The Extinct Birds of Rodriguez.*—*By Dr. A. Günther, F.R.S., and Edward Newton, C.M.G., M.A., F.L.S.*

(Plates XLI.–XLIII.)

The following notes are the results of our examination of two sets of materials, one collected by Mr. H. H. Slater, one of the naturalists of the Transit of Venus Expedition, the other obtained previously by Mr. George Jenner when magistrate of Rodriguez. The majority of the remains brought home by Mr. Slater have been deposited in the British Museum, whilst the bulk of the latter set has been deposited in the Museum of Zoology of the University of Cambridge. As far as practicable, and without detracting from the value of each set, the two sets have been mutually supplemented by an exchange of duplicate specimens, but originally they consisted of the following remains:—

Carine murivora.

	T. of V.	Jenner.		T. of V.	Jenner.
Cranium	—	1	Metacarpus	1	2
Mandible	1	1	Coracoid	—	1
Pelvis	2	3	Femur	3	9
Humerus	4	5	Tibia	2	10
Ulna	—	2	Metatarsus	3	6

Necropsar rodericanus.

Cranium	1	1	Ulna	8	—
Mandible	1	2	Metacarpus	1	—
Sternum	—	1	Femur	2	2
Coracoid	1	—	Tibia	15	23
Humerus	5	7	Metatarsus	11	5

Turtur picturatus.

Sterna	3	—	Tibia	4	—
Humerus	1	—	Metatarsus	1	—

Necropsittacus rodericanus.

Upper part of cranium	—	1	Ulna	2	1
Mandible	1	1	Femur	2	1
Coracoid	2	—	Tibia	2	2
Humerus	6	4	Tarsus	1	—

Palæornis exsul.

Humerus	—	6	Femur	—	1
Ulna	—	1	Tibia	—	5

* With the exception of the Solitaire, which is the subject of a subsequent separate paper.

Erythromachus leguati.

	T. of V.	Jenner.		T. of V.	Jenner.
Cranium	1	2	Ulna	8	4
Bill	5	2	Radius	2	—
Mandible	—	5	Metacarpus	2	—
Pelvis	5	6	Femur	13	15
Sternum	2	—	Tibia	16	18
Scapula	1	—	Tarsus	10	17
Humerus	3	12			

Ardea megacephala.

Cranium with bill	—	1	Ulna	—	2
Tympanic	—	1	Radius	—	1
Mandