

Pergesa velata, Walker, Lep. Het. Suppl. v. p. 1853 (1866).
? *Pergesa castor,* Moore (nec Walker), Cat. Lep. E.I. Comp. i. p. 273. no. 630 (1857).

Darjeeling (*Russell*). Type, B.M.

Mr. Moore has an example from the North-west Himalayas.

6. PERGESA CASTOR.

Pergesa castor, Walker, Lep. Het. viii. p. 153. no. 5 (1856).

Java (*Henry*). B.M.

7. PERGESA OLIVACEA.

Pergesa olivacea, Moore, P. Z. S. 1872, p. 567.
Pergesa castor, var. β, Walker, *l. c.* (1856).

——— ? (*E. Doubleday*). B.M.

Walker asserts that this species is from Silhet; but there is no locality given for it in the register. It was presented to the collection by Mr. Doubleday along with many other species, most of them without localities. It is a well-marked species, and perfectly distinct from *P. castor*. The type in Mr. Moore's collection comes from Simla, North-west Himalayas, 7000 feet; it was taken by Capt. Lang.

8. PERGESA SWINHOEI.

Chærocampa swinhoei, Moore, Proc. Zool. Soc. 1866, p. 362. no. 3.

Formosa (*Swinhoe*). Type, coll. F. Moore.

This appears to me to be better placed in *Pergesa* than in *Chærocampa*.

9. PERGESA ? MACROGLOSSOIDES.

Perigonia macroglossoides, Walker, Lep. Het. Suppl. v. p. 1851 (1866).

Darjeeling.

Possibly referable to *Panacra*, but certainly not to the New-World genus *Perigonia*; I have not seen the type.

10. Pergesa castanea.

Pergesa castanea, Moore, P. Z. S. 1872, p. 567.

Bombay. Type, coll. F. Moore.

This is a curious dark little species, with a broad plumbaginous or silky greyish border to primaries.

11. Pergesa vampyrus.

Sphinx vampyrus, Fabricius, Mant. Ins. ii. p. 98. no. 66 (1787).

East Indies?

Evidently a *Pergesa* with reddish secondaries.

12. Pergesa ægrota. (Plate XCII. fig. 2.)

Pergesa ægrota, Butler, P. Z. S. 1875, p. 246.

Silhet. Type, coll. F. Moore.

13. Pergesa aurifera.

Pergesa aurifera, Butler, P. Z. S. 1875, p. 7. no. 11.

Sikkim (*Whitely*); North India. Type, B.M.

Mr. Moore has two examples of the brownish variation of this species, labelled "North-east Himalayas," and a third, labelled "Darjeeling."

14. Pergesa fusimacula.

Pergesa fusimacula, Felder, Reise der Nov., Lep. iv. tab. 76. fig. 4 (1874).

——— ?

Allied to the preceding, and to *P. castor*.

15. Pergesa gloriosa. (Plate XCII. fig. 3.)

Pergesa gloriosa, Butler, P. Z. S. 1875, p. 246.

Darjeeling. Type, coll. F. Moore.

Genus 6. Panacra, Walker.

Panacra, Walker, Lep. Het. viii. p. 154. gen. 17 (1856).

1. Panacra busiris.

Panacra busiris, Walker, Lep. Het. viii. p. 158. no. 6 (1856).

Silhet (*Stainsforth*, *Doubleday*). Type, B.M.

2. PANACRA TESTACEA.

Perigonia testacea, Walker, Lep. Het. viii. p. 102. no. 3 (1856).

——— ? (*Doubleday*); Ceylon (*Green*). Type, B.M.

3. PANACRA ELLA. (Plate XCII. fig. 7.)

Panacra ella, Butler, P. Z. S. 1875, p. 246.

Silhet. Type, coll. F. Moore.

4. PANACRA ASSAMENSIS.

Panacra assamensis, Walker, Lep. Het. viii. p. 160. no. 9 (1856).

Silhet (*Stainsforth*). Type, B.M.

5. PANACRA TRUNCATA.

Panacra truncata, Walker, Lep. Het. viii. p. 160. no. 8 (1856).

Silhet (*Stainsforth*). Type, B.M.

6. PANACRA AUTOMEDON.

Panacra automedon, Walker, Lep. Het. viii. p. 154. no. 1 (1856).

Silhet (*Stainsforth*, *Doubleday*, *Sowerby*). Type, B.M.

7. PANACRA MYDON.

Panacra mydon, Walker, Lep. Het. viii. p. 155. no. 2 (1856).
Panacra scapularis (part.), Walker, *l. c.* p. 157. no. 5 (1856).

Silhet (*Argent*, *Sowerby*, *Doubleday*); Barrackpore (*Hearsay*). Type, B.M.

8. PANACRA ? MINUS.

Sphinx minus, Fabricius, Mant. Ins. ii. p. 96. no. 44 (1787).
Chærocampa minus, Walker, Lep. Het. viii. p. 262 (1856).

India.

9. PANACRA METALLICA.

Panacra metallica, Butler, P. Z. S. 1875, p. 6. no. 9.

North India (*Parry*). Type, B.M.

10. PANACRA ORPHEUS.

Chærocampa orpheus, Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 23. fig. 104 (1850–1858).

Cape of Good Hope.

11. PANACRA VARIOLOSA.

Panacra variolosa, Walker, Lep. Het. viii. p. 156. no. 4 (1856).

Silhet.

12. Panacra scapularis.

Panacra scapularis, Walker, Lep. Het. viii. p. 157. no. 5 (1856).
Var. *Panacra elegantulus*, Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 83. fig. 479 (1850–58).

Java (*Horsfield*); Silhet (*Sowerby*). Type, B.M.

The example from Silhet and one of the Javan examples are quite different in appearance from the typical form, the ground-colour of the wings being much paler and without the usual reddish tint, and the bands and spots on the wings much darker; they agree with Herrich-Schäffer's figure. The transformations are figured by Moore.

13. Panacra? ochracea.

Calliomma ochracea, Walker, Lep. Het. viii. p. 112. no. 5 (1856).

Sumatra.

14. Panacra regularis. (Plate XCII. fig. 4.)

Panacra regularis, Butler, P. Z. S. 1875, p. 247.

Java. Type, coll. F. Moore.

15. Panacra vigil.

Sphinx (*Deilephila*) *vigil*, Guérin-Méneville, in Delessert's Souv. Voy. dans l'Inde, pt. ii. p. 80, pl. 23. fig. 1 (1843).
Sphinx phœnyx, Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 83. fig. 478 (1850–1858).
Anceryx phœnyx, Walker, Lep. Het. Suppl. i. p. 36 (1864).

Colombo, Ceylon (*Nietner*); Ceylon (*Templeton*); Coimbatoor, South India (*Walhouse*); Philippines (*Stevens*). B.M.

The larva is described by Dr. Semper, Verhandl. zool.-botan. Gesellsch. Wien, p. 699 (1867).

16. Panacra lignaria.

Panacra lignaria, Walker, Lep. Het. viii. p. 156. no. 3 (1856).
Chærocampa phœnix, Koch (nec H.-Sch.), Indo-Austral. Lep. Fauna, ii. p. 53 (1873).

Cape York (*Macgillivray & Higgins*). Type, B.M.

"The Ceylon specimen" mentioned by Mr. Walker is *P. vigil*; it not only differs from *P. lignaria* in being "much smaller," but in its much paler wings with the black lines in the light band very indistinct.

17. Panacra? bubastus.

Sphinx bubustus, Cramer, Pap. Exot. ii. p. 84, pl. 149. fig. E (1779).
Amblypterus bubastus, Hübner, Verz. bek. Schmett. p. 133. no. 1431 (1816).
Calliomma bubastus, Walker, Lep. Het. viii. p. 112. no. 6 (1856).

Coromandel.

Genus 7. CIZARA, Walker.

CIZARA ARDENIÆ.

Sphinx ardeniæ, Lewin, Prodr. Ent. iii. pl. 2 (1805).
Deilephila ardeniæ, Boisduval, Voy. de l'Astrolabe, Ent. p. 183. no. 1 (1832–1835).
Cizara ardeniæ, Walker, Lep. Het. viii. p. 120. no. 1 (1856).

Australia (*Strange, Stevens*). B.M.

Genus 8. MICROLOPHIA, Felder.

Microlophia, Felder, Reise der Nov., Lep. v. (1865).

Allied to *Pergesa* and *Panacra*; at once distinguished by the strongly arched outer margin of the primaries, abruptly excavated above the external angle, also by the shorter body and much less prominent head.

MICROLOPHIA SCULPTA.

Microlophia sculpta, Felder, Reise der Novara, Lep. iv. pl. 75. fig. 9 (1874).

Primaries with basal two-thirds olive-brown, with the outer margin very irregular, festooned, with a buff edge; external third of wing whity brown, darker along the margin; a transverse central horizontal whitish bar, terminating at the end of the cell in a hyaline spot; secondaries with basal third and abdominal area fulvous, costal area testaceous, remainder of the wing chocolate-brown, marked near anal angle by a whitish submarginal litura and two or three small black buff-zoned ocellated spots; body pale brown, with the pterygodes and a central prothoracic streak red-brown; wings below clay-coloured, and transversely crossed by indistinct dots and lines; primaries with end of cell brownish, a reniform discocellular hyaline white spot; body below sordid clay-colour. Expanse of wings 2 inches 2 lines.

South India (*Ward*). Type, coll. F. Moore.

Genus 9. BASIOTHEA, Walker.

Basiothea, Walker, Lep. Het. viii. p. 124. gen. 13 (1856).

BASIOTHEA IDRICUS.

Sphinx idricus, Drury, Ill. Nat. Hist. iii. p. 2, pl. 2. fig. 2 (1773).
Basiothea idricus, Walker, Lep. Het. viii. p. 125. no. 1 (1856).
Deilephila idrieus (sic), Boisduval, Faune Ent. de Madag. p. 73. no. 73, pl. 10. fig. 5 (1833).
Chærocampa idræus (sic!), Guénée, Notes sur l'île de la Réunion, Lép. p. 21 (1862).
Sphinx medea, Fabricius, Sp. Ins. ii. p. 143. no. 19 (1781).
Sphinx clio, Fabricius, Ent. Syst. iii. 1, p. 377. no. 65 (1793).
Sphinx onothberina, Martyn, *Psyche,* pl. 22. figs. 58, 59 (1797).
Chærocampa transfigurata, Wallengren, Wien. ent. Monatschr. vol. iv. p. 42. no. 42 (1860).

Port Natal (*Plant*, *Gueinzius*); Sierra Leone (*Morgan*). B.M.

Wallengren (Öfv. Vet. Akad. 1871, p. 913), publishes his opinion that his *C. transfigurata* is =*B. idricus*.

Genus 10. GNATHOSTYPSIS, Wallengren.

Gnathostypsis, Wallengren, Öfvers. Kongl. Vetensk-akad. Förhandl. 1858, p. 137.

Allied to *Chœrocampa*. Antennæ with recurved apex, furnished with a fasciculus of rigid hairs. Palpi ascending, forming a projection in front of the head as in *Chœrocampa*, hairy; last joint large, acicular, pilose, robust; intermediate joint laterally compressed, with a slender fringe of hairs separated from the last joint by an interval destitute of hairs on its outer edge. Proboscis long, not concealed. Head porrect; vertex convex, crested. Thorax sloping from the vertex, very convex on the dorsum, smooth, with the pterygodes appressed. Abdomen thick. Form of the wings almost as in *Chœrocampa*, but broader; primaries with the apex not falcate, external angle more rounded; secondaries with outer margin not excised.

GNATHOSTYPSIS OSTRACINA.

Gnathostypsis ostracina, Wallengren, Wien. ent. Mon. iv. p. 42. no. 43 (1860); Kongl. Svensk. Vetensk.-Akad. Handl. v. p. 19. no. 1 (1863).

Caffraria.

Genus 11. DIODOSIDA, Walker.

Diodosida, Walker, Lep. Het. viii. p. 163. gen. 19 (1856).

1. DIODOSIDA MURINA.

Diodosida murina, Walker, Lep. Het. viii. p. 163. no. 1 (1856).
Darapsa marginata, var. β, Walker, *l. c.* p. 185. no. 5 (1856).

♀, Port Natal (*Stevens*, *Gueinzius*). Type, B.M.

2. DIODOSIDA MARGINATA.

Darapsa marginata, Walker, Lep. Het. viii. p. 185. no. 5 (1856).

♂ ♀, Port Natal (*Gueinzius*). Type, B.M.

Very distinct from the preceding, but unquestionably belonging to the same genus.

3. DIODOSIDA FUMOSA.

Zonilia fumosa, Walker, Lep. Het. viii. p. 193. no. 3 (1856).

Congo (*Richardson*). Type, B.M.

The palpi in this species are rather long for the genus, and the prothorax is rather prominent; but the distinctions are scarcely sufficiently well marked to warrant its generic separation.

4. Diodosida? rhadamistus.

Sphinx rhadamistus, Fabricius, Mant. Ins. ii. p. 93. no. 10 (1787).

Sierra Leone.

Genus 12. Cypa[1], Walker.

Cypa, Walker, Lep. Het. Suppl. i. p. 41 (1864).

Cypa ferruginea.

Cypa ferruginea, Walker, Lep. Het. Suppl. i. p. 42 (1864).

Ceylon (*Stevens*). Type, B.M.

Genus 13. Chærocampa, Duponchel.

Chærocampa, Duponchel, Hist. Nat. Lép. Fr. Suppl. ii. p. 159.

1. Chærocampa elpenor.

Sphinx elpenor, Linnæus, Faun. Suec. p. 288. no. 1089 (1746).
Oreus elpenor, Hübner, Verz. bek. Schmett. p. 136. no. 1463 (1816).
Deilephila elpenor, Stevens, Ill. Brit. Ent. Haust. i. p. 131 (1828).
Chærocampa elpenor, Westwood & Humphrey, Brit. Moths, i. p. 22, pl. 51. figs. 7, 8 (1843–5).

Germany (*Becker*); England (*British Coll.*). B.M.

2. Chærocampa lewisii. (Plate XC. figs. 13–15.)

Chærocampa lewisii, Butler, P. Z. S. 1875, p. 247.

Japan (*Lewis*). Type, B.M.

3. Chærocampa macromera.

Chærocampa macromera, Butler, P. Z. S. 1875, p. 7.
Chærocampa elpenor, var., Walker, Lep. Het. viii. p. 128 (1856).
Chærocampa rivularis, Boisduval, Sp. Gén. Lép. p. 280 (1875).

Silhet (*Macgillivray*); ——— ? (*Doubleday*). Type, B.M.

4. Chærocampa fraterna.

Chærocampa fraterna, Butler, P. Z. S. 1875, p. 248.

Simla (*coll. F. Moore*); North India. B.M.

5. Chærocampa mirabilis. (Plate XCII. fig. 1.)

Chærocampa mirabilis, Butler, P. Z. S. 1875, p. 248.

North-west Himalayas. Type, coll. F. Moore.

[1] Seems allied to *Pergesa*; but the head is much smaller and almost concealed by the thorax, as seen from above. It may belong to the *Smerinthinæ*, as suggested by Dr. Boisduval.

6. Chærocampa alecto.

Sphinx alecto, Linnæus, Mus. Lud. Ulr. p. 357 (1764); Drury, Ill. Exot. Ins. ii. p. 48, pl. 27. fig. 4 (1773).
Isoples alecto, Hübner, Verz. bek. Schmett. p. 135. no. 1453 (1816).
Deilephila alecto, Boisduval, Ind. Meth. p. 46. no. 376.
Chærocampa alecto, Walker, Lep. Het. viii. p. 130. no. 3 (1856).
Deilephila cretica, Boisduval. Ann. Soc. Linn. Paris, 1827, p. 118, pl. 6.

North India (*James*); Landoor (*Hearsay*); Silhet (*Stainsforth*); Hong-Kong (*Stevens*); Borneo (*Lowe*); Java (*Horsfield*). B.M.

Var. ? altogether paler (possibly faded).

Turkey (*Loftus*). B.M.

7. Chærocampa suffusa.

Chærocampa suffusa, Walker, Lep. Het. viii. p. 146. no. 32 (1856).

Hong-Kong (*Bowring*); Borneo (*Lowe, Wallace*). Type, B.M.

Allied to the preceding species.

8. Chærocampa cecrops.

Sphinx cecrops, Cramer, Pap. Exot. iii. p. 57, pl. 226. fig. B (1782).
Thaumas cecrops, Hübner, Verz. bek. Schmett. p. 138. no. 1478 (1816).
Chærocampa cecrops, Walker, Lep. Het. viii. p. 145. no. 30 (1856).

Cape.

This seems to be a remarkable variety of *C. capensis*; but it may be distinct.

9. Chærocampa capensis.

Sphinx capensis, Linnæus, Mus. Lud. Ulr. p. 349 (1764).
Thaumas capensis, Hübner, Verz. bek. Schmett. p. 138. no. 1477 (1816).
Chærocampa capensis, Walker, Lep. Het. viii. p. 139. no. 21 (1856).
Sphinx immaculata, Gmelin, Syst. Nat. i. 5, p. 2386; Zschach, p. 95, pl. 3. fig. 283.
Sphinx æas, Cramer, Pap. Exot. iii. p. 57, pl. 226. fig. A (1782).

Cape (*Drège, Milne, Becker*); Natal (*Gueinzius*); Zoolu (*Angas*). B.M.

Somewhat like *C. alecto,* but altogether much paler.

10. Chærocampa eson.

Sphinx eson, Cramer, Pap. Exot. iii. p. 57, pl. 226. fig. C (1782).
Isoples eson, Hübner, Verz. bek. Schmett. p. 135. no. 1452 (1816).
Deilephila eson, Boisduval, Faune Ent. de Madag. p. 71. no. 2 (1833).
Chærocampa eson, Walker, Lep. Het. viii. p. 137. no. 17 (1856).

Natal (*Gueinzius*); Cape (*Becker*). B.M.

Evidently quite distinct from the Indian *C. theylia*; it is as large as *C. suffusa,* which it is not unlike.

11. Chærocampa gracilis.

Chærocampa gracilis, Butler, P. Z. S. 1875, p. 8, pl. ii. fig. 2.

Congo (*Richardson*); Sierra Leone (*Morgan*). Type, B.M.

12. Chærocampa elegans.

Chærocampa elegans, Butler, P. Z. S. 1875, p. 8, pl. ii. fig. 1.

♂, Java (*Horsfield*); ♀, Silhet (*Stainsforth*). Type, B.M.

In Mr. Moore's collection from North-east Bengal.

13. Chærocampa theylia.

Sphinx theylia, Linnæus, Mus. Lud. Ulr. p. 360 (1764).
Isoples theylia, Hübner, Verz. bek. Schmett. p. 1455 (1816).
Chærocampa thyelia (sic), Moore, Cat. Lep. E.I. Comp. i. p. 276. no. 638 (1857).
Sphinx boerhaviæ, Fabricius, Syst. Ent. p. 542. no. 22 (1775); Sulzer, Gesch. Ins. p. 40. no. 3, pl. xx. fig. 3 (1776).
Sphinx pinastrina, Martyn, Psyche, pl. 30. fig. 85 (1797).
Sphinx octopunctata, Gmelin, Syst. Nat. i. 5, p. 2386; Zschach, p. 95. no. 286.
Chærocampa eson (part.), Walker, Lep. Het. viii. p. 137. no. 17 (1856).

North India (*Argent, Hearsay*); Ceylon (*Templeton*); Hong-Kong (*Bowring*); Saráwak (*Wallace*). B.M.

14. Chærocampa rafflesii, Horsfield, MS.

Sphinx theylia ♂, Cramer, Pap. Exot. iii. 1, p. 58, pl. 226. fig. F (1782).

♂, Java (*Horsfield*); ♂ ♀, Canara (*Ward*). Type, B.M.

The above is easily distinguished from *C. theylia*, Linnæus (see Cramer, Pap. Exot. iii. pl. 226. fig. E), by its deeper coloration, the two continuous parallel dark bands of the primaries, and the uniformly dark dull red of the secondaries; it may, perhaps, be only a dark variety. Mr. Moore has it from Madras.

15. Chærocampa trilineata.

Chærocampa trilineata, Walker, Lep. Het. Suppl. i. p. 30 (1864).

Venezuela (*Dyson*). Type, B.M.

Very similar to the preceding, but much larger, with more elongated primaries.

16. Chærocampa neoptolemus.

Sphinx neoptolemus, Cramer, Pap. Exot. iv. p. 23, pl. 301. fig. F (1782).
Isoples neoptolemus, Hübner, Verz. bek. Schmett, p. 135. no. 1454 (1816).
Chærocampa neoptolemus, Walker, Lep. Het. viii. p. 134. no. 12 (1856).

Surinam.

Only differs from the preceding in the narrower red band of the secondaries.

17. CHÆROCAMPA CURVATA.

♀, *Chærocampa curvatus* (sic), Schaufuss, Nunquam Otiosus, i. p. 17 (1870).

Cuba (*Gundlach*).

Allied to the preceding according to the author.

18. CHÆROCAMPA ? BRASILIENSIS.

Chærocampa brasiliensis, Schaufuss, Nunquam Otiosus, i. p. 18 (1870).

Brazil.

The author of this species merely indicates the differences existing between it and "*C. jason*," Linn. That species is not described in the 'Systema Naturæ;' nor is it referred to in Fabricius, Ent. Syst. As he places it next to the *Thorates* of Hübner, I doubt its being a *Chærocampa*.

19. CHÆROCAMPA SCHENKI.

Chærocampa schenki, Möschler, Stett. ent. Zeit. 1872, p. 339.

♂ ♀, Port Natal (*Gueinzius*, *Higgins*). B.M.

Differs from *C. charis* in its superior size, broader wings, the single silver line on the body, and the single brown line in the whitish band of primaries.

20. CHÆROCAMPA CHARIS.

Chærocampa charis, Walker, Lep. Het. viii. p. 136. no. 15 (1856).

Port Natal (*Plant*, *Gueinzius*, *Stevens*). Type, B.M.

This and the preceding species have much the aspect of *Deilephilæ*.

21. CHÆROCAMPA CELERIONINA.

Chærocampa celerionina, Walker, Lep. Het. viii. p. 136. no. 16 (1856).

Congo (*Richardson*). Type, B.M.

Perhaps a faded example of the preceding.

22. CHÆROCAMPA OSIRIS.

Deilephila osiris, Dalman, Analecta Entom. p. 48. no. 21 (1823); Boisduval, Icon. Hist. Lép., Sph. p. 18, pl. 49. fig. 1 (1832).

Chærocampa osiris, Walker, Lep. Het. viii. p. 135. no. 14 (1856).

Natal (*Gueinzius*); Madagascar (*Pfeiffer*) ——? (*Doubleday*); Sierra Leone (*Morgan*). B.M.

23. CHÆROCAMPA CELERIO.

Sphinx celerio, Linnæus, Syst. Nat. i. 2, p. 800 (1766); Cramer, Pap. Exot. ii. p. 42, pl. 25. fig. E (1779).

Hippotion celerio, Hübner, Verz. bek. Schmett. p. 135. no. 1450 (1816).

Chærocampa celerio, Stephens, Cat. Brit. Lep. p. 28.

Deilephila celerio, Stephens, Ill. Brit. Ent. Haust. i. p. 128 (1828).
Hippotion ocys, Hübner, Verz. bek. Schmett. p. 135. no. 1451 (1816)
Deilephila inquilina, Harris, Ex. p. 93, pl. 28. fig. 1.

England (*British Coll.*); Natal (*Krauss, Gueinzius*); Zoolu country (*Angas*); South Africa (*Smith*); Cape, Teneriffe, North India (*Argent, Stevens*); Borneo (*Lowe*); Java (*Horsfield*); Fiji (*Voy. Herald*); Australia (*Stutchbury*); South Australia (*Bakewell*); Sidney (*Lambert*). B.M.

The examples from Australia and the Fiji Islands are more brilliantly silvered than those from other parts of the world; otherwise there is no variation in the species.

24. Chærocampa boisduvalii.

Deilephila boisduvalii, Bugnion, Ann. Soc. Ent. France, 1839, p. 115.
Deilephila cretica, Boisduval, Icon. Hist. Lép., Sph. p. 20. no. 2, pl. 49. fig. 2 (1832).

Caucasus.

Intermediate in character between the *C. celerio* and *C. oldenlandiæ* groups; Hopffer, in the Stettin. ent. Zeit. p. 42. no. 130 (1874), remarks of *C. lucasii,* "Lucasii wird kaum als Varietät von Boisduval's *cretica* zu trennen sein," an idea as absurd as it is original; the paper in which it appears is full of equally useful and suggestive observations, the only synonymic notes of any value being, almost without exception, adopted from previously published Lepidopterous Catalogues and their "Errata;" he has, however, rightly restored *Daphnis hypothoüs* to its genus, which Walker had most incomprehensibly failed to do.

25. Chærocampa celæno.

Sphinx celæno, Esper, Schmett. ii. tab. xxviii. Cont. iii. fig. 2 (1779).
Sphinx gordius, Cramer, Pap. Exot. iv. p. 147, pl. 367. fig. A (1782).
Chærocampa gordius, Walker, Lep. Het. viii. p. 138. no. 19 (1856).

Natal (*Gueinzius*); Cape (*Drège*); Zoolu (*Angas*); South Africa (*Pamplin*). B.M.

Esper's figure unquestionably represents the *Sphinx gordius* of Cramer.

26. Chærocampa caius.

Sphinx cajus, Cramer, Pap. Exot. ii. p. 80, pl. 146. fig. F (1779).
Xylophanes cajus, Hübner, Verz. bek. Schmett. p. 136. no. 1459 (1816).
Chærocampa caius, Walker, Lep. Het. viii. p. 139. no. 20 (1856).

Cape.

Mr. Walker queries this as *C. oldenlandiæ*, var.; I believe myself that it is a bad representation of *C. celæno.*

27. Chærocampa saclavorum.

Deilephila saclavorum, Boisduval, Faune Ent. de Madag. p. 71. no. 1, pl. 10. fig. 6 (1833).

Madagascar.

This species may perhaps belong to the *D. clotho* group.

28. Chærocampa drancus.

Sphinx drancus, Cramer. Pap. Exot. ii. p. 56, pl. 132. fig. F (1779).
Xylophanes drancus, Hübner, Verz. bek. Schmett. p. 136. no. 1460 (1816).
Chærocampa drancus, Walker, Lep. Het. viii. p. 133. no. 9 (1856).
Chærocampa druacus (sic), Proc. Ent. Soc. Phil. 1861, Index.

"East Indies" (*Cramer*).

29. Chærocampa oldenlandiæ. (Plate XCI. fig. 1.)

Sphinx oldenlandiæ, Fabricius, Sp. Ins. ii. p. 148. no. 37 (1781).
Chærocampa oldenlandiæ, Walker, Lep. Het. viii. p. 142. no. 25 (1856).
Xylophanes gortys, Hübner, Samml. exot. Schmett. Zuträge, figs. 513, 514 (1806).

North India (*James, Argent, Stevens*); Landoor (*Hearsay*); North Bengal (*Saunders*); Shanghai, Java (*Horsfield*). B.M.

The larva is dark slaty-brown, with continuous lateral series of varied but chiefly red-brown ocellated spots; the anterior segments sometimes black laterally and dorsally; the remaining segments sometimes laterally speckled with whitish; the falces, legs, and anal clasps black; a black style-shaped anal horn, much like a needle sticking out of the body; it feeds on *Cissus, Colocasia,* and *Balsaminea.*

30. Chærocampa argentata.

Chærocampa argentata, Butler, P. Z. S. 1875, p. 8, pl. ii. fig. 3.
? *Chærocampa firmata,* Walker, Lep. Het. viii. p. 148. no. 36 (1856).
Deilephila oldenlandiæ, Boisduval, Voy. de l'Astrolabe, Ent. p. 184. no. 2 (1832–35).
Chærocampa oldenlandiæ, Koch, Indo-Austral. Lep.-Fauna, ii. p. 53 (1873).

Moreton Bay (*Gibbons*); Sidney (*Lambert*); North Australia (*Elsey*); Australia (*Stutchbury, Stevenson, Stevens*). Type, B.M.

The only example which could be Walker's type was placed in the collection amongst our examples of *C. oldenlandiæ* without any distinguishing label; it is evident, therefore, that (if it be the type) Mr. Walker must subsequent to his description of the species have considered it identical with *C. oldenlandiæ* and abandoned it, throwing away the ticket; and as none of his types were labelled by him, this act would at once destroy the best means of identifying his species. As it is, the example obtained from Mr. Stevens of *C. argentata* differs in several important points from the description of *C. firmata.*

31. Chærocampa rosina.

Chærocampa rosina, Butler, P. Z. S. 1875, p. 248, pl. xxxvii. fig. 6.

Masuri, N.W. Himalayas (*Hutton*). Type, coll. F. Moore.

32. Chærocampa silhetensis. (Plate XCII. fig. 8.)

Chærocampa silhetensis, Walker, Lep. Het. viii. p. 143. no. 27 (1856); ? Schaufuss, Nunquam Otiosus, p. 17 (1870).

Chærocampa bisecta, Moore, Cat. Lep. E.I. Comp. i. p. 278 (1857).

North India (*Stevens, James*); Silhet (*Stainsforth*); Ceylon (*Templeton*); Borneo (*Lowe, Wallace*); Java (*Horsfield Coll.*) B.M.

The larva is bright green or pale green, with the dorsal area red-brown, with a lateral pale stripe uniting a series of ocellated spots; the green form has also a pale lateral ventral fold, and a dark dorsal line, horn yellow; the dark form has a pale dorsal line, horn red-brown. It feeds on *Colocasia,* according to Mr. Lewis.

33. Chærocampa balsaminæ.

Chærocampa balsaminæ, Walker, Lep. Het. viii. p. 138. no. 18 (1856).

Port Natal (*Plant, Gueinzius*). B.M.

Allied to *C. japonica.*

34. Chærocampa japonica. (Plate XCI. figs. 7–9.)

Chærocampa japonica, Boisduval, in De l'Orza's Lép. Japonais, p. 36. no. 79 (1869).

Hakodadi (*Stevens, Whitely*); Shanghai (*Fortune*); Japan (*Lewis*). B.M.

Closely alled to *C. lycetus,* but compared by M. Boisduval to *C. oldenlandiæ.*

The larva, collected by Mr. Lewis in Japan, is either pale green with a darker green white-bordered lateral longitudinal streak from the sixth segment to the horn, or pale clay-colour with a similar streak, sometimes with the first two or three segments greenish, two or three lateral ocelli, beginning from the front of the fifth segment, horn, and prolegs reddish; the clay-coloured variety with a lateral series of cornucopia-shaped markings between the spiracles. It feeds on *Cissus.*

35. Chærocampa lycetus.

Sphinx lycetus, Cramer, Pap. Exot. i. p. 96, pl. 61. fig. D (1779).

Xylophanes lycetus, Hübner, Verz. bek. Schmett, p. 136. no. 1457 (1816).

Chærocampa lycetus, Walker, Lep. Het. viii. p. 143. no. 26 (1856).

"Bengal" (*Cramer*).

Mr. Walker thinks this may be a variety of *C. oldenlandiæ*; excepting in the silver lines on abdomen, it is more like *C. japonica.*

36. Chærocampa lucasii.

Chærocampa lucasii, Walker, Lep. Het. viii. p. 141. no. 24 (1856).

North India (*Doubleday, James*); Silhet (*Stainsforth*); Ceylon (*Nietner, Templeton*); ong-Kong (*Bowring*); Borneo (*Lowe, Wallace*). Type, B.M.

Mr Moore has this species from Silhet and Bombay, also a very dark example from Ceylon; the latter may prove to be distinct.

37. CHÆROCAMPA COMMINUENS.

Chærocampa comminuens, Walker, Lep. Het. Suppl. i. p. 31 (1864).

Moreton Bay (*Diggles*). Type. B.M.

38. CHÆROCAMPA INORNATA.

Chærocampa inornata, Walker, Lep. Het. Suppl. i. p. 31 (1864).

North Australia (*Elsey*). Type, B.M.

39. CHÆROCAMPA PORCUS.

Oreus porcus, Hübner, Samml. exot. Schmett. ii. pl. 162 (1806).
Darapsa porcus, Walker, Lep. Het. viii. p. 187. no. 10 (1856).
Chærocampa porcus, Herrich-Schäffer, Corr.-Blatt. 1865, p. 58.

"Tropical Insular District" (*Grote*).

40. CHÆROCAMPA VELOX.

Sphinx velox, Fabricius, Ent. Syst. iii. 1, p. 378. no. 68 (1795).

East India.

Seems allied to *C. porcus,* but according to Fabricius comes near *C. tersa.*

41. CHÆROCAMPA BUTUS.

Sphinx butus, Cramer, Pap. Exot. ii. p. 88, pl. 152. fig. A (1779).
Darapsa butus, Walker, Lep. Het. viii. p. 186. no. 7 (1856).
? *Chærocampa butus,* Herrich-Schäffer, Samml. auss. Schm. ii. fig. 559 (1869).
Sphinx gnoma, Fabricius, Sp. Ins. ii. p. 152. no. 53 (1781).

Coromandel.

42. CHÆROCAMPA CYRENE.

Deilephila cyrene, Westwood, Cab. Orient. Ent. p. 13, pl. 6. fig. 1 (1848).
Chærocampa clotho, var., Walker, Lep. Het. viii. p. 141. no. 23 (1856).

♂ ♀, Java (*Horsfield*). B.M.

Allied to *C. lucasii,* but lighter and redder in tint, and with usually a larger testaceous patch at anal angle of secondaries; abdomen of female with a distinct black spot on each side at base.

43. CHÆROCAMPA CLOTHO.

Sphinx clotho, Drury, Ill. Nat. Hist. ii. p. 48, pl. 28. fig. 1 (1773).
Chærocampa clotho, Walker, Lep. Het. viii. p. 141. no. 23 (1856).
Var.? *Sphinx batus,* Fabricius, Ent. Syst. iii. p. 377. no. 64 (1793).

Silhet (*Sowerby*); North India (*James, Stevens*); Moulmein (*Clerk*); Ceylon (*Templeton*). B.M.

The larva and pupa of *C. clotho* are figured by Dr. Semper, Verhandl. zool.-botan. Gesellsch. Wien, 1867, pl. xxiii. figs. 3*a*, 3*b*, 3*c*.

Mr. Moore has this species from Masuri and Bombay; it varies much in tint.

44. CHÆROCAMPA PUNCTIVENATA.

Chærocampa punctivenata, Butler, P. Z. S. 1875, p. 248.

Masuri (*Hutton*); Silhet. Type, coll. F. Moore.

45. CHÆROCAMPA BISTRIGATA.

Chærocampa bistrigata, Butler, P. Z. S. 1875, p. 249.

Java (*Horsfield*). Colls. Moore and B.M.

46. CHÆROCAMPA GONOGRAPTA.

Chærocampa gonograpta, Butler, P. Z. S. 1875, p. 249.

Bombay and South India. Type, coll. F. Moore.

47. CHÆROCAMPA MINOR.

Chærocampa minor, Butler, P. Z. S. 1875, p. 249.

Masuri (*Hutton*). Type, coll. F. Moore.

48. CHÆROCAMPA MAJOR.

Chærocampa major, Butler, P. Z. S. 1875, p. 249.

Darjeeling (*coll. Moore*); Silhet. B.M.

49. CHÆROCAMPA LINEOSA.

Chærocampa lineosa, Walker, Lep. Het. viii. p. 144. no. 28 (1856).

Silhet (*Stainsforth*). Type, B.M.

50. CHÆROCAMPA ANUBUS.

Sphinx anubus, Cramer, Pap. Exot. ii. p. 46, pl. 128. fig. C (1779).
Chærocampa anubus, Walker, Lep. Het. viii. p. 134. no. 13 (1856).

Brazil, Rio (*Stevens*). B.M.

Our examples are smaller, paler, and have larger spots on secondaries than the figure by Cramer.

51. CHÆROCAMPA FALCO.

Chærocampa falco, Walker, Lep. Het. viii. p. 132. no. 8 (1856).

Mexico (*Doubleday, Hartweg*). Type, B.M.

52. CHÆROCAMPA ROBINSONII.

Chærocampa robinsonii, Grote, Proc. Ent. Soc. Phil. v. p. 54, pl. 1. fig. 2 (1865); Herrich-Schäffer, Samml. ausseur. Schm. ii. fig. 555 (1869).

Chærocampa falco, Herrich-Schäffer (nec Walker), Corr.-Blatt. 1863, p. 148.

"Tropical Insular District" (*Grote*).

53. CHÆROCAMPA TERSA.

Sphinx tersa, Linnæus, Mantissa, p. 538; Drury, Ill. Nat. Hist. i. p. 61, pl. 28. fig. 3 (1770).

Theretra tersa, Hübner, Verz. bek. Schmett. p. 135. no. 1449 (1816).

Deilephila tersa, Westwood in Drury's Ill. i. p. 56, pl. 28. fig. 3 (1837).

Chærocampa tersa, Harris, Sill. Journ. vol. xxxvi. p. 303 (1839).

Metopsilis tersa, Duncan, Nat. Libr. vol. xxxvii. pl. 5. fig. 1, pl. 6. fig. 1 (1852).

Philampelus tersa, Burmeister, Sph. Bras. Abhandl. naturf. Gesellsch. Halle, p. 61. no. 4 (1855).

? *Sphinx sagittata,* Goeze, Beytr. iii. 2, p. 216. no. 42 (1780).

Brazil (*Mornay*); Mexico (*Hartweg*); Jamaica, St. Thomas (*Hornbeck*); Haiti (*Tweedie*). B.M.

54. CHÆROCAMPA? HYSTRIX.

Chærocampa hystrix, Felder, Reise der Nov., Lep., iv. tab. 76. fig. 5 (Nov. 1874).

——— ?

I do not for a moment believe this to be a *Chærocampa*; the form of the palpi and primaries (in Felder's figure) differ entirely from this genus. However, as I have not seen the insect, I leave it provisionally in that group of *Chærocampa* which it most resembles.

55. CHÆROCAMPA CROTONIS.

Chærocampa crotonis, Walker, Lep. Het. viii. p. 133. no. 10 (1856).

Venezuela (*Dyson*). Type, B.M.

56. CHÆROCAMPA ARISTOR.

Chærocampa aristor, Boisduval, Lép. Guat. p. 69 (1870).

"Guatemala" (*Boisduval*); Venezuela (*Dyson*). B.M.

Differs from the preceding species in the colour of the primaries, the less distinct oblique lines crossing them, and the absence of the dorsal grey streak on the body.

57. CHÆROCAMPA VIRESCENS. (Plate XCIV. fig. 2.)

Chærocampa virescens, Butler, P. Z. S. 1875, p. 9.

Bogota (*Stevens*). Type, B.M

58. Chærocampa nitidula.

Chærocampa nitidula, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 151.
♀ var. *Chærocampa lævis,* Grote & Robinson, Lyc. Nat. Hist. New York, vol. viii. p. 356, pl. 14. fig. 1.

Mexico (*Sallé*). B.M.

Our example is intermediate between *C. nitidula* and *C. lævis*; it possesses the "lateral caputal and thoracic discolorations," and the "abdominal double row of dark brown dots;" the primaries are "sparsely irrorate with black scales, especially terminally;" they also possess the angulated oblique line, but it is not so strongly defined as in Mr. Grote's figure.

59. Chærocampa versuta.

Chærocampa versuta, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 152.

Mexico.

60. Chærocampa procne.

Chærocampa procne, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 152.

California.

61. Chærocampa thalassina.

Chærocampa thalassina, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 150. no. 33.

——— ?

Seems allied to *C. amadis.*

62. Chærocampa docilis. (Plate XCIV. fig. 1.)

Chærocampa docilis, Butler, P. Z. S. 1875, p. 9, n. 17.

Ecuador (*Buckley*). Type, B.M.

63. Chærocampa amadis.

Sphinx amadis, Cramer, Pap. Exot. iv. p. 216, pl. 394. fig. C (1782).
Orcus amadis, Hübner, Verz. bek. Schmett. p. 136. no. 1464 (1816).
Chærocampa amadis, Walker, Lep. Het. viii. p. 134. no. 11 (1856).

Surinam.

64. Chærocampa gundlachii.

Chærocampa gundlachii, Herrich-Schäffer, Corr.-Blatt. 1863, p. 149.

"Tropical Insular District!" (*Grote*).

65. Chærocampa irrorata.

Chærocampa irrorata, Grote, Proc. Ent. Soc. Phil. vol. v. p. 52, pl. 1. fig. 2 (1865).

"Tropical Insular District!" (*Grote*).

66. CHÆROCAMPA HAITENSIS.

Chærocampa haitensis, Butler, P. Z. S. 1875, p. 9. no. 18.

Haiti (*Tweedie*). Type, B.M.

67. CHÆROCAMPA CHIRON.

Sphinx chiron, Drury, Ill. Nat. Hist. i. p. 56, pl. 26. fig. 3 (1770).
Chærocampa chiron (part.), Walker, Lep. Het. viii. p. 132. no. 7 (1856).

Brazil (*Saunders*); Monte Video (*Darwin*). B.M.

68. CHÆROCAMPA NECHUS.

Sphinx nechus, Cramer, Pap. Exot. vol. ii. p. 125, pl. 178. fig. B (1779).
Theretra nechus, Hübner, Verz. bek. Schmett. p. 135. no. 1447 (1816).
Chærocampa chiron (part.), Walker, Lep. Het. viii. p. 132. no. 7 (1856).
Chærocampa hortulanus (sic), Schaufuss, Nunquam Otiosus, i. p. 18 (1870).

Mexico (*Doubleday*). B.M.

69. CHÆROCAMPA FUGAX.

Chærocampa fugax, Boisduval, Lep. Guat. p. 70 (1870).

Honduras and Mexico.

Apparently allied to *C. ceratomioides.*

70. CHÆROCAMPA CERATOMIOIDES.

♀. *Chærocampa ceratomioides,* Grote & Robinson, Lyc. Nat. Hist. vol. viii. p. 358, pl. 14. fig. 2 (1867).
Pergesa anubus, Walker (nec *Sphinx anubus,* Cramer), Lep. Het. viii. p. 151. no. 3.

Brazil (*Becker*); Rio (*Stevens*); Venezuela (*Dyson*). B.M.

71. CHÆROCAMPA NESSUS.

Sphinx nessus, Drury, Ill. Nat. Hist. ii. p. 46, pl. 27. fig. 1 (1773).
Chærocampa nessus, Walker, Lep. Het. viii. p. 140. no. 22 (1856).
Sphinx equestris, Fabricius, Ent. Syst. iii. p. 365. no. 29 (1793).
Var. *Chærocampa rubicundus,* Schaufuss, Nunquam Otiosus, i. p. 18 (1870).

Silhet (*Stainsforth*); North India (*James*); Moulmein (*Clerck*); Canara (*Ward*); Ceylon (*Templeton*); Hong-Kong (*Bowring*); Java (*Horsfield*). B.M.

Dr. Schaufuss describes the Javan type.

Mr. Lewis took the larva of *C. nessus* upon the wild yam (*Dioscorea*); it is of a chalky-green colour, whitish above, with paler dorsal and a lateral longitudinal subdorsal white streak, also six oblique white stripes between the spiracles, one or two rounded whitish lateral spots on the anterior segments; anal horn yellow, prolegs also yellow.

The dark variety of the larva is pale brick-red above and pale purplish brown below; the lateral longitudinal and oblique lines dusky brown; lateral rounded spots with pale bluish superior areas; anterior segments greyish; horn olivaceous.

72. CHÆROCAMPA SCROFA.

Deilephila scrofa, Boisduval, Voy. de l'Astrolabe, Ent. p. 185. no. 3 (1832–35).
Chærocampa scrofa, Walker, Lep. Het. viii. p. 147. no. 35 (1856).
Deilephila porcia, Wallengren, Wien. ent. Monatschr. iv. p. 42 (1860).

South Australia (*Bakewell*); Australia (*Ker*). B.M.

Dr. Boisduval speaks of this as perhaps only a variety of *thyelia*, a species to which it bears no resemblance.

73. CHÆROCAMPA IGNEA.

Chærocampa ignea, Butler, P. Z. S. 1875, p. 10, pl. i. fig. 4.

Moreton Bay (*Gibbons*). Type, B.M.

This may perhaps be the undescribed form quoted by Koch (Indo-Austral. Lep. Fauna, ii. p. 53, 1873) under the name of *C. bernardus.*

74. CHÆROCAMPA BRENNUS.

Sphinx brennus, Cramer, Pap. Exot. iv. p. 233, pl. 398. fig. B (1782).
Amphion brennus, Hübner, Verz. bek. Schmett. p. 135. no. 1445 (1816).
Chærocampa brennus, Walker, Lep. Het. viii. p. 144. no. 29 (1856).

Amboina.

75. CHÆROCAMPA PALLICOSTA.

Chærocampa pallicosta, Walker, Lep. Het. viii. p. 145. no. 31 (1856).

Silhet (*Stainsforth*); Hong-Kong (*Harrington*). Type, B.M.

76. CHÆROCAMPA EROTUS.

Sphinx erotus, Cramer, Pap. Exot. ii. p. 12, pl. 104. fig. B (1779).
Chromis erotus, Hübner, Verz. bek. Schmett. p. 138. no. 1479 (1816).
Chærocampa erotus (part.), Walker, Lep. Het. viii. p. 146. no. 34 (1856).

Australia (*Stevens, Stevenson*); Cape York (*Macgillivray*); Solomon Islands (*Brenchley*). B.M.

All our examples are females; so that I doubt the distinctness of this and the next species. See, however, Koch (Stett. ent. Zeit. 1871, pp. 239–41).

77. CHÆROCAMPA EROTOIDES.

Gnathothlibus erotoides, Wallengren, Wien. ent. Monatsschrift, iv. p. 43. no. 44 (1860).
Chærocampa erotus (part.), Walker, Lep. Het. viii. p. 146. no. 34 (1856), Suppl. p. 1852 (1866).

Australia (*Becker*, *Wood*); Navigators' Islands. B.M.

The typical *C. erotus*, although perhaps a second form of the female of this species, may at once be distinguished by its slightly superior size, deeper colouring, the glossy character of the primaries above, the broader black border to the secondaries, and the deep reddish coloration of the under surface of all the wings, which almost obliterates the mottled hatchings so distinctly seen in *C. erotoides*.

78. CHÆROCAMPA ERAS.

Deilephila eras, Boisduval, Voy. de l'Astrolabe, Ent. p. 185. no. 4 (1832–35); Feisthamel, Mag. de Zool., Ins. pl. 21. fig. 2 (1839).

Darapsa eras, Walker, Lep. Het. viii. p. 186. no. 3 (1856).

Australia.

Nearly allied to the preceding species.

79. CHÆROCAMPA? BATSCHII.

Chærocampa batschii, Keferstein, Entomol. Notizen, p. 14, fig. 4 (1870).

Madagascar.

I have been unable to obtain the above work, and therefore have failed to identify the species.

Genus 14. DARAPSA, Walker.

Darapsa, Walker, Lep. Het. viii. p. 182. gen. 22 (1856).

This genus was founded upon most heterogeneous material, the first three species being referable to Hübner's genus *Otus*, the fifth to Walker's genus *Diodosida*, the sixth and eighth to the genus *Daphnis* of Hübner, the seventh, ninth and tenth to *Chærocampa* of Duponchel; there therefore remains only the fourth species, allied to *Chærocampa*, but apparently sufficiently distinct. It differs as follows:—

Primaries comparatively shorter, costal margin more arched at apex, outer margin much arched and shorter, inner margin strongly waved, almost sigmoidal; secondaries comparatively much longer and narrower.

DARAPSA RHODOCERA.

Darapsa rhodocera, Walker, Lep. Het. viii. p. 184. no. 4 (1856).

Haiti. Type, B.M.

Most like the *C. clotho* group of *Chærocampa* in colouring.

Genus 15. Deilephila, Ochsenheimer.

Deilephila, Ochsenheimer, Eur. Schmett. iv. p. 42 (1816).

1. Deilephila livornica.

Sphinx livornica, Esper, Ausl. Schmett. ii. pp. 87, 196, pl. 8. fig. 4 (1785).
Phryxus livornica, Hübner, Verz. bek. Schmett. p. 137 (1816).
Deilephila livornica, Stephens, Cat. Brit. Lep. Brit. Mus. pt. i. p. 28 (1850).
Sphinx koechlini, Fuessly, Arch. Insectengesch. t. 33. figs. 1–6 (1781).

South France, Turkey (*Loftus*); Landoor (*Hearsay*); North India (*Stevens*). B.M.

The larva of this species has been carefully described by Bignell, Farn, Hobbs, and Hellins (1870).

2. Deilephila lineata.

Sphinx lineata, Fabricius, Ent. Syst. p. 541 (1775).
Deilephila lineata, Harris, Cat. N.A. Sph., Sill. Journ. p. 304 (1839).
Sphinx daucus, Cramer, Pap. Exot. ii. p. 41, pl. 125. fig. D (1779).
Deilephila daucus, Stephen, Ill. Brit. Ent., Haust. i. p. 126 (1828).

New York (*Milne*); Nova Scotia, Canada West (*Bush*); California, Oaxaca (*Hartweg*); Haiti (*Tweedie*); St. Thomas (*Hornbeck*); New Granada, Jamaica (*Redman*). B.M.

Larva figured Am. Ent. ii. pp. 257, 258 (1870).

3. Deilephila biguttata.

Deilephila biguttata, Walker, Lep. Het. viii. p. 172. no. 15 (1856).

Madagascar (*Stevens*). Type, B.M.

4. Deilephila opheltes.

Sphinx opheltes, Cramer, Pap. Exot. iii. p. 164, pl. 285. fig. B (1782).
Hyles opheltes, Hübner, Verz. bek. Schmett. p. 137. no. 1471 (1816).
Deilephila opheltes, Walker, Lep. Het. viii. p. 173. no. 17 (1856).

Cape.

5. Deilephila spinifascia.

Deilephila spinifascia, Butler, Proc. Zool. Soc. p. 81 (1871).

Buenos Ayres (*Burmeister*); Patagonia (*Cunningham*). Type, B.M.

I believe that this species also occurs in Chili.

6. Deilephila galii.

Sphinx galii, Fabricius, Sp. Ins. ii. p. 147. no. 33 (1781).
Hyles galii, Hübner, Verz. bek. Schmett. p. 137. no. 1470 (1816).
Deilephila galii, Stephens, Ill. Brit. Ent., Haust. i. p. 125. 2, pl. 12. fig. 2 (1828).
Sphinx euphorbiæ (part), Linnæus, Syst. Nat. i. 2, p. 802. no. 19 (1766).

Europe (*Becker*). B.M.

Larva described by Newman and Buckler (1870).

7. Deilephila chamænerii.

Deilephila chamænerii, Harris, Cat. N.-Am. Sph., Sill. Journ. p. 305 (1839).
Sphinx epilobii, Harris (nec Boisd.), Cat. p. 530 (1833).
Deilephila galii (part), Walker, Lep. Het. viii. p. 166. no. 4 (1856).

West Canada (*Bush*); York Factory (*Rae*); United States (*Doubleday*). B.M.

There is an example of this species in the British cabinet from the Stephensian Collection; other American species are also in this collection.

According to Strecker (Canad. Ent. iv. p. 206) *D. chamænerii* is =*D. galii*.

8. Deilephila intermedia.

Deilephila intermedia, Kirby, Fauna Amer.-Bor. vol. iv. p. 302 (1837).

"Canada" (*Kirby*).

9. Deilephila calverleyi.

Deilephila calverleyi, Grote, Notes Cub. Sph., Proc. Ent. Soc. Phil. p. 56, pl. 1. fig. 4 (1865).

"Tropical Insular District" (*Grote*).

10. Deilephila costata.

Sphinx (Deilephila) costata, Nordmann, Bull. Soc. Imp. Mosc. ii. p. 444, pl. xi. figs. 3, 4 (1851).

"Neighbourhood of Kjachta" (*Popoff*).

Somewhat like *D. chamænerii*, but the tapering discal band intersected by white nervures.

11. Deilephila dahlii.

Sphinx dahlii, Treitschke, Schmett. Eur. x., Suppl. p. 132; Hübner, Samml. eur. Schmett. ii. pl. 36. figs. 161–164.
Deilephila dahlii, Rambur, Ann. Soc. Ent. France, p. 266 (1832).

Europe (*Becker*); South Europe (*Pierret*). B.M.

We have what appears to be a hybrid between this species and *D. euphorbiæ* (not unlike Godart's figure of *D. tithymali*, although utterly unlike Boisduval's); it approaches very close to *D. lathyrus* of Walker, from North India, chiefly differing, in fact, in its more vivid colouring.

12. Deilephila tithymali.

Deilephila tithymali, Boisduval, Icon. Hist. Lép., Sph. p. 30, pl. 51. fig. 1 (1832).

Canaries (*Wollaston*). B.M.

Possibly a variety of the preceding, but without the third black spot on each side of the abdomen, and with the band of primaries sometimes narrower.

13. Deilephila mauritanica.

Deilephila mauritanica, Staudinger, Cat. Lep. Europ. Faun. i. p. 36. no. 466 (1871).
Deilephila tithymali, Bellier (nec Boisd.), Ann. Soc. Ent. France, p. 45 (1848), p. 488, pls. ii., iii. (1858).
Deilephila euphorbiæ, Lucas, Expl. Alg. p. 370, pl. ii. fig. 8 (1848).

Mauritania; Madeira.

14. Deilephila zygophylli.

Sphinx zygophylli, Ochsenheimer, Eur. Schmett. iii. p. 226. no. 5; Hübner, Samml. europ. Schmett. pl. 27. fig. 125.
Deilephila zygophylli, Boisduval, Icon. Hist. Lép., Sph. p. 32. no. 8, pl. 51. fig. 2 (1832).

Shores of the Caspian.

Allied to *D. tithymali,* but smaller.

15. Deilephila euphorbiæ.

Sphinx euphorbiæ, Linnæus, Syst. Nat. i. 2, p. 802. no. 19 (1766).
Hyles euphorbiæ, Hübner, Verz. bek. Schmett. p. 137. no. 1475 (1816).
Deilephila euphorbiæ, Curtis, Brit. Ent. i. pl. 3 (1823–40).

Europe (*Becker*). B.M.

16. Deilephila lathyrus.

Deilephila lathyrus, Walker, Lep. Het. viii. p. 172. no. 16 (1856).

North India. Type, B.M.

Apparently a very common species.

17. Deilephila nicæa.

Sphinx nicæa, De Prunner, Lep. Pedemont. p. 85 (1798).
Deilephila nicæa, Boisduval, Ind. Méth. p. 47. no. 381.
Hyles nicea (sic), Hübner, Verz. bek. Schmett. p. 137. no. 1474 (1816).
Sphinx cyparissiæ, Hübner, Samml. eur. Schmett. ii. pl. 24. fig. 115.

South Europe (*Becker*). B.M.

18. DEILEPHILA ANNEI.

Sphinx annei, Guérin, Mag. de Zool. 2nd ser. i. Ins. pl. 2 (1839).

Santiago, Chili.

In the coloration and pattern of the wings this species nearly approaches *D. hippophaës*; but in size and the tint of the primaries it seems to come nearer to *D. nicæa*. The body is peculiar, the abdomen being white at the sides, interrupted by five transverse black spots; in this respect it resembles *D. spinifascia*.

19. DEILEPHILA ESULÆ.

Deilephila esulæ, Boisduval, Icon. Hist. Lép., Sph. p. 26. no. 5, pl. 50. fig. 1.

Calabria.

Nearly allied to *D. hippophaës*.

20. DEILEPHILA BIENERTI.

Deilephila beinerti, Staudinger, Stett. ent. Zeit. xxxv. p. 91 (1874).

Persia.

Size of the largest examples of *D. hippophaes*, to which it is nearly allied.

21. DEILEPHILA HIPPOPHAËS.

Sphinx hippophaës, Esper, Eur. Schmett. ii. p. 6, pl. 38. figs. 1, 2 (1777).
Hyles hippophaës, Hübner, Verz. bek. Schmett. p. 137. no. 1473 (1816).
Deilephila hippophaës, Boisduval, Ind. Méth. p. 47. no. 388.
Hybrid. *Sphinx vespertilioides*, Boisduval, Ann. Soc. Linn. Paris, vol. vi. pl. 6. fig. 4 (1827).
Deilephila vespertilioides, Boisduval, Icon. Hist. Lép., Sph. p. 22. no. 3, pl. 49. fig. 3 (1832).
Hybrid. *Deilephila epilobii*, Boisduval, *loc. cit.* p. 24. no. 4, pl. 51. fig. 3 (1832).

Europe (*Becker*). B.M.

D. epilobii seems scarcely to differ from *D. hippophaës*, excepting in the more decided markings of primaries. *D. vespertilioides* is apparently a hybrid between *D. hippophaës* and *D. vespertilio*, and is quite intermediate in character between them.

22. DEILEPHILA VESPERTILIO.

Sphinx vespertilio, Fabricius, Sp. Ins. ii., Append. p. 504 (1781).
Thaumas vespertilio, Hübner, Verz. bek. Schmett. p. 138. no. 1476 (1816).
Deilephila vespertilio, Walker, Lep. Het. viii. p. 169. no. 10 (1856).

Europe (*Becker*). B.M.

Characteristically figured by Hübner, Samml. eur. Schmett. ii. pl. 21. figs. 103, 104; a variety, pl. 11. fig. 62; he also figures the larva.

Genus 16. Daphnis, Hübner.

Daphnis, Hübner, Verz. bek. Schmett. p. 134 (1816).

1. Daphnis nerii.

Sphinx nerii, Linnæus, Syst. Nat. i. 2, p. 798. no. 5 (1766); Roesel, Ins. Belust. iii. p. 85, pl. 15. figs. 1–3, pl. 16. figs. 4–6 (1755).
Daphnis nerii, Hübner, Verz. bek. Schmett. p. 134. no. 1441 (1816).
Chærocampa nerii, Curtis, Brit. Ent. xiii. pl. 626.
Deilephila nerii, Boisduval, Faune Ent. de Madag. p. 74. no. 6 (1833).

Italy (*Leach*); Athens (*Merlin*); East India, Canara (*Ward*); Mauritius (*Beke*); Natal (*Gueinzius*). B.M.

The examples mentioned by Mr. Walker as coming from Ceylon are sexes of *D. hypothoüs* of Cramer.

2. Daphnis hypothoüs.

Sphinx hypothoüs, Cramer, Pap. Exot. iii. p. 165, pl. 285. fig. F (1782).
Daphnis hypothoüs, Hübner, Verz. bek. Schmett. p. 134. no. 1440 (1816).
Darapsa hypothoüs (part.), Moore, Cat. Lep. E.I. Comp. p. 271. no. 627, pl. x. figs. 2, 2 *a*, transformations (1857).

♂ ♀, Ceylon (*Templeton*); Java (*Horsfield*); Labuan and Sarawak (*Low*). B.M.

The larva of *D. hypothoüs* is figured in Horsfield and Moore's Catalogue, pl. x. fig. 2.

3. Daphnis pallescens.

Daphnis pallescens, Butler, P. Z. S. 1875, p. 6.

Queensland (*Janson*). Type, B.M.

4. Daphnis protrudens.

Daphnis protrudens, Felder, Reise der Nov., Lep. iv. tab. lxxvi. fig. 7 (Nov. 1874).

——— ?

Allied to the preceding.

5. Daphnis angustans.

Daphnis angustans, Felder, Reise der Nov., Lep. iv. tab. lxxvi. fig. 6 (Nov. 1874).

——— ?

Allied to the succeeding species, but altogether darker and differently coloured.

6. Daphnis horsfieldii, n. sp.

Darapsa hypothoüs, Walker (nec Cramer), Lep. Het. viii. p. 185. no. 6 (1856).
Darapsa hypothoüs ♂, Moore, Cat. Lep. E.I. Comp. p. 271. no. 627 (1857).

Smaller than *D. hypothoüs*; primaries with the outer margin much more waved, acutely pointed at apex; colours similar but less green; the subbasal pale band wider; the broad band crossing the middle of the wing replaced by a broad nebulous area, crossed by an angular band of olive-brown; no white spot at apex; secondaries altogether redder, especially towards apex; underside altogether paler and testaceous instead of rosy. Expanse of wings, ♂ 2 inches 9 lines, ♀ 3 inches 3 lines.

♂ ♀, Java (*Horsfield*). Type, B.M.

The pupa-skin of the female shows that this species differs in that stage from *D. hypothoüs* by being much less heavily spotted with black longitudinally; the two species, however, are so abundantly distinct that it does not require differences in the early stages to separate them with ease.

7. Daphnis minima, n. sp. (Pl. XCII. fig. 5.)

Much like a minute, pale, undercoloured *D. horsfieldii.* Wings above whity brown or brownish grey; primaries crossed by a basal and an angulated central clay-coloured band; a brown-edged greyish transverse discal line; outer margin, especially near apex, chocolate-brown; inner margin chocolate-brown at external angle; discal area from external angle to end of cell suffused with clay-colour; secondaries with external two thirds reddish-brown, interrupted by a disco-submarginal whitish line from anal angle to apical costa: body as in *D. horsfieldii*, but paler: wings below nearly as in *D. horsfieldii*; no white point in cell of secondaries. Expanse of wings 1 inch 9 lines.

South India (*S. N. Ward*). Type, Coll. F. Moore.

By far the smallest species in the genus. The larva is golden green, with a lateral white-dotted longitudinal blue line, and above it a reddish orange line, terminating towards the head in two small white-zoned black ocelli; the lateral and ventral surfaces are covered with granular white dots; the feet, claspers, and horn orange; the latter black-tipped; spiracles reddish orange; an oblique white line on anal claspers.

8. Daphnis placida.

Darapsa placida, Walker, Lep. Het. viii. p. 186. no. 8 (1856).

Sumatra.

9. Daphnis bhaga.

Darapsa bhaga, Moore, P. Z. S. 1865, p. 794.

N.E. Bengal (*Russell*). Type, Coll. F. Moore.

A very remarkable species, having a long curved apical hook to the primaries.

Genus 17. Philampelus, Harris.

Philampelus, Harris, Amer. Journ. Sci. vol. xxxvi. p. 299 (1839).

Section Dupo, Hübner.

1. Philampelus vitis.

Sphinx vitis, Linnæus, Mus. Lud. Ulr. p. 354 (1764).
Philampelus vitis, Harris, Sill. Journ. vol. xxxvi. p. 299 (1839).
Sphinx fasciatus, Sulzer, Gesch. Ins. p. 151, pl. 20. fig. 1 (1776).
Philampelus fasciatus, Herrich-Schäffer, Corr.-Blatt. 1865, p. 58.
♂ *Eumorpha elegans jussieuæ,* Hübner, Samml. exot. Schmett. i. pl. 169. figs. 1, 2 (1806).
♀ *Dupo jussieuæ,* Hübner, Samml. exot. Schmett. ii. pl. 163. figs. 3, 4 (1806).
Philampelus jussieuæ, Walker, Lep. Het. viii. p. 177. no. 6 (1856).

Mexico (*Sallé*); west coast of South America (*Kellet & Wood*); Haiti (*Tweedie*); Jamaica (*Redman*, *Gosse*); Brazil (*Stevens*). B.M.

Mr. Grote has very rightly restored Linné's name to this species, the figure referred to in the original description (Merian, Surin. 47, t. 47. f. 1—that is, the upper figure) being evidently intended for the *S. fasciatus* of Sulzer (*Eumorpha jussieuæ*, Hübn.).

2. Philampelus linnei.

Philampelus linnei, Grote & Robinson, Proc. Ent. Soc. Phil. vol. v. pp. 157, 179, 182, pl. 3. fig. 3 (1865).
Sphinx vitis, Cramer, Pap. Exot. vol. iii. pl. 268. fig. E (1782).
Dupo vitis, Hübner, Verz. bek. Schmett. p. 137. no. 1466 (1816).
Philampelus vitis, Walker, Lep. Het. viii. p. 176. no. 4 (1856).
Philampelus fasciatus, Grote, Notes Cub. Sph., Proc. Ent. Soc. Phil. vol. v. pp. 59, 84 (1865).

Mexico (*Hartweg*); Haiti (*Cuming & Tweedie*); —— ? (*Stevens*). **B.M.**

3. Philampelus hornbeckiana.

Philampelus hornbeckiana, Harris, Cat. N.-Am. Sph., Sill. Journ. p. 299 (1839).

"St. Thomas, West Indies."—*Harris.*

Apparently allied to the preceding.

4. Philampelus strenuus.

Chærocampa strenua, Ménétriés, Enum. Corp. Anim. Mus. Ac. Sci. Petrop., Ins. Lép. ii. p. 132, pl. 12. fig. 3 (1857); Walker, Lep. Het., Suppl. i. p. 30 (1864).
Philampelus strenuus, Grote, Proc. Ent. Soc. Phil. vol. v. pp. 60, 157 (1865).

"Haiti."—*Ménétréis.*

Allied to *P. linnei.*

5. PHILAMPELUS TYPHON.

Sphinx typhon, Klug, Neue Schmett. Heft i. pl. 3. fig. 1 (1836).
Philampelus typhon, Walker, Lep. Het. viii. p. 177. no. 5 (1856).

Mexico (*Doubleday*). B.M.

Section PHILAMPELUS (Harris), Grote.

Philampelus, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 21 (1873).

6. PHILAMPELUS ACHEMON.

Sphinx achemon, Drury, Ill. Nat. Hist. vol. ii. p. 51, pl. 29. fig. 1 (1773).
Philampelus achemon, Harris, Sill. Journ. vol. xxxvi. p. 300 (1839); Scudder, Harris Corresp. p. 283, pl. 3. fig. 11 (1869).
Sphinx crantor, Cramer, Pap. Exot. ii. p. 11, pl. 104. fig. A (1779).
Pholus crantor, Hübner, Verz. bek. Schmett. p. 134. no. 1435 (1816).

New York (*Doubleday*). B.M.

Transformations figured (Am. Ent. ii. pp. 22–24, 1870).

7. PHILAMPELUS POSTICATUS.

Philampelus posticatus, Grote, Proc. Ent. Soc. Phil. vol. v. p. 62 (1865).
Pholus licaon, Hübner (nec Cramer), Samml. exot. Schmett. ii. pl. 160. figs. 3, 4 (1806).
Philampelus lycaon (part.), Grote, Proc. Ent. Soc. Phil. vol. v. p. 157. no. 54 (1865).
Philampelus satellitia (part.), Walker (nec Linnæus), Lep. Het. viii. p. 175. no. 3 (1856).

Bolivia (*Bridges*). B.M.

The rose colour at anal angle of secondaries is more strongly pronounced in our example than in Hübner's figure.

8. PHILAMPELUS MIRIFICATUS.

Philampelus (*Dupo*) *mirificatus,* Grote, Bull. Buff. Soc. Nat. Sci. ii. p. 148 (1874).

Cuba (*Wright*).

"Allied to *P. posticatus*, *P. linnei*, and *P. strenuus*; from all differing by the white linear bands on the fore wings and their apical white line, and by the distinctly white-banded abdomen and tegulæ."

"While nearest to *P. posticatus* in the appearance of the hind wings, it is most dissimilar in the markings of the primaries, which are more like those of *P. linnei* in the evenness of the ground-colour."

9. PHILAMPELUS PANDORUS.

Daphnis pandorus, Hübner, Samml. exot. Schmett. ii. pl. 161. figs. 3, 4.
Philampelus pandorus, Walker, Lep. Het. viii. p. 174. no. 1 (1856).
Sphinx satellitia ♂, Drury (nec Linnæus), Ill. Nat. Hist. i. pl. xxix. fig. 2 (1770).

United States (*Doubleday*); North America (*Hardwicke*); Jamaica. B.M.

I believe that Mr. Walker was quite right in separating this species from *P. satellitia* of Linnæus (see Drury, pl. 29. fig. 1); the male of that species does not differ in size or colouring, but slightly in form and pattern, from the female. *P. pandorus* is, in fact, allied to *P. licaon*, Cramer (nec Hübner) more nearly than to *P. satellitia*; it shows also traces of affinity to *P. achemon* in the more angulated form of the line defining the clouded discal area of primaries.

10. PHILAMPELUS EACUS.

Sphinx eacus, Cramer, Pap. Exot. iii. p. 166, pl. 285. fig. E (1782).
Philampelus eacus, Walker, Lep. Het. viii. p. 179. no. 9 (1856).

Surinam.

This appears to me to be a variety of *P. pandorus.*

11. PHILAMPELUS CISSI.

Philampilus cissi (sic), Schaufuss, Nunquam Otiosus, i. p. 19 (1870).

Venezuela.

Probably the male of *P. satellitia*, but so imperfectly described that it is impossible to identify it with certainty.

12. PHILAMPELUS LYCAON.

Sphinx licaon, Cramer, Pap. Exot. i. p. 86, pl. 55. fig. A (1779).
Philampelus lycaon, Grote, Proc. Ent. Soc. Phil. vol. v. pp. 60, 84, 157 (1865).
Philampelus satellitia (part.), Walker, Lep. Het. viii. p. 175. no. 3 (1856).

Mexico (*Sallé*). B.M.

This species is of a redder tint than *P. satellitia*; the primaries exhibit more markedly than in any of the other species the apparent division into a basi-internal light and an apical dark area; the hind wings have no rosy flush (as in Hübner's species) at anal angle of secondaries; but they have on the underside an indistinct rusty reddish apical spot on secondaries. The insect is, as Cramer says, "*en dessous de couleur minium et vers les pointes des ailes inférieures de couleur rousse.*" Mr. Grote appears to have misunderstood this description.

13. PHILAMPELUS SATELLITIA.

Sphinx satellitia, Linnæus, Mantissa, i. p. 539; Drury, Ill. Nat. Hist. i. pl. 29. fig. 1 (1770).
Philampelus satellitia, Harris, Sill. Journ. vol. xxxvi. p. 299 (1839).

♂ ♀. Honduras (*Dyson*); Jamaica. B.M.

Transformations figured, Am. Ent. ii. pp. 22–24 (1870).

14. Philampelus anchemolus.

Sphinx anchemolus, Cramer, Pap. Exot. iii. p. 50, pl. 224. fig. C (1782).
Philampelus anchemolus, Walker, Lep. Het. viii. p. 178. no. 8 (1856).
Philampelus satellitia (part.), Walker, *l. c.* p. 175. no. 3 (1856).

Rio Janeiro (*Stevens*); west coast of South America (*Kellett & Wood*). B.M.

A larger and more heavily-coloured species than the preceding, the sides of the body much redder; with other less evident differences.

15. Philampelus helops.

Philampelus helops, Walker, Lep. Het. viii. p. 180. no. 12 (1856).
Philampelus orientalis, Felder, Reise der Nov., Lep. iv. tab. 77. fig. 1 (1874).

"Port Natal (*Krauss*)."—*Walker.* Type, B.M.

I have examined a specimen of this species taken by Mr. W. L. Distant in Penang. It differs in no respect from the type; and therefore I have little doubt that our locality is wrong. Mr. Moore has a pale example taken by Mr. Grote in North India.

Section Argeus, Hübner (*Chlorina,* Guénée).

Argeus, Hübner, Verz. bek. Schmett. p. 134. no. 3 (1816).

16. Philampelus megæra.

Sphinx megæra, Linnæus, Mus. Lud. Ulr. p. 358 (1764); Clerck's Icones, pl. 47. fig. 2.
Philampelus megæra, Walker, Lep. Het. viii. p. 179. no. 11 (1856).

Port Natal (*Stevens & Gooch*); Ashanti. B.M.

It is evident from M. Guénée's note on "*Chærocampa megæra,*" and his description of a new genus to receive it, that he had neglected to examine Mr. Walker's Catalogue, and consequently was not aware that recent naturalists had moved *Sphinx megæra* to *Philampelus.*

The example of *P. megæra* received from Mr. Gooch has the abdomen red.

17. Philampelus phorbas.

♀. *Sphinx phorbas,* Cramer, Pap. Exot. i. p. 86, pl. 55. fig. B (1779).
Philampelus phorbas, Walker, Lep. Het. viii. p. 179. no. 10 (1856).
♂. *Sphinx pandion,* Cramer, Pap. Exot. iv. p. 65, pl. 321. fig. A (1782).
Argeus pandion, Hübner, Verz. bek. Schmett. p. 134. no. 1443 (1816).

"Surinam."—*Cramer.*

Closely allied to *P. megæra.*

18. Philampelus lacordairei.

Deilephila lacordairei, Boisduval, Faune Ent. de Madag. p. 73. no. 5, pl. 11. fig. 1 (1853).
Chlorina Megæra, Guénée (nec Linn.), Notes sur l'île de la Réunion, Lép. p. 22. no. 21 (1862).

Madagascar and Bourbon.

I have seen an example of this species formerly in Mr. Herbert Sharpe's collection; it is allied to the two preceding species.

19. PHILAMPELUS LABRUSCÆ.

Sphinx labruscæ, Linnæus, Mus. Lud. Ulr. p. 352 (1764); Clerck's Icones, pl. 47. fig. 3.
Eumorpha elegans labruscæ, Hübner, Samml. exot. Schmett. i. pl. 167. figs. 1, 2 (1806).
Argeus labruscæ, Hübner, Verz. bek. Schmett. p. 134. no. 1442 (1816).

Mexico, Jamaica (*Gosse*); Haiti (*Tweedie*); Venezuela (*Dyson*); Columbia. B.M.

Genus 18. PACHYLIA, Walker.

Pachylia, Walker, Lep. Het. viii. p. 189. gen. 24 (1856).

1. PACHYLIA FICUS.

Sphinx ficus, Linnæus, Mus. Lud. Ulr. p. 352 (1764); Clerck's Icones, pl. 49. fig. 2.
Pholus ficus, Hübner, Verz. bek. Schmett. p. 134 (1816).
Pachylia ficus (part.), Walker, Lep. Het. viii. p. 189. no. 1 (1856).
Chærocampa crameri, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 133 (1857).
Var. *Pachylia venezuelensis*, Schaufuss, Nunquam Otiosus, i. p. 16 (1870).

Mexico (*Hartweg*); Haiti (*Tweedie*). B.M.

2. PACHYLIA UNDATIFASCIA, n. sp.

Nearly allied to *P. ficus*, but more ochraceous in tint; all the transverse lines much less defined (scarcely perceptible in the male); secondaries with the central black bar distinctly waved, not denticulate; discal line indistinct; body with the transverse darker bars much less distinct; wings below much more ochreous, the transverse lines obsolete. Expanse of wings—♂ 4 inches 4 lines, ♀ 5 inches 2 lines.

♂, Haiti (*Tweedie*); ♀, "Brazil." Type, B.M.

Possibly an extreme variety of *P. ficus*; but the two males look very distinct.

3. PACHYLIA? MOLUCCA.

Eurypteryx molucca, Felder, Reise der Nov., Lep. iv. pl. lxxvi. fig. 1 (1874).

——?

4. PACHYLIA SYCES.

Enyo syces, Hübner, Verz. bek. Schmett. p. 132. no. 1424 (1816).
Sphinx ficus, Cramer, Pap. Exot. iv. p. 216, pl. 394. fig. D (1782).
Pachylia ficus (part.), Walker, Lep. Het. viii. p. 189. no. 1 (1856).
Chærocampa ficus, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 133 (1857).
Pachylia inornata, Clemens, Journ. Acad. Nat. Sci. Phil. p. 159 (1859).

♂, Brazil (*Stevens*); ♀, Jamaica (*Argent*); ♂, Haiti (*Tweedie*). B.M.

I have to thank Mr. Kirby for calling my attention to Hübner's name for this species.

5. Pachylia resumens.

Pachylia resumens, Walker, Lep. Het. viii. p. 190. no. 2 (1856); Herrich-Schäffer, Samml. auss. Schmett. ii. fig. 556 (1869).

Haiti (*Tweedie*); Honduras (*Dyson*); Rio Janeiro (*Stevens*). Type, B.M.

6. Pachylia inconspicua.

Pachylia inconspicua, Walker, Lep. Het. viii. p. 190. no. 3 (1856).

Jamaica.

Subfamily III. AMBULICINÆ.

Genus 1. Ambulyx, Walker.

Ambulyx, Walker, Lep. Het. viii. p. 120. gen. 11 (1856).

1. Ambulyx strigilis.

Sphinx strigilis, Linnæus, Mant. i. p. 538 (1771); Cramer, Pap. Exot. ii. pl. 106. fig. B (1779).
Sphinx strigiles (sic), Drury, Ill. Nat. Hist. i. p. 62, pl. 28. fig. 4 (1770).
Pholus strigilis, Hübner, Verz. bek. Schmett. p. 113. no. 1437 (1816).
Ambulyx strigilis, Walker, Lep. Het. viii. p. 121. no. 1 (1856).

Haiti (*Tweedie*); west coast of South America (*Kellett & Wood*); Brazil (*Saunders*); Rio Janeiro (*Stevens*); Pará (*Bates*).

Var. *rubripennis*. Primaries much darker, the transverse lines and spots blacker, the hatchings less distinct; secondaries reddish castaneous, transverse lines obsolete; body less yellowish; wings below altogether darker and redder, transverse lines obsolete; whitish border of outer margin diffused internally. 4 inches to 5 inches 1 line.

Haiti (*Tweedie*). Two specimens. B.M.

This may possibly be specifically distinct, but I think not.

2. Ambulyx eurycles.

Ambulyx eurycles, Herrich-Schäffer, Aussereurop. Schmett. pl. 22. fig. 102 (1850–58).

Surinam.

Scarcely distinct from *A. strigilis*, so far as I can remember. Unfortunately, not having the above work by me, I have been obliged to depend upon notes made from it.

3. Ambulyx substrigilis.

Sphinx (Ambulyx) substrigilis, Westwood, Cab. Orient. Ent. p. 61, pl. 30. fig. 2.

Silhet (*Stainsforth*). Type, B.M.

Allied to *A. strigilis*. Mr. Moore has specimens from Darjeeling.

4. Ambulyx maculifera.

Ambulyx maculifera, Walker, Lep. Het., Suppl. v. p. 1851 (1866).

Darjeeling (*Russell*). Type, B.M.

Allied to the preceding species. Mr. Moore's examples of this species are rather less dusky than the type.

5. Ambulyx liturata. (Pl. XCI. figs. 2, 3.)

Ambulyx liturata, Butler, P. Z. S. 1875, p. 250.

—— ? ♂ ♀ Type, coll. F. Moore.

6. Ambulyx rhodoptera. (Pl. XCIII. fig. 8.)

Ambulyx rhodoptera, Butler, P. Z. S. 1875, p. 251.

Darjeeling. Type, coll. F. Moore.

7. Ambulyx subocellata.

Ambulyx subocellata, Felder, Reise der Nov., Lep. iv. tab. lxxvi. fig. 3 (Nov. 1874).

—— ?

Allied to the preceding species, and still more closely to *A. moorei.*

8. Ambulyx sericeipennis.

Ambulyx sericeipennis, Butler, P. Z. S. 1875, p. 251.

Massuri, N.W. Himalayas (*Hutton*). Type, coll. F. Moore.

9. Ambulyx lahora. (Pl. XCIII. fig. 9.)

Ambulyx lahora, Butler, P. Z. S. 1875, p. 251.

N.W. Himalayas. Type, coll. F. Moore.

10. Ambulyx turbata. (Pl. XCIII. fig. 7.)

Ambulyx turbata, Butler, P. Z. S. 1875, p. 252.

Darjeeling. Type, coll. F. Moore.

Var. Canara, South India. Coll. F. Moore.

11. Ambulyx moorei, n. sp.

Ambulyx moorei, Butler, P. Z. S. 1875, p. 10.

Java (*Horsfield*). Type, B.M.

12. Ambulyx? constrigilis.

Ambulyx constrigilis, Walker, Characters of Lepidoptera Heterocera from Congo, p. 4. no. 2 (1869).

Congo.

Judging from the description alone, I rather doubt this being a true *Ambulyx*.

13. Ambulyx canescens.

Basiana? canescens, Walker, Lep. Het., Suppl. i. p. 38 (1864).

Cambodia.

Unquestionably an *Ambulyx*, apparently allied to *A. liturata*, but without the dark spots at base of primaries.

14. Ambulyx tigrina.

Ambulyx tigrina, Felder, Reise der Nov., Lep. iv. tab. lxxvii. fig. 4 (Nov. 1874).

——?

Allied to *A. gannascus*, but with the hind wings golden yellow. It comes in well between the *A. strigilis* and *A. gannascus* groups.

15. Ambulyx gannascus.

Sphinx gannascus, Stoll, Pap. Exot. p. 157. no. 3, pl. 35. figs. 3, 3*b* (1791).
Ambulyx gannascus, Burmeister, Sph. Bras., Abhandl. naturf. Gesellsch. Halle, p. 72 (1855).
Amblypterus ganascus (sic), Hübner, Verz. bek. Schmett. p. 133. no. 1429 (1816).
Ambulyx ganascus (sic), Walker, Lep. Het. viii. p. 121. no. 2 (1856).

Jamaica (*Gosse*). B.M.

16. Ambulyx rostralis.

Ambulyx rostralis, Boisduval, Lép. Guat. p. 68 (1873); Felder, Reise der Nov., Lep. iv. tab. lxxvii. fig. 6 (Nov. 1874).

Amazons (*Bates*); Brazil (*Stevens*). B.M.

According to Boisduval, from Nicaragua and New Granada.

17. Ambulyx marginata.

Ambulyx marginata, Butler, P. Z. S. 1875, p. 10.

Rio Janeiro (*Stevens*). Type, B.M.

18. Ambulyx eurysthenes.

Ambulyx eurysthenes, Felder, Reise der Nov., Lep. iv. tab. lxxvii. fig. 5 (Nov. 1874).

——?

Allied to the preceding species.

19. Ambulyx? hyposticta.

Ambulyx hyposticta, Felder, Reise der Nov., Lep. iv. tab. lxxvii. figs. 2, 3 (Nov. 1874).

—— ?

Not nearly allied to any known species.

20. Ambulyx? schauffelbergeri.

Ambulyx schauffelbergeri, Bremer & Grey, Beitr. Schmett. Faun. nördl. Chinas, p. 53.
Ambulyx substrigilis, var.?, Walker, Lep. Het. viii. p. 123. no. 5 (1856).

North China.

21. Ambulyx rubricosa.

Ambulyx rubricosa, Walker, Lep. Het. viii. p. 122. no. 4 (1856).
Basiana superba, Moore, P. Z. S. 1865, p. 793.

Darjeeling (*Grote*); Calcutta. Coll. F. Moore.

Mr. Walker's description of this marvellously beautiful insect is very poor; I should never have recognized it. Fortunately Mr. Moore has been enabled to compare the types of *A. rubricosa* and *B. superba*, and finds them to be synonymous.

22. Ambulyx sexoculata.

Ambulyx sexoculata, Grote, Ann. Lyc. Nat. Hist. New York, viii. p. 204 (1867).

Brazil (*Grote*).

We have an *Ambulyx* from Guatemala, placed by Mr. Walker with *A. gannascus*, which so nearly agrees with the description of the above, that I cannot help thinking it a variety of it. The only difference seems to be that the ocellate spots on the middle band of secondaries are so exceedingly undefined that, even with a lens, it is difficult to make them out.

23. Ambulyx?? heuglini.

Smerinthus heuglini, Felder, Reise der Nov., Lep. iv. tab. lxxviii. fig. 2 (Nov. 1874).

—— ?

Subfamily IV. SMERINTHINÆ.

Genus 1. Metamimas, n. g.

Cæquosa, group 2, Walker, L. H. viii. p. 257 (1856).

1. Metamimas australasiæ.

Sphinx australasiæ, Donovan, Ins. New Holl. pl. 33. fig. 1 (1805).
Acherontia australasiæ, Boisduval, Voy. de l'Astrolabe, Ent. p. 181. no. 2 (1832–35).
Cæquosa australasiæ, Walker, Lep. Het. viii. p. 257. no. 2 (1856).

Australia (*Strange*, *Stevens*, *Wood*). B.M.

2. METAMIMAS AMBOINICUS.

Smerinthus amboinicus, Felder, Sitz. Akad. Wiss. Wien, xliii. p.29. no. 63; Reise der Nov., Lep. iv. tab. 78. fig. 1 (Nov. 1874).
Smerinthus amboiniens (sic), Walker, Lep. Het., Suppl. i. p. 41 (1864).

Amboina.

Genus 2. MIMAS [1], Hübner.

Mimas, Hübner, Verz. bek. Schmett. p. 142. gen. 2 (1816).

1. MIMAS QUERCÛS.

Sphinx quercûs, Denis, Wien. Verzeichn. p. 4, tab. 1 *a*. figs. 1 *a*, 1 *b*, tab. 1 *b*. fig. 1.
Polyptychus quercûs, Hubner, Verz. bek. Schmett. p. 141. no. 1518 (1816).
Smerinthus quercûs, Godart, Hist. Nat. Lép. France, iii. p. 181, pl. 17. fig. 3.
Merinthus quercûs, Meigen, Syst. Beschr. eur. Schmett. ii. p. 150. no. 4, pl. 78. fig. 5.

Europe (*Becker*). B.M.

2. MIMAS TILIÆ.

Sphinx tiliæ, Linnæus, Syst. Nat. i. 2, p. 797. no. 3 (1766).
Mimas tiliæ, Hübner, Verz. bek. Schmett. p. 142. no. 1522 (1816).
Smerinthus tiliæ, Godart, Hist. Nat. Lép. France, iii. p. 64, pl. 20. fig. 1.
Merinthus tiliæ, Meigen, Syst. Beschr. eur. Schmett. ii. p. 149. no. 2, pl. 78. fig. 2.

Europe (*Becker*); Sierra Leone (*Morgan*). B.M.

The antennæ of the male of this species are rather less strongly pectinated than in *M. quercûs.*

3. MIMAS DECOLOR.

Smerinthus decolor, Walker, Lep. Het. viii. p. 255. no. 19 (1856); Schaufuss, Nunquam Otiosus, i. p. 14 (1870–71).

Darjeeling (*Grote*). Coll. F. Moore.

Mr. Walker says that this species possesses the "structure of *S. tiliæ*." The secondaries, however, differ slightly; and the costa of primaries is not quite so much arched. In the outline of the outer margin it agrees better with *M. quercûs.*

Genus 3. POLYPTYCHUS, Hübner (restricted).

Polyptychus, Hübner, Verz. bek. Schmett. p. 141. gen. 2 (1816).

1. POLYPTYCHUS DENTATUS. (Plate XCI. fig. 10.)

Sphinx dentata, Cramer, Pap. Exot. ii. p. 42, pl. 125. fig. G (1779).

[1] Easily distinguished from *Laothoë* by the form of the wings, the outer margin of secondaries deeply excavated below the apex, and the secondaries narrow and not denticulated. The type is *M. tiliæ.*

Polyptychus dentatus, Hübner, Verz. bek. Schmett. p. 141. no. 1514 (1816).
Smerinthus dentatus, Walker, Lep. Het. viii. p. 252. no. 14 (1856).

♀, Bengal and Darjeeling, coll. Moore; ♂ ♀, North India (*Hearsay, Stevens*). B.M.
The larva is bluish green at the sides, with oblique purple stripes, with a broad dorsal longitudinal golden-green band bordered by subtriangular purple spots, one above each oblique stripe.

2. POLYPTYCHUS TIMESIUS.

Sphinx timesius, Stoll, Suppl. Cramer, p. 172, pl. 40. fig. 1 (1791).
Smerinthus timesius, Walker, Lep. Het. viii. p. 252. no. 15 (1856).

"Tranquebar" (*Stoll*); ♂, Nepal (*Saunders*); ♀, Silhet (*Stainsforth*) B.M.; ♀, Massuri (Hutton), coll. F. Moore.
Nearly allied to the preceding species. I feel pretty sure about the identification; but Stoll's figure is not very good.

3. POLYPTYCHUS NUMOSÆ.

Smerinthus numosæ, Wallengren, Wien. ent. Monatschr. iv. p. 42. no. 40 (1860).
Smerinthus mimosæ, Wallengren, Kongl. Vetensk.-Akad. Handl. 1863, p. 20. no. 1.

Caffraria.

4. POLYPTYCHUS GRAYII.

Smerinthus grayii, Walker, Lep. Het. viii. p. 249. no. 11 (1856).

Port Natal (*Gueinzius*). Type, B.M.
Apparently nearly allied to the preceding species.

5. POLYPTYCHUS ANDOSUS.

Panacra andosa, Walker, Lep. Het. viii. p. 159. no. 7 (1856).

Sierra Leone (*Morgan*). Type, B.M.

6. POLYPTYCHUS? BASALIS.

Smerinthus basalis, Walker, Lep. Het. Suppl. p. 1158 (1866).

Zambesi river.

7. POLYPTYCHUS? SUBJECTUS.

Smerinthus subjectus, Walker, Characters of Heterocerous Lepidoptera from Congo, p. 4. no. 1 (1869).

Congo.

Genus 4. Lophostethus, Butler.

Euclea, Boisduval, Sp. Gén. Lép. i. p. 14 (1875). Name preoccupied.

Form of wings as in *Triptogon*; metathorax and base of abdomen tufted with erect scales; collar wide; palpi small, with very short pointed terminal joint; tibiæ of front pair of legs terminating externally in a formidable hooked claw, of second pair in two claws, external and internal, of third pair in three unequal internal spines; basal half of wings below densely clothed with long hair-scales.

Type *E. demolinii.*

I know of no other moth armed with such powerful weapons as this genus. It is impossible to guess their use, unless they are intended for scratching.

Lophostethus demolinii.

Sphinx demolinii, Angas, Kaffirs Illustrated, pl. xxx. fig. 11 (1849).

Smerinthus dumolinii (sic), Walker, Lep. Het. viii. p. 250. no. 12 (1856); Felder, Reise der Nov., Lep. iv. tab. 82. fig. 2 (Nov. 1874).

♂ ♀, Port Natal (*Gueinzius*). Type, B.M.

Mr. Walker quotes Guérin's 'Iconographie' for this species, but gives no reference to page or plate. I have referred to the book, but cannot find it; and Angas states his belief that it is a new species, which renders it most probable that he was the first to publish it.

Genus 5. Sphingonæpiopsis, Wallengren.

Sphingonæpiopsis, Wallengren, Öfvers. Kongl. Vetensk.-Akad. Förhandl. 1858, p. 138.

Sphingonæpiopsis gracilipes.

Sphingonæpiopsis gracilipes, Wallengren, Wien. ent. Mon. iv. p. 42. no. 39 (1860); Kongl. Svenska Vetensk.-Akad. Handl. v. p. 19. no. 1 (1866).

Interior of East Caffraria (*Wahlberg*).

I have not seen any examples of this curious little Smerinthine Sphingid.

Genus 6. Langia [1], Moore.

Langia, Moore, P. Z. S. 1872, p. 567.

1. Langia zenzeroides.

Langia zenzeroides, Moore, P. Z. S. 1872, p. 567.

[1] This genus is nearly allied to *Triptogon*

2. Langia khasiana.

Langia khasiana, Moore, P. Z. S. 1872, p. 568.

Khasia hills (*Godwin-Austen*). Type, coll. F. Moore.

This is a magnificent species. Unfortunately the type is much ruined by mites.

Genus 7. Triptogon, Bremer.

Triptogon, Bremer, Bull. de l'Acad. Imp. St. Pétersb. iii. (1861); Butler, P. Z. S. 1875, p. 253.

1. Triptogon cristata.

Triptogon cristata, Butler, P. Z. S. 1875, p. 253. no. 39.

Vicinity of Darjeeling. Type, coll. W. B. Farr.

2. Triptogon gigas.

Triptogon gigas, Butler, P. Z. S. 1875, p. 253. no. 38.

Silhet (*Stainsforth*). Type, B.M.

3. Triptogon albicans. (Plate XCIII. fig. 6.)

Triptogon albicans, Butler, P. Z. S. 1875, p. 254. no. 40.

Massuri (*Hutton*). Type, coll. F. Moore.

4. Triptogon sperchius.

Smerinthus sperchius, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 137. no. 1565, pl. xiii. fig. 5 (1857).

Smerinthus dryas, Boisduval (nec *dyras* [sic], Walker), in De l'Orza's Lép. Jap. p. 37 (1869).

Japan (*Gaschkevitsch*).

5. Triptogon dissimilis.

Triptogon dissimilis, Bremer, Bull. de l'Acad. Imp. St. Pétersb. iii. (1861).

Smerinthus dissimilis, Bremer, Lep. Ost-Sibir. p. 35, tab. iii. fig. 12 (1865).

Ussuri.

6. Triptogon dyras.

Smerinthus dyras (part.), Walker, Lep. Het. viii. p. 250. no. 13 (1856).

♂, Canara (*Ward*), coll. F. Moore; ♀, Ceylon (*Wenham*). Type, B.M.

Mr. Walker's description of this species is evidently taken from the two insects (male and female) from Ceylon—the colour characters in part from the male (*T. ceylanica,* mihi), the size from the female. The male in Mr. Moore's collection is very similar to our female, excepting that it is smaller.

M. Boisduval, in a note on his *S. dryas*, states that this is the correct spelling of the name (*S. dyras* being a misprint); all I can say is that one of our examples of *T. silhetensis* has attached to it a label bearing the name "*Sm. dyras*" (sic), very legibly inscribed in Dr. Boisduval's handwriting.

All the forms of the *T. dyras* group are at once distinguished from the *Smerinthus sperchius* of Ménétriés, by the shortness of their wings, the much less prominently undulated outer margin of primaries, and the entirely different disposition of the transverse lines.

7. TRIPTOGON SINENSIS.

Triptogon sinensis, Butler, P. Z. S. 1875, p. 254. no. 41.

Hong Kong (*Harrington*). Type, B.M.

8. TRIPTOGON JAVANICA.

Triptogon javanica, Butler, P. Z. S. 1875, p. 254. no. 42.

Java (*Horsfield*). ♂ ♀, B.M.; ♀, coll. F. Moore.

9. TRIPTOGON CEYLANICA.

Triptogon ceylanica, Butler, P. Z. S. 1875, p. 255. no. 43.
Smerinthus dyras ♂, Walker, Lep. Het. viii. p. 250. no. 13 (1856).

Ceylon (*Templeton*). Type, B.M.

10. TRIPTOGON SILHETENSIS.

Triptogon silhetensis, Butler, P. Z. S. 1875, p. 255. no. 44.

♂ ♀, Silhet, coll. F. Moore; ♀ (*Stainsforth*). B.M.

11. TRIPTOGON ORIENS. (Plate XCIII. fig. 3.)

Triptogon oriens, Butler, P. Z. S. 1875, p. 255. no. 45.

N.E. India. Type, coll. F. Moore.

12. TRIPTOGON MASSURENSIS. (Plate XCIII. fig. 5.)

Triptogon massurensis, Butler, P. Z. S. 1875, p. 256. no. 46.

Massuri (*Hutton*). Type, coll. F. Moore.

13. TRIPTOGON FUSCESCENS. (Plate XCIII. fig. 2.)

Triptogon fuscescens, Butler, P. Z. S. 1875, p. 256. no. 47.

Darjeeling. Type, coll. F. Moore.

This and the six preceding forms are local representatives of *T. dyras*.

14. Triptogon decorata.

Smerinthus decoratus, Moore, P. Z. S. 1872, p. 568.

Sikkim (*Lang*).

15. Triptogon spectabilis. (Plate XCIII. fig. 1.)

Triptogon spectabilis, Butler, P. Z. S. 1875, p. 256. no. 48.

Darjeeling. Type, coll. F. Moore.

16. Triptogon ? populeti.

Smerinthus populeti, Bienert, Lep. Ergebn. p. 33 (1870).

Persia.

17. Triptogon ? pusillus.

Smerinthus pusillus, Felder, Reise der Nov., Lep. iv. tab. 82. fig. 1 (Nov. 1874).

—— ?

I am not quite certain that this species belongs to the genus in which I have placed it; but it is more like it than any thing else.

18. Triptogon indica.

Smerinthus indicus, Walker, Lep. Het. viii. p. 254. no. 17 (1856).

North India (*Stevens*). Type, B.M.

This little species differs from the normal type of the genus in having the primaries more rounded at apex. The specimen in our collection may, however, be stunted.

19. Triptogon complacens.

♂, *Smerinthus complacens*, Walker, Lep. Het. Suppl. i. p. 40 (1864).
♀, *Smerinthus dyras*, var. β, Walker, Lep. Het. viii. p. 251 (1856).

♂ ♀, Amoy (*Stevens*); ♀, Shanghai (*Fortune*); Japan (*Whitely*). Typ e, B.M.

A well-marked and beautiful species.

20. Triptogon roseipennis. (Plate XCI. fig. 6.)

Triptogon roseipennis, Butler, P. Z. S. 1875, p. 257. no. 49.

Hakodadi (*Whitely*). Type, B.M.

Allied to *T. gaschkevitschii.*

Mr. Lewis bred this species from larvæ found on the plum and cherry.

21. Triptogon gaschkevitschii.

Smerinthus gaschkevitschii, Bremer, Beitr. Schmett. Faun. nördl. China's, p. 13. no. 58; Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 94. no. 1563, pl. xiii. fig. 4 (1857).

Pekin; Mongolia. B.M.

22. Triptogon maackii.

Smerinthus maackii, Bremer, Bull. de l'Acad. Sci. St. Pétersb. iii. (1861); Lep. Ost-Sibiriens, p. 34. no. 153, tab. iii. fig. 11 (1864).

Ussuri.

23. Triptogon modesta.

Smerinthus modestus, Harris, Sill. Journ. vol. xxxvi. p. 292 (1839); ♂, Strecker, Lep. Rhop. & Het. part 7, p. 60, pl. vii. fig. 11 (1873).
Laothoë modesta, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 24 (1873).
Smerinthus princeps, Walker, Lep. Het. viii. p. 255. no. 21 (1856).

Canada, Lake Superior, New England, &c. (*Strecker*). ♀, B.M.
This is unquestionably the proper place for this species.

Genus 8. Laothoë, Fabricius.

Laothoë, Illiger's Mag. vi. p. 287 (1808).

1. Laothoë populi.

Sphinx populi, Linnæus, Syst. Nat. i. 2, p. 797. no. 2 (1766).
Polyptychus populi, Hübner, Verz. bek. Schmett. p. 141. no. 1517 (1816).
Smerinthus populi, Godart, Hist. Nat. Lép. France, iii. p. 71, pl. 20. fig. 3.
Laothoë populi, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 24 (1873).

England [Brit. Coll.]; Europe (*Becker*). B.M.

I find, after a careful comparison of the *Smerinthus modestus* of Harris with *L. populi* that they differ so much in structure from one another, that I cannot follow Mr. Grote in placing them in the same genus. The form of the wings, the direction of the discocellulars, and the length of the branches of the subcostal nervure, will at once distinguish them.

I have not thought it worth while to refer to the hybrid form between this genus and *Smerinthus*, although Mr. Strecker gives it, in his work, a distinct heading, as if it were a species.

2. Laothoë tremulæ.

Sphinx tremulæ, Treitschke, Schmett. Eur. x. 1, p. 140 (1834).
Smerinthus tremulæ, Duponchel, Hist. Nat. Lép. France, Suppl. ii. p. 29, pl. 2. fig. 2.

Moscow.

Genus 9. CRESSONIA, Grote and Robinson.

Cressonia, Grote and Robinson, Proc. Ent. Soc. Phil. v. p. 186 (1865).

1. CRESSONIA JUGLANDIS.

Sphinx juglandis, Smith and Abbot, Lep. Ins. Georg. vol. i. p. 57, pl. 29 (1797).
Amorpha dentata juglandis, Hübner, Samml. exot. Schmett. i. pl. 171. figs. 1–4 (1806–24).
Polyptychus juglandis, Hübner, Verz. bek. Schmett. p. 141. no. 1516 (1816).
Smerinthus juglandis, Harris, Sill. Journ. vol. xxxvi. p. 292 (1839); Strecker, Lep. Rhop. & Het. pt. 7, pl. vii. figs. 12, 13 (1873).
Cressonia juglandis, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 161. no. 74 (1865).
Sphinx instibilis, Martyn, *Psyche*, pl. xx. fig. 49, and pl. 21. fig. 53 (1797).

♂ ♀ North America, ♂ West Canada (*Bush*); East Florida (*Doubleday*). B.M.

We have a pair of what seems to be a second species; it is of a greyer tint and half as large again, the transverse lines wider apart, and the primaries with central band not darkened on the inner margin. I propose to call it *C. robinsonii*, n. sp.

2. CRESSONIA ROBINSONII.

Cressonia robinsonii, Butler, *suprà*.

New York. Type, B.M.

It is quite possible that the above may be a large form of *C. juglandis*; but it differs noticeably from our six examples of that species.

3. CRESSONIA PALLENS [1].

♀, *Smerinthus pallens*, Strecker, Lep. Rhop. & Het. pt. 7, p. 54, pl. vii. fig. 14 (1873).

Texas.

In Mr. Strecker's jocular strictures on the excellent subdivision of the *Smerinthinæ* proposed by Mr. Grote, he exhibits a weakness in admitting that *S. juglandis* and *S. pallens* might be placed in one genus, provided that uniformity of shape in the wings were taken as the basis thereof. I find that dissimilarity in the outline of the wings is almost always accompanied by modification of the discocellular nervelets, which would be sufficient in the eyes of any Lepidopterist to warrant generic separation.

Genus 10. PAONIAS, Hübner (restricted) [2].

Paonias, Hübner, Verz. bek. Schmett. p. 142 (1816).

1. PAONIAS EXCÆCATUS.

Sphinx excæcatus, Smith and Abbot, Lep. Ins. Georg. i. p. 49, pl. 25 (1797).

[1] Mr. Grote is confident that this is only a variety of *C. juglandis*. It looks quite distinct.

[2] At once distinguished from *Calasymbolus* and *Triptogon* by the form of the secondaries, which approach *Laothoë* in outline.

Paonias excæcatus, Hübner, Verz. bek. Schmett. p. 142. no. 1521 (1816).
Smerinthus excæcatus, Walker, Lep. Het. viii. p. 246. no. 8 (1856); Strecker, Lep. Rhop. & Het. pt. 7, p. 54, pl. viii. figs. 1, 2 (1873).
Smerinthus excæcata (sic), Harris, Sill. Journ. vol. xxxvi. p. 230 (1839).
Paonias pavonina, Hübner, Zuträge, figs. 835, 836 (1837).
Smerinthus pavoninus, Grote & Robinson, Proc. Ent. Soc. Phil. vol. v. p. 160. no. 70 (1865).
Paonias pavoninus, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 23 (1873).

New York (*Doubleday*); Canada (*Barnston*); Canada West (*Bush*). B.M.

2. Paonias myops.

Sphinx myops, Smith & Abbot, Lep. Ins. Georg. vol. i. p. 51, pl. 26 (1797).
Paonias myops, Hübner, Verz. bek. Schmett. p. 142. no. 1520 (1816).
Smerinthus myops, Harris, Sill. Journ. vol. xxxvi. p. 291 (1839); Strecker, Lep. Rhop. & Het. pt. 7, p. 55, pl. vii. fig. 9 (1873).
Sphinx ocellatus jamaicensis, Drury, Ill. Nat. Hist. vol. ii. p. 43, pl. 25. figs. 2, 3 (1773).
Smerinthus jamaicensis, Westwood, Drury, *l. c.* (1837).
Smerinthus rosacearum, Boisduval, Sp. Gén. Lép. pl. 15. fig. 4 (1836).

United States (*Doubleday*). B.M.

I believe Drury's locality to be incorrect; his name is therefore not appropriate. Although the primaries of this species agree with *Calasymbolus* in the absence of the undulation of outer margin, it agrees so closely in all other structural respects with *P. excæcatus*, that I am satisfied to leave it in the same genus with it. The form of the secondaries in *Paonias* is markedly distinct from *Calasymbolus*, the apical part of costa being abruptly convex, modifying the first branch of the subcostal nervure.

Genus 11. Calasymbolus, Grote.

Calasymbolus, Grote, Bull. Buff. Soc. Nat. Sci. p. 23 (1873).

Differs from *Smerinthus* in the form of the primaries, and from *Paonias* in the form of the secondaries.

1. Calasymbolus astylus.

Sphinx astylus, Drury, Ill. Nat. Hist. ii. p. 45, pl. 26. fig. 2 (1773).
Smerinthus astylus, Westwood, Drury, *l.* c. (1837); ♂, Strecker, Lep. Rhop. & Het. pt. 7, p. 56. pl. 7. fig. 10 (1873).
Calasymbolus astylus, Grote, Bull. Buff. Soc. Nat. Sci. vol. i. p. 23 (1873).
Smerinthus io, Boisduval, Guérin's Icon. Règne Anim. Ins. pl. 84. fig. 2 (1829–44).

"Atlantic District!" (*Grote and Robinson*).

Strecker's figure of this species has the two opposite primaries rather different in outline; but, judging from Drury's figure, I have little doubt as to its genus.

2. Calasymbolus geminatus.

Smerinthus geminatus, Say, Am. Ent. vol. i. p. 25, pl. 12 (1824); Strecker, Lep. Rhop. & Het. pt. 7, p. 56, pl. vii. figs. 6, 7 (1873).

United States (*Doubleday*); W. Canada (*Bush*). B.M.

3. Calasymbolus cerisii.

Smerinthus cerisii, Kirby, Faun. Bor.-Am. vol. iv. p. 302, pl. iv. fig. 4 (1837); Strecker, Lep. Rhop. & Het. pt. 7, p. 59, pl. vii. fig. 3 (1873).

"Atlantic District!" (*Grote and Robinson*).

4. Calasymbolus cæcus.

Smerinthus cæcus, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 135. no. 1560, pl. xiii. fig. 2 (1857).

Amur Land.

Nearly allied to *C. geminatus*.

5. Calasymbolus kindermanni.

Smerinthus kindermanni, Lederer, Verhandl. zool.-botan. Vereins, Wien, Band ii. pt. 2, p. 92 (1853).

Pontus.

Genus 12. Smerinthus, Latreille.

Smerinthus, Hist. Nat. Ins. iii. p. 431 (1802).

1. Smerinthus ocellatus.

Sphinx ocellata, Linnæus, Syst. Nat. i. 2, p. 796. no. 1 (1766); Roesel, Ins. Belust. i. tab. 1 (1746).
Merinthus ocellatus, Meigen, Syst. Beschr. eur. Schmett. ii. p. 148. no. 1, pl. 78. fig. 1.
Smerinthus ocellatus, Godart, Hist. Nat. Lép. France, i. p. 68, pl. 20. fig. 2.
Sphinx salicis, Hübner, Eur. Schmett. Sph. i. pl. 15. fig. 73.
Paonias salicis, Hübner, Verz. bek. Schmett. p. 142. no. 1519 (1816).

England [Brit. coll.]; Europe (*Becker*). B.M.

2. Smerinthus ophthalmicus.

Smerinthus ophthalmicus, Boisduval, Ann. Ent. Soc. Belge, xii. p. 67. no. 72 (1868); Strecker, Lep. Rhop. & Het. pt. 7, p. 58, pl. vii. figs. 4, 5 (1873).

California and Mexico. B.M.

According to M. Boisduval, this species should be placed between *S. ocellatus* and *S. geminatus*. We have both sexes of an insect which agrees with the descriptions and figures of this species; but, unfortunately, our specimens have no locality upon them; they are, however, set in the same way and have the same green label as many of our

Californian Lepidoptera. A female example of a species from Vancouver's Island is also in the collection; although rather a larger insect, it approaches very close to *S. ophthalmicus* ♀, as figured by Strecker, but has the primaries of a much browner tint, as in *S. ocellatus*, and less excavated below external angle; the central band forms a large oblong patch on inner margin; and the whitish submarginal streak is less distinct. The secondaries are bright rose-colour, excepting a narrow buff outer border and a diffused whitish patch at anal angle; the ocellus is larger. I propose to call it *S. vancouveriensis*.

3. SMERINTHUS PLANUS. (Plate XCII. fig. 11.)

Smerinthus planus, Walker, Lep. Het. viii. p. 254. no. 18 (1856).

♂, North China (*Cuming*); ♀, Shanghai. Type, B.M.

The larva is pale green, with white or yellow lateral stripes. It feeds on the 'Yanagi," or weeping willow. (Geo. Lewis, in litt.)

4. SMERINTHUS ARGUS.

Smerinthus argus, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 136. no. 1561, tab. xiii. fig. 3 (1857).

Amur Land.

Probably a local form of the preceding, from which it chiefly differs in being much paler.

5. SMERINTHUS TATARINOVII. (Plate XC. fig. 16.)

Smerinthus tatarinovii, Motschulsky, Etudes Entom. p. 62 (1852); Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. tab. xiii. fig. 1 (1857).

Japan (*Fortune*). B.M.

The larva of *S. tatarinovii* is figured among the unpublished drawings prepared for Mr. Lewis in Japan. It is pale sea-green, tuberculated with white, with seven lateral oblique crimson-edged white stripes; the horn red-brown or sordid rose-colour; prolegs yellowish.

Genus 13. PSEUDOSMERINTHUS, n. gen.

At once distinguished from *Basiana* by its short and strongly falcated primaries, with short outer margin, and with the inner margin strongly excavated below external angle; prothorax very short; head small; palpi very short, not visible from above; antennæ short, slender; secondaries subpyriform; upper discocellular longer than lower, oblique, strongly concave.

1. Pseudosmerinthus submarginalis.

♀, *Basiana submarginalis,* Walker, Lep. Het. Suppl. i. p. 37 (1864).

Sierra Leone (*Foxcroft*). Type, B.M.

2. Pseudosmerinthus suffusus.

Basiana suffusa, Walker, Characters of Heterocerous Lepidoptera from Congo, p. 5. no. 3 (1869).

Congo.

Genus 14. Daphnusa, Walker.

Daphnusa, Walker, Lep. Het. viii. p. 237. gen. 36 (1856).

1. Daphnusa ocellaris.

♂, *Daphnusa ocellaris,* Walker, Lep. Het. viii. p. 238. no. 1 (1856).

Borneo (*Horsburgh*); Sarawak (*Wallace*). Type, B.M.

2. Daphnusa orbifera.

♀, *Daphnusa orbifera,* Walker, Journ. Linn. Soc. vi. p. 85. n. 16 (1862).

Sarawak (*Wallace*). Type, B.M.

I believe this to be the female of the preceding species.

3. Daphnusa colligata.

Daphnusa colligata, Walker, Lep. Het. viii. p. 238. no. 2 (1856).

North China (*Stevens*); Hong Kong (*Bowring*). Type, B.M.

Genus 15. Leucophlebia, Westwood.

Leucophlebia, Westwood, Cab. Orient. Ent. p. 46 (1848).

1. Leucophlebia lineata.

Leucophlebia lineata, Westwood, Cab. Orient. Ent. pl. 22. fig. 2 (1848).

♂, Nepal (*Hardwicke*); ♀, Java (*Horsfield*). B.M.

The description of the body is scarcely defined enough, as there are nearly allied species from other parts of India which chiefly differ from *L. lineata* in the colouring of the head and thorax. The head and antennæ above are cream-coloured; the thorax pinkish cream-coloured, with a broad increasing central ochreous-brown patch; the abdomen above dull ochreous, pink at the sides; head, antennæ, and palpi below ferruginous; pectus dull pale ochreous at the sides, rosy in the centre; legs white above, brownish rose-colour below; venter dull rose-colour. The larva is figured by Moore, Cat. Lep. E.I. C. i. pl. viii. fig. 5 (1857).

2. Leucophlebia rosacea.

♂, *Leucophlebia rosacea*, Butler, P. Z. S. 1875, p. 15, pl. 2. fig. 4.

Coimbatoor (*Walhouse*). Type, B.M.

Altogether darker than the preceding; the vertex of the head dark brown. Mr. Moore has this species from Kussowlee, N.W. Himalayas.

3. Leucophlebia bicolor.

Leucophlebia bicolor, Butler, P. Z. S. 1875, p. 16, pl. 2. fig. 5.

Almorah (*Boys*); North India? (*Argent*). Type, B.M.

Allied to *L. lineata* and *L. emittens*. Mr. Moore has both sexes from Bombay.

4. Leucophlebia emittens.

Leucophlebia emittens, Walker, Lep. Het. Suppl. v. p. 1858 (1866).

India. Type, B.M.

Genus 16. Basiana, Walker.

Basiana, Walker, Lep. Het. viii. p. 236. gen. 35 (1856).

1. Basiana deucalion.

♀, *Basiana deucalion*, Walker, Lep. Het. viii. p. 236. no. 1 (1856).

North India (*Mauger*). Type, B.M.

2. Basiana bilineata.

♂, *Basiana bilineata*, Walker, Lep. Het. Suppl. v. p. 1857 (1866).

Darjeeling (*Russell*). Type, B.M.

I formerly believed this to be the male of the preceding species; but Mr. Moore has the female of *B. bilineata* in his collection from Shanghai. This doubtless gives the species a tremendous range; but I think there is no doubt of the specific identity of the two sexes.

3. Basiana exusta. (Plate XCIII. fig. 4)

Basiana exusta, Butler, P. Z. S. 1875, p. 252. no. 37.

Kunawur (*Lang*). Type, coll. F. Moore.

The larva feeds on poplar. I have seen a second example in Mr. Sharpe's collection.

4. Basiana phalaris.

♀, *Sphinx phalaris*, Cramer, Pap. Exot. ii. p. 83, pl. 149. fig. A (1779).
Clanis phalaris, Hübner, Verz. bek. Schmett. p. 138. no. 1481 (1816).
Cæquosa? phalaris, Walker, Lep. Het. viii. p. 258. no. 3 (1856).
♂, *Sphinx pagana*, Fabricius, Sp. Ins. ii. p. 146. no. 29 (1781).
♀, *Basiana cervina* (part.), Walker, Lep. Het. viii. p. 237. no. 2 (1856).

♂ ♀, North India (*Stevens*). B.M.

Although Cramer's figure appears far too deeply coloured for this species, I have very little doubt of the correctness of my determination. The type of *S. pagana* of Fabricius is in the Banksian Collection in the British Museum. The larva is clumsy, green, with seven oblique lateral white stripes and a very short, aborted anal horn.

5. Basiana cervina.

Basiana cervina, Walker, Lep. Het. viii. p. 237. no. 2 (1856).

♂ ♀, North India (*Stevens*); Madras. Type, B.M.

6. Basiana semifervens.

Basiana semifervens, Walker, Lep. Het. Suppl. i. p. 38 (1864).

Ternate (*Wallace*).

7. Basiana pudorina.

Smerinthus pudorinus, Walker, Lep. Het. viii. p. 253. no. 16 (1856).

♂ ♀, North India (*Stevens*). Type, B.M.

8. Basiana postica.

Basiana postica, Walker, Lep. Het. viii. p. 237. no. 3 (1856).

Port Natal (*Gueinzius* &c.). Type, B.M.

9. Basiana abyssinica.

Smerinthus abyssinica, Lucas, Ann. Soc. Ent. France, 3e sér. v. p. 606, pl. 13. fig. 2 (1857).
Zonilia abyssinica, Walker, Lep. Het. Suppl. i. p. 34 (1864).

Abyssinia.

Closely allied to the preceding species.

Genus 17. CÆQUOSA, Walker.

Cæquosa, Walker, Lep. Het. viii. p. 256. gen. 38 (1856).

CÆQUOSA TRIANGULARIS.

Sphinx triangularis, Donovan, Ins. New Holl. pl. 33. fig. 2 (1805).
Acherontia triangularis, Boisduval, Voy. de l'Astrolabe, Ent. p. 181. no. 1 (1832–35).
Sphynx castaneus, Perry, Arcana or Mus. Nat. Hist. i. (1811).
Cæquosa triangularis, Walker, Lep. Het. viii. p. 257. no. 1 (1856).

Moreton Bay (*Gibbons*); Australia (*Hunter*). B.M.

Subfamily V. ACHERONTIINÆ.

Genus ACHERONTIA, Hübner.

Acherontia, Hübner, Verz. bek. Schmett. p. 139 (1816).

1. ACHERONTIA STYX.

Acherontia styx, Westwood, Cab. Orient. Ent. p. 88, pl. 42. fig. 3 (1847).
Acherontia atropos (part.), Walker, Lep. Het. viii. p. 234 (1856).

North India (*James*); Turkey in Asia (*Loftus*). B.M.
The larva is very pale green, or bright golden yellow, irrorated with black dots, with lilac-bordered oblique white streaks; it has also a dark brown form. It feeds on *Paulownia imperialis.*

2. ACHERONTIA MEDUSA, n. sp. (Plate XCII. fig. 10.)

Acherontia medusa, De Cerisy, MS.
Acherontia styx (part.), Moore, Cat. Lep. E.I. Comp. i. p. 267 (1857).

Altogether darker than the preceding, and running to a larger size; primaries above without or with very indistinct longitudinal reddish streaks; subapical paler area less oblique, the intersecting transverse lines less strongly dentated; secondaries with the black bands, as a rule, closer together, better-defined, the inner one generally extending to third subcostal branch; body above darker, the scull-marking on thorax much darker, and consequently rather less conspicuous; head blacker; abdomen with the dorsal blue bar darker, the transverse bands blacker; primaries below with the outer border much more dusky; secondaries with the outer band more dusky. Expanse of wings 3 inches 5 lines to 4 inches 10 lines (*A. styx* measures 3 inches 2 lines to 4 inches 5 lines).

Java (*Horsfield*); Hong Kong (*Bowring*); Shanghai, China, East India, Philippines (*Bowring*). B.M.

I have received examples of this species from Mr. Lewis. The smaller form of it was bred by him in Japan; and as he has had the transformations carefully drawn by a native artist, I am now enabled to figure them, proving the entire distinctness of this species from *A. atropos*. He believes that the larger examples may be referable to a distinct species, the small Japanese examples being constant in size and in the absence of the ventral black spots upon the abdomen. The larva feeds on *Sesamum orientale*.

3. Acherontia atropos.

Sphinx atropos, Linnæus, Mus. Lud. Ulr. p. 348. no. 8 (1764).
Acherontia atropos, Hübner, Verz. bek. Schmett. p. 139. no. 1494 (1816).

England [Brit. coll.]; Europe (*Becker*); Sierra Leone (*Morgan*); Mauritius (*Beke*); South Africa (*Smith*). B.M.

This species may be at once distinguished from the two preceding (in its perfect state) by the deeper orange tint of the secondaries and abdomen, and by the transverse blackish belts on the underside of the abdomen. The larvæ differ considerably.

4. Acherontia morta. (Plate XCII. fig. 9.)

Acherontia morta, Hübner, Verz. bek. Schmett. p. 140. no. 1496 (1816).
Sphinx atropos, var., Cramer, Pap. Exot. iii. p. 74, pl. 237. fig. A (1782).
Sphinx atropos, Gray, Cuvier's Animal Kingdom, pl. 137. fig. 4 (1832).
Acherontia satanas, Boisduval, Hist. Nat. des Lép. pl. 16. fig. 1 (1836).
Acherontia lethe, Westwood, Cab. Orient. Ent. p. 87, pl. 42. fig. 2 (1848).
? *Sphinx lachesis*, Fabricius, Ent. Syst. Suppl. p. 434. nos. 26, 27 (1798).

Java (*Horsfield*); Hong Kong (*Bowring*); Ceylon (*Templeton*); Silhet (*Sowerby*); Assam (*Warwick*). B.M.

Mr. Walker adopted the most recent name for this species: Mr. Moore, however, recorded it as *A. satanas*, with a query as to Hübner's species being the same; but as Cramer's figure is clearly a representation of a Javese example of this species, we cannot avoid adopting Hübner's name for it.

Subfamily VI. SPHINGINÆ.

Genus 1. Tatoglossum, n. gen.

Allied to *Anceryx* (restricted). Body more robust; thorax much shorter; prothorax not extending so far in advance of the wings; mesothorax not crested. Head shorter; palpi narrower, closely appressed to the front of head; proboscis long; anus of male not tufted; primaries less pointed at apex; discocellulars more transverse; secondaries broader and more rounded at apex.

TATOGLOSSUM CARICÆ.

Sphinx caricæ, Linnæus, Mus. Lud. Ulr. p. 350 (1764).
Erinnyis caricæ, Hübner, Verz. bek. Schmett. p. 139. no. 1493 (1816).
Sphinx cacus, Cramer, Pap. Exot. iv. p. 73, pl. 46. fig. E (1782).

♂ ♀, Colombia? (*Parzudaki*). B.M.

Genus 2. AMPHONYX, Poey.

Amphonyx, Poey, Cent. Lep. Cuba (1832).

1. AMPHONYX DUPONCHEL.

Amphonyx duponchel, Poey, Cent. Lep. Cuba (1832).
Macrosilia duponchel, Herrich-Schäffer, Corr.-Blatt, 1865, p. 59.
Macrosilia antæus (part.), Walker, Lep. Het. viii. p. 200. no. 1 (1856).

♂ ♀, Haiti (*Tweedie*); ♀, Jamaica (*Gosse*). B.M.

2. AMPHONYX RIVULARIS. (Plate XCIV. fig. 6.)

Amphonyx rivularis, Butler, P. Z. S. 1875, p. 11. no. 22.

♀ ♂, —— ?; ♂, Ega (*Bates*). Type, B.M.

3. AMPHONYX ANTÆUS.

♂, *Sphinx antæus,* Drury, Ill. Nat. Hist. ii. p. 43, pl. 25. fig. 2 (1773).
Amphonyx antæus, Poey, Cent. Lep. Cuba, Dec. 1 (1832).
Macrosila antæus (part.), Walker, Lep. Het. viii. p. 200. no. 4 (1856).
Macrosila anthæus (sic), Herrich-Schäffer, Corr.-Blatt, 1865, p. 59.
Sphinx iatrophæ, Fabricius, Syst. Ent. p. 538. no. 8 (1775).
Cocytius iatrophæ, Hübner, Verz. bek. Schmett. p. 140. no. 1497 (1816).
Ancistrognathus iatrophæ, Wallengren, Öfvers. Kongl. Vetensk.-Akad. Förhandl. 1858, p. 138.

♀, Haiti (*Tweedie*). B.M.

4. AMPHONYX MEDOR.

♀, *Sphinx medor,* Cramer, Pap. Exot. iv. p. 215, pl. 394. fig. A (1782).

♂ ♀, Mexico (*Hartweg*). B.M.

This species is altogether darker in colouring than the preceding; the body is of a dark gunpowder-grey tint, on which the orange spots stand out very vividly.

5. AMPHONYX HYDASPUS.

♀, *Sphinx hydaspus,* Cramer, Pap. Exot. ii. p. 31, pl. 118. fig. A (1779).
Sphinx hydaspes, Grote, Proc. Ent. Soc. Phil. v. p. 66 (1865).

Surinam.

This species is certainly distinct; Cramer's figures of *A. medor* and *A. hydaspus* are evidently both taken from female examples; the white spots are most distinctive.

6. AMPHONYX CLUENTIUS.

Sphinx cluentius, Cramer, Pap. Exot. i. p. 124, pl. 78. fig. B (1779).
Phlegethontius cluentius, Hübner, Verz. bek. Schmett. p. 140. no. 1500 (1816).
Amphonyx cluentius, Poey, Cent. Lep. Cuba, Dec. 1 (1832).
Macrosila cluentius, Walker, Lep. Het. viii. p. 200. no. 3 (1856).

Brazil (*Saunders*); Rio Janeiro (*Stevens*); Haiti (*Tweedie*). B.M.

Genus 3. ANCERYX, Walker (restricted)[1].

Anceryx, Walker, Lep. Het. viii. p. 222. gen. 29 (1856).

1. ANCERYX ALOPE.

♀, *Sphinx alope,* Drury, Ill. Nat. Hist. i. p. 58, pl. 27. fig. 1 (1770).

Jamaica.

Comparing this species with the various allied but distinct forms in the genus *Dilophonota*, several of them sent by the same collector from Oaxaca, Mexico, I cannot believe that Drury's figure can be so gross as to be a representation of the *Sphinx alope* of Cramer; not only is the banding and coloration of the primaries utterly different, but the body is both described and represented as "clay-coloured;" I therefore adopt Swainson's name of *Sphinx fasciata* for Cramer's insect.

2. ANCERYX FASCIATA.

♂, *Sphinx fasciata,* Swainson, Zool. Ill. 2nd ser. vol. iii. pl. 150 (1823).
♀, *Sphinx alope,* Cramer (nec Drury), Pap. Exot. iv. p. 23, pl. 301. fig. G (1782).
Erinnyis alope, Hübner, Verz. bek. Schmett. p. 139. no. 1492 (1816).
Dilophonota alope, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 70. no. 2 (1855).
Anceryx alope, Walker, Lep. Het. viii. p. 225. no. 6 (1856).

♂ ♀, Haiti (*Tweedie*); Jamaica (*Gosse*); South America (*Milne*). B.M.

[1] Allied to *Amphonyx*; thorax with a broad and very prominent dorsal tuft, dilated in front and excavated above; proboscis long, but shorter than in *Amphonyx*; head and thorax projecting a long way in front of primaries; secondaries narrow, especially towards apex.

Genus 4. Isognathus, Felder.

Isognathus, Felder, Wien. ent. Mon. vi. p. 187 (1862).

Section Erinnyis, Hübner (restricted)[1].

1. Isognathus rimosus.

♂, *Erinnyis rimosa,* Grote, Proc. Ent. Soc. Phil. v. pp. 73 and 167, pl. 2. fig. 1 (1865).
Anceryx scyron (part.), Walker, Lep. Het. viii. p. 225. no. 5 (1856).
Sphinx mnechus, Poey, in Grote's 'Notes on Cuban Sphingidæ,' p. 75 (1865).

Haiti (*Tweedie*). B.M.

2. Isognathus laura, n. sp.

Nearly allied to the preceding, but rather smaller; the primaries more distinctly marked, the black discal dash shorter; the secondaries of a rather paler yellow colour, with the marginal border one third narrower; body darker; wings below darker, transverse bar more distinct. Expanse of wings 2 inches 4 lines.

Venezuela (*Dyson*). Type, B M.

3. Isognathus amazonicus, n. sp. (Plate XCIV. fig. 8.)

♀, *Anceryx scyron,* Walker (nec Cramer), Lep. Het. viii. p. 225. no. 5 (1856).

Villa Nova (*Bates*). Type, B.M.

This is the species described by Walker; it is the largest in the genus. The primaries have a peculiar greyish tint, and the markings are strongly defined; the outer border of secondaries takes up a little more than one third of the wing; the bands on the abdomen are well defined, and scarcely interrupted in the centre.

4. Isognathus congratulans.

Erinnyis congratulans, Grote, Ann. Lyc. Nat. Hist. New York, viii. p. 200 (1867).

Cuba (*Gundlach and Poey*).

5. Isognathus fumosa.

Isognathus fumosa, Butler, P. Z. S. 1875, p. 258. no. 50.

Brazil (*Stevens*). Type, B.M.

[1] Mr. Grote remarks, Lyc. Nat. Hist. New York, that *E. rimosa* and *E. congratulans* are a group "characterized by the elevated square thoracic parts, which are but slightly advanced before the insertion of the primaries." They remind one of the genus *Diludia* in pattern.

6. Isognathus leachii.

Sphinx leachii, Swainson, Zool. Ill. 2nd ser. vol. iii. pl. 150 (1823).
Isognathus leachii, Felder, Wien. ent. Mon. vi. p. 187 (1862).

——— ?

The primaries and body of this species are like my *I. fumosa*, but the secondaries like *I. laura*.

7. Isognathus metascyron. (Plate XCIV. fig. 7.)

Isognathus metascyron, Butler, P. Z. S. 1875, p. 258, no. 51.

Villa Nova (*Bates*). Type, B.M.

8. Isognathus scyron.

Sphinx scyron, Cramer, Pap. Exot. iv. p. 23, pl. 301. fig. E (1782).
Erinnyis scyron, Hübner, Verz. bek. Schmett. p. 139. no. 1491 (1816).

Surinam.

Not in the collection of the British Museum; the species most nearly allied to it was placed with *Anceryx alope*, and four other distinct species represent *Anceryx scyron*, in Mr. Walker's catalogue.

9. Isognathus swainsonii.

Isognathus swainsonii, Felder, Wien. ent. Mon. vi. p. 187 (1862).

Rio Negro.

Very nearly allied to *I. scyron*.

Genus 5. Cautethia, Grote.

Cautethia, Grote, Lyc. Nat. Hist. New York, viii. p. 202 (1867).

1. Cautethia noctuiformis.

Œnosanda noctuiformis, Walker, Lep. Het. viii. p. 232. no. 1 (1856).
Cautethia noctuiformis, Grote, Proc. Ent. Soc. Phil. v. p. 168. no. 116 (1865); Herrich-Schäffer, Samml. auss. Schmett. ii. fig. 552 (1869).

Haiti (*Tweedie*). Type, B.M.

I think that *Œnosandra* of Newman is too close to *Œnosanda* for both names to be retained.

2. Cautethia chinensis.

Œnosanda chinensis, Schaufuss, Nunquam Otiosus, i. p. 23 (1870).

"East India."

"Distinguished from *Œ. noctuiformis* by its narrower body, altogether more grey-brown colour without white dusting, and the denser yellow on the secondaries." If this is all, it is evidently a variety of that species with a wrong locality; and, judging by the state of the localities in the Rhopalocera of Kaden's collection, I should say this was highly probable.

Genus 6. Dilophonota, Burmeister.

Dilophonota, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 69. gen. 6 (1855).

1. Dilophonota ello.

Sphinx ello, Linnæus, Mus. Lud. Ulr. p. 351 (1764); Drury, Ill. Nat. Hist. i. p. 58, pl. 27. fig. 3 (1770).
Erinnyis ello, Hübner, Verz. bek. Schmett. p. 139. no. 1489 (1816).
Dilophonota ello, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 70. no. 1 (1855).
Anceryx ello, Walker, Lep. Het. viii. p. 224. no. 4 (1856).

♂ ♀, Mexico (*Hartweg*); ♀, west coast of South America (*Kellett & Wood*); New Granada, ♂ ♀, Haiti (*Tweedie*); St. Thomas (*Hornbeck*). B.M.

2. Dilophonota piperis.

Anceryx piperis, Schaufuss, Nunquam Otiosus, i. p. 17 (1870).

Venezuela (*Moritz*).

Apparently nearly allied to *A. ello*, but with the blackish border of secondaries much broader.

3. Dilophonota merianæ.

Erinnyis merianæ, Grote, Proc. Ent. Soc. Phil. v. pp. 75 and 168, pl. 2. fig. 2 (1865).

"Tropical Insular and Continental Districts!" (*Grote*).

4. Dilophonota omphaleæ.

♂, *Anceryx omphaleæ,* Boisduval, Lép. Guat. p. 72 (1870).
♀, *Erinnyis œnotrus,* Grote (nec Cramer), Proc. Ent. Soc. Phil. v. pl. ii. fig. 3 (1865).

♂ ♀, Mexico (*Hartweg*); ♀, Haiti (*Tweedie*). B.M.

I cannot agree with Mr. Grote in thinking Cramer's figure to be intended for this species; the distinctive apical and inner marginal pale areas of primaries are not marked in that figure, whilst the transverse wavy lines are far more like the *E. melancholica* of Grote.

5. Dilophonota œnotrus.

Sphinx œnotrus, Cramer, Pap. Exot. vol. iv. p. 22, pl. 201. fig. C (1782).
Erinnyis œnotrus, Hübner, Verz. bek. Schmett. p. 139. no. 1490 (1816)
Dilophonota œnotrus, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 71. no. 3 (1855).
Anceryx œnotrus (part.), Walker, Lep. Het. viii. p. 227. no. 9 (1856).
♂, *Erinnyis melancholica,* Grote, Proc. Ent. Soc. Phil. vol. v. pp. 77 and 168, pl. 2. fig. 4 (1865).
♀, *Erinnyis cinerosa,* Grote, Lyc. Nat. Hist. New York, vol. viii. p. 201 (1867).

♂ ♀, Mexico (*Hartweg*); ♂ ♀, Haiti (*Tweedie*); ♀, West coast of South America (*Kellett & Wood*); New Granada. B.M.

Mr. Grote, in his description of *E. cinerosa*, states that he formerly regarded it as the female of *E. melancholica*; his opinion seems to have been changed by some remarks of Mr. Gundlach, which, however, apply perfectly to good examples of *E. œnotrus* ♂ (*melancholica*, Grote).

6. Dilophonota dominyonis.

Dilophonota domingonis, Butler, P. Z. S. 1875, p. 258. no. 52.

Haiti (*Tweedie*). Type, B.M.

7. Dilophonota obscura.

♀, *Sphinx obscura*, Fabricius, Syst. Ent. p. 538 (1775).
♂ ♀, *Anceryx obscura*, Walker, Lep. Het. viii. p. 226. no. 7 (1856).
Dilophonota obscura, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 27 (1873).
Erinnyis stheno, Hübner, Samml. exot. Schmett. ii. Add. pl. 12. figs. 1–4 (1806–24).
♂, *Anceryx rhœbus*, Boisduval, Lép. Guat. p. 72 (1870).
? *Sphinx penæus*, Fabricius, Ent. Syst. iii. 1, p. 360. no. 15 (1793).

♂ ♀, Mexico (*Hartweg*); Haiti (*Tweedie*). B.M.

Our examples from Haiti are paler than those from Mexico.

8. Dilophonota pallida.

♀, *Erinnyis pallida*, Grote, Proc. Ent. Soc. Phil. v. pp. 78 and 168, pl. 1. fig. 6 (1865).

Cuba (*Poey*).

This appears only to differ from *D. gutturalis* in being somewhat larger; I rather doubt its being distinct, although Mr. Grote had both species before him.

9. Dilophonota gutturalis.

♂, *Anceryx gutturalis*, Walker, Lep. Het. viii. p. 227. no. 8 (1856).
Erinnyis gutturalis, Grote, Proc. Ent. Soc. Phil. v. p. 79 (1865).

Haiti (*Tweedie*). Type, B.M.

10. Dilophonota lassauxii.

Anceryx lassauxii, Boisduval, Bull. Ent. Soc. France, 3me sér. vii. p. clvii. no. 2 (1859).

Buenos Ayres.

"It has altogether the character of *Œnothrus* of Cramer and of *Omphaleæ* of Central America, but is easily distinguished from all the *Sphingidæ* of this genus by its black inferior wings, since they are yellow or fulvous, with a black border, in all the known species."—*Boisduval.*

Section PHRYXUS[1], Hübner (restricted).

11. DILOPHONOTA CAICUS.

Sphinx caicus, Cramer, Pap. Exot. ii. p. 42, pl. 125. fig. F (1779).
Phryxus caicus, Hübner, Verz. bek. Schmett. p. 137. no. 1469 (1816).
Anceryx caicus, Walker, Lep. Het. viii. p. 228. no. 10 (1856).
Erinnyis caicus, Grote, Proc. Ent. Soc. Phil. v. p. 72 (1865).

♂, South America, Honduras (*Miller*); ♂ ♀, Haiti (*Tweedie*). B.M.

Genus 7. ORYBA, Walker.

Oryba, Walker, Lep. Het. viii. p. 197. gen. 26 (1856).

ORYBA ROBUSTA.

Oryba robusta, Walker, Lep. Het. viii. p. 197. no. 1 (1856).

Brazil.

Genus 8. MACROSILA, Walker (part., *nec* Grote).

Macrosila (part.), Walker (nec Grote), Lep. Het. viii. p. 198. gen. 27 (1856).

Differs from *Diludia*, *Pseudosphinx*, and allies in its narrower wings, the (in the type) more incurved external angle, more arched costa, and longer outer margin of primaries and the somewhat longer head.

1. MACROSILA INCISA.

Macrosila incisa, Walker, Lep. Het. viii. p. 205. no. 11 (1856).

♂, Rio Janeiro (*Stevens*). Type, B.M.

The general coloration of the wings is that of *Diludia*; but the primaries have an oblique diffused brown bar across them from the costa to the outer margin; the thorax is grey, with a pitchy streak on each side; the abdomen above dark grey, a black streak on each side, and an ochreous spot on the four basal segments; wings below light chocolate-brown, whitish at base; body whitish testaceous.

2. MACROSILA HANNIBAL.

Sphinx hannibal, Cramer, Pap. Exot. iii. 1, p. 39, pl. 216. fig. A (1782).
Phlegethontius hannibal, Hübner, Verz. bek. Schmett. p. 140. no. 1502 (1816).

Brazil (*Stevens*). B.M.

Cramer's figure gives an entirely false notion of the form of the wings, the primaries being more elongated than in *Sphinx kalmiæ*; they are not incurved above external angle as in the type of the genus; and the coloration is more like *Sphinx lucetius* of Cramer.

[1] Characterized by its slightly smaller head, coarser antennæ, and the entire margin to the wings; the style of coloration is also not quite the same.

Genus 9. PROTOPARCE, Burmeister.

Protoparce, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 63. gen. 3 (1855).

If *M. rustica* were to be considered the type of *Macrosila*, Walker, as suggested by Mr. Grote, that genus would have to sink as a synonym of *Protoparce*, described the year previously; this, however is unnecessary; I have therefore rejected Mr. Grote's emendation, and adopted as the type of *Macrosila* a species possessing a vague likeness to the whole of the groups placed under that name by its author.

1. PROTOPARCE RUSTICA.

Sphinx rustica, Fabricius, Syst. Ent. p. 540 (1775).
Cocytius rustica, Hübner, Verz. bek. Schmett, p. 140. no. 1498 (1816).
Protoparce rustica, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 63 (1855).
Macrosila rustica, Walker, Lep. Het. viii. p. 199. no. 2 (1856).
Sphinx chionanthi, Smith & Abbot, Lep. Ins. Georg. i. p. 67, pl. 34 (1797).

Brazil (*Children*); Mexico (*Hartweg*); Haiti (*Tweedie*). B.M.

2. PROTOPARCE FULVINOTATA.

Macrosila solani (part.), Walker, Lep. Het. viii. p. 206. no. 13 (1856).

♂, Port Natal (*Plant*); ♀ (*Gueinzius*); ♂, Ashanti. Type, B.M.

Mr. Walker's ♀, var. β, is the typical female of his male; the darker form may be an extreme variety of the same species, but differs as follows:—"Body above dark brown, especially the thorax (the abdomen of the male paler), lateral yellow spots as usual, but the white segmental streaks better-defined, antennæ more distinctly white-tipped; body below whiter; wings above darker, subapical patch whiter; secondaries below with the central bars nearer together." I will call this form *P. mauritii*.

3 PROTOPARCE MAURITII, sp. n.?

Macrosila solani ♂ var. β and ♀, Walker, Lep. Het. viii. p. 207 (1856).

♂ ♀, Mauritius (*Becker*); ♀, Port Natal (*Gueinzius*). B.M.

This may perhaps be a variation of the preceding; it is altogether much darker, with the subapical patch of primaries whiter.

4. PROTOPARCE SOLANI.

Sphinx solani, Boisduval, Faune ent. de Madag. p. 76, pl. xi. fig. 2 (1833); Herrich-Schäffer, Samml. neuer oder wenig bekannter aussereurop. Schmett. pl. 22. fig. 101 (1850–1858).

Madagascar (*Stevens*). Type, B.M.

This is distinct from the South-African species named *Macrosila solani* by Mr. Walker. Irrespective of the different pattern and coloration of the wings, it may at once be distinguished by the white (instead of fulvous) lateral spots on the abdomen.

5. PROTOPARCE MORGANII.

Macrosila morganii, Walker, Lep. Het. viii. p. 206. no. 12 (1856).

Sierra Leone (*Morgan*); Congo (*Richardson*). Type, B.M.

6. PROTOPARCE OCHUS.

Sphinx ochus, Klug, Neue Schm. Heft i. p. 4, pl. 3. fig. 2 (1836).
Macrosila ochus, Grote, Proc. Ent. Soc. Phil. v. p. 68 (1865).
Macrosila instita, Clemens, Journ. Acad. Nat. Sci. Phil. p. 164 (1859).

"Mexico" (*Klug*); "Honduras" (*Clemens*).

7. PROTOPARCE DIFFISSA.

Sphinx diffissa, Butler, P. Z. S. 1871, p. 82.

Buenos Ayres (*Burmeister*). Type, B.M.

8. PROTOPARCE EURYLOCHUS.

Sphinx eurylochus, Philippi, Linn. Ent. xiv. p. 273. no. 13 A (1860).
? *Sphinx cæstri*, Blanchard, Gay's Hist. de Chili, Lép. pl. 5. fig. 9 (1854).

Santiago.

The figure in Gay's 'Chili' is very poor; and the description is not precise.

9. PROTOPARCE CELEUS.

Phlegethontius celeus, Hübner, Samml. exot. Schmett. ii. pl. 164. figs. 3, 4 (1806–24).
Sphinx carolina, Donovan (nec Linn.), Nat. Hist. Brit. Ins. ii. pl. 361 (1804).
Sphinx quinquemaculata, Stephens, Ill. Brit. Ent., Haust. vol. i. p. 119 (1828).
Macrosila quinquemaculata, Clemens, Journ. Acad. Nat. Sci. Phil. p. 166 (1859).

United States (*Doubleday*). B.M.

All the stages of this species are described in Packard's 'Guide,' p. 273.

10. PROTOPARCE TROJANUS.

Sphinx trojanus, Schaufuss, Nunquam Otiosus, i. p. 15 (1870).

Venezuela.

11. PROTOPARCE CAROLINA.

Sphinx carolina, Linnæus, Mus. Lud. Ulr. p. 346 (1764).
Manduca obscura carolina, Hübner, Samml. exot. Schmett. i. pl. 170. figs. 3, 4 (1806–24).
Phlegethontius carolina, Hübner, Verz. bek. Schmett. p. 140. no. 1503 (1816).
Macrosila carolina, Clemens, Journ. Acad. Nat. Sci. Phil. p. 165 (1859).

Delaware (*Doubleday*); Mexico (*Sallé*); Panama ?, Haiti (*Tweedie*); Brazil, Pernambuco (*Argent*). B.M.

The larva of *P. carolina* is described and figured in Packard's 'Guide,' p. 274, fig. 200.

I believe the form from Jamaica to be distinct; it is larger, has most of the markings of primaries confused, the submarginal irregular whitish line much more distinct, the subapical whitish patch more distinct, and the whitish ground-colour of secondaries replaced by dull pale brown. I shall call it *P. jamaicensis.*

12. PROTOPARCE JAMAICENSIS, n. sp.

Sphinx carolina (part.), Walker, Lep. Het. viii. p. 216. no. 4 (1856).

♂ ♀, Jamaica. B.M.

13. PROTOPARCE PAPHUS.

Sphinx paphus, Cramer, Pap. Exot. iii. p. 39, pl. 216. fig. B (1782).
Phlegethontius paphus, Hübner, Verz. bek. Schmett. p. 140. no. 1504 (1816).

Surinam.

Possibly a melanistic variety of *P. carolina*; but, from the deep colouring of the primaries, it has a very distinct appearance.

14. PROTOPARCE GRISEATA.

Protoparce griseata, Butler, P. Z. S. 1875, p. 259. no. 53.

Venezuela (*Dyson*). Type, B.M.

15. PROTOPARCE CONTRACTA.

Protoparce contracta, Butler, P. Z. S. 1875, p. 12. no. 24.

Rio Janeiro (*Stevens*). Type, B.M.

Allied to *P. lucetius.*

16. PROTOPARCE PELLENIA.

Chærocampa pellenia, Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 22. fig. 103 (1850–1858).
Sphinx pellenia, Walker, Lep. Het. Suppl. i. p. 36 (1864).

South America.

17. PROTOPARCE LUCETIUS.

Sphinx lucetius, Cramer, Pap. Exot. iv. p. 21, pl. 301. fig. B (1782).
Phlegethontius lucetius, Hübner, Verz. bek. Schmett. p. 140. no. 1501 (1816).

Brazil (*Stevens & Becker*). B.M.

18. PROTOPARCE CINGULATA.

Sphinx cingulata, Fabricius, Syst. Ent. p. 545 (1775).
Agrius cingulatus, Hübner, Samml. exot. Schmett. ii. pl. 165. figs. 1, 2 (1806–24).
Macrosila cingulata, Clemens, Journ. Acad. Nat. Sci. Phil. p. 164 (1859).
Sphinx convolvuli, Drury (nec. Linn.), Ill. Nat. Hist. i. pl. 25. fig. 4 (1770).
Sphinx affinis, Goeze, Beytr. iii. 2, p. 215. no. 4 (1780).
Sphinx druræi, Donovan, Nat. Hist. Brit. Ins. p. 14, pl. 469 (1810).
Sphinx pungens, Eschscholtz, in Kotzebue's Reise, p. 218, pl. xi. fig. 28 (1821).

Jamaica, Mexico (*Hartweg*); Haiti (*Tweedie*); New Granada. B.M.

19. PROTOPARCE CONVOLVULI.

Sphinx convolvuli, Linnæus, Syst. Nat. i. ii. p. 789. no. 6 (1766) ; Roesel, -Ins. Belust. i. tab. vii. figs. 1–5 (1746).

Agrius convolvuli, Hübner, Verz. bek. Schmett. p. 140. no. 1506 (1816).

England [British Coll.]; Europe (*Becker*); South Africa (*Smith*); Port Natal (*Gueinzius*).

I cannot find any difference between African and European examples.

20. PROTOPARCE DISTANS.

Sphinx convolvuli, var. *distans,* Butler, Lep. New Zealand, in Voy. 'Erebus' and 'Terror,' i. p. 30. no. 10, pl. ix. fig. 11 (1874).

Sphinx convolvuli (part.), Boisduval, Voy. de l'Astrolabe, p. 187 (1832–35) ; Walker, Lep. Het. viii. p. 212. no. 1 (1856).

Sphinx roseafasciata, Scott (cit. Koch), Indo-Austral. Lep.-Faun. p. 54 (1873).

New Zealand (*Sinclair, Bolton*); Sydney (*Lambert*); Australia. Type, B.M.

This is altogether darker in both sexes, and has a more ashy hue than the European species; the early stages will probably be quite unlike.

21. PROTOPARCE ORIENTALIS, n. sp. (Plate XCI. figs. 16, 17.)

Sphinx convolvuli, Moore, Cat. Lep. E.I. Comp. i. p. 267. no. 616 (1857).

North India (*James, Hearsay*); Scinde? (*Warwick*); North Bengal (*Saunders*); Moulmein (*Clerck*); Ceylon (*Templeton*); Hong-Kong (*Bowring*); Java (*Horsfield*); Hakodadi (*Whitely*). B.M.

This species is wonderfully like some African examples of *P. convolvuli*, being altogether paler than the European form; it differs from the African variety in always having the centre of the middle band of secondaries quite pale, and paler rosy bands on the abdomen; the larva differs considerably, being more slenderly formed, and without the double dorsal series of black spots. It feeds on the sweet potato.

22. PROTOPARCE PSEUDOCONVOLVULI.

Sphinx pseudoconvolvuli, Schaufuss, Nunquam Otiosus, i. p. 15 (1870).

Natal.

"Like a small pale *Sphinx convolvuli*; the underside uniform grey, only the margin a little darker. Width 75 millimetres." The above is the only description given of this insect.

23. PROTOPARCE? TISIPHONE.

Sphinx tisiphone, Linnæus, Mus. Lud. Ulr. p. 359. no. 19 (1764).

"Indies."

The description of this species is not sufficiently precise to enable me to determine it.

Genus 10. Pseudosphinx, Burmeister.

Pseudosphinx, Burmeister, Abhandl. naturf. Gesellsch. Halle, p. 65 (1855).

1. Pseudosphinx tetrio.

Sphinx tetrio, Linnæus, Mantissa, i. p. 538; Fabricius, Syst. Ent. p. 540. no. 14 (1775).
Pseudosphinx tetrio, Burmeister, Sp. Braz. in Abhandl. naturf. Gesellsch. Halle, 1855, p. 65.
♀, *Sphinx hasdrubal,* Cramer, Pap. Exot. iii. p. 90, pl. 246. fig. F (1782).
Hyloicus hasdrubal, Hübner, Verz. bek. Schmett. p. 139. no. 1488 (1816).
Macrosila hasdrubal, Walker, Lep. Het. viii. p. 202. no. 6 (1856).
Sphinx asdrubal (sic), Poey, Cent. Lep. Cuba (1832).

♂, Honduras (*Miller*); ♀, Haiti (*Cuming, Tweedie*); Brazil (*Argent*). B.M.

2. Pseudosphinx obscura, n. sp.

Allied to *P. tetrio.* All the wings darker, the lines more prominent, primaries clouded with blackish brown; bands on abdomen better-defined. Expanse of wings 5 inches 4 lines to 6 inches 5 lines.

♂, Honduras (*Miller*); ♀, New Granada, ♂, Brazil (*Argent, Stevens*). B.M.

I was at first inclined to consider *P. obscura* a dark form of *P. tetrio*; but Herr Flohr, who knows *P. tetrio* in all its stages, informs me that he has seen no such variety, and he is satisfied that it is distinct. The male is very unlike *P. tetrio*, owing to the broad dark nebulous band (interrupted at end of cell by a greyish white patch) which crosses the middle of the wing, and by the dark triangular apical area; these characters, however, are not so pronounced in the female. The Brazilian males are deepest in colour, and more elegantly formed than our male from Honduras.

3. Pseudosphinx? luctifera.

Macrosila luctifera, Walker, Lep. Het. Suppl. i. p. 35 (1864).

New Guinea, Mysol, Ceram.

I have not seen the type of this species (formerly in Mr. Saunders's collection); therefore I am unable to be certain of its genus.

4. Pseudosphinx menephron.

Sphinx menephron, Cramer, Pap. Exot. iii. p. 164, pl. 285. fig. A (1782).
Macrosila menephron, Walker, Lep. Het. viii. p. 210. no. 18 (1856).

Amboina.

5. Pseudosphinx nyctiphanes.

Macrosila nyctiphanes, Walker, Lep. Het. viii. p. 209. no. 16 (1856).

Silhet (*Doubleday, Sowerby, Stainsforth, Dale*). Type, B.M.

6. Pseudosphinx inexacta.

Macrosila inexacta, Walker, Lep. Het. viii. p. 208. no. 14 (1856).

North India (*Hawes, Doubleday*). Type, B.M.

Mr. Moore has the sexes collected in Masuri by Messrs. Grote and Hutton.

7. Pseudosphinx cyrtolophia. (Plate XCI. figs. 11–13, XCII. fig. 6.)

Pseudosphinx cyrtolophia, Butler, P. Z. S. 1875, p. 259. no. 54.

Madras. Type, coll. F. Moore.

Genus 11. Daremma, Walker.

Daremma, Walker, Lep. Het. viii. p. 230. gen. 31 (1856).

Daremma undulosa.

Daremma undulosa, Walker, Lep. Het. viii. p. 231. no. 1 (1856).
Sphinx brontes, Boisduval (nec Drury), Sp. Gén. Lép. pl. 15. fig. 6 (1832).
Macrosila brontes, Walker, Lep. Het. viii. p. 199. no. 1 (1856).
Ceratomia repentinus, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 180.
Sphinx repentinus, Grote, Proc. Ent. Soc. Phil. v. p. 39 (1865).
Daremma repentinus, Grote, *l. c.* p. 164. no. 88 (1865).

West Canada (*Bush*); United States (*Doubleday & Jones*). Type, B.M.

Mr. Walker's type is simply a rather small specimen; it does not differ more from the examples referred by Mr. Walker to *Sphinx brontes* than they do from each other, the primaries being 5 millims. less in expanse than Boisduval's figure, and the pattern almost identical.

Genus 12. Syzygia[1], Grote and Robinson.

Syzygia, Grote & Robinson, Proc. Ent. Soc. Phil. v. p. 189 (1865).

Syzygia afflicta.

Sphinx afflicta, Grote, Proc. Ent. Soc. Phil. v. p. 71 (1865).
Syzygia afflicta, Grote & Robinson, *l. c.* p. 164. no. 87, pl. 3. fig. 5 (1865).
Macrosila afflicta, Walker, Lep. Het. Suppl. v. p. 1855 (1866).

"Tropical Insular District!"

Sphinx pamphilius of Cramer, placed by Messrs. Grote and Robinson as a second species of this genus (P. E. S. P. v. p. 189), is certainly a *Diludia.*

[1] Seems allied to *Daremma*; in the description a comparison is drawn between it and *Diludia.* Mr. Grote has proposed (1866) to withdraw it as a genus; but I rather doubt the advantage of this step.

Genus 13. DOLBA, Walker.

Dolba, Walker, Lep. Het. viii. p. 229. gen. 30 (1856).

1. DOLBA FO.

Zonilia fo, Walker, Lep. Het. viii. p. 195. no. 6 (1856).

North India (*Mauger & Argent*). Type, B.M.

2. DOLBA HYLÆUS.

Sphinx hylæus, Drury, Ill. Nat. Hist. ii. p. 45, pl. 26. fig. 3 (1773).
Hyloicus hylæus, Hübner, Verz. bek. Schmett. p. 139. no. 1487 (1816).
Dolba hylæus, Walker, Lep. Het. viii. p. 230. no. 1 (1856).
Sphinx prini, Smith & Abbot, Lep. Ins. Georg. i. p. 69, pl. 35 (1797).

Philadelphia (*Milne*); United States (*Doubleday*); Massachusetts (*Sheppard*). B.M.
The Mexican species is distinct.

3. DOLBA HARTWEGII.

Dolba hartwegii, Butler, P. Z. S. 1875, p. 259. no. 55.

Oaxaca (*Hartweg*). Type, B.M.

Genus 14. EURYGLOTTIS, Boisduval.

Euryglottis, Boisduval, Sp. Gén. Lép. p. 14 (1875).

Allied to *Diludia*; primaries elongate subtriangular, inner margin slightly waved; discocellulars very oblique, basal half and costal area below clothed with hair-like scales, which obscure the venation; secondaries ovate-triangular, outer margin undulated, discocellulars obscured by elongate scales, oblique, upper about three times as long as lower, and slightly concave; head and thorax above, and entire body below, clothed with coarse erect bristling scales; antennæ two fifths the length of primaries; palpi large, closely compressed, very hairy.

Type *E. aper*.

EURYGLOTTIS APER.

Macrosila aper, Walker, Lep. Het. viii. p. 204. no. 10 (1856); Herrich-Schäffer, Samml. aussereurop. Schmett. pl. 83. fig. 477 (1850–1858).

Bogota (*Stevens*); var.? Columbia (*Becker*). Type, B.M.
A very handsome and elaborately ornamented moth.

Genus 15. DILUDIA, Grote and Robinson.

Diludia, Grote & Robinson, Proc. Ent. Soc. Phil. v. p. 188 (1865).

1. DILUDIA BRONTES.

Sphinx brontes, Drury, Ill. Nat. Hist. ii. p. 53, pl. 29. fig. 4 (1773).

Diludia brontes, Grote & Robinson, Proc. Ent. Soc. Phil. v. p. 164 (1865).
Macrosila collaris, Walker, Lep. Het. viii. p. 201. no. 5 (1856).
Sphinx cubensis, Grote, Proc. Ent. Soc. Phil. 1865, p. 189.

Jamaica (*Argent*); Haiti (*Tweedie*). B.M.

I think it very probable that Drury's type came from Jamaica. It was described from the collection of Dr. Fothergill; and all the species noted as from that collection are said to come either from Jamaica or New York; so that a locality ticket may easily have been transposed. Moreover our example from Jamaica agrees better with Drury's figure than those from Haiti, although still differing in the indistinctness of the pale transverse band of secondaries. In the event of the two species proving not to be identical, the Insular type will, of course, have to take Walker's specific name and Grote's generic, and will then stand as *Diludia collaris*. I cannot but regret that Mr. Grote has thought it necessary to add to the synonymy by proposing names for species before they were required. It is true that he might otherwise have been superseded; but, as a fact, it does not matter who names a species, so long as the name given be euphonious, whilst on the other hand a cumbrous synonymy is a great evil.

2. Diludia pamphilius.

Sphinx pamphilius, Cramer, Pap. Exot. iv. p. 217, pl. 294. fig. E (1782).
Dolba pamphilus (sic), Walker, Lep. Het. viii. p. 230. no. 2 (1856).

Surinam.

This is certainly not *Syzigia afflicta* of Grote; but I strongly suspect it to be *Diludia brontes* badly figured.

3. Diludia florestan.

Sphinx florestan, Cramer, Pap. Exot. iv. p. 216, pl. 394. fig. B (1782).
Diludia florestan, Grote & Robinson, Proc. Ent. Soc. Phil. v. p. 164. no. 85 (1865).
Cocytius forestan (sic), Hübner, Verz. bek. Schmett. p. 140. no. 1499 (1816).
Macrosila forestan (part.), Walker, Lep. Het. viii. p. 203. no. 8 (1856).

♂ ♀, Rio Janeiro (*Stevens*). B.M.

4. Diludia brevimargo.

Diludia brevimargo, Butler, P. Z. S. 1875, p. 12. no. 25.

Brazil (*Becker*). Type, B.M.

5. Diludia analis.

Sphinx analis, Felder, Reise der Novara, Lep. iv. tab. 78. fig. 4 (Nov. 1874).

——— ?

6. Diludia rufescens.

Diludia rufescens, Butler, P. Z. S. 1875, p. 12. no. 26.

Rio Janeiro (*Stevens*). Type, B.M.

7. Diludia lichenea.

Macrosila lichenea (part.), Walker, Lep. Het. viii. p. 204. no. 9 (1856).

♂ ♀, Brazil (*Becker*). Type, B.M.

Mr. Walker's description is a compound one; it begins with the male, which I therefore consider the type. The description of the secondaries, "Hind wings whitish, tinged with brown and with several darker brown bands," is evidently taken from the example from Rio Janeiro, supposed by Walker to be a female variety, but clearly a distinct species; the secondaries of *D. lichenea* are very similar to those of *D. florestan*, excepting that the central whitish bands in the male are more distinct.

8. Diludia sesquiplex.

Sphinx sesquiplex, Boisduval, Lép. Guat. p. 73 (1870); Felder, Reise der Nov., Lep. iv. tab. 78. fig. 5 (Nov. 1874).

Guatemala.

One of the handsomest species in the genus.

9. Diludia albiplaga.

Macrosila albiplaga, Walker, Lep. Het. viii. p. 202. no. 7 (1856).
Diludia albiplaga, Grote & Robinson, Notes on North-American Lep. described by Mr. Walker, Tr. Am. Ent. Soc. p. 10 (1868).

Rio Janeiro (*Stevens*). Type, B.M.

10. Diludia obliqua.

Macrosila obliqua, Walker, Lep. Het. viii. p. 208. no. 15 (1856).

Ceylon (*Templeton*). Type, B.M.

11. Diludia grandis.

Diludia grandis, Butler, P. Z. S. 1875, p. 260. no. 56.

Nepal. Type, coll. F. Moore.

12. Diludia? latreillii.

Sphinx latreillei, McLeay, in King's Survey of Australia, Appendix, p. 464. no. 165 (1827).

Australia.

McLeay quotes this as "*Dielophila latreillii,* De Cerisy, MSS."

13. Diludia ? godarti.

Sphinx godarti, McLeay, in King's Survey of Australia, Appendix, p. 464. no. 166 (1827).

Australia.

Quoted by McLeay as "*Dielophila godarti,* De Cerisy, MSS." The two species above referred to are so insufficiently described that I have been unable to recognize them; I am satisfied that they are not referable to *Deilephila*; but they do not agree in all respects with any *Diludia* in the National collection. Walker omitted them from his catalogue. Possibly they are *Chærocampæ.*

14. Diludia casuarinæ.

Macrosila casuarinæ, Walker, Lep. Het. viii. p. 210. no. 19 (1856).

Sidney (*Sinclair*); Australia, North Australia (*Elsey*). Type, B.M.

15. Diludia nebulosa, n. sp.

Macrosila casuarinæ, var., Walker, Lep. Het. viii. p. 210 (1856).

Cape York (*Macgillivray*). Type, B.M.

This species is nearly allied to *D. discistriga.*

16. Diludia discistriga.

Macrosila discistriga, Walker, Lep. Het. viii. p. 209. no. 17 (1856); ? Lep. Het. Suppl. i. p. 34 (1864).

Hong-Kong (*Bowring*); North China (*Cuming*); Java (*Horsfield*). Type, B.M.

The larva and pupa of *D. discistriga* are figured by Dr. Semper, Verhandl. zool.-botan. Gesellsch. Wien, pl. xxiii. figs. 2 a, 2 b (1867). Mr. Moore has both sexes of the species taken by Captain Hutton at Masuri, and the female from Bombay.

17. Diludia melanomera. (Plate XCIV. fig. 4.)

Diludia melanomera, Butler, P. Z. S. 1875, p. 13. no. 27.

Silhet (*Dale*). Type, B.M.

Mr. Moore also has this species from Silhet, to which habitat it appears to be restricted.

18. Diludia rubescens.

Diludia rufescens, Butler, P. Z. S. 1875, p. 260. no. 57, (*rubescens*) p. 623.

North India. Type, coll. F. Moore.

19. Diludia increta.

Anceryx increta, Walker, Lep. Het. Suppl. i. p. 36 (1864).

Shanghai, North China (*Fortune*). Type, B.M.

I found the example registered "North China" among our examples of *D. discistriga*; it is not, however, quoted by Mr. Walker under that species. Mr. Moore has this species from Masuri and South India.

20. DILUDIA VATES. (Plate XCI. figs. 18, 19.)

Diludia vates, Butler, P. Z. S. 1875, p. 13. no. 28.
Macrosila dicistriga (part.), Walker, Lep. Het. viii. pp. 209, 210 (1856).
Anceryx pinastri (*g*), Walker, *l. c.* p. 223 (1856).

Ceylon (*Templeton*); Madras, Moulmein (*Clerck*); Silhet (*Sowerby*); North India (*Stevens*). Type, B.M.

The larva is pale green, with darker oblique green lines and reddish-edged spiracles; front segments and horn tuberculated. It feeds on *Gmelina arborea* according to W. Elliot, on privet, *Polownia*, &c. according to Mr. George Lewis.

21. DILUDIA NATALENSIS. (Plate XCIV. fig. 5.)

Diludia natalensis, Butler, P. Z. S. 1875, p. 13. no. 29.

Natal (*Gueinzius*). Type, B.M.

Genus 16. HYLOICUS, Hübner.

Hyloicus, Hübner, Verz. bek. Schmett. p. 138 (1816).

1. HYLOICUS PINASTRI.

Sphinx pinastri, Linnæus, Syst. Nat. i. ii. p. 802. no. 22 (1766).
Hyloicus pinastri, Hübner, Verz. bek. Schmett. p. 139. no. 1483 (1816).

England [Brit. Coll.]; Europe (*Becker*). B.M.

2. HYLOICUS SEQUOIÆ.

Sphinx sequoiæ, Boisduval, Ann. Soc. Ent. Belge, xii. p. 66. no. 70 (1868).
Hyloicus sequoiæ, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 27 (1873).
Anceryx coniferarum ♂, Walker, Lep. Het. viii. p. 224. no. 2 (1856).

United States (*Doubleday*). B.M.

The *Anceryx coniferarum* of Walker has been placed as a synonym of *Ellema harrisii*; his female, however, appears to me to be Abbot's species, whilst the male is undoubtedly generically distinct.

3. HYLOICUS ASIATICUS.

Hyloicus asiaticus, Butler, P. Z. S. 1875, p. 260. no. 58.

Scinde? (*Warwick*). Type, B.M.

4. HYLOICUS UNIFORMIS.

Hyloicus uniformis, Butler, P. Z. S. 1875, p. 261. no. 59.

North-west Himalayas. Type, coll. F. Moore.

The smallest species in the genus.

5. HYLOICUS STROBI.

Sphinx strobi, Boisduval, Ann. Soc. Ent. Belge, xii. p. 67. no. 71 (1868).
Hyloicus strobi, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 27 (1873).

California (*Lorquin*).

Also allied to *H. pinastri.* M. Boisduval thinks the species may possibly have been taken in Chili; but he is tolerably certain that California is the correct locality.

6. HYLOICUS PLEBEIA.

Sphinx plebeia, Fabricius, Gen. Ins. p. 273 (1776).
Anceryx plebeia, Walker, Lep. Het. viii. p. 224. no. 3 (1856).
Hyloicus plebeia, Grote & Robinson, Proc. Ent. Soc. Phil. v. p. 166. no. 99 (1865).

United States (*Doubleday*); Delaware (*Doubleday*). B.M.

7. HYLOICUS PŒCILA.

Sphinx pœcila, Stephens, Ill. Brit. Ent. Haust. i. p. 122. no. 8 (1828).
Anceryx pœcila, Walker, Lep. Het. viii. p. 229. no. 13 (1856).

——— ? (*Vigors's Coll.*). Type, B.M.

Like a strongly marked female of *H. plebeia,* which I believe it to be.

8. HYLOICUS POEYI.

Hyloicus poeyi, Grote, Lyc. Nat. Hist. New York, p. 200 (1863).

"Atlantic District!"

9. HYLOICUS JUNIPERI.

Sphinx juniperi, Boisduval, Voy. de Delagorgue, ii. p. 595. no. 112 (1847).
Anceryx juniperi, Walker, Lep. Het. viii. p. 229. no. 12 (1856).

Port Natal (*Gueinzius & Stevens*). B.M.

This is the only Sphingid described by Dr. Boisduval in the above work.

Genus 17. SPHINX, Linnæus.

Sphinx, Linnæus, Syst. Nat. i. 2, p. 796 (1766).

1. SPHINX CHERSIS.

Lethia chersis, Hübner, Samml. exot. Schmett. ii. pl. 167. figs. 1, 2 (1806).
Sphinx chersis, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 165. no. 92 (1865).
Sphinx cinerea, Harris, Cat. N.-Am. Sph., Sill. Journ. vol. xxxvi. p. 295 (1839); Scudder, Harris's Corresp. p. 282, pl. 2. fig. 6, larva (1869).

United States (*Doubleday*); North America. B.M.

2. Sphinx leucophæata.

Sphinx leucophæata, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 168.
Sphinx lugens (part.), Walker, Lep. Het. viii. p. 219. no. 11 (1856).

Oaxaca, Mexico (*Hartweg*). B.M.

3. Sphinx lugens.

Sphinx lugens, Walker, Lep. Het. viii. p. 219. no. 11 (1856).
Sphinx andromedæ, Boisduval, Lép. Guat. p. 74 (1870).

Oaxaca, Mexico (*Hartweg*). Type, B.M.

Although coming from the same locality as the preceding, and very like it in its general characters, I believe this species to be quite distinct. It is altogether shorter, broader, and darker, and has the pale bars of secondaries much narrower and whiter.

4. Sphinx jasminearum.

Sphinx jasminearum, Boisduval, Griffith's Anim. Kingd. vol. ii. pl. 83. fig. 1 (1832).

New York, Pennsylvania.

5. Sphinx vancouverensis.

Sphinx vancouverensis, H. Edwards, Proc. Calif. Acad. Sci. v. p. 111 (1874).

Esquimault, Vancouver Island (*Bremner*).

Taken in August 1871. It seems closely allied to *S. gordius.*

6. Sphinx gordius.

Sphinx gordius, Cramer, Pap. Exot. vol. iii. p. 91, pl. 247. fig. B (1782).
Lethia gordius, Hübner, Verz. bek. Schmett. p. 141. no. 1512 (1816).
Sphinx pœcila, Stephens, Ill. Brit. Ent., Haust. i. p. 222 (1828).

United States (*Doubleday*); North America (*Jones*). B.M.

I cannot see any reason for separating this generically from *Sphinx.*

7. Sphinx luscitiosa.

Sphinx luscitiosa, Clemens, Journ. Acad. Nat. Sci. Phil. p. 172 (1859).
Lethia luscitiosa, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 28 (1873).

New York; Wisconsin.

8. Sphinx oreodaphne.

Sphinx oreodaphne, H. Edwards, Proc. Calif. Acad. Sci. v. p. 109 (1874).

California.

Henry Edwards says:—"Taken on the wing, about flowers of Californian Laurel (*Oreodaphne californica*), near St. Helena, Napa County, in June 1872. A strongly marked species, readily distinguished by its pale fore wings, and by the triangular mark of the thorax."

9. Sphinx justiciæ.

Sphinx justiciæ, Walker, Lep. Het. viii. p. 220. no. 12 (1856).

Brazil (*Stevens*); Rio Janeiro (*Stevens*). Type, B.M.

10. Sphinx anteros.

Sphinx anteros, Ménétriés, Enum. Corp. Anim. Mus. Imp. Acad. Sci. Petrop. ii. p. 131. no. 1478, pl. xii. fig. 1 (1857).

"New Friburg (not far from Rio Janeiro)."

Allied to the preceding species and to *S. chersis*.

11. Sphinx merops.

Sphinx merops, Boisduval, Lép. Guat. p. 73 (1870).

Honduras and Mexico.

Closely allied to *S. justiciæ*, from which it seems chiefly to differ in having three black bands on the under surface of secondaries.

12. Sphinx? lanceolata.

Sphinx lanceolata, Felder, Reise der Nov., Lep. iv. tab. lxxviii. fig. 3 (Nov. 1874).

Guatemala and Mexico.

Seems allied to *S. chersis*, but may possibly belong to the genus *Pseudosphinx*; without seeing the insect it is impossible to decide.

13. Sphinx capreolus.

Anceryx capreolus, Schaufuss, Nunquam Otiosus, i. p. 16 (1870).

"Virmont"[1] (*Kaden*); "Venezuela!" (*Schaufuss*).

This appears to me to be a very faulty description of a faded *S. kalmiæ*, Sm. & Abb.; for although the description of the body[2] and the under surface of the wings does not agree with *S. kalmiæ*, the former *may* be rubbed or greasy, and the latter faded. The apparently arbitrary alteration of the locality makes me suspicious of there being an error somewhere: if the species was, as Dr. Schaufuss says, labelled "Mit der Bezeichnung 'Virmont' in der Sammlung," why alter it to Venezuela?

[1] ? State Vermont, United States.

[2] The body (apparently only the abdomen) is described as pitch-black at the sides, with a pale spot, with a slender longitudinal red line and two other black ones; whereas *S. kalmiæ* is black at the sides, with about five white bars, interrupted by a longitudinal red-brown band with a central black line.

14. SPHINX KALMIÆ.

Sphinx kalmiæ, Smith and Abbot, Lep. Ins. Georg. i. p. 73, pl. 37 (1797).
Lethia kalmiæ, Hübner, Verz. bek. Schmett. p. 141. no. 1511 (1816).

Canada West (*Bush*); New York (*Doubleday*); United States. B.M.

15. SPHINX DRUPIFERARUM.

Sphinx drupiferarum, Smith and Abbot, Lep. Ins. Georg. i. p. 71. pl. 36 (1797).
Lethia drupiferarum, Hübner, Verz. bek. Schmett. p. 141. no. 1510 (1816).

United States. B.M.

16. SPHINX LIGUSTRI.

Sphinx ligustri, Linnæus, Fauna Suecica, p. 287. no. 1087.
Lethia ligustri, Hübner, Verz. bek. Schmett. p. 141. no. 1508 (1816).
Sphinx spireæ, Esper, Eur. Schmett. ii. p. 21, pl. 42. fig. 1 (1777).

England [Brit. Coll.]; Europe (*Becker*). B.M.

17. SPHINX? SNELLI.

Sphinx snelli, Weyenbergh, Ins. Foss. (1871).

——— ?

Genus 18. LINTNERIA, n. gen.

Agrius, Lintner (part.), nec Hübner.

1. LINTNERIA EREMITUS.

Agrius eremitus, Hübner, Samml. exot. Schmett. ii. pl. 166. figs. 1, 2 (1806–24).
Sphinx eremitus, Walker, Lep. Het. viii. p. 221. no. 16 (1856).
Sphinx sordida, Harris, Sill. Journ. vol. xxxvi. p. 296 (1839).
? *Sphinx abadonna,* Fabricius, Ent. Syst. Suppl. p. 435. nos. 56, 57 (1793).

United States (*Doubleday, Milne*). B.M.

This species differs from all others (until recently) referred to *Sphinx*, in its shorter and broader primaries. It cannot be associated with *Sph. lugens*, as that species cannot be separated generically from *Sph. justiciæ*, being in fact nearly allied to *Sph. leucophæata*. I cannot follow my friend Grote in adopting the name incorrectly applied by Hübner in his figure, the *Agrius* of the Verzeichniss being a mixture of *Philampelus* and *Protoparce*.

Sphinx abadonna is said to come from East India; but this locality may be wrong, as many of Fabricius's localities undoubtedly are.

2. Lintneria ? perelegans.

Sphinx perelegans, H. Edwards, Proc. Calif. Acad. Sci. v. p. 109 (Jan. 1874).

Gilroy, Santa Clara County, California (*G. R. Crotch*).

Mr. Henry Edwards says:—"This beautiful specimen closely resembles *Sph. eremitus*, Walk., of the Atlantic States, but is readily known by its more brilliant grey colouring, by the very sharply defined demi-bands, and by the strongly marked whitish submarginal band of the fore wings."

3. Lintneria ? eremitoides.

Sphinx eremitoides, Strecker, Lep. Rhop. and Het. p. 93 (1874).

Kansas.

Very briefly described, and, owing to Mr. Strecker's incomprehensible affection for unmanageably extensive genera, described as a *Sphinx*, without a hint as to its structural characters. In the same page he described a *Hemaris* as a *Macroglossa*, which at first fairly puzzled me, it not being a New-World genus; but, fortunately, he observed that it was allied to *M. diffinis* (one of the most typical species of *Hemaris*), which at once enlightened me.

Mr. Grote thinks it probable that *S. eremitoides* is = *S. lugens* of Walker; but (judging from Mr. Grote's previous papers on the Sphingidæ) I am doubtful whether he knows the *S. lugens* of Walker. It is certain that Clemens did not; for he separated it by a wide interval from his *S. leucophæata*.

Genus 19. Ceratomia, Harris.

Ceratomia, Harris, Sill. Journ. vol. xxxvi. p. 293 (1839).

1. Ceratomia amyntor.

Agrius amyntor, Hübner, Samml. exot. Schmett. ii. (1806).
Ceratomia amyntor, Grote and Robinson, Proc. Ent. Soc. Phil. vol. v. p. 164. no. 89 (1865).
Ceratomia quadricornis, Harris, Sill. Journ. xxxvi. p. 293 (1839).

United States (*Doubleday*); Massachusetts (*Sheppard*); Mexico (*Sallé*). B.M.

2. Ceratomia hageni.

Ceratomia hageni, Grote, Bull. Buff. Soc. Nat. Sci. ii. p. 149 (1874).

Texas.

Genus 20. Nephele, Hübner (Zonilia, Walker).

Nephele, Hübner, Verz. bek. Schmett. p. 133. gen. 5 (1816).

1. Nephele æquivalens.

Pachylia æquivalens, Walker, Lep. Het. viii. p. 191. no. 5 (1856).

Sierra Leone (*Morgan*). Type, B.M.

This species is certainly a *Nephele.* It differs from *Pachylia* in the form of the wings. The latter genus appears to be strictly confined to the New World.

2. Nephele ænopion.

Orneus ænopion, Hübner, Samml. exot. Schmett. ii. pl. 159. figs. 1, 2 (1806).
Deilephila ænopion, Boisduval, Faune Ent. de Madag. p. 75. no. 8 (1833).
Philampelus ænopion, Walker, Lep. Het. viii. p. 182. no. 14 (1856).
Zonilia ænopion, Walker, *l. c.* Suppl. i. p. 33 (1864).

Bourbon, Madagascar.

3. Nephele densoi.

Zonilia densoi, Keferstein, Entomol. Notizen, p. 14. fig. 5 (1870).

Madagascar.

I have been unable to refer to this species.

4. Nephele rosæ. (Plate XCIV. fig. 3.)

Nephele rosæ, Butler, P. Z. S. 1875, p. 14. no. 30.

Boma (*Mrs. Monteiro*). Type, B.M.

5. Nephele kadeni.

Pachylia kadeni, Schaufuss, Nunquam Otiosus, i. p. 16 (1870).

"S. America."

Said to be allied to *N. ænopion*; but as the primaries are described as crossed by two purplish whitish bands, and the secondaries as spotted with white, with alternately broad and narrow bands, I think the affinity cannot be very great. *N. ænopion* is an African species. I doubt the locality of *N. kadeni.*

6. Nephele argentifera.

Zonilia argentifera, Walker, Lep. Het. viii. p. 194. no. 4 (1856).

Port Natal.

7. NEPHELE VARIEGATA.

Nephele variegata, Butler, P. Z. S. 1875, p. 15. no. 31.

Congo (*Richardson*); Africa (*Milne*); Abyssinia. Type, B.M.

Possibly a variety, or more probably a local form, of *N. accentifera*.

8. NEPHELE ACCENTIFERA.

Sphinx accentifera, Palisot de Beauvais, Ins. rec. en Afrique et en Amérique, p. 264, pl. xxiv. fig. 1 (1805).

Sphinx (*Deilephila*) *tridyma*, Van der Hoeven, Tijd. voor Naturlijke Gesch. en Phys. vii. p. 278. no. 2, pl. 5. figs. 2 *a*, 2 *b* (1840).

Deilephila Ranzani, Bertoloni, Mem. Accad. Sci. Istit. Bologna, ii. p. 183. no. 21, tab. 9. fig. 6 (1850).

Sierra Leone (*Morgan*). B.M.

This species was omitted by Mr. Walker; and I have to thank Mr. Kirby for calling my attention to it. Bertoloni's figure is very poor, the abdomen being represented as uniform.

9. NEPHELE MALGASSICA. (*N. Densoi*?)

Zonilia malgassica, Felder, Reise der Nov., Lep. iv. tab. 76. fig. 2 (1874).

Madagascar.

10. NEPHELE PENEUS.

Sphinx peneus, Cramer, Pap. Exot. i. p. 139, pl. 88. fig. D (1779).

Zonilia peneus (part.), Walker, Lep. Het. viii. p. 193. no. 2 (1856).

Var. *Nephele peneus*, Hopffer in Peters's Reise nach Mossambique, Ins. p. 422, pl. 27. fig. 11 (1862).

West Africa (*Stevens*); Africa (*Milne*); Sierra Leone (*Morgan*). B.M.

11. NEPHELE COMMA.

Nephele comma, Hopffer in Peters's Reise nach Mossambique, Ins. p. 424, pl. 27. fig. 12 (1862).

Zonilia comma, Walker, Lep. Het. Suppl. i. p. 33 (1864).

Zonilia viridescens, var. γ, Walker, Lep. Het. viii. p. 193 (1856).

Port Natal (*Gueinzius*). B.M.

Our example is darker and not so green as Hopffer's figure.

12. NEPHELE VIRIDESCENS.

Zonilia viridescens (part.), Walker, Lep. Het. viii. p. 192. no. 1 (1856).

Port Natal (*Gueinzius*). Type, B.M.

13. Nephele funebris.

Sphinx funebris, Fabricius, Ent. Syst. iii. p. 371. no. 47 (1793).
Zonilia viridescens (part., and var. β), Walker, Lep. Het. viii. p. 192. no. 1 (1856).

Congo (*Richardson*); Ambriz (*Monteiro*). B.M.

This species may at once be distinguished from the preceding by the much more regular submarginal line of primaries, the usually greener tint, and the less prominent lateral black bars on the abdomen, which at the base are obsolete; the dark border of secondaries is also broader. The variety described by Walker has a silver spot on the primaries somewhat like that of *N. comma*, but less oblique.

14. Nephele hespera. (Plate XCI. figs. 20, 21.)

Sphinx hespera, Fabricius, Syst. Ent. p. 546. n. 33 (1775).
Sphinx chiron, Cramer, Pap. Exot. ii. p. 62, pl. 137. fig. E (1779).
Nephele chiron, Hübner, Verz. bek. Schmett. p. 133. no. 1434 (1816).
Zonilia chiron, Walker, Lep. Het. viii. p. 196. no. 8 (1856).
Perigonia obliterans, Walker, Lep. Het. Suppl. i. p. 28 (1864).
Var. *Sphinx morpheus,* Cramer, Pap. Exot. ii. p. 84, pl. 149. fig. D (1779).
Nephele morpheus, Hübner, Verz. bek. Schmett. p. 133. no. 1432 (1816).
Zonilia morpheus, Walker, Lep. Het. viii. p. 194. no. 5 (1856).
Sphinx didyma, Fabricius, Sp. Ins. ii. p. 148. no. 41 (1781).
Nephele didyma, Hübner, Verz. bek. Schmett. p. 133. no. 1433 (1816).

N. hespera type: N. India (*Baker, Strachey*); Almorah (*Stevens*); Landoor (*Hearsay*); E. India, Canara (*Ward*); Ceylon (*Templeton*); Australia (*Hunter*). B.M.

N. morpheus type: N. India (*Baker*); Landoor (*Hearsay*); Canara (*Ward*); Ceylon (*Templeton*); Australia (*Hunter*). B.M.

"Larva dark green, unspotted, without eyes; front segments nonretractile, but attenuated in front, with small globose head. A longitudinal line from the front of sixth segment white, and rising abruptly near the tail, fading in front into yellowish green. The fourth, fifth, and upper part of sixth segments are striped diagonally, the lines being rather faintly defined except on the fifth segment, where (near the bottom of the side) they are pure white. Horn purplish grey; scaly legs ditto, with dark articulations and stripe down the middle. Spiracles purplish red, ill-defined."

"Changes beneath fallen leaves and rubbish. Chrysalis state lasts about twenty days. End of April, May, and June. Feeds on the Kler Kei (*Mal.*). Kowlee Murrei (*Car.*)."

15. Nephele subvaria.

Zonilia subvaria, Walker, Lep. Het. viii. p. 196. no. 9 (1856).

Australia (*Strange*). Type, B.M.

16. NEPHELE METAPYRRHA.

Zonilia metapyrrha, Walker, Lep. Het. viii. p. 196. no. 10 (1856).
Deilephila dalii, Newman, Trans. Ent. Soc. 2nd ser. vol. iv. p. 54 (1857).

Moreton Bay (*Gibbons*). Type, B.M.

It is possible that this may prove to be a variety of the preceding. I think, however, considering their differences, Mr. Walker would scarcely have been justified in uniting them, there being only one example of each in the collection.

17. NEPHELE VAU.

Zonilia vau, Walker, Lep. Het. iii. p. 197. no. 11 (1856).
Var. *Zonilia schimperi*, Lucas, Ann. Soc. Ent. France, 3me sér. tom. v. p. 603, pl. 13. fig. 1 (1857).

(Kartoum) Abyssinia (*Lucas*); ——— ? Type, B.M.

The figure by Lucas represents the species as much redder than our example, but does not otherwise differ.

Zonilia antipoda, *rhadama*, and *zebu* of Boisduval appear to be MS. names (*cf.* p. 630).

18. NEPHELE ? FAVILLACEA.

Anceryx favillacea, Walker, Lep. Het. Suppl. v. p. 1856 (1866).

Zambesi river.

SPHINGINÆ *incertæ sedis.*

Genus 21. CALYMNIA, Walker.

Calymnia, Walker, Lep. Het. viii. p. 123. gen. 12 (1856).

CALYMNIA PANOPUS.

Sphinx panopus, Cramer, Pap. Exot. iii. p. 50, pl. 224. figs. A, B (1782).
Amblypterus panopus, Hübner, Verz. bek. Schmett. p. 133. no. 1430 (1816).
Smerinthus ? panopus, Westwood, Cab. Orient. Ent. p. 13, pl. 6. fig. 2 (1848).
Calymnia panopus, Walker, Lep. Het. viii. p. 124. no. 1 (1856).

Java (*Horsfield*); Ceylon (*Cuming*); North India (*James*). B.M.

This genus, as shown by Horsfield and Moore's figures of its earlier stages, clearly belongs to the Sphinginæ; in general coloration, however, it is far more like *Ambulyx*.

Genus. 22. ELLEMA, Clemens.

Ellema, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 187.

1. ELLEMA CONIFERARUM.

Sphinx coniferarum, Smith & Abbot, Lep. Ins. Georg. p. 81, pl. 41 (1797).

Hyloicus coniferarum, Hübner, Verz. bek. Schmett. p. 139. no. 1484 (1816).
Anceryx coniferarum, Walker, Lep. Het. viii. p. 224. no. 2 (1856).
Sphinx cana, Martyn, Psyche, pl. 19. fig. 1 (1797).
Ellema coniferarum, Grote, Bull. Buff. Soc. Nat. Sci. i. p. 27 (1873).

Georgia (*Abbot*). B.M.

I am glad to see this species referred by Mr. Grote to *Ellema*, that being unquestionably the true position for it; our example agrees far better with Abbot's figure than with the description of *E. harrisii*; it is certainly *S. cana* of Martyn.

2. Ellema harrisii.

Ellema harrisii, Clemens, Journ. Acad. Nat. Sci. Phil. 1859, p. 188; Lintner, Rep. New-York St. Cab. xxiii. pp. 170, 171, pl. 8. figs. 8–11 (1872).
Eilema (sic) *harrisii*, Walker, Lep. Het. Suppl. i. p. 37 (1864).
Sphinx coniferarum, Harris (nec Sm. & Abb.), Sill. Journ. vol. xxxvi. p. 297 (1839).
Ellema harrisi (sic), Morris, Syn. N.-Am. Lep. Sm. Ins. p. 216 (1862).

"Atlantic District!" (*Grote*).

The larva of this species is described at p. 272 of Packard's 'Guide.'

3. Ellema pineum.

Ellema pineum, Lintner, Rep. New-York St. Cab. xxiii. p. 169, pl. 8. figs. 12, 13 (1871).

Canada.

The larva of this species is described by Lintner.

Genus 23. Lapara[1], Walker.

Lapara, Walker, Lep. Het. viii. p. 232. gen. 33 (1856).

Lapara bombycoides.

Lapara bombycoides, Walker, Lep. Het. viii. p. 233. no. 1 (1856).

Canada.

But for Mr. Walker's description of the body of this species as "body rather slender" and "abdomen linear" I should have been inclined to think the species a male *Ellema*; as I have not seen males of that genus it may possibly be so.

Genus Himantoides, n. gen.

Himantoides undata.

Perigonia undata, Walker, Lep. Het. viii. p. 103. no. 6 (1856).

Jamaica. Type, B.M.

[1] See Mr. Grote's remarks in Bull. Buff. Soc. Nat. Sci. i. p. 28 (1873).

The abdomen and secondaries of the type are wanting, so that is impossible to decide positively as to its position; the long whip-like antennæ at once distinguish it from *Perigonia*.

Doubtful SPHINGIDÆ.

Genus ARCTONOTUS[1], Boisduval.

Arctonotus, Boisduval, Ann. Soc. Ent. France, 2^{me} sér. x. p. 319 (1852).

ARCTONOTUS LUCIDUS.

Arctonotus lucidus, Boisduval, Ann. Soc. Ent. France, 2^{me} sér. x. p. 319 (1852).

California. B.M.

Genus COLAX, Hübner.

Colax, Hübner, Verz. bek. Schmett. p. 141. (1816).

COLAX APULUS.

Sphinx apulus, Cramer, Pap. Exot. i. p. 8, pl. 88. fig. E (1779).
Colax apulus, Hübner, Verz. bek. Schmett. p. 141. no. 1513 (1816).
Smerinthus apulus, Walker, Lep. Het. viii. p. 255. no. 20 (1856).

Surinam.

Allied apparently to nothing else; it is best placed near the *Sphinx australasiæ* of Donovan, so far as I can judge by Cramer's figure. Mr. Walker suggests its possible affinity to the genus *Calliomma*; but the structure of that genus seems quite distinct. It may perhaps be a *Corymbia* (Noctuidæ).

Genus CLANIS (part.), Hübner.

Clanis (part.), Hübner, Verz. bek. Schmett. p. 138. gen. 4 (1816).

CLANIS ACHEMENIDES.

Sphinx achemenides, Cramer, Pap. Exot. iii. pl. 225. fig. C (1782).
Clanis achemenides, Hübner, Verz. bek. Schmett. p. 138. no. 1482 (1816).
Pachylia achemenides, Walker, Lep. Het. viii. p. 191. no. 4 (1856).

Surinam.

As I have never seen the species figured by Cramer, and as it differs too much from

[1] I would rather see this genus among the *Bombycidæ* than in the *Sphingidæ*; I believe it has about as much right to be in the latter family as the Geometrine genus *Œnochromia*, which has even a more Sphingoid appearance; however, as I am not acquainted with the early stages of *Arctonotus*, I leave it provisionally at the end of the *Sphingidæ*.

Pachylia to be referred to that genus, I have preferred to retain Hübner's generic name for it.

Hübner notes three species of *Clanis*. The first, *C. nicobarensis* (Schwarz, Beytr. i. 1), I cannot identify, as I have only been able to obtain the Coleopterous portion of the work in which it is described; and I can find no figure in Roesel that will at all do for the genus.

APPENDIX I.

Genera and Species described as new by Dr. BOISDUVAL *in the Spec. Gén. Lép. Hét.* tome i. *Sphinges, Sésiides, Castniides*, plates 1–11.

Genus METAMIMAS, Butler.

Brachyglossa banksiæ, Boisd. p. 11.
Smerinthus meander, Boisd. p. 22, pl. 4. fig. 1, will come next to *M. amboinicus*.

Genus METAGASTES, Boisd. p. 11=*Basiana*.

Genus NYCERYX, Boisd. p. 16: type *Ambulyx hyposticta*, Felder.

Genus TRIPTOGON, Bremer.

Smerinthus echephon, Boisd. p. 21. no. 6, pl. 3. fig. 3, allied to *T. sinensis*.
—— *indicus*, Boisd. p. 45. no. 36=*S. indicus*, Walker, Lep. Het.

? Genus POLYPTYCHUS. Hübner.

Smerinthus adansoniæ, Boisd. p. 27. no. 15, seems allied to *P. andosa*.

Genus DAPHNUSA, Walker.

Smerinthus ailanti, Boisd. p. 28. no. 16, pl. 3. fig. 2, closely allied to *D. ocellaris*.

Genus PAONIAS, Hübner.

Smerinthus oculata, Boisd. p. 29. no. 17, allied to *P. myops*.
—— *saliceti*, Boisd. p. 35. no. 24.

? Genus AMBULYX, Walker (*cf.* p. 360).

Smerinthus pseudambulyx, p. 29. no. 18.

Genus BASIANA, Walker.

Smerinthus pudorinus, Boisd. p. 46. no. 37,=*S. pudorinus*, Walker.

Genus Leucophlebia, Westwood.

Leucophlebia luxeri, Boisd. p. 55. no. 1,=*L. lineata*, Westwood.

Genus Meganoton, Boisd.,=*Pseudosphinx*.

Genus Amphonyx, Poey.

Amphonyx beelzebuth, Boisd. p. 63. no. 2, allied to *A. duponchelii*.
—— *godartii*, Boisd. p. 65. no. 4, pl. 5. fig. 1, near *A. duponchelii*.
—— *walkeri*, Boisd. p. 67. no. 7, near *A cluentius*.

Genus Protoparce, Burmeister.

Sphinx lycospersici, Boisd. p. 71. no. 2, near *P. carolina*.
—— *petuniæ*, Boisd. p. 73. no. 5, pl. 5. fig. 2, close to *P. diffissa*.
—— *nicotiana*, Boisd. p. 75. no. 7,=? *P. carolina*, var.
—— *tabaci*, Boisd. p. 78. no. 10, near *P. lucetius*.
—— *astaroth*, Boisd. p. 86. no. 20, near *P. solani*.

Genus Macrosila, Walker.

Sphinx hamilcar, Boisd. p. 79. no. 12.

Genus Sphinx, Linnæus.

Sphinx capsici, Boisd. p. 80. no. 14, close to *S. pellenia*.
—— *canadensis*, Boisd. p. 93. no. 29,=? *Sphinx leucophæata*.

Genus Hyloicus, Hübner.

Sphinx strobi, figured pl. 5. fig. 3.
—— *cupressi*, Boisd. p. 102. no. 41, pl. 2. figs. 3–5.

Genus Pseudosphinx, Burmeister.

Sphinx catalpæ, Boisd. p. 103. no. 42, pl. 2. figs. 1, 2.

Genus Diludia, Grote.

Sphinx abietina, Boisd. p. 108. no. 47,=*D. vates* (northern type).

I think the above may be distinct from the pale and less-marked species of southern India.

Genus Isognathus, Felder.

Anceryx cahuchu, Boisd. p. 122. no. 4,=? *I. metascyron*.
—— *pedilanthi*, Boisd. p. 124. no. 6, pl. 7, fig. 1, near the preceding.
—— *menechus*, Boisd. p. 124. no. 7,=? *I. scyron*.
—— *papayæ*, Boisd. p. 126. no. 10, near *I. amazonica*.

Anceryx pelops, Boisd. p. 126. no. 11, allied to the preceding.
—— *excelsior*, Boisd. p. 127. no. 12, near *I. fumosa*.

Genus DILOPHONOTA, Burmeister.

Anceryx lassauxii, Boisd. p. 129. no. 14, very distinct, secondaries black.
—— *janiphæ*, Boisd. p. 131. no. 17,=? *D. omphaleæ* ♀.

Genus NEPHELE, Hübner.

Zonilia zebu, Boisd. p. 148. no. 16,=*Z. æquivalens*, Walker.
—— *rhadama*, Boisd. p. 146. no. 13, pl. 6. fig. 1, close to *N. peneus*.

Genus MADORYX, Boisd. p. 150,=*Hemeroplanes*.

Madoryx lyncus, Boisd. p. 151. no. 2, near *H. oiclus*.
—— *deborrei*, Boisd. p. 155. no. 6, near *H. triptolemus*.

Genus CALLIOMMA, Walker (see *Eucheryx*).

Madoryx faunus, Boisd. p. 153, no. 4, near *C. pluto*.

Genus DEILEPHILA, Ochsenheimer.

Deilephila celeno, Boisd. p. 170. no. 13,=*D. spinifascia*.
—— *lathyrus*, Boisd. figured pl. 6. fig. 2.

Genus ELIBIA, Walker.

Elibia linigera, Boisd. p. 180. no. 4, near *E. dolichoides*.

Genus AMBULYX, Walker.

Ambulyx palmeri, Boisd. p. 181. no. 1, pl. 4. fig. 3, near *A. marginata*.
—— *crethon*, Boisd. p. 182. no. 2, *A. gannascus* group.
—— *astygonus*, Boisd. p. 188. no. 10, allied to *A. eurycles*.
—— *coquerelii*, Boisd. p. 191. no. 14, pl. 4. fig. 2, Indian group.
—— *lycidas*, Boisd. p. 191. no. 15, *A. strigilis* group.

Genus PHILAMPELUS, Harris.

Philampelus capronnieri, Boisd. p. 194. no. 3, pl. 7. fig. 2, unites the *P. satellitia* and *P. megæra* groups.
—— *pistacina*, Boisd. p. 199. no. 8, possibly a different genus.

Genus ALEURON, Boisduval.

Aleuron pudens, Boisd. p. 207. no. 5, near *A. smerinthoides*.

Genus GONENYO, Butler.

Aleuron orophilus, Boisd. p. 205. no. 1, ? var. of *G. carinata*.

Genus Everyx, Boisd. p. 208,=*Otus*, Hübner,

Everyx astyaenor, Boisd. p. 211. no. 3, near *O. myron.*

Genus Euchloron, Boisd. p. 213,=*Argeus*, Hübner.

Genus Acosmeryx, Boisd. p. 214.

Acosmeryx anceoides, Boisd. p. 216. no. 2,=*A. sericeus.*
—— *shervilii*, Boisd. p. 217. no. 4,=? *A. cinerea.*
—— *daulis*, Boisd. p. 218. no. 5,=? *P. miskini.*
—— *socrates*, Boisd. p. 219. no. 6.

Genus Eucheryx, Boisd.,=*Calliomma.*

Eucheryx licastus, figured pl. 6. fig. 3.
—— *nomius*, Boisd. p. 221. no. 2,=*Calliomma nomius*, Walker.
—— *depuiseti*, Boisd. p. 222. no. 4, ? near *C. thorates.*

Genus Daphnis, Hübner.

Chærocampa hesperus, Boisd. p. 228. no. 5, near *D. pallescens.*

Genus Chærocampa, Duponchel.

Chærocampa echeclus, Boisd. p. 233. no. 10,=probably *C. elegans.*
—— *kotschyi*, Kollar, p. 234. no. 11, ? a faded *C. alecto.*
—— *geryon*, Boisd. p. 241. no. 21, pl. 7. fig. 3, near *C. celæno.*
—— *epicles*, Boisd. p. 244. no. 23,=*C. gordius.*
—— *yorkii*, Boisd. p. 248. no. 28, said to be described from a unique example (allied to *C. oldenlandiæ*) in the British-Museum collection from Cape York; but as we have only one Australian species of that group (not registered Cape York), which has been unique in the collection since 1857, and as the only other Australian species, unique only between 1847 and 1848, is registered "Sidney," *C. yorkii* may be considered a fictitious species: its description agrees with nothing that I ever saw; and I am inclined to think that it is some half-described insect with a wrong locality.
—— *rhesus*, Boisd. p. 254. no. 36,=? *C. cyrene* (olivaceous type).
—— *jugurtha*, Boisd. p. 256. no. 39, *C. clotho* group.
—— *pollux*, Boisd. p. 261. no. 47, near *C. nessus.*
—— *tyndarus*, Boisd. p. 264. no. 51, pl. 4. fig. 5, *C. amadis* group.
—— *alcides*, Boisd. p. 266, no. 54,=*C. anubus* (bright examples).
—— *epaphus*, Boisd. p. 267. no. 56, near *C. chiron.*
—— *druryi*, Boisd. p. 267. no. 57,=*C. chiron*, var.
—— *eumedon*, Boisd. p. 272. no. 64, *C. crotonis* group.
—— *isaon*, Boisd. p. 272. no. 65, *C. crotonis* group.

Chærocampa maculator, Boisd. p. 274. no. 67, close to *C. amadis*.
—— *aglaor*, Boisd. p. 275. no. 70, close to *C. falco*.

Genus Panacra, Walker.

Panacra tiridates, Boisd. p. 286. no. 3, pl. 7. fig. 4, near *P. truncata*.

Genus Temnora, Walker.

Temnora natalii, Boisd. p. 290. no. 2,=*T. natalis*, Walker.
—— *rhadamistus*, Fabr. figured pl. 9. fig. 1.

Genus Unzela, Walker.

Tylognathus emus, Boisd. p. 294. no. 2.

Genus Tylognathus, Felder.

Tylognathus ypanemæ, Boisd. p. 295. no. 4.

Genus Epistor, Boisd. p. 296,=*Enyo*.

Epistor luctuosus, Boisd. p. 298. no. 2,=*E. lugubris* (slight variety).

Genus Tricholon, Boisd. p. 301,=*Deidamia*.

Genus Ocyton, Boisd. p. 303,=*Diodosida*.

Ocyton tyrrhus, Boisd. p. 303. no. 1,=*D. murina*, Walker.

Genus Aspledon, Boisd. p. 305,=*Lophura* (part.).

Aspledon dorus, Boisd. p. 305. no. 1,=*Lophura nana*.
—— *brisæus*, Boisd. p. 306. no. 3,=*L. pylas* of Cramer.

Genus Lophura, Walker.

Lophura pumilio, Boisd. p. 311. no. 2, close to *L. pusilla*.

Genus Pterogon, Boisd. p. 311,=*Proserpinus* and *Lophura* (part.).

Pterogon pumilum, Boisd. p. 312. no. 2, a species of *Lophura*.
—— *nanum*, Boisd. p. 314. no. 4, pl. 9. fig. 2,=*Lophura nana*, Walker.

Genus Pogocolon, Boisd. p. 314,=*Proserpinus* and *Amphion*.

Genus Angonyx, Boisd. p. 317,=*Panacra* (part.).

Angonyx emilia, Boisd. p. 318, pl. 8. fig. 1 (*P. testacea* group).

The *P. testacea* group of *Panacra* may perhaps be separated with advantage: they certainly have a somewhat different outline from the typical species; and the coloration is very dissimilar.

Genus Cautethia, Grote.

Œnosanda spuria, Boisd. p. 319. no. 2.

Genus Pachygonia, Felder.

Perigonia coffeæ, Boisd. (nec Walker), pl. 8. fig. 4, being a new species, may be named *Pachygonia boisduvalii* (from New Freiburg).

—— *nictitans*, Boisd. p. 322. no. 4, near to *P. coffeæ*, Walker. It is just possible that this may be *P. coffeæ*; the description, however, hardly agrees with it.

Genus Perigonia, Herrich-Schäffer.

Perigonia nephus, Boisd. p. 323. no. 5, near *P. lusca*.

—— *iloides*, Boisd. p. 327. no. 11, =*P. lefebvrei*.

Genus Macroglossa, Ochsenheimer.

Macroglossa bombylans, Boisd. p. 334. no. 2, =[1]*M. walkeri*, Butler, M.S.

—— *avicula*, Boisd. p. 334. no. 3, =*M. obscuripennis*.

—— *regulus*, Boisd. p. 335. no. 5, near *M. gyrans*.

—— *zena*, Boisd. p. 337. no. 9, =*M. belis*, var.

—— *pyrrhula*, Boisd. p. 338. no. 10, =*M. belis*, typical.

—— *sinica* (sic), Boisd. p. 340. no. 12.

—— *aquila*, Boisd. p. 340. no. 13, near *M. proxima*.

—— *bengalensis*, Boisd. p. 341. no. 14, near *M. divergens*.

—— *sitiens*, Boisd. p. 343. no. 18, =*M. sitiene*, Walker.

—— *troglodytus*, Boisd. p. 344. no. 19, =? *M. belis*, dwarfed. We have one example of this form from North India; it may be distinct.

—— *tinnunculus*, Boisd. p. 344. no. 20, ? near *M. imperator*.

—— *opis*, Boisd. p. 345. no. 21, =*M. belis*.

—— *phlegeton*, Boisd. p. 346. no. 22, close to *M. alcedo*.

—— *hirundo*, Boisd. p. 346. no. 23, pl. 9. fig. 4, near *M. divergens*.

—— *motacilla*, Boisd. p. 347. no. 25, =*M. alcedo*, var.

—— *sturnus*, Boisd. p. 349. no. 28, =*M. passalus*.

—— *sylvia*, Boisd. p. 350. no. 29, allied to *M. faro*.

—— *cyniris*, Boisd. p. 350. no. 30, probably large race of *M. alcedo*.

—— *mitchelii*, Boisd. p. 351. no. 31, pl. 8. fig. 5, near *M. imperator*.

—— *fringilla*, Boisd. p. 352. no. 33, near *M. errans*.

—— *heliophila*, Boisd. p. 354. no. 36, pl. 11. fig. 2, near *M. sitiene*.

[1] I am obliged to mention this to explain a note in P. Z. S. 1875.

Genus Aëllopus, Hübner.

Macroglossa westermannii, Boisd. p. 355. no. 38.
—— *ædon*, Boisd. p. 357. no. 40, pl. 11. fig. 1.

Genus Hemaris, Dalman.

Macroglossa etolus, Boisd. p. 370. no. 59, near *H. thysbe.*
—— *pyramus*, Boisd. p. 372. no. 62, near *H. ruficaudis.*
—— *curtisii*, Boisd. p. 374. no. 67,=? *H. saundersii*, Walker.

There is no *Hemaris* in the British Museum from Silhet; and the only species from North India is *H. saundersii.*

Section Cephonodes, Hübner.

Macroglossa confinis, Boisd. p. 376. no. 6,=*H. hylas.*
—— *yunx*, Boisd. p. 376. no. 7, pl. 9. fig. 5,=*H. hylas.*

Genus Sataspes, Moore.

Sataspes infernalis, Boisd. (nec Westwood), pl. 10. figs. 1, 2,=*S. uniformis*, var.
—— *tagalica*, Boisd. p. 378. no. 2, pl. 10. figs. 3, 4,=*S. ventralis.*

Appendix of additions to the Family collated since the reading of this paper.

Subfamily MACROGLOSSINÆ.

Genus Lepisesia, Grote.

Lepisesia flavofasciata.

Macroglossa flavofasciata, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 4 (1876).

Lepisesia victoria.

Said to be identical with *Pterogon clarkiæ* of Boisduval; see Bull. Buff. Soc. ii. p. 225.

Genus Hemaris, Dalman.

Hemaris æthra.

Macroglossa æthra, Strecker, Lep. Rhop. and Het. i. p. 107 (1875); pl. xiii. fig. 2 (1876).
———— ?

Hemaris fumosa.

Macroglossa fumosa, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 3 (1876).

HEMARIS RUBENS.

Hemaris rubens, H. Edwards, Proc. Cal. Acad. Sci. 1875, p. 2.

Oregon.

HEMARIS CYNOGLOSSUM.

Hemaris cynoglossum, H. Edwards, Proc. Cal. Acad. Sci. 1875, p. 3.

Napa and Calaveras counties, and Vancouver Island.

Section HÆMORRHAGIA, Grote.

HEMARIS RUFICAUDIS (synonym).

Macroglossa ruficaudis, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 1 (1876).

Genus MACROGLOSSA, Ochsenheimer.

MACROGLOSSA OBSCURICEPS.

Macroglossa obscuriceps, Butler, P. Z. S. 1876, p. 309. no. 3, pl. xxii. fig. 5.

Ayerpanas, Malacca. Coll. Capt. Roberts.

MACROGLOSSA LEPCHA, n. sp.

Allied to *M. obscuriceps*, from which it differs in having the head and thorax olive-green; the black band across the abdomen feebly developed; the primaries narrower; the central greyish band (which is scarcely distinguishable in *M. obscuriceps*) quite obsolete, the subbasal lines bounding it internally, converted into a black band, which is broad on the inner margin, and tapers towards the costa; wings below with the transverse lines less distinctly marked; the internal orange area brighter. Expanse of wings 2 inches.

Calcutta (*Atkinson*). Coll. Dr. O. Staudinger.

This species is also allied (but less closely) to *M. avicula* and *M. bombylans*. Mr F. Moore has generously permitted me to describe the Sphingidæ recently forwarded to him by Dr. Staudinger, and forming part of the late Mr. Atkinson's collection.

Genus PACHYGONIA, Felder.

PACHYGONIA HOPFFERI.

Pachygonia hopfferi, Staudinger, Verh. zool.-botan. Gesellsch. Wien, 1875, p. 118.

Chiriqui.

May not this be a form of *P. caliginosa*?

Genus Deidamia, Clemens.

Deidamia inscripta.

Pterogon inscriptum, Strecker, Lep. Rhop. and Het. pl. xiii. fig. 8 (1876).

This is not Cramer's *S. japix,* if Mr. Strecker's figure is correct (see p. 535).

Genus Proserpinus, Hübner.

Proserpinus œnotheroides.

Proserpinus œnotheroides, Butler, P. Z. S. 1875, p. 621.

Brazil. Type, B.M.

Proserpinus clarkiæ.

Pterogon clarkiæ, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 5 (1876).

Proserpinus juanita.

Pterogon juanita, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 6 (1876).

Proserpinus terlooi.

Proserpinus terlooi, H. Edwards, Proc. Cal. Acad. Sci. 1875, p. 4.

Mexico.

Genus Euproserpinus, Grote.

Euproserpinus phaëton of Grote is said to be identical with *Macroglossa erato* of Boisduval; see H. Edwards in Proc. Cal. Acad. Sci. 1875, p. 3.

Genus Lophura, Walker.

Lophura himachala.

Lophura himachala, Butler, P. Z. S. 1875, p. 621.

North-east Himalayas (*Farr*). Coll. F. Moore.

Lophura sangaica.

Lophura sangaica, Butler, P. Z. S. 1875, p. 621.

Shanghai. Coll. F. Moore.

Lophura erebina.

Lophura erebina, Butler, P. Z. S. 1875, p. 621.

North-west India. Coll. F. Moore.

LOPHURA MINIMA.

Lophura minima, Butler, P. Z. S. 1876, p. 310. no. 4, pl. xxii. fig. 2.

Ayerpanas, Malacca. Coll. Capt. Roberts.

Subfamily CHÆROCAMPINÆ.

Genus ELIBIA, Walker.

ELIBIA VERSICOLOR.

Darapsa versicolor, Strecker, Lep. Rhop. and. Het. i. pl. xiii. fig. 9 (1876).

It is evident from Strecker's figure, that this species has been erroneously referred to the allied genus *Otus*; see p. 546.

Genus PERGESA, Walker.

PERGESA MONGOLIANA. (Plate XCI. figs. 14, 15.)

Pergesa mongoliana, Butler, P. Z. S. 1875, p. 622.

Nankow Pass (*Swinhoe*). Type, B.M.

Genus PANACRA, Walker.

PANACRA PERFECTA.

Panacra perfecta, Butler, P. Z. S. 1875, p. 391.

Darjeeling (*Sadler*). Type, B.M.

Genus DIODOSIDA, Walker.

DIODOSIDA PECKOVERI, n. sp.

Nearly allied to *D. fumosa*, altogether darker; the wings much more purple in tint; the bands of primaries more regular; body uniform greyish olive, abdomen not ochreous at the sides; antennæ ferruginous. Expanse of wings 2 inches 4 lines.

Madagascar (*Kingdon*). Type, B.M.

Presented by Miss Algerina Peckover.

Genus CHÆROCAMPA, Duponchel.

CHÆROCAMPA PRUNOSA.

Chærocampa prunosa, Butler, P. Z. S. 1875, p. 622.

Ceylon (*Skinner*). Coll. F. Moore.

CHÆROCAMPA PUELLARIS.

Chærocampa puellaris, Butler, P. Z. S. 1875, p. 623.

Rawul Pindi (*Hellard*). Coll. F. Moore.

CHÆROCAMPA INTERSECTA.

Chærocampa intersecta, Butler, P. Z. S. 1875, p. 623.

Queensland (*Janson*). Type, B.M.

CHÆROCAMPA PROCNE (synonym).

Chærocampa procne, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 10 (1876).

"South California" (*Strecker*).

It is much more probable that this is an Asiatic species allied to *C. lucasii*.

CHÆROCAMPA DESERTA, n. sp.

Sandy brown: primaries with two ill-defined oblique brown lines, the first proceeding from the internal nervure just before the middle to the apical fourth of costal nervure, the second parallel to and about two lines in advance of the first, proceeding almost to apex, and dotted with darker brown upon the nervures; a very indistinct brownish nebula upon the median interspaces just beyond the middle; a small blackish spot on the lower discocellular; outer area sparsely irrorated with brown scales; fringe dark brown, excepting at external angle: secondaries smoky brown; costa, anal area, and fringe, excepting at the anal angle (where it is white), sandy brown: body sandy brown, becoming smoky in front, sides of abdomen and head paler; sides of collar, outer border of tegulæ, legs and antennæ above, whitish. Primaries below with internodiscoidal area dusky; a large diffused smoky brown patch from the end of the cell to the inner margin; disk sparsely irrorated with dark brown, three decreasing spots of the same colour parallel to the outer margin upon the veins towards costa: secondaries below sandy; costal and external areas dotted with brown; a discal series of seven brown dots parallel to the outer margin: body below sandy whitish; antennæ below reddish. Expanse of wings 3 inches 4 lines.

Hunter River, Australia (*W. Scott*). Coll. O. Staudinger.

This species was in Mr. Atkinson's collection.

Genus DEILEPHILA, Ochsenheimer.

DEILEPHILA EUPHORBIARUM=*D. spinifascia*.

Sphinx euphorbiarum, Boisduval, in Guérin and Percheron's Insectes, 2e Liv. 8, pl. 3 (1835).

I have to thank Mr. Kirby for a reference to this species, which has not only been overlooked by all subsequent authors, but by Dr. Boisduval himself in his monograph of the family.

Subfamily AMBULICINÆ.

Genus Ambulyx, Walker.

Ambulyx floralis, n. sp.

Allied to *A. superba*, but smaller, and clouded with bronze and green.

♂ shining bronzy clay-colour: primaries with the apical half of costal area, the central and internodiscal areas washed with green; subbasal area dusky olivaceous, limited externally by an oblique olive line, a second parallel line crossing the wing over the base of the first median branch; three ill-defined oblique waved lines, the outermost, undulated, crossing the disk; between the second and third a very indistinct diffused sinuous line; inner margin and the lines as they approach it blackish; a white-pupilled rounded black spot on the lower discocellular; a tuft of rose-red hairs at the base of inner margin: secondaries with the basal two thirds rose-red; costal area whitish; external third washed with green, especially towards apex, brownish towards the anal border; fringe for the most part white: head and collar brown, tegulæ and abdomen washed with green; antennæ testaceous, pectinations brown; anterior tibiæ and tarsi above brown. Wings below much paler, testaceous, washed with pale green: primaries with the internodiscoidal area rose-red; costal area greenish; a transverse brown litura beyond the cell; a transverse oblique, nearly straight white-bordered olive discal line; a zigzag line nearer to the outer margin, becoming black towards inner margin; a submarginal series of spots, only distinct and blackish at the external angle: secondaries crossed by three parallel white-bordered olive lines; a squamose brown submarginal spot near anal angle: body below whity brown; palpi, pectus, and legs slightly dusky. Expanse of wings 3 inches 8 lines.

♀ much larger, altogether less lively in colour, the green colouring less perceptible. Expanse of wings 4 inches 11 lines.

Darjeeling (*Atkinson*). Coll. O. Staudinger.

One of the handsomest species in the genus.

Subfamily SMERINTHINÆ.

Genus Leucophlebia, Westwood.

Leucophlebia damascena.

Leucophlebia damascena, Butler, P. Z. S. 1875, p. 392.

Sikkim (*Whitely*). Type, B.M.

Genus Basiana, Walker.

Basiana phalaris.

♂, *Sphinx nicobarensis*, Charpentier, ed. Esper's Ausl. Schmett. Sphing. tab. 1. fig. 1 (1830).

The publication of a plate of Sphingidæ, as also of a plate of Charideinæ and Ctenuchiinæ in the above edition of Esper's work has hitherto been overlooked; as usual, we have to thank Mr. Kirby for calling attention to the fact.

Genus Daphnusa, Walker.

Daphnusa porphyria, n. sp.

Primaries reddish brown, the basal area transversely marked with an irregularly arched whitish line, external area rather darker, marked from near external angle to a little below apical angle by a diffused whitish curved streak; a subapical sepia-brown excavated quadrangular patch; apex grey, with a large semicircular sepia-brown spot bordered externally by a white lunule on the outer margin; a broad central red-brown band (bordered on each side by a whitish streak, its outer line angular), much broader in front than behind, transversely clouded with grey, its outer third beyond the discoidal cell darker; the base of second median interspace and the discocellulars blackish piceous; two dissimilar whitish-edged black spots on the veins near external angle: secondaries pale brown, with two very indistinct discal streaks, clearly discernible upon the abdominal area; outer border rather broadly smoky brown; costa whitish; anal angle marked with a greyish and ferruginous dash, upon which is a black spot; a nearly marginal grey line: body pale brown, varied with dark brown; a black spot on the crest of the head. Primaries below greyish brown; apical half of costa and internal area pale greyish; apical markings as above, but redder: secondaries pale rosy greyish, paler on the abdominal area; three angulated ferruginous diffused discal lines; outer border rather broadly pale ferruginous, fringe dark piceous: body below pale reddish brown; palpi chocolate-brown. Expanse of wings 2 inches 3 lines.

Darjeeling (*coll. Atkinson*). In coll. O. Staudinger.

Allied to *D. colligata*.

Genus Mimas, Hübner.

Mimas terranea.

Mimas terranea, Butler, P. Z. S. 1876, p. 310. no. 5, pl. xxii. fig. 3.

Ayerpanas, Malacca. Coll. Capt. Roberts.

Subfamily SPHINGINÆ.

Genus Diludia, Grote.

Diludia jasminearum.

Sphinx jasminearum, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 14 (1876).

Judging by the figure, Boisduval's species is referable to this genus.

DILUDIA TRANQUILLARIS, n. sp.

♀. Nearly allied to *D. grandis*, slightly smaller, the markings much less strongly defined, the central irregular transverse congregation of parallel bands broader; black band only visible on costal area; the apical patch more uniformly dark grey, much narrower and longer, oblique behind, more narrowly black-bordered; secondaries with only one abbreviated black zigzag band across the grey anal patch; body slightly browner in tint; head not varied with white; abdomen with lateral diffused brown longitudinal bands instead of the black spots; wings below more uniform in colour, the transverse bands less strongly marked, narrower, and nearer to the outer border, the central blackish band of primaries obsolete. Expanse of wings 5 inches 3 lines.

Darjeeling (*Atkinson*). Coll. O. Staudinger.

At first I was inclined to think this might be the female of *D. grandis*; but a comparison of the sexes of allied species convinces me that the differences are too great to admit of this.

APOCALYPSIS, n. gen.

Allied to *Euryglottis*; similar in pattern, but at once to be distinguished by the much smoother thorax, shorter and more slender antennæ, more prominent and less crested head. Type:—

A. VELOX, n. sp.

Primaries long and pointed, sepia-brown, with the veins, a chain-like discal excavated transverse band, and some oblique lines connecting its outer border with the apices of the radial veins pale brown; an oblique white streak from the apex to the upper radial: secondaries smoky brown, the costal and abdominal areas paler; a basal hairy patch, two diffused abbreviated bands (distinct towards abdominal area), and a broad outer border (darkest at anal angle) deep brown; margin blackish, the fringe and a diffused narrower streak at anal angle white: body smoky brown, head and collar darker; a central longitudinal streak, the borders of the thorax, and a series of lateral abdominal transverse bands black-brown; lateral margins of head, fringe of tegulæ, back of thorax, and front margins of the abdominal segments white; antennæ whitish, with testaceous serrations. Wings below smoky brown: primaries with the internal area whitish; base of discoidal cell testaceous; a white apical streak, less distinct than above: secondaries with the base and abdominal area whitish; two diffused ill-defined transverse bars; margin as above: body below smoky brown; palpi, sides and hinder part of pectus, and centre of venter white. Expanse of wings 6 inches 2 lines.

Darjeeling (*Atkinson*). Coll. O. Staudinger.

The anterior wings of this species are coloured almost exactly as in *E. aper* from Bogota.

Genus SPHINX, Linnæus.

SPHINX LUGENS.

Sphinx lugens, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 12 (1876).

SPHINX PLOTA.

Sphinx plota, Strecker, Lep. Rhop. and Het. i. p. 106 (1875); pl. xiii. fig. 13 (1876).

Canada, Cincinnati.

Section LETHIA, Hübner.

SPHINX LUSCITIOSA.

Sphinx luscitiosa, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 11 (1876).

There seems to be no doubt that this is a *Lethia,* as determined by Mr. Grote.

Genus HYLOICUS, Hübner.

HYLOICUS CONIFERARUM.

Sphinx coniferarum, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 15 (1876).

HYLOICUS HARRISII.

Sphinx harrisii, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 16 (1876).

HYLOICUS SEQUOIÆ.

Sphinx sequoiæ, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 17 (1876).

HYLOICUS SANIPTRI.

Sphinx saniptri, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 18 (1876).

Canada and Philadelphia.

I have to thank Mr. Kirby for lending me Mr. Strecker's work, and the author of it for his excellent figures, which have enabled me to refer the above species to their correct genera.

Genus NEPHELE, Hübner.

NEPHELE HESPERA.

Sphinx quaterna, Charpentier, ed. Esper's Ausl. Schmett. Sphing. tab. i. fig. 2 (1830).

Genus ARCTONOTUS, Boisduval.

ARCTONOTUS LUCIDUS.

Arctonotus lucidus, Strecker, Lep. Rhop. and Het. i. pl. xiii. fig. 7 (1876).

A. G. Butler, 25th September, 1876.

DESCRIPTION OF PLATES.

PLATE XC.

Figs. 1–3. Larvæ and pupa of *Lophura hyas*, Walker, p. 538.
Figs. 4, 5. Larva and pupa of *Hemaris hylas*, Linn., p. 522.
Figs. 6, 7. Larva and pupa of *Macroglossa belis*, Cramer, p. 526.
Fig. 8. Larva (feeding on *Pæderia fœtida*) of *Macroglossa pyrrhosticta*, Butler, p. 527.
Figs. 9, 10. Larva and pupa of *Macroglossa gilia*, Herr.-Sch., p. 527.
Figs. 11, 12. Larva and pupa of *Acosmeryx anceus*, Cramer, p. 544.
Figs. 13–15. Larvæ and pupa of *Chærocampa lewisii*, Butler, p. 554.
Fig. 16. Larva of *Smerinthus tatarinovii*, Ménétriés, p. 593.

PLATE XCI.

Fig. 1. Larva of *Chærocampa oldenlandiæ*, Fabricius, p. 559.
Figs. 2, 3. Larva and pupa of *Ambulyx liturata*, Butler, p. 580.
Figs. 4, 5. Larva and pupa of *Ampelophaga rubiginosa*, Ménétriés, p. 546.
Fig. 6. Larva of *Triptogon roseipennis*, Butler, p. 588.
Figs. 7–9. Larvæ and pupa of *Chærocampa japonica*, Boisduval, p. 560.
Fig. 10. Larva of *Polyptychus dentatus*, Cramer, p. 583.
Figs. 11–13. Larvæ and pupa of *Pseudosphinx cyrtolophia*, Butler, p. 611.
Figs. 14, 15. Larva and pupa of *Pergesa mongoliana*, Butler, p. 637.
Figs. 16, 17. Larva and pupa of *Protoparce orientalis*, Butler, p. 609.
Figs. 18, 19. Larva and pupa of *Diludia vates*, Butler, p. 616.
Figs. 20, 21. Larva and pupa of *Nephele hespera*, Fabricius, p. 624.

PLATE XCII.

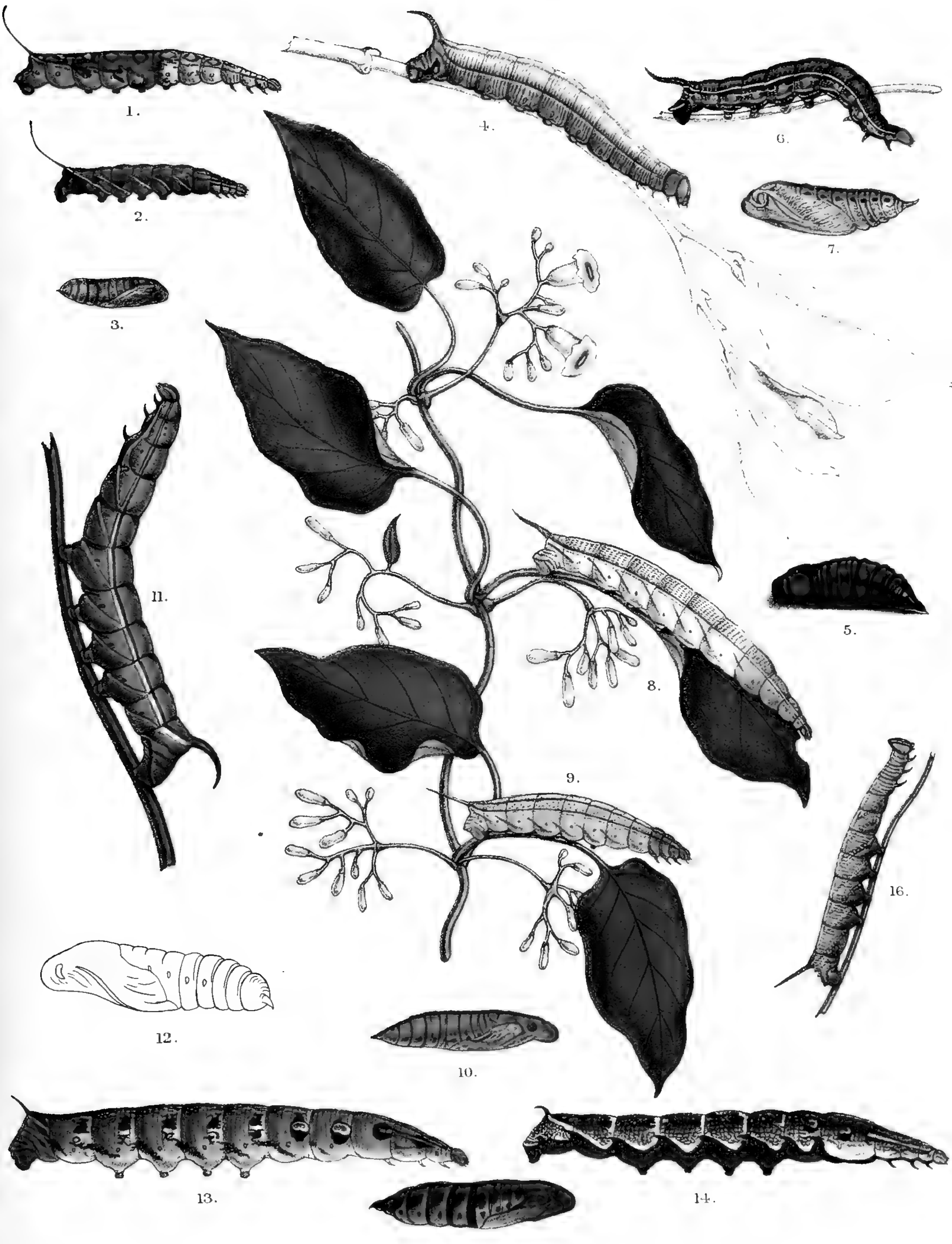
Fig. 1. *Chærocampa mirabilis*, Butler, p. 554.
Fig. 2. *Pergesa ægrota*, Butler, p. 549.
Fig. 3. *Pergesa gloriosa*, Butler, p. 549.
Fig. 4. *Panacra regularis*, Butler, p. 551.
Fig. 5. *Daphnis minima*, Butler, p. 573.
Fig. 6. *Pseudosphinx cyrtolophia*, Butler, p. 611.
Fig. 7. *Panacra ella*, Butler, p. 550.
Fig. 8. Larva and pupa of *Chærocampa silhetensis*, Walker, p. 560.
Fig. 9. Larva of *Acherontia morta*, Hübner, p. 598.
Fig. 10. Larva and pupa of *Acherontia medusa*, Butler, p. 597.
Fig. 11. Larva of *Smerinthus planus*, Walker, p. 593.

PLATE XCIII.

Fig. 1. *Triptogon spectabilis*, Butler, p. 588.
Fig. 2. *Triptogon fuscescens*, Butler, p. 587.
Fig. 3. *Triptogon oriens*, Butler, p. 587.
Fig. 4. *Basiana exusta*, Butler, p. 595.
Fig. 5. *Triptogon massurensis*, Butler, p. 587.
Fig. 6. *Triptogon albicans*, Butler, p. 586.
Fig. 7. *Ambulyx turbata*, Butler, p. 580.
Fig. 8. *Ambulyx rhodoptera*, Butler, p. 580.
Fig. 9. *Ambulyx lahora*, Butler, p. 580.

PLATE XCIV.

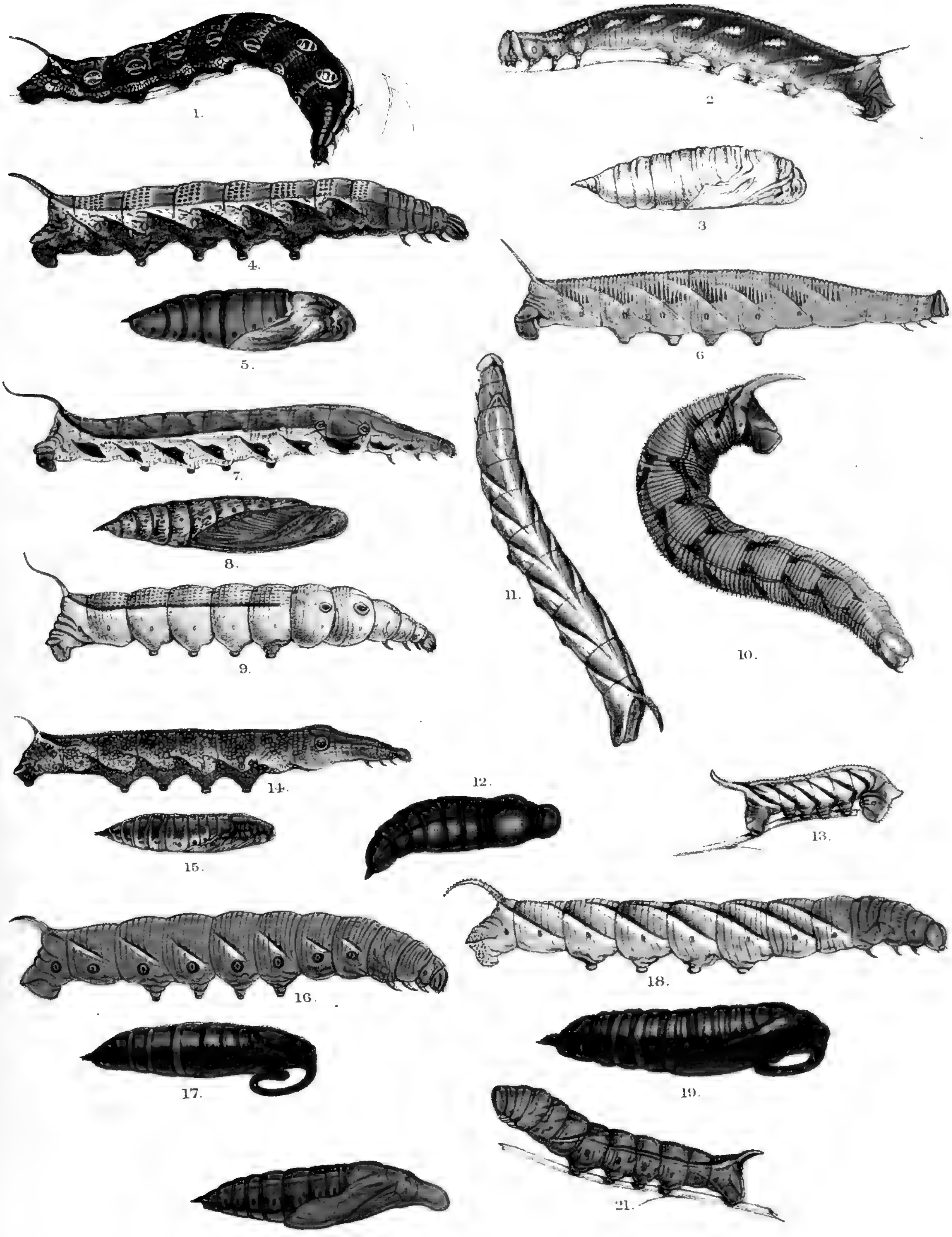
Fig. 1. *Chærocampa docilis*, Butler, p. 564.
Fig. 2. *Chærocampa virescens*, Butler, p. 563.
Fig. 3. *Nephele rosæ*, Butler, p. 622.
Fig. 4. *Diludia melanomera*, Butler, p. 615.
Fig. 5. *Diludia natalensis*, Butler, p. 616.
Fig. 6. *Amphonyx rivularis*, Butler, p. 599.
Fig. 7. *Isognathus metascyron*, Butler, p. 602.
Fig. 8. *Isognathus amazonicus*, Butler, p. 601.



A G Butler lith. May 1875.

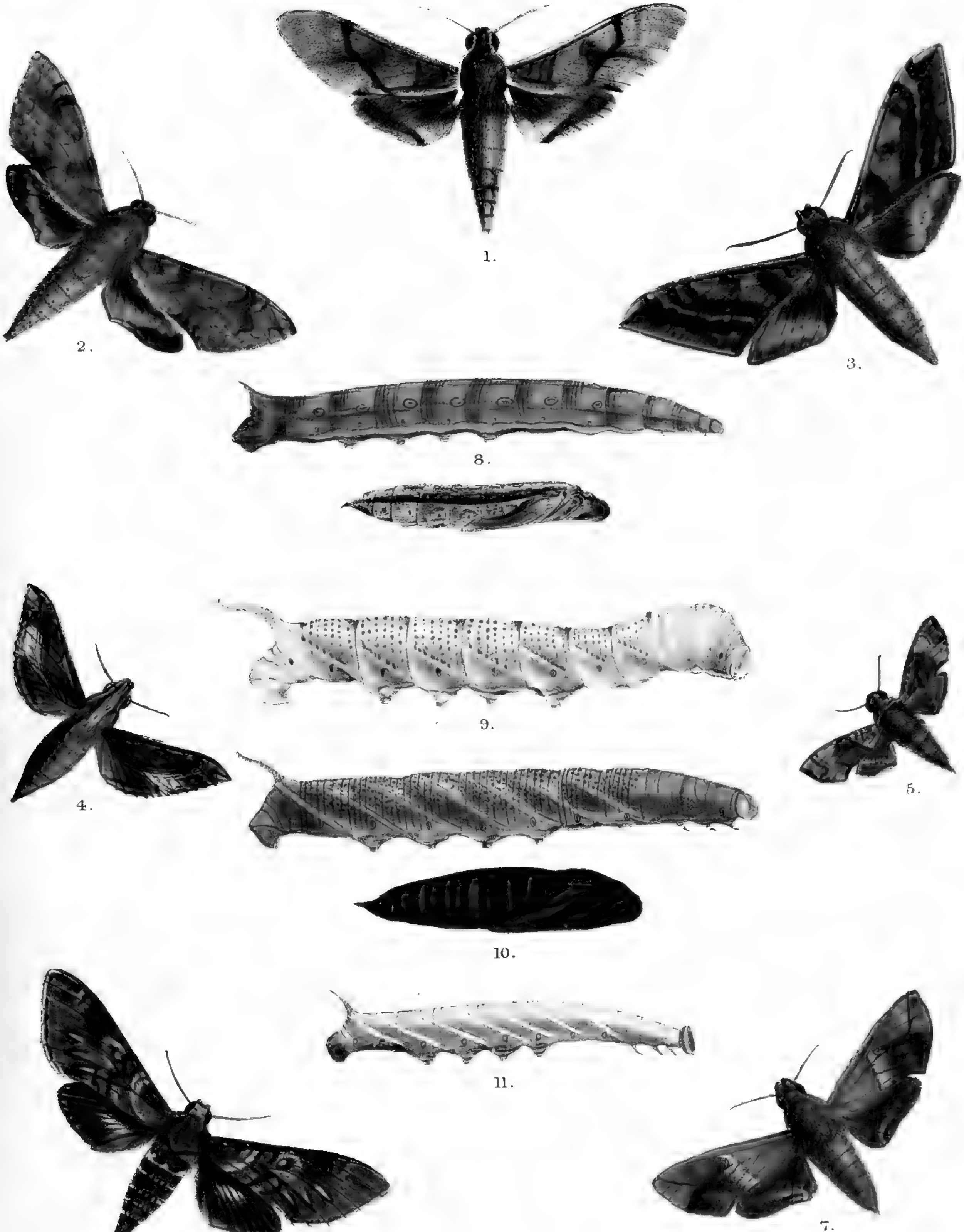
Mintern Bros imp

TRANSFORMATIONS OF SPHINGIDÆ



A G Butler Chromo-lith 1875

TRANSFORMATIONS OF SPHINGIDÆ.



R. Mintern del et lith.

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NEW SPHINGIDÆ & TRANSFORMATIONS.

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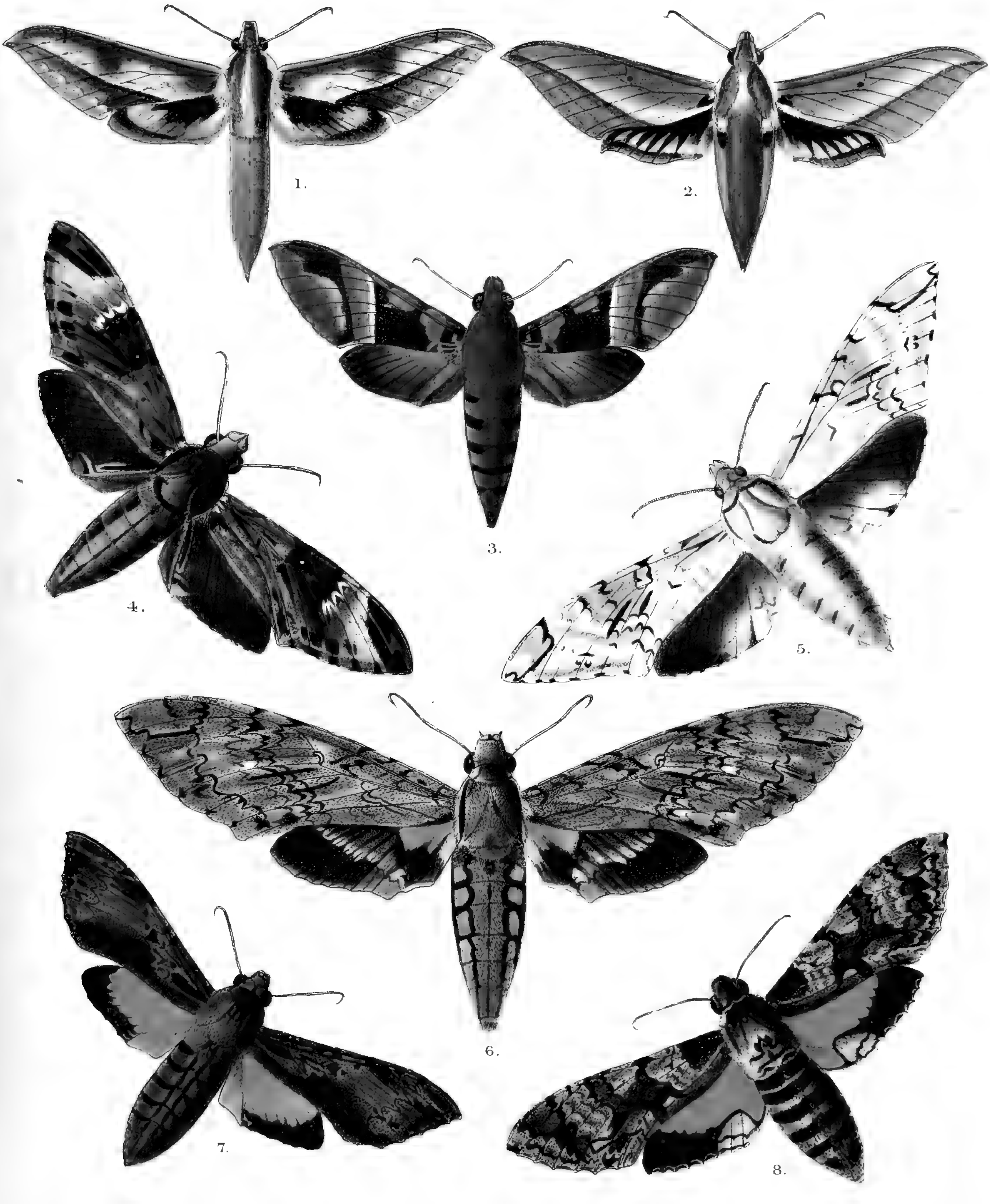
[illegible] SPHINGIDÆ



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NEW SPECIES OF SPHINGIDÆ.

XII. *On the Rhinoceroses now or lately living in the Society's Menagerie.*

By P. L. Sclater, *M.A., Ph.D., F.R.S., Secretary to the Society.*

Read June 15, 1875.

[Plates XCV. to XCIX.]

THE main object of my remarks on the present occasion is to illustrate the very beautiful drawings by Mr. Wolf now before us. The series of the living species of the genus *Rhinoceros* now or lately living in the Society's Gardens being much larger than any that has ever yet been brought together, and the figures of these animals hitherto published having been mostly taken from stuffed and distorted skins, it has been thought that the present opportunity of obtaining correct outlines of the external form of the five species in our Gardens should not be passed by. Under these circumstances the finished water-colour drawings which I now exhibit have been prepared by Mr. Wolf. Taking them in order, one by one, I propose to say a few words, chiefly on the life-history of the individual specimens figured, and on points in immediate connexion therewith.

1. Rhinoceros unicornis. (Plate XCV.)

Rhinoceros unicornis, Linn. S. N. i. p. 104 (1766).
Rhinoceros indicus, Cuv. Ménag. d. Mus. d'H. N. (1801).
Rhinoceros unicornis, Sclater, Rev. Cat. Vert. p. 79.

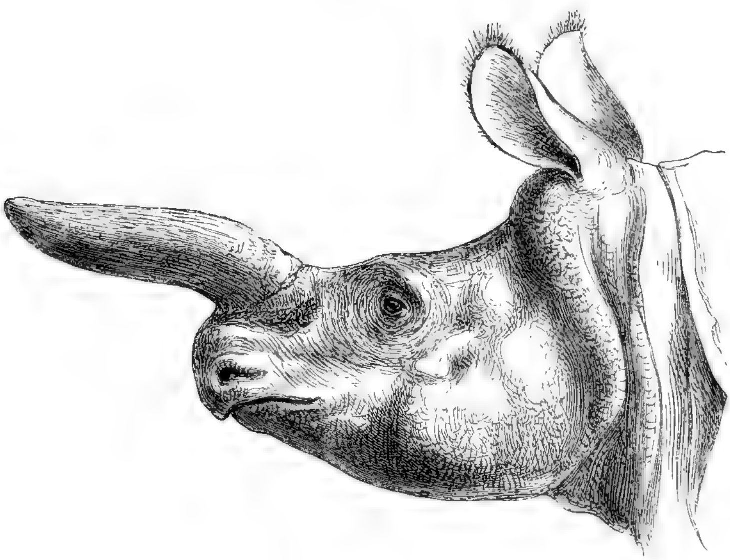
Of this huge animal the first specimen obtained by the Society was a male, purchased on the 28th of May, 1834, from Capt. Fergusson, for the sum of £1050[1], as I find on reference to the 'Minutes of Council' of that date. It died in November 1849, and was dissected by Professor Owen, who has given us the results of his examination of it in the excellent memoir published in the Society's 'Transactions'[2]. Its skin was mounted, and is now in the Gallery of the British Museum.

In the following year this loss was replaced by the acquisition of a young female of the same species, purchased on the 5th of July, 1850, for the sum of £350. This animal lived more than twenty-three years in the Gardens, and died on the 14th of December 1873[3]. A few years before her death this Rhinoceros grew a horn of very abnormal size and shape, which I described as follows in a communication to the Society on this subject in 1871[4]:—

[1] See P. Z. S. 1834, p. 41, and Minutes of Council, vol. iii. p. 413.
[2] Trans. Zool. Soc. vol. iv. p. 31.
[3] *Cf.* Garrod, P. Z. S. 1874, p. 2.
[4] P. Z. S. 1871, p. 10.

"I beg leave to exhibit a drawing of the present state of the horn of our old female Rhinoceros, which has now been in the Gardens since 1850 (fig. 1). Instead of rising nearly perpendicularly from the nose, as in the ordinary form of this species, the horn in this animal projects forward beyond the end of the nostrils, and has now attained a length of 18 inches or thereabouts. This may perhaps be due to the practice indulged in by this animal for several years of grinding down her horn against the bars of her cage; for it is only within the last few years that this appendage has grown into its present shape."

Fig. 1.



Head of *R. unicornis* ♀, with distorted horn.

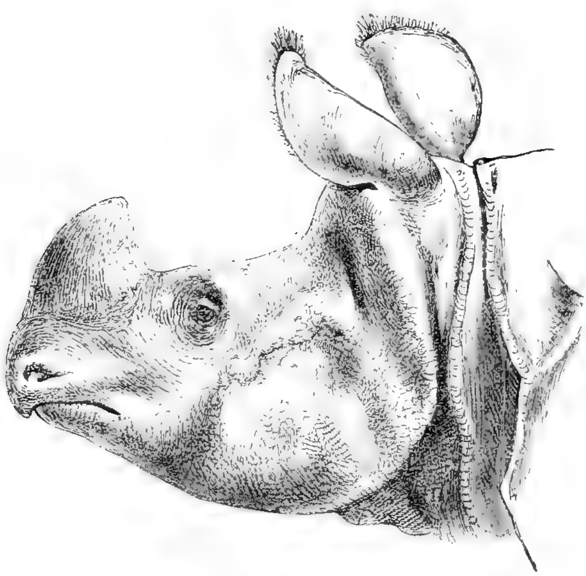
In 1864 an important addition was made to our series of Rhinoceroses by the arrival of a young pair of the present species from Calcutta, along with other animals, under the care of the late Mr. James Thompson, then head Keeper. Of these the male had been sent home as a present by Mr. A. Grote; the female was purchased for us by Mr. Thompson in Calcutta, along with a third specimen destined for the Zoological Gardens of Dublin. All these Rhinoceroses were, as Mr. Grote has kindly informed me, originally obtained from Assam, through the intervention of Colonel Agnew, then Commissioner of that province.

Having already a female *R. unicornis* in the Menagerie, the Council determined to part with the second example of the same sex thus acquired, and, in 1865, exchanged her with the Jardin des Plantes, Paris, for an African Elephant. The male remains still in our Gardens in excellent health and condition, and is the original of the water-colour drawing taken by Mr. Wolf in 1872, from which Plate XCV. has been lithographed. He is of enormous size, and measures about 5 feet 3 inches in height at the shoulder, and about 10 feet 6 inches in length along the back from the tip of the nose to the root of the tail.

In August 1870 a curious accident befell this animal, which I recorded as follows in the 'Proceedings' for 1871 (p. 8 *et seq.*):—

"Our male and female Indian Rhinoceroses having been placed in the adjoining yards, in front of the new Elephant-house, on the 10th of August last the male made frequent attempts to raise the lower transverse bar of the strong iron railing that separates the two enclosures, by placing his horn under it. After repeating these attempts several times, in spite of the interference of the keepers, his efforts were such that the horn became suddenly detached under the violent pressure to which it was subjected, and rolled off into the yard. The animal appeared to be much hurt, and roared lustily for a few minutes. There was a considerable loss of blood from the wound, which, however, healed in a few days, neat's-foot oil being applied to it to keep off the flies.

Fig. 2.



Head of male Rhinoceros before the horn was torn off (August 10th, 1870).

"The horn, as will be seen (fig. 2), measures about 12 inches in length along its anterior surface, which curves gradually backwards; the widened base is $8\frac{1}{4}$ inches in long diameter, and $5\frac{1}{2}$ inches across. The lower surface presents a considerable cavity, about $1\frac{3}{4}$ inch in depth, upon examining which it is clearly seen that the whole horn has been cleanly torn away from the matrix.

"Very soon after the loss of the old horn, we observed indications that a new horn was forming. This has increased rapidly in size, and is now already perhaps $1\frac{1}{2}$ inch in height (see fig. 3). It is thus certain that the Rhinoceros has the power of reproducing its horn

Fig. 3.

Head of male Rhinoceros, with new horn growing (January 3rd, 1871).

after the existing one has been broken off. I am well aware that this fact has already been noticed by different explorers and observers; moreover Mr. Blyth has informed us (see 'Field,' Aug. 20, 1870, p. 173) that several years ago an accident similar to what has been here recorded occurred to an animal of the same species in the Zoological Gardens at Moscow, and that in this case likewise the horn grew again. I have nevertheless thought that the present occurrence is well worthy of a place among the records of the Society. It is notorious that the reproduced horn of an animal is liable to be materially different in structure from the normal horn; and it is very possibly due to some such accident as above mentioned, that we have been favoured with the creation of certain new species of Rhinoceroses that have been based upon horns alone." [1]

At the scientific meeting of this Society held on Feb. 16th last I read an extract from a letter addressed to me by Mr. William Jamrach, stating that he was bringing home from Calcutta an example of "a new Rhinoceros, procured in the Bhootan Terai," and I exhibited a drawing of the animal taken in Calcutta in January 1875 by Khaliludin

[1] *Rhinoceros crossii*, Gray, P. Z. S. 1854, p. 250, probably based upon an anterior horn of *R. sumatranus* (*cf.* Blyth, P. Z. S. 1852, p. 1), and *R. oswellii*, Gray, P. Z. S. 1853, p. 46, which is usually considered the same as *R. simus*.

Ahmed, a native draftsman [1]. Mr. Jamrach grounded his supposed new species on "the markings of the skin, which seemed to be studded with buck-shot," the "very long tail" and "extraordinary large ears."

When this animal reached London it was carefully examined by Mr. Garrod, Mr. Bartlett, and myself, who all agreed that it was merely a young *R. unicornis*; as might have been supposed to be probable from the locality in which it was obtained. The animal died in Mr. Rice's establishment; and the skin was not preserved; but the skull is in the Museum of the Royal College of Surgeons. Mr. Garrod, who has carefully examined it, assures me that it agrees in every respect with the skull of *R. unicornis* of corresponding age.

The present Rhinoceros, so far as is yet positively known, is only met with in a wild state in the Terai region of Nepal and Bhootan and in the upper valley of the Brahmaputra or province of Assam.

2. Rhinoceros sondaicus. (Plate XCVI.)

Rhinoceros sondaicus, Desm. Mamm. ii. p. 399 (1822); Sclater, P. Z. S. 1874, p. 182, pl. xxviii.
Rhinoceros javanicus, Geoff. St.-Hil. et F. Cuv. in Hist. Nat. Mamm. sub tab. 309.
"*Indian Rhinoceros,* Liverpool Zool. Gardens," Nat. Libr. vol. xxiii. plates 8 and 9.

Of the smaller One-horned Asiatic Rhinoceros the only specimen yet acquired by the Society is the original of Mr. Wolf's second drawing (Pl. XCVI.), which was executed in the summer of 1874. This animal, which is of the male sex, was purchased by us of Messrs. Cross and Jamrach on the 1st of March, 1874, for £800 [2]. We were informed that it had been obtained at Batavia, and had been previously for some time in captivity in some tea-gardens near the city. It stands about 3 feet 9 inches in height at the shoulder.

Mr. Blyth, in a note to his memoir on Indian Rhinoceroses published in 1862 [3], has stated that the adult male Rhinoceros which lived for many years in our gardens, and for which the sum of £1000 was paid (meaning, I suppose, the specimen purchased in 1834), belonged to this species and not to *R. unicornis*. But there can be no doubt that he was mistaken, as may be proved by reference to the specimen itself, now in the British Museum.

On the other hand it seems probable that there had been a specimen of *R. sondaicus* living in England previously to the arrival of our example. On referring to the figure of the "Indian Rhinoceros in the Liverpool Zoological Gardens," given by Sir William Jardine in the volume of the 'Naturalist's Library' on "Thick-skinned Quadrupeds," the second fold of the skin across the back of the neck which distinguished *R. sondaicus* from *R. unicornis* is plainly visible. So far, therefore, as can be ascertained from the figure, the Rhinoceros living in the Liverpool Zoological Gardens in 1836, or there-

[1] See P. Z. S. 1875, p. 82. [2] See Report of the Council for 1875, p. 25. [3] J. A. S. B. xxxi. p. 151.

abouts, must have been *R. sondaicus*[1]. In the 'Naturalist's Library' we are told that this animal was brought from Bengal, having been for some time kept in the gardens of the Governor-General at Calcutta. At the time Sir William Jardine's correspondent who describes it was writing, it had been sixteen months in Great Britain, during which time it had visited London, Glasgow, and Edinburgh, and was the property of the Managers of the Zoological Gardens at Liverpool. It was then supposed to be six years old, and measured 4 feet 8 inches in height at the highest part of the back.

This Lesser One-horned Indian Rhinoceros was, as is well known, formerly supposed to be only found in Java. From the researches of Mr. Blyth[2] and other Indian naturalists, we now know that this is an error, and that *R. sondaicus* (or a very closely allied form) occurs also in various parts of British Burmah, and in the Sunderbans of Bengal, in the immediate neighbourhood of Calcutta. Of a specimen obtained in this last-named locality I exhibit a drawing by a native artist, taken from the specimen in the Indian Museum at Calcutta, which, so far as I can see, indicates no material differences from *R. sondaicus verus.*

In the spring of 1874 Mr. W. Jamrach imported from Calcutta a young Rhinoceros, stated to have been obtained in the Munipore district, of which I exhibit a drawing made while the animal was at Hamburg. The example is rather remarkable for its large head, long ears, and the numerous boss-like excrescences which cover its body; but after examining it in company with Mr. Bartlett and Mr. Garrod I came to the conclusion that it was a young *R. sondaicus*[3], although it appeared to have a rather squarer, shorter upper lip than is usual in that species. This animal, after remaining some time in London, was transferred to the Zoological Gardens at Berlin, where it now remains. Dr. Peters, who, with his usual kindness, has more than once carefully examined it for me, believes it to be *R. sondaicus.*

3. Rhinoceros sumatrensis. (Plate XCVII.)

Double-horned Rhinoceros of Sumatra, Bell, Phil. Trans. 1793, p. 283, *undè*
Rhinoceros sumatrensis, Cuv. Règn. An. i. p. 240 (1817).

[1] It would have been more satisfactory, of course, to have been able to examine the preserved specimen of this animal; but this unfortunately cannot be done. The specimen in question was acquired after its death by the Trustees of the British Museum, and mounted, and is entered in the 'Catalogue of Mammals,' published by Dr. Gray in 1843, as "*Rhinoceros unicornis, a.* From Mr. Atkins' Menagerie". When our *R. unicornis,* which died in 1849, was received at the British Museum, its skin was, as I have been informed, mounted over that of the Liverpool specimen, which is consequently rendered inaccessible. It will be observed that notwithstanding this, in the new 'Handlist of the Edentate, Thick-skinned, and Ruminant Mammals,' published by Dr. Gray in 1873, the former entry is continued (p. 46) " 88 *a.* Animal stuffed, Atkin's Menagerie " whereas it should be " Zool. Society's Gardens."

[2] See Mr. Blyth's memoir on the living Asiatic species of Rhinoceros, J. A. S. B. xxxi. p. 151 (1863).

[3] This conclusion did not please Mr. Jamrach, who in October 1874 printed an account of the supposed new species on a sheet of green paper, and proposed to call it *R. jamrachii*!

Rhinoceros sumatranus, Raffles, Linn. Trans. xiii. p. 268 (1820).
Rhinoceros sumatrensis, Sclater, P. Z. S. 1872, p. 790, pl. lxvii.; Bartlett, P. Z. S. 1873, p. 10!, pl. xi. (*vit.*).
Ceratorhinus sumatrensis, Garrod, P. Z. S. 1873, p. 92.
Ceratorhinus crossii, Gray, Ann. N. H. ser. 4, vol. x. p. 209.
Ceratorhinus niger, Gray, Hand-l. Edent. &c. p. 48.

The first example of the true Sumatran Rhinoceros received by the Society arrived in the Gardens on the 2nd of August, 1872, and, after some negotiations, was purchased of Mr. William Jamrach, who had deposited it in our care, for the sum of £600. Shortly after its arrival the present drawing of it (Plate XCVII.) was taken by Mr. Wolf. The animal, which was an old female with the lower incisors lost, did not thrive with us, and died about six weeks after its arrival. Professor Garrod has given us an excellent account of the anatomy of its soft parts in the Society's 'Proceedings'[1]; and the skin and skull were sold to the trustees of the British Museum.

Some time afterwards I ascertained from Mr. William Krohn that this animal had been originally captured in the Sunghi-njong district of Malacca, and had been sold by him to Mr. Jamrach through a London agent.

Although after this date several Rhinoceroses from the same district or the neighbouring territory of Johore were imported into Europe[2], we have not up to the present time succeeded in replacing our loss of this species[3].

In an article in the 'Annals of Natural History' for 1872[4], the late Dr. Gray, without even ever having seen the two animals then living in our Gardens, endeavoured to show that the next species, which I have named *R. lasiotis*, was the true *R. sumatrensis*, and termed the present animal *R. crossii*, Blyth having previously suggested that the horn upon which *R. crossii*, Gray (P. Z. S. 1854, p. 250), was established probably might have been that of an individual of *R. sumatrensis*[5]. But in his 'Hand-list of Edentate Thick-skinned and Ruminant Mammals,' published in 1873, Dr. Gray changed his opinion, and proposed the new name *Ceratorhinus niger* for the Sumatran Rhinoceros, under which designation our specimen, now stuffed, in the British Museum, at present stands[6].

[1] "On the Visceral Anatomy of the Sumatran Rhinoceros (*Ceratorhinus sumatrensis*)," by A. H. Garrod, B.A., F.Z.S. (P. Z. S. 1873, p. 92).

[2] See Mr. Bartlett's account of a female of this species that produced a young one on board ship in the Victoria Docks in December 1872 (P. Z. S. 1873, p. 104).

[3] *P.S.*, July 28th, 1876.—In July 1875, just after this paper was read, Mr. C. Jamrach deposited in the Gardens an adult female of this Rhinoceros, which was subsequently purchased by the Society for the sum of £600.

[4] Ann. Nat. Hist. ser. 4. vol. x. p. 207.

[5] J. A. S. B. xxxi. p. 156.

[6] *P.S.*, July 1876.—Blyth, however, in his 'Catalogue of the Mammals of Burmah,' published after his decease, came to exactly the contrary conclusion, and united *R. lasiotis* to *R crossii*. So much for the value of names based on horns and such fragments of specimens!

4. Rhinoceros lasiotis. (Plate XCVIII.)

Rhinoceros sumatrensis, Anderson, P. Z. S. 1872, p. 129; Sclater, P. Z. S. 1872, p. 185.

Rhinoceros lasiotis, Sclater, P. Z. S. 1872, p. 493, pl. xxiii. and p. 790; Ann. N. H. ser. 4, vol. x. p. 298; Rev. List of Vert. Suppl. p. 8.

Ceratorhinus lasiotis, Garrod, P. Z. S. 1873, p. 92.

Ceratorhinus sumatranus, Gray, Hand-list of Edentates &c. p. 47.

Ceratorhinus crossii, Blyth, J. A. S. B. vol. xliii. p. 51 (1875).

Mr. Wolf's drawings of the present Rhinoceros were taken in 1872 from the only individual of the present species yet known, which is still living in good health in our Gardens.

This animal was originally captured near Chittagong in Eastern Bengal, in January 1868, in the manner described as follows in one of the Calcutta newspapers:—

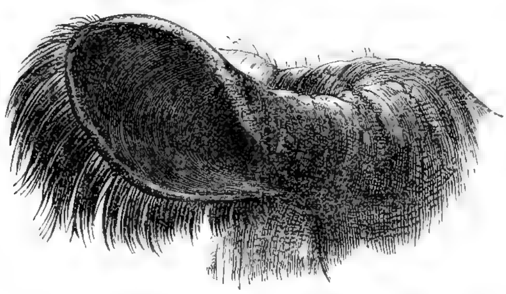
"The quiet station of Chittagong has been lately enlivened by the presence of a Rhinoceros. It appears that about a month ago some natives came into Chittagong and stated that a Rhinoceros had been found by them in a quicksand, and was quite exhausted with her efforts to release herself. They had attached two ropes to the animal's neck, and with the assistance of about 200 men dragged her out, and keeping her taut between two ropes they eventually made her fast to a tree. The next morning, however, they found the Rhinoceros so refreshed and making such efforts to free herself that they were frightened, and made application to the magistrate of Chittagong for assistance. The same evening Captain Hood and Mr. H. W. Wickes started with eight Elephants to secure the prize, and after a march of about sixteen hours to the south of Chittagong they came up with the animal. She was then discovered to be a Sumatran Rhinoceros, rather more than four feet in height, with a smooth hairy skin somewhat like that of a Pig, and with two horns (one up high, almost between the eyes, and small, the other rather larger and just above the nose), and the upper lip almost coming to a point and protruding a little.

"The Elephants at the first sight of the Rhinoceros were very much afraid and bolted one and all, but after some little exertion they were brought back and made to stand by. A rope was now with some trouble attached to the animal's hind leg and secured to an Elephant; at this juncture the Rhinoceros roared, the Elephants again bolted; and had it not been for the rope slipping from the leg of the Rhinoceros, that limb might have been pulled from the body. The Rhinoceros was, however, eventually secured with ropes between Elephants and marched into Chittagong in perfect health. Two large rivers had to be crossed:—first, the Sungoo river, where the animal was towed between Elephants, for she could not swim and could only just keep her head above water by paddling with the fore feet like a Pig; and secondly, the Kurnafoolie river, when the ordinary cattle ferry-boat was used. Thousands of natives thronged the march in, which occupied a few days, the temporary bamboo bridges on the Government road invariably falling in with the numbers collected thereon to watch the Rhinoceros crossing the stream below; and sometimes the procession was at least a mile in length. The 'Begum,' as the Rhinoceros has been named, is now free from all ropes and kept within a stockaded enclosure, having therein a good bath excavated in the ground and a comfortable covered shed attached. She is already very tame, and will take plantain-leaves or chuppattees from the hand, and might almost be led about by a string."

The fact of a Two-horned Rhinoceros being in captivity in Chittagong having become known to the Council of the Society, various endeavours were made to come to some arrangement with the owners for its acquisition. These, however, did not lead to any result.

In November 1871 Mr. William Jamrach, being in Calcutta and nearer to the spot, was more successful in his negotiations, and, having obtained possession of the animal, removed it to that city. Here it was carefully examined by Dr. Anderson, and minutely described in a communication to the Society read on the 6th of February, 1872 [1], under the name of *R. sumatrensis*. On its arrival in England on the 15th of the same month it was purchased by the Society for the sum of £1250, and placed in the Elephant-house, being still supposed to be an example of *R. sumatrensis* [2]. Later in the same year, however, an example of the true *R. sumatrensis* having been obtained by the Society, it became obvious that the Chittagong animal must belong, so far as could be told from an examination of the living individual, to a different species. I accordingly proposed to name it *lasiotis*, from the peculiar fringe of long hairs on the edges of the

Fig. 4.



Right ear of *R. lasiotis*, showing long hairs on ear-conch.

ears, and described it under that name first at the meeting of the British Association at Brighton on the 16th of August [3], and subsequently in a communication to this Society [4].

Dr. Anderson, in his memoir above mentioned, has specially commented on this

[1] See P. Z. S. 1872, p. 129.

[2] See P. Z. S. 1872, p. 185, and Ill. London News, March 23rd, 1872.

[3] See Rep. Brit. Ass. 1872, p. 140; also 'Times,' August 19th, 1872, p. 5; 'Athenæum,' Aug. 24, 1872, p. 243; and 'Nature,' Oct. 24, 1872, p. 518.

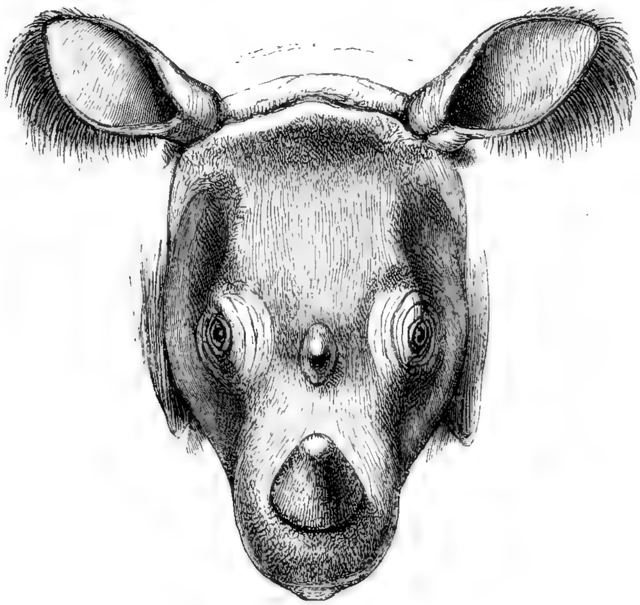
[4] See P. Z. S. 1872, p. 790.

peculiarity, but was inclined to think it might be individual, not being aware of the other differences between the two forms. In *R. sumatrensis* the ears are filled with short bristly hairs internally, but there is no special elongated fringe on the outer edge. In *R. lasiotis* the interior of the ear-conch is nearly naked.

The Sumatran Rhinoceros is also much smaller in bulk than the Hairy-eared, and about 6 inches less in height at the shoulder.

Another point of distinction between the two animals is the longer tail of *R. sumatrensis*, which is only covered by short black straggling bristles. In *R. lasiotis* the tail is shorter and tufted, terminating in long brown hairs.

Fig. 5.



Front view of head of *R. lasiotis*.

Fig. 6.

Front view of head of *R. sumatrensis*.

The distance between the ears is much greater in *R. lasiotis* than in *R. sumatrensis*, as will be seen by the accompanying drawings (figs. 5 and 6); and there can be no doubt that the skulls of the two species, when they can be compared, will exhibit corresponding differences.

The skin of *R. lasiotis* is smoother and paler in colour; the hairs are longer and finer and of a rufescent hue, giving the animal a general colouring of lightish brown. In *R. sumatrensis* the skin is much darker and the hairs are short and bristly.

Whether these and other differences between *R. lasiotis* and the ordinary *R. sumatrensis* will be strengthened by corresponding divergences in their anatomy and osteology cannot be ascertained until the death of the present individual.

In the mean time I may be permitted to state my own opinion, that it will be found that *R. lasiotis* is a northern representative of *R. sumatrensis*, taking its place in Chittagong and Assam, where there are reports of the existence of a Two-horned Rhinoceros [1].

5. Rhinoceros bicornis. (Plate XCIX.)

Rhinoceros unicornis, β. bicornis, Linn. S. N. i. p. 104.
Rhinoceros bicornis, Gm. S. N. i. p. 57, 1788; Sclater, P. Z. S. 1868, p. 529, pl. 41; Rev. Cat. Vert. p. 80; Student & Int. Obs. vol. iv. p. 321, cum tab.; Ill. London News, Oct. 3rd, 1868.
Rhinoceros keitloa, Blanford, Zool. Geol. Abyss. p. 243.
Black Rhinoceros of Abyssinia, Baker, Nile-Tributaries (1872), p. 246.

On the 11th of September, 1868, the first living African Rhinoceros that had been brought to Europe since the days of the Roman Amphitheatre arrived in the Society's Gardens, where it still remains in excellent health and condition. On its arrival this animal, which is of the male sex, and was then quite young (probably not *more* than two years old), measured about 6 feet in length of body, and stood 3 feet 6 inches in height at the shoulders. In August 1872 it stood 4 feet 6 inches in height, and has not much increased in that respect since that date, though the length of its body is now rather greater (about 8 feet 6 inches), and its bulk is certainly more considerable.

Mr. Wolf's drawing (Pl. XCIX.) represents this animal as it appeared in 1872, and may be compared with Mr. Smit's drawing of the same individual (P. Z. S. 1868, pl. 41), which was taken in 1868, shortly after its arrival.

The present animal was purchased by the Council of Mr. Carl Hagenbeck, the well-known dealer of Hamburg, for the sum of £1000. Mr. Hagenbeck had received it a few days previously, along with a large collection of other animals, from the late Herr Casanova, of Vienna. For several years successively this enterprising traveller had been in the habit of visiting in winter the country inhabited by the Hamran Arabs, to the south of Caşsalá, in Upper Nubia, and of bringing home thence Giraffes, Elephants, and other large animals captured by the prowess of those mighty hunters of whom Sir Samuel Baker has told us such marvellous stories [2]. In Herr Casanova's last expedition, made in the winter of 1867–68, this living Rhinoceros was one of his spoils, previous attempts to bring home living specimens of the same animal having been unsuccessful. The African Rhinoceros in the Zoological Gardens of Berlin was received subsequently—from the same source, I believe.

To assign to this animal its correct scientific name is a matter of some little difficulty, as I shall now endeavour to show. Of the two forms of African Rhinoceros commonly distinguished as "White" and "Black"—though, according to some authorities, there

[1] These reports have since been confirmed by more positive evidence. See P. Z. S. 1875, p. 566.
[2] See Baker's 'Nile-Tributaries of Abyssinia' (new edition), 1872, p. 114 *et seq.*

is much variation in the colour of both forms, and these terms do not well distinguish them—there can be no question that our specimen belongs to the latter category. The long extensile upper lip of our animal and the shape of its horns at once show that it is not referable to *R. simus*, and that it belongs to the form of which the species (if there really be more than one) are commonly known as *R. bicornis*. The late Sir

Fig. 7.

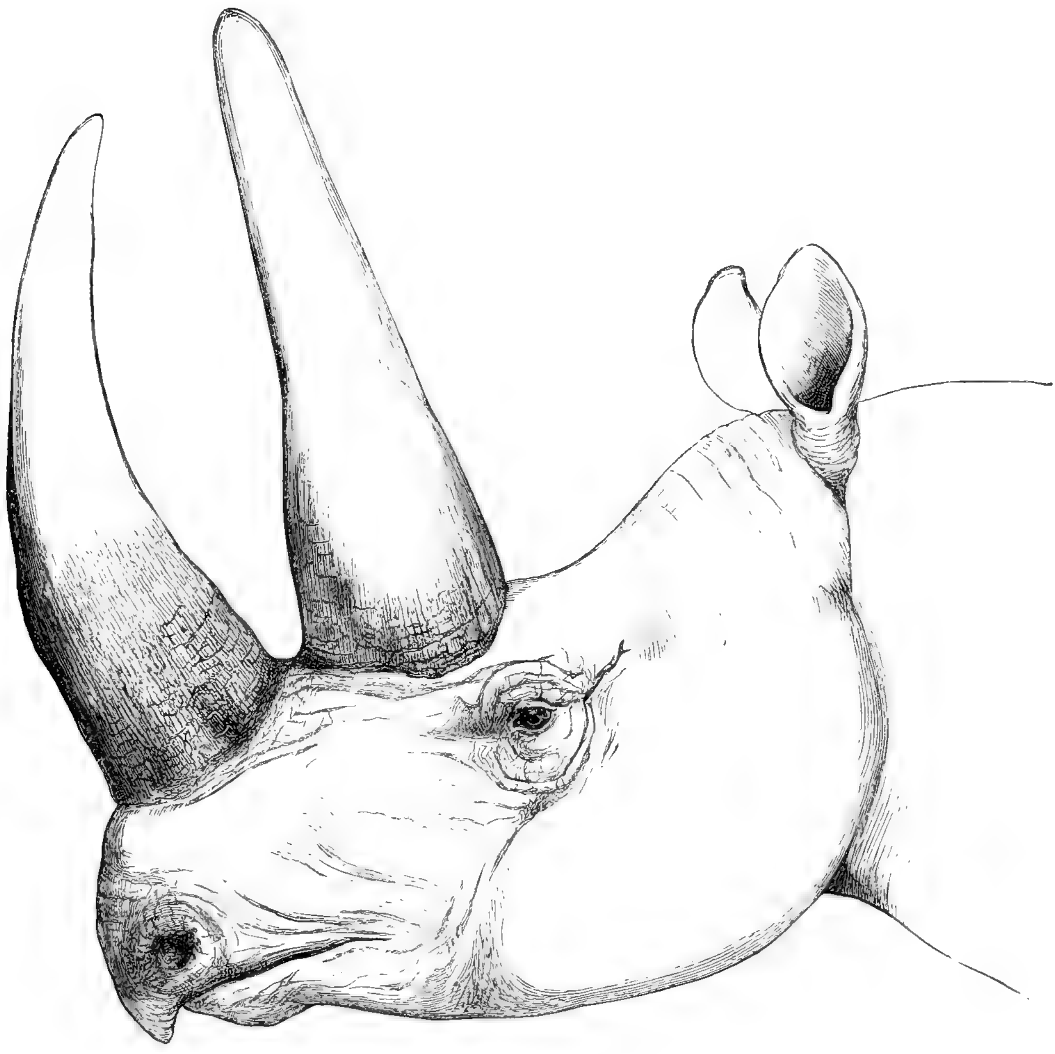
Head of *R. bicornis*, from specimen in Brit. Mus.

Andrew Smith, an excellent authority on African mammals, was the first to separate a species from *R. bicornis* under the name *R. keitloa*[1], distinguished principally by the two horns being equal or nearly equal in length, whereas in *R. bicornis* "the posterior in neither sex is ever much beyond a third of the length of the anterior." On examining the stuffed specimens of these two supposed species in the gallery of the British Museum these differences are most satisfactorily apparent, as will be seen by the sketches which I exhibit (figs. 7 & 8).

[1] See Illustr. Zool. S. Afr., Mammals, pl. 1.

But our Nubian animal, as will be seen from Pl. XCIX., is unfortunately intermediate between the two; and the same is the case with other specimens of African Rhinoceroses that I have examined. Our beast is certainly, as regarded its horns,

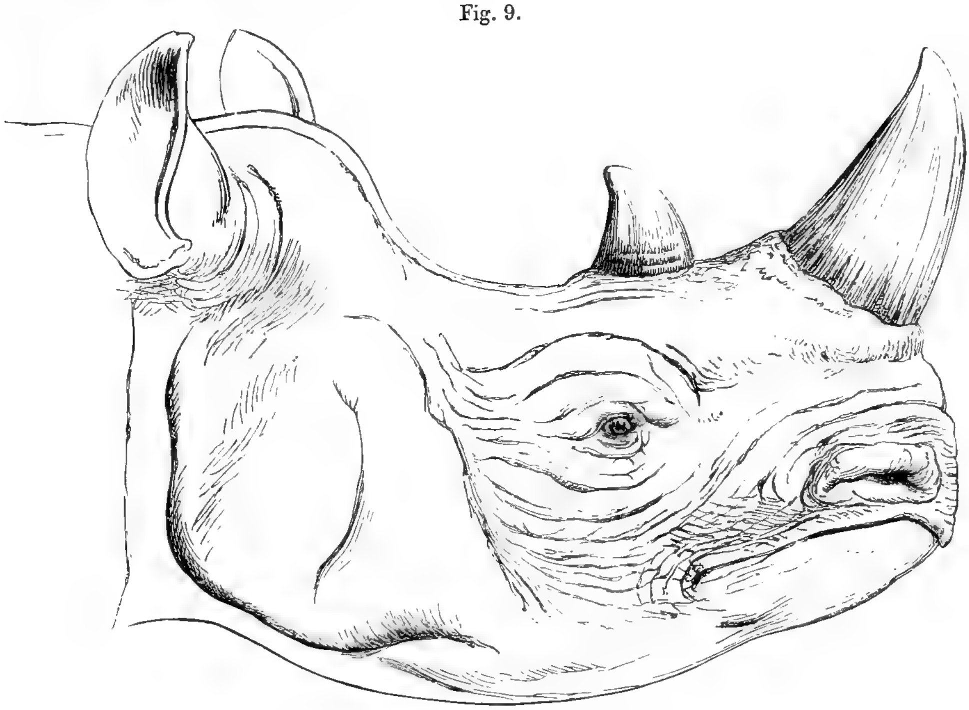
Fig. 8.



Head of *R. keitloa*, from specimen in Brit. Mus.

nearer in character to the so-called *R. keitloa*; and the same was the case with Mr. Blanford's specimen killed on the Anseba, and now in the British Museum, so that Mr. Blanford[1] has identified the Rhinoceros of N.E. Africa with *R. keitloa*[2]. But in the Rhinoceros at Berlin, of the head of which I exhibit a drawing kindly procured for me by Dr. Peters (fig. 9), the horns would appear to be much more nearly like those of *R. bicornis*; and we must recollect that that came from exactly the same district as our specimen. I have also seen other examples of Two-horned Rhinoceroses clearly intermediate between the two forms.

Fig. 9.



Head of Nubian Rhinoceros in Zool. Gard. Berlin.

Under these circumstances I have thought it better for the present to let our Rhinoceros stand under the name *R. bicornis.* At the same time, I think it highly probable that, when more specimens have been obtained and the subject has been more thoroughly investigated, ample difference will be found to exist between *R. bicornis* and *R. keitloa.* And, looking to the extent of country between the known patriæ of these species and the Nubian form to which our animal belongs, I think it by no means unlikely that the latter may be ultimately found to belong to a third species, or, at all events, to a third well-marked geographical race.

[1] Geol. and Zool. of Abyssinia, p. 243.

[2] See also Gray, Ann. N. H. ser. 4, vol. iii. p. 244 (1869), where Mr. Jesse's specimen, killed in Abyssinia, is referred to *R. keitloa.* But in the same author's 'Handlist,' published in 1873 (p. 51), Mr. Blanford's specimen killed on the same occasion is entered as *Rhinaster bicornis*! (*l. c.* p. 51. sp. 1365. *k*).

APPENDIX.

List of Rhinoceroses belonging to the Society's Collection, 1834–1875.

1. RHINOCEROS UNICORNIS, Linn. Indian Rhinoceros.
   - *a.* Male. Purchased, May 28th, 1834. See P. Z. S. 1834, p. 41, and Trans. Zool. Soc. iv. p. 31. Died Sept. 19, 1849.
   - *b.* Female. Purchased, July 5th, 1850. Died Dec. 14, 1873.
   - *c.* Male. Presented by A. Grote, Esq., F.Z.S., July 25, 1864. See P. Z. S. 1864, p. 373.
   - *d.* Female. Brought from Calcutta by the Society's Collector, July 25, 1864. Sent in exchange to the Jardin des Plantes, June 20, 1865.

2. RHINOCEROS SONDAICUS, Cuv. Javan Rhinoceros.
   - *a.* Male. Purchased, March 1, 1874.

3. RHINOCEROS LASIOTIS, Sclater. Hairy-eared Rhinoceros.
   - *a.* Female. Purchased, Feb. 14, 1872. See P. Z. S. 1872, p. 185 et p. 493, pl. 23.

4. RHINOCEROS SUMATRENSIS, Cuv. Sumatran Rhinoceros.
   - *a.* Female. Deposited, Aug. 2; purchased Aug. 21, 1872. Died Sept. 21, 1872. See P. Z. S. 1872, p. 794, pl. 67, et P. Z. S. 1873, p. 92.
   - *b.* Female. Deposited, July 14, 1875.

5. RHINOCEROS BICORNIS, Linn. Two-horned Rhinoceros.
   - *a.* Purchased, Sept. 11, 1868. From Upper Nubia. See P. Z. S. 1868, p. 529, pl. 41.

DESCRIPTION OF THE PLATES.

PLATE XCV.

Rhinoceros unicornis, male.

Lithographed from a water-colour drawing made by Mr. Wolf in 1872, from the male specimen presented by Mr. A. Grote, F.Z.S., July 25, 1864.

PLATE XCVI.

Rhinoceros sondaicus, male.

Lithographed from a water-colour drawing made by Mr. Wolf, in 1874, of the male specimen purchased March 1, 1874.

PLATE XCVII.

Rhinoceros sumatrensis, female.

Lithographed from a water-colour drawing made by Mr. Wolf, in 1872, from the female deposited August 2, 1872, and purchased August 21, 1872.

PLATE XCVIII.

Rhinoceros lasiotis, female.

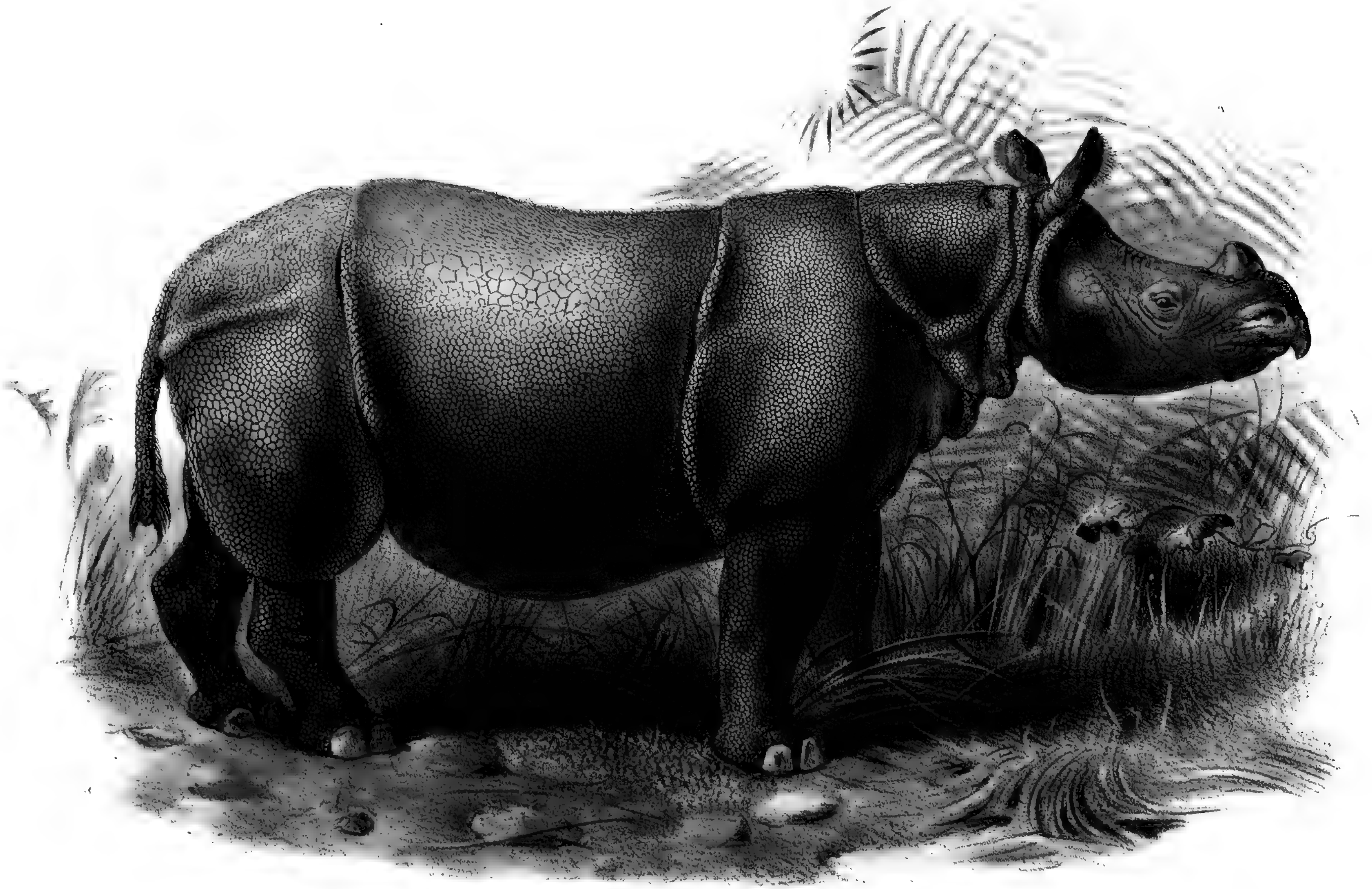
Lithographed from a water-colour drawing made by Mr. Wolf, in 1872, from the female purchased February 14, 1872.

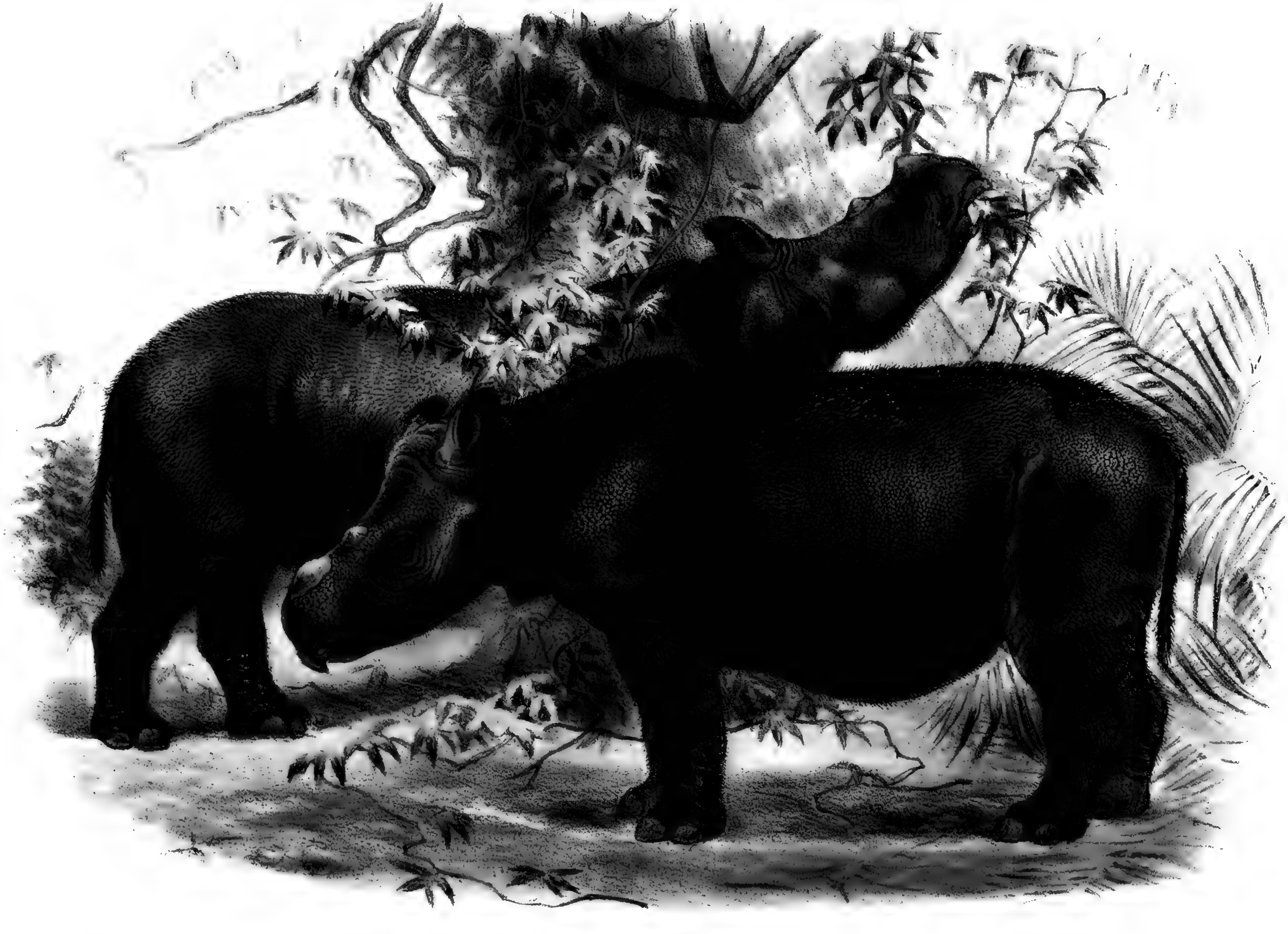
PLATE XCIX.

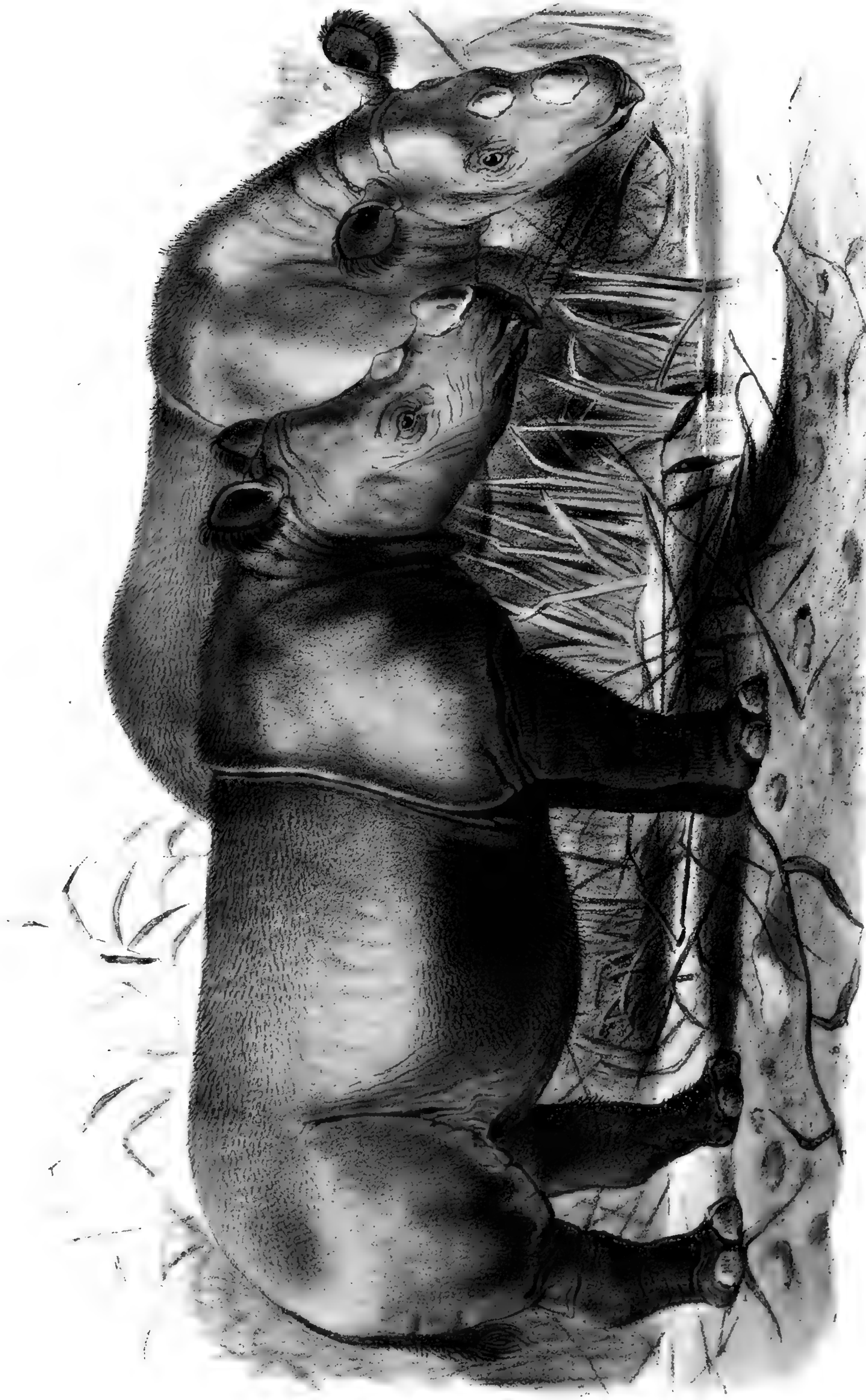
Rhinoceros bicornis, male.

Lithographed from a water-colour drawing made by Mr. Wolf, in 1872, from the male specimen purchased September 11, 1868.

RHINOCEROS UNICORNIS







RHINOCEROS BICORNIS.

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„ 4. (1873)	„	0	15	9		1	1	0
„ 5. (1873)	„	0	18	0		1	4	0
„ 6. (1873)	„	0	19	6		1	6	0
„ 7. (1874)	„	0	16	6		1	2	0
„ 8. (1874)	„	0	18	0		1	4	0
„ 9. (1874)	„	1	11	6		2	2	0
VOLUME IX.								
Part 1.* (1875) containing 22 Plates	Price	1	11	6		2	2	0
„ 2. (1875) containing 12 Plates	„	1	11	6		2	2	0
„ 3. (1875) containing 5 Plates	„		18	0		1	4	0

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P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
June 1, 1875.

CONTENTS.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. IX.—PART 4.

(FOURTEEN PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER, AND DYER, PATERNOSTER-ROW.

1875.

Price 42*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME I. (1833–1835, containing 59 Plates)	Price	3 13 6	4 18 0
Part 1. (1833)	„	0 14 3	0 19 0
„ 2. (1834, out of print.)			
„ 3. (1835)	„	0 15 9	1 1 0
„ 4. (1835)	„	1 5 6	1 14 0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4 0 0	5 6 6
Part 1. (1836)	„	1 4 0	1 12 0
„ 2. (1838, out of print.)			
„ 3. (1839)	„	0 15 0	1 0 0
„ 4. (1840)	„	0 14 3	0 19 0
„ 5. (1841, out of print.)			
VOLUME III. (1842–1849, containing 63 Plates)	Price	3 8 6	4 11 0
Part 1. (1842, out of print.)			
„ 2. (1843)	„	0 14 8	0 19 6
„ 3. (1844)	„	0 14 8	0 19 6
„ 4. (1846, out of print.)			
„ 5. (1848)	„	0 7 10	0 10 6
„ 6. (1849)	„	0 7 10	0 10 6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6 2 0	8 2 6
Part 1. (1851)	„	0 9 0	0 12 0
„ 2. (1852)	„	0 18 9	1 5 0
„ 3. (1853, out of print.)			
„ 4. (1857)	„	0 18 0	1 4 0
„ 5. (1858)	„	0 18 0	1 4 0
„ 6. (1859)	„	0 18 0	1 4 0
„ 7, sec. 1. (1861)	„	0 15 9	1 1 0
„ 7, sec. 2. (1862)	„	0 18 0	1 4 0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5 3 6	6 19 0
Part 1. (1862)	„	0 18 0	1 4 0
„ 2. (1863)	„	0 18 9	1 5 0
„ 3. (1864)	„	1 2 6	1 10 0
„ 4. (1865)	„	1 2 6	1 10 0
„ 5. (1866)	„	1 2 6	1 10 0

[*Continued on page 3 of Wrapper.*]

		To Fellows.			To the Public.		
		£	s.	d.	£	s.	d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11	5	0	15	0	0
Part 1. (1866)	„	1	7	0	1	16	0
„ 2. (1867)	„	1	7	0	1	16	0
„ 3. (1867)	„	1	7	0	1	16	0
„ 4. (1867)	„	1	7	0	1	16	0
„ 5. (1868)	„	1	7	0	1	16	0
„ 6. (1868)	„	1	7	0	1	16	0
„ 7. (1868)	„	1	16	0	2	8	0
„ 8. (1869)	„	1	7	0	1	16	0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8	17	0	11	16	0
Part 1. (1869)	„	1	2	6	1	10	0
„ 2. (1870)	„	1	2	6	1	10	0
„ 3. (1870)	„	1	2	6	1	10	0
„ 4. (1870)	„	1	7	0	1	16	0
„ 5. (1871)	„	1	13	0	2	4	0
„ 6. (1871)	„	1	7	0	1	16	0
„ 7. (1871)	„	1	7	0	1	16	0
„ 8. (1872)	„	1	2	6	1	10	0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9	8	3	12	11	0
Part 1. (1872)	„	0	10	6	0	14	0
„ 2. (1872)	„	1	11	6	2	2	0
„ 3. (1872)	„	1	7	0	1	16	0
„ 4. (1873)	„	0	15	9	1	1	0
„ 5. (1873)	„	0	18	0	1	4	0
„ 6. (1873)	„	0	19	6	1	6	0
„ 7. (1874)	„	0	16	6	1	2	0
„ 8. (1874)	„	0	18	0	1	4	0
„ 9. (1874)	„	1	11	6	2	2	0
VOLUME IX.							
Part 1. (1875) containing 22 Plates	Price	1	11	6	2	2	0
„ 2. (1875) containing 12 Plates	„	1	11	6	2	2	0
„ 3. (1875) containing 5 Plates	„	0	18	0	1	4	0

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P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
July 1875.

CONTENTS.

Presented to the Library, Zoological De[p]
by the Zoological Society
March 2

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. IX.—PART 5.

(NINE PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER, AND DYER, PATERNOSTER-ROW.

1875.

Price 30*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME I. (1833–1835, containing 59 Plates) (out of print)	Price	3 13 6	4 18 0
Part 1. (1833)	„	0 14 3	0 19 0
„ 2. (1834, out of print.)			
„ 3. (1835)	„	0 15 9	1 1 0
„ 4. (1835)	„	1 5 6	1 14 0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4 0 0	5 6 6
Part 1. (1836)	„	1 4 0	1 12 0
„ 2. (1838, out of print.)			
„ 3. (1839)	„	0 15 0	1 0 0
„ 4. (1840)	„	0 14 3	0 19 0
„ 5. (1841, out of print.)			
VOLUME III. (1842–1849, containing 63 Plates)	Price	3 8 6	4 11 0
Part 1. (1842, out of print.)			
„ 2. (1843)	„	0 14 8	0 19 6
„ 3. (1844)	„	0 14 8	0 19 6
„ 4. (1846, out of print.)			
„ 5. (1848)	„	0 7 10	0 10 6
„ 6. (1849)	„	0 7 10	0 10 6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6 2 0	8 2 6
Part 1. (1851)	„	0 9 0	0 12 0
„ 2. (1852)	„	0 18 9	1 5 0
„ 3. (1853, out of print.)			
„ 4. (1857)	„	0 18 0	1 4 0
„ 5. (1858)	„	0 18 0	1 4 0
„ 6. (1859)	„	0 18 0	1 4 0
„ 7, sec. 1. (1861)	„	0 15 9	1 1 0
„ 7, sec. 2. (1862)	„	0 18 0	1 4 0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5 3 6	6 19 0
Part 1. (1862)	„	0 18 0	1 4 0
„ 2. (1863)	„	0 18 9	1 5 0
„ 3. (1864)	„	1 2 6	1 10 0
„ 4. (1865)	„	1 2 6	1 10 0
„ 5. (1866)	„	1 2 6	1 10 0

[*Continued on page 3 of Wrapper.*]

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11 5 0	15 0 0
Part 1. (1866)	„	1 7 0	1 16 0
„ 2. (1867)	„	1 7 0	1 16 0
„ 3. (1867)	„	1 7 0	1 16 0
„ 4. (1867)	„	1 7 0	1 16 0
„ 5. (1868)	„	1 7 0	1 16 0
„ 6. (1868)	„	1 7 0	1 16 0
„ 7. (1868)	„	1 16 0	2 8 0
„ 8. (1869)	„	1 7 0	1 16 0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8 17 0	11 16 0
Part 1. (1869)	„	1 2 6	1 10 0
„ 2. (1870)	„	1 2 6	1 10 0
„ 3. (1870)	„	1 2 6	1 10 0
„ 4. (1870)	„	1 7 0	1 16 0
„ 5. (1871)	„	1 13 0	2 4 0
„ 6. (1871)	„	1 7 0	1 16 0
„ 7. (1871)	„	1 7 0	1 16 0
„ 8. (1872)	„	1 2 6	1 10 0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9 8 3	12 11 0
Part 1. (1872)	„	0 10 6	0 14 0
„ 2. (1872)	„	1 11 6	2 2 0
„ 3. (1872)	„	1 7 0	1 16 0
„ 4. (1873)	„	0 15 9	1 1 0
„ 5. (1873)	„	0 18 0	1 4 0
„ 6. (1873)	„	0 19 6	1 6 0
„ 7. (1874)	„	0 16 6	1 2 0
„ 8. (1874)	„	0 18 0	1 4 0
„ 9. (1874)	„	1 11 6	2 2 0
VOLUME IX.			
Part 1. (1875) containing 22 Plates	Price	1 11 6	2 2 0
„ 2. (1875) containing 12 Plates	„	1 11 6	2 2 0
„ 3. (1875) containing 5 Plates	„	0 18 0	1 4 0
„ 4. (1875) containidg 14 Plates	„	1 11 6	2 2 0

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P L. SCLATER,
Secretary.

11 Hanover Square, London, W.
Dec. 1875.

CONTENTS.

Presented to the Library, Zoological [illegible]
by the Zoological Society.
March 2nd.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

Vol. IX.—Part 6.

(FOUR PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER, AND DYER, PATERNOSTER-ROW.

1876.

Price 14*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £	s.	d.	To the Public. £	s.	d.
VOLUME I. (1833–1835, containing 59 Plates) (out of print)	Price	3	13	6	4	18	0
Part 1. (1833)	„	0	14	3	0	19	0
„ 2. (1834, out of print.)							
„ 3. (1835)	„	0	15	9	1	1	0
„ 4. (1835)	„	1	5	6	1	14	0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4	0	0	5	6	6
Part 1. (1836)	„	1	4	0	1	12	0
„ 2. (1838, out of print.)							
„ 3. (1839)	„	0	15	0	1	0	0
„ 4. (1840)	„	0	14	3	0	19	0
„ 5. (1841, out of print.)							
VOLUME III. (1842–1849, containing 63 Plates)	Price	3	8	6	4	11	0
Part 1. (1842, out of print.)							
„ 2. (1843)	„	0	14	8	0	19	6
„ 3. (1844)	„	0	14	8	0	19	6
„ 4. (1846, out of print.)							
„ 5. (1848)	„	0	7	10	0	10	6
„ 6. (1849)	„	0	7	10	0	10	6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6	2	0	8	2	6
Part 1. (1851)	„	0	9	0	0	12	0
„ 2. (1852)	„	0	18	9	1	5	0
„ 3. (1853, out of print.)							
„ 4. (1857)	„	0	18	0	1	4	0
„ 5. (1858)	„	0	18	0	1	4	0
„ 6. (1859)	„	0	18	0	1	4	0
„ 7, sec. 1. (1861)	„	0	15	9	1	1	0
„ 7, sec. 2. (1862)	„	0	18	0	1	4	0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5	3	6	6	19	0
Part 1. (1862)	„	0	18	0	1	4	0
„ 2. (1863)	„	0	18	9	1	5	0
„ 3. (1864)	„	1	2	6	1	10	0
„ 4. (1865)	„	1	2	6	1	10	0
„ 5. (1866)	„	1	2	6	1	10	0

[*Continued on page 3 of Wrapper.*]

		To Fellows.			To the Public.		
		£	s.	d.	£	s.	d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11	5	0	15	0	0
Part 1. (1866)	,,	1	7	0	1	16	0
,, 2. (1867)	,,	1	7	0	1	16	0
,, 3. (1867)	,,	1	7	0	1	16	0
,, 4. (1867)	,,	1	7	0	1	16	0
,, 5. (1868)	,,	1	7	0	1	16	0
,, 6. (1868)	,,	1	7	0	1	16	0
,, 7. (1868)	,,	1	16	0	2	8	0
,, 8. (1869)	,,	1	7	0	1	16	0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8	17	0	11	16	0
Part 1. (1869)	,,	1	2	6	1	10	0
,, 2. (1870)	,,	1	2	6	1	10	0
,, 3. (1870)	,,	1	2	6	1	10	0
,, 4. (1870)	,,	1	7	0	1	16	0
,, 5. (1871)	,,	1	13	0	2	4	0
,, 6. (1871)	,,	1	7	0	1	16	0
,, 7. (1871)	,,	1	7	0	1	16	0
,, 8. (1872)	,,	1	2	6	1	10	0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9	8	3	12	11	0
Part 1. (1872)	,,	0	10	6	0	14	0
,, 2. (1872)	,,	1	11	6	2	2	0
,, 3. (1872)	,,	1	7	0	1	16	0
,, 4. (1873)	,,	0	15	9	1	1	0
,, 5. (1873)	,,	0	18	0	1	4	0
,, 6. (1873)	,,	0	19	6	1	6	0
,, 7. (1874)	,,	0	16	6	1	2	0
,, 8. (1874)	,,	0	18	0	1	4	0
,, 9. (1874)	,,	1	11	6	2	2	0
VOLUME IX.							
Part 1. (1875, containing 22 Plates)	Price	1	11	6	2	2	0
,, 2. (1875, containing 12 Plates)	,,	1	11	6	2	2	0
,, 3. (1875, containing 5 Plates)	,,	0	18	0	1	4	0
,, 4. (1875, containing 14 Plates)	,,	1	11	6	2	2	0
,, 5. (1875, containing 9 Plates)	,,	1	2	6	1	10	0

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P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
Feb. 1876.

CONTENTS.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

Vol. IX.—Part 7.

(SEVEN PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER, AND DYER, PATERNOSTER-ROW.

1876.

Price 21*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME I. (1833–1835, containing 59 Plates) (out of print)	Price	3 13 6	4 18 0
Part 1. (1833)	„	0 14 3	0 19 0
„ 2. (1834, out of print.)			
„ 3. (1835)	„	0 15 9	1 1 0
„ 4. (1835)	„	1 5 6	1 14 0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4 0 0	5 6 6
Part 1. (1836)	„	1 4 0	1 12 0
„ 2. (1838, out of print.)			
„ 3. (1839)	„	0 15 0	1 0 0
„ 4. (1840)	„	0 14 3	0 19 0
„ 5. (1841, out of print.)			
VOLUME III. (1842–1849, containing 63 Plates)	Price	3 8 6	4 11 0
Part 1. (1842, out of print.)			
„ 2. (1843)	„	0 14 8	0 19 6
„ 3. (1844)	„	0 14 8	0 19 6
„ 4. (1846, out of print.)			
„ 5. (1848)	„	0 7 10	0 10 6
„ 6. (1849)	„	0 7 10	0 10 6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6 2 0	8 2 6
Part 1. (1851)	„	0 9 0	0 12 0
„ 2. (1852)	„	0 18 9	1 5 0
„ 3. (1853, out of print.)			
„ 4. (1857)	„	0 18 0	1 4 0
„ 5. (1858)	„	0 18 0	1 4 0
„ 6. (1859)	„	0 18 0	1 4 0
„ 7, sec. 1. (1861)	„	0 15 9	1 1 0
„ 7, sec. 2. (1862)	„	0 18 0	1 4 0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5 3 6	6 19 0
Part 1. (1862)	„	0 18 0	1 4 0
„ 2. (1863)	„	0 18 9	1 5 0
„ 3. (1864)	„	1 2 6	1 10 0
„ 4. (1865)	„	1 2 6	1 10 0
„ 5. (1866)	„	1 2 6	1 10 0

[*Continued on page 3 of Wrapper.*]

	To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME VI. (1866–1869, containing 91 Plates) . . Price	11 5 0	15 0 0
Part 1. (1866)	,, 1 7 0	1 16 0
,, 2. (1867)	,, 1 7 0	1 16 0
,, 3. (1867)	,, 1 7 0	1 16 0
,, 4. (1867)	,, 1 7 0	1 16 0
,, 5. (1868)	,, 1 7 0	1 16 0
,, 6. (1868)	,, 1 7 0	1 16 0
,, 7. (1868)	,, 1 16 0	2 8 0
,, 8. (1869)	,, 1 7 0	1 16 0
VOLUME VII. (1869–1872, containing 73 Plates) . . Price	8 17 0	11 16 0
Part 1. (1869)	,, 1 2 6	1 10 0
,, 2. (1870)	,, 1 2 6	1 10 0
,, 3. (1870)	,, 1 2 6	1 10 0
,, 4. (1870)	,, 1 7 0	1 16 0
,, 5. (1871)	,, 1 13 0	2 4 0
,, 6. (1871)	,, 1 7 0	1 16 0
,, 7. (1871)	,, 1 7 0	1 16 0
,, 8. (1872)	,, 1 2 6	1 10 0
VOLUME VIII. (1872–1874, containing 82 Plates) . . Price	9 8 3	12 11 0
Part 1. (1872)	,, 0 10 6	0 14 0
,, 2. (1872)	,, 1 11 6	2 2 0
,, 3. (1872)	,, 1 7 0	1 16 0
,, 4. (1873)	,, 0 15 9	1 1 0
,, 5. (1873)	,, 0 18 0	1 4 0
,, 6. (1873)	,, 0 19 6	1 6 0
,, 7. (1874)	,, 0 16 6	1 2 0
,, 8. (1874)	,, 0 18 0	1 4 0
,, 9. (1874)	,, 1 11 6	2 2 0
VOLUME IX.		
Part 1. (1875, containing 22 Plates) . . . . . Price	1 11 6	2 2 0
,, 2. (1875, containing 12 Plates)	,, 1 11 6	2 2 0
,, 3. (1875, containing 5 Plates)	,, 0 18 0	1 4 0
,, 4. (1875, containing 14 Plates)	,, 1 11 6	2 2 0
,, 5. (1875, containing 9 Plates)	,, 1 2 6	1 10 0
,, 6. (1876, containing 4 Plates)	,, 0 10 6	0 14 0

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P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
March 1876.

CONTENTS.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. IX.—PART 8.

(TEN PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER AND DYER, PATERNOSTER-ROW.

1876.

Price 24*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows.				To the Public.		
		£	s.	d.		£	s.	d.
VOLUME I. (1833–1835, containing 59 Plates) (out of print)	Price	3	13	6	. . .	4	18	0
PART 1. (1833)	„	0	14	3	. . .	0	19	0
„ 2. (1834, out of print.)								
„ 3. (1835)	„	0	15	9	. . .	1	1	0
„ 4. (1835)	„	1	5	6	. . .	1	14	0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4	0	0	. . .	5	6	6
PART 1. (1836)	„	1	4	0	. . .	1	12	0
„ 2. (1838, out of print.)								
„ 3. (1839)	„	0	15	0	. . .	1	0	0
„ 4. (1840)	„	0	14	3	. . .	0	19	0
„ 5. (1841, out of print.)								
VOLUME III. (1842–1849, containing 63 Plates)	Price	3	8	6	. . .	4	11	0
PART 1. (1842, out of print.)								
„ 2. (1843)	„	0	14	8	. . .	0	19	6
„ 3. (1844)	„	0	14	8	. . .	0	19	6
„ 4. (1846, out of print.)								
„ 5. (1848)	„	0	7	10	. . .	0	10	6
„ 6. (1849)	„	0	7	10	. . .	0	10	6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6	2	0	. . .	8	2	6
PART 1. (1851)	„	0	9	0	. . .	0	12	0
„ 2. (1852)	„	0	18	9	. . .	1	5	0
„ 3. (1853, out of print.)								
„ 4. (1857)	„	0	18	0	. . .	1	4	0
„ 5. (1858)	„	0	18	0	. . .	1	4	0
„ 6. (1859)	„	0	18	0	. . .	1	4	0
„ 7, sec. 1. (1861)	„	0	15	9	. . .	1	1	0
„ 7, sec. 2. (1862)	„	0	18	0	. . .	1	4	0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5	3	6	. . .	6	19	0
PART 1. (1862)	„	0	18	0	. . .	1	4	0
„ 2. (1863)	„	0	18	9	. . .	1	5	0
„ 3. (1864)	„	1	2	6	. . .	1	10	0
„ 4. (1865)	„	1	2	6	. . .	1	10	0
„ 5. (1866)	„	1	2	6	. . .	1	10	0

[*Continued on page 3 of Wrapper.*]

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11 5 0	15 0 0
Part 1. (1866)	„	1 7 0	1 16 0
„ 2. (1867)	„	1 7 0	1 16 0
„ 3. (1867)	„	1 7 0	1 16 0
„ 4. (1867)	„	1 7 0	1 16 0
„ 5. (1868)	„	1 7 0	1 16 0
„ 6. (1868)	„	1 7 0	1 16 0
„ 7. (1868)	„	1 16 0	2 8 0
„ 8. (1869)	„	1 7 0	1 16 0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8 17 0	11 16 0
Part 1. (1869)	„	1 2 6	1 10 0
„ 2. (1870)	„	1 2 6	1 10 0
„ 3. (1870)	„	1 2 6	1 10 0
„ 4. (1870)	„	1 7 0	1 16 0
„ 5. (1871)	„	1 13 0	2 4 0
„ 6. (1871)	„	1 7 0	1 16 0
„ 7. (1871)	„	1 7 0	1 16 0
„ 8. (1872)	„	1 2 6	1 10 0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9 8 3	12 11 0
Part 1. (1872)	„	0 10 6	0 14 0
„ 2. (1872)	„	1 11 6	2 2 0
„ 3. (1872)	„	1 7 0	1 16 0
„ 4. (1873)	„	0 15 9	1 1 0
„ 5. (1873)	„	0 18 0	1 4 0
„ 6. (1873)	„	0 19 6	1 6 0
„ 7. (1874)	„	0 16 6	1 2 0
„ 8. (1874)	„	0 18 0	1 4 0
„ 9. (1874)	„	1 11 6	2 2 0
VOLUME IX.			
Part 1. (1875, containing 22 Plates)	Price	1 11 6	2 2 0
„ 2. (1875, containing 12 Plates)	„	1 11 6	2 2 0
„ 3. (1875, containing 5 Plates)	„	0 18 0	1 4 0
„ 4. (1875, containing 14 Plates)	„	1 11 6	2 2 0
„ 5. (1875, containing 9 Plates)	„	1 2 6	1 10 0
„ 6. (1876, containing 4 Plates)	„	0 10 6	0 14 0
„ 7. (1876, containing 7 Plates)	„	0 15 9	1 1 0

The 'Transactions' and other publications of the Society may be obtained at the Office (11 Hanover Square, W.), at Messrs. Longmans', the Society's publishers (Paternoster Row, E.C.), or through any bookseller.

Fellows, Honorary, Foreign, and Corresponding Members of the Society, who pay a Subscription of £1 1s. before the day of the Anniversary Meeting (April 29th) in each year, are entitled to receive all the Society's Publications for the year. They are likewise entitled to purchase the Publications of the Society at 25 per cent. less than the price charged for them to the Public. A further reduction of 25 per cent. is made upon purchases of Publications issued prior to 1861, if they exceed the value of five pounds.

P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
March 21st, 1876.

CONTENTS.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. IX.—PART 9.

(SIX PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER AND DYER, PATERNOSTER-ROW.

1876.

Price 32*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME I. (1833–1835, containing 59 Plates) (out of print)	Price	3 13 6	4 18 0
Part 1. (1833)	,,	0 14 3	0 19 0
,, 2. (1834, out of print.)			
,, 3. (1835)	,,	0 15 9	1 1 0
,, 4. (1835)	,,	1 5 6	1 14 0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4 0 0	5 6 6
Part 1. (1836)	,,	1 4 0	1 12 0
,, 2. (1838, out of print.)			
,, 3. (1839)	,,	0 15 0	1 0 0
,, 4. (1840)	,,	0 14 3	0 19 0
,, 5. (1841, out of print.)			
VOLUME III. (1842–1849, containing 63 Plates)	Price	3 8 6	4 11 0
Part 1. (1842, out of print.)			
,, 2. (1843)	,,	0 14 8	0 19 6
,, 3. (1844)	,,	0 14 8	0 19 6
,, 4. (1846, out of print.)			
,, 5. (1848)	,,	0 7 10	0 10 6
,, 6. (1849)	,,	0 7 10	0 10 6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6 2 0	8 2 6
Part 1. (1851)	,,	0 9 0	0 12 0
,, 2. (1852)	,,	0 18 9	1 5 0
,, 3. (1853, out of print.)			
,, 4. (1857)	,,	0 18 0	1 4 0
,, 5. (1858)	,,	0 18 0	1 4 0
,, 6. (1859)	,,	0 18 0	1 4 0
,, 7, sec. 1. (1861)	,,	0 15 9	1 1 0
,, 7, sec. 2. (1862)	,,	0 18 0	1 4 0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5 3 6	6 19 0
Part 1. (1862)	,,	0 18 0	1 4 0
,, 2. (1863)	,,	0 18 9	1 5 0
,, 3. (1864)	,,	1 2 6	1 10 0
,, 4. (1865)	,,	1 2 6	1 10 0
,, 5. (1866)	,,	1 2 6	1 10 0

[*Continued on page 3 of Wrapper.*]

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11 5 0	15 0 0
Part 1. (1866)	„	1 7 0	1 16 0
„ 2. (1867)	„	1 7 0	1 16 0
„ 3. (1867)	„	1 7 0	1 16 0
„ 4. (1867)	„	1 7 0	1 16 0
„ 5. (1868)	„	1 7 0	1 16 0
„ 6. (1868)	„	1 7 0	1 16 0
„ 7. (1868)	„	1 16 0	2 8 0
„ 8. (1869)	„	1 7 0	1 16 0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8 17 0	11 16 0
Part 1. (1869)	„	1 2 6	1 10 0
„ 2. (1870)	„	1 2 6	1 10 0
„ 3. (1870)	„	1 2 6	1 10 0
„ 4. (1870)	„	1 7 0	1 16 0
„ 5. (1871)	„	1 13 0	2 4 0
„ 6. (1871)	„	1 7 0	1 16 0
„ 7. (1871)	„	1 7 0	1 16 0
„ 8. (1872)	„	1 2 6	1 10 0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9 8 3	12 11 0
Part 1. (1872)	„	0 10 6	0 14 0
„ 2. (1872)	„	1 11 6	2 2 0
„ 3. (1872)	„	1 7 0	1 16 0
„ 4. (1873)	„	0 15 9	1 1 0
„ 5. (1873)	„	0 18 0	1 4 0
„ 6. (1873)	„	0 19 6	1 6 0
„ 7. (1874)	„	0 16 6	1 2 0
„ 8. (1874)	„	0 18 0	1 4 0
„ 9. (1874)	„	1 11 6	2 2 0
VOLUME IX.			
Part 1. (1875, containing 22 Plates)	Price	1 11 6	2 2 0
„ 2. (1875, containing 12 Plates)	„	1 11 6	2 2 0
„ 3. (1875, containing 5 Plates)	„	0 18 0	1 4 0
„ 4. (1875, containing 14 Plates)	„	1 11 6	2 2 0
„ 5. (1875, containing 9 Plates)	„	1 2 6	1 10 0
„ 6. (1876, containing 4 Plates)	„	0 10 6	0 14 0
„ 7. (1876, containing 7 Plates)	„	0 15 9	1 1 0
„ 8. (1876, containing 10 Plates)	„	0 18 0	1 4 0

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P. L. SCLATER,
Secretary.

11 Hanover Square, London, W.
July 6th, 1876.

CONTENTS.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. IX.—PART 10.

(FIVE PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER AND DYER, PATERNOSTER-ROW.

February 1*st*, 1877.

Price 30*s*.

Taylor and Francis, Printers.] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows.			To the Public.		
		£	s.	d.	£	s.	d.
VOLUME I. (1833–1835, containing 59 Plates)	Price	3	13	6	4	18	0*
Part 1. (1833)	„	0	14	3	0	19	0
„ 2. (1834)*							
„ 3. (1835)	„	0	15	9	1	1	0
„ 4. (1835)	„	1	5	6	1	14	0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4	0	0	5	6	6*
Part 1. (1836)	„	1	4	0	1	12	0
„ 2. (1838)*							
„ 3. (1839)	„	0	15	0	1	0	0
„ 4. (1840)	„	0	14	3	0	19	0
„ 5. (1841)*							
VOLUME III. (1842–1849, containing 63 Plates)	Price	3	8	6	4	11	0*
Part 1. (1842)*							
„ 2. (1843)	„	0	14	8	0	19	6
„ 3. (1844)	„	0	14	8	0	19	6
„ 4. (1846)*							
„ 5. (1848)	„	0	7	10	0	10	6
„ 6. (1849)	„	0	7	10	0	10	6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6	2	0	8	2	6
Part 1. (1851)	„	0	9	0	0	12	0
„ 2. (1852)	„	0	18	9	1	5	0
„ 3. (1853)*							
„ 4. (1857)	„	0	18	0	1	4	0
„ 5. (1858)	„	0	18	0	1	4	0
„ 6. (1859)	„	0	18	0	1	4	0
„ 7, sec. 1. (1861)	„	0	15	9	1	1	0
„ 7, sec. 2. (1862)	„	0	18	0	1	4	0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5	3	6	6	19	0
Part 1. (1862)	„	0	18	0	1	4	0
„ 2. (1863)	„	0	18	9	1	5	0
„ 3. (1864)	„	1	2	6	1	10	0
„ 4. (1865)	„	1	2	6	1	10	0
5. (1866)	„	1	2	6	1	10	0

[*Continued on page 3 of Wrapper.*]

* The volumes and parts thus marked are out of print.

	To Fellows. £	s.	d.	To the Public. £	s.	d.
VOLUME VI. (1866–1869, containing 91 Plates) . . Price	11	5	0	15	0	0
Part 1. (1866) . . . . „	1	7	0	1	16	0
„ 2. (1867) . . . . „	1	7	0	1	16	0
„ 3. (1867) . . . . „	1	7	0	1	16	0
„ 4. (1867) . . . . „	1	7	0	1	16	0
„ 5. (1868) . . . . „	1	7	0	1	16	0
„ 6. (1868) . . . . „	1	7	0	1	16	0
„ 7. (1868) . . . . „	1	16	0	2	8	0
„ 8. (1869) . . . . „	1	7	0	1	16	0
VOLUME VII. (1869–1872, containing 73 Plates) . . Price	8	17	0	11	16	0
Part 1. (1869) . . . . „	1	2	6	1	10	0
„ 2. (1870) . . . . „	1	2	6	1	10	0
„ 3. (1870) . . . . „	1	2	6	1	10	0
„ 4. (1870) . . . . „	1	7	0	1	16	0
„ 5. (1871) . . . . „	1	13	0	2	4	0
„ 6. (1871) . . . . „	1	7	0	1	16	0
„ 7. (1871) . . . . „	1	7	0	1	16	0
„ 8. (1872) . . . . „	1	2	6	1	10	0
VOLUME VIII. (1872–1874, containing 82 Plates) . . Price	9	8	3	12	11	0
Part 1. (1872) . . . . „	0	10	6	0	14	0
„ 2. (1872) . . . . „	1	11	6	2	2	0
„ 3. (1872) . . . . „	1	7	0	1	16	0
„ 4. (1873) . . . . „	0	15	9	1	1	0
„ 5. (1873) . . . . „	0	18	0	1	4	0
„ 6. (1873) . . . . „	0	19	6	1	6	0
„ 7. (1874) . . . . „	0	16	6	1	2	0
„ 8. (1874) . . . . „	0	18	0	1	4	0
„ 9. (1874) . . . . „	1	11	6	2	2	0
VOLUME IX.						
Part 1. (1875, containing 22 Plates) . . . . . Price	1	11	6	2	2	0
„ 2. (1875, containing 12 Plates) . . . . . „	1	11	6	2	2	0
„ 3. (1875, containing 5 Plates) . . . . . . „	0	18	0	1	4	0
„ 4. (1875, containing 14 Plates) . . . . . „	1	11	6	2	2	0
„ 5. (1875, containing 9 Plates) . . . . . . „	1	2	6	1	10	0
„ 6. (1876, containing 4 Plates) . . . . . . „	0	10	6	0	14	0
„ 7. (1876, containing 7 Plates) . . . . . . „	0	15	9	1	1	0
„ 8. (1876, containing 10 Plates) . . . . . „	0	18	0	1	4	0
„ 9. (1876, containing 6 Plates) . . . . . . „	1	4	0	1	12	0

The 'Transactions' and other publications of the Society may be obtained at the Office (11 Hanover Square, W.), at Messrs. Longmans', the Society's publishers (Paternoster Row, E.C.), or through any bookseller

CONTENTS.

THE PUBLICATIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

The scientific publications of the Zoological Society are of two kinds—"Proceedings," published in an octavo form, and "Transactions," in quarto.

According to the present arrangements, the "Proceedings" contain not only notices of all business transacted at the scientific meetings, but also all the papers read at such meetings and recommended to be published by the Committee of Publication. From fifty to seventy coloured plates and engravings are attached to each annual volume of the "Proceedings," to illustrate the new or otherwise remarkable species of animals described in them. Amongst such illustrations, figures of the new or rare species acquired in a living state for the Society's Gardens are often given.

The "Proceedings" for each year are issued in four parts, on the first of the months of June, August, October, and April, the part published in April completing the volume for the preceding year. They may be obtained with black or coloured illustrations.

The "Transactions" contain such of the more important communications made to the scientific meetings of the Society as, on account of the nature of the plates required to illustrate them, are better adapted for publication in the quarto form. They are published at irregular intervals, but not less than three parts are usually issued in each year.

Fellows, and Corresponding Members, upon payment of a Subscription of £1 1s. before the day of the Anniversary Meeting in each year, are entitled to receive all the Society's Publications for the year. They are likewise entitled to purchase the Publications of the Society at 25 per cent. less than the price charged for them to the Public. A further reduction of 25 per cent. is made upon purchases of Publications issued prior to 1861, if they exceed the value of five pounds.

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January 15th, 1877.

P. L. SCLATER,
Secretary.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

Vol. IX.—Part 11.

[CONCLUDING THE VOLUME.]

(FIVE PLATES.)

LONDON:

PRINTED FOR THE SOCIETY:

SOLD AT THEIR HOUSE IN HANOVER-SQUARE;

AND BY MESSRS. LONGMANS, GREEN, READER AND DYER, PATERNOSTER-ROW.

March 1*st*, 1877.

Price 21*s*.

Taylor and Francis, Printers,] [Red Lion Court, Fleet Street.

TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON.

		To Fellows. £ s. d.	To the Public. £ s. d.
VOLUME I. (1833–1835, containing 59 Plates)	Price	3 13 6	4 18 0*
Part 1. (1833)	„	0 14 3	0 19 0
„ 2. (1834)*			
„ 3. (1835)	„	0 15 9	1 1 0
„ 4. (1835)	„	1 5 6	1 14 0
VOLUME II. (1836–1841, containing 71 Plates)	Price	4 0 0	5 6 6*
Part 1. (1836)	„	1 4 0	1 12 0
„ 2. (1838)*			
„ 3. (1839)	„	0 15 0	1 0 0
„ 4. (1840)	„	0 14 3	0 19 0
„ 5. (1841)*			
VOLUME III. (1842–1849, containing 63 Plates)	Price	3 8 6	4 11 0*
Part 1. (1842)*			
„ 2. (1843)	„	0 14 8	0 19 6
„ 3. (1844)	„	0 14 8	0 19 6
„ 4. (1846)*			
„ 5. (1848)	„	0 7 10	0 10 6
„ 6. (1849)	„	0 7 10	0 10 6
VOLUME IV. (1851–1862, containing 78 Plates)	Price	6 2 0	8 2 6
Part 1. (1851)	„	0 9 0	0 12 0
„ 2. (1852)	„	0 18 9	1 5 0
„ 3. (1853)*			
„ 4. (1857)	„	0 18 0	1 4 0
„ 5. (1858)	„	0 18 0	1 4 0
„ 6. (1859)	„	0 18 0	1 4 0
„ 7, sec. 1. (1861)	„	0 15 9	1 1 0
„ 7, sec. 2. (1862)	„	0 18 0	1 4 0
VOLUME V. (1862–1866, containing 67 Plates)	Price	5 3 6	6 19 0
Part 1. (1862)	„	0 18 0	1 4 0
„ 2. (1863)	„	0 18 9	1 5 0
„ 3. (1864)	„	1 2 6	1 10 0
„ 4. (1865)	„	1 2 6	1 10 0
„ 5. (1866)	„	1 2 6	1 10 0

[*Continued on page* 3 *of Wrapper.*]

* The volumes and parts thus marked are out of print.

		To Fellows. £	s.	d.	To the Public. £	s.	d.
VOLUME VI. (1866–1869, containing 91 Plates)	Price	11	5	0	15	0	0
Part 1. (1866)	„	1	7	0	1	16	0
„ 2. (1867)	„	1	7	0	1	16	0
„ 3. (1867)	„	1	7	0	1	16	0
„ 4. (1867)	„	1	7	0	1	16	0
„ 5. (1868)	„	1	7	0	1	16	0
„ 6. (1868)	„	1	7	0	1	16	0
„ 7. (1868)	„	1	16	0	2	8	0
„ 8. (1869)	„	1	7	0	1	16	0
VOLUME VII. (1869–1872, containing 73 Plates)	Price	8	17	0	11	16	0
Part 1. (1869)	„	1	2	6	1	10	0
„ 2. (1870)	„	1	2	6	1	10	0
„ 3. (1870)	„	1	2	6	1	10	0
„ 4. (1870)	„	1	7	0	1	16	0
„ 5. (1871)	„	1	13	0	2	4	0
„ 6. (1871)	„	1	7	0	1	16	0
„ 7. (1871)	„	1	7	0	1	16	0
„ 8. (1872)	„	1	2	6	1	10	0
VOLUME VIII. (1872–1874, containing 82 Plates)	Price	9	8	3	12	11	0
Part 1. (1872)	„	0	10	6	0	14	0
„ 2. (1872)	„	1	11	6	2	2	0
„ 3. (1872)	„	1	7	0	1	16	0
„ 4. (1873)	„	0	15	9	1	1	0
„ 5. (1873)	„	0	18	0	1	4	0
„ 6. (1873)	„	0	19	6	1	6	0
„ 7. (1874)	„	0	16	6	1	2	0
„ 8. (1874)	„	0	18	0	1	4	0
„ 9. (1874)	„	1	11	6	2	2	0
VOLUME IX.							
Part 1. (1875, containing 22 Plates)	Price	1	11	6	2	2	0
„ 2. (1875, containing 12 Plates)	„	1	11	6	2	2	0
„ 3. (1875, containing 5 Plates)	„	0	18	0	1	4	0
„ 4. (1875, containing 14 Plates)	„	1	11	6	2	2	0
„ 5. (1875, containing 9 Plates)	„	1	2	6	1	10	0
„ 6. (1876, containing 4 Plates)	„	0	10	6	0	14	0
„ 7. (1876, containing 7 Plates)	„	0	15	9	1	1	0
„ 8. (1876, containing 10 Plates)	„	0	18	0	1	4	0
„ 9. (1876, containing 6 Plates)	„	1	4	0	1	12	0
„ 10. (1877, containing 5 Plates)	„	1	2	6	1	10	0

CONTENTS.

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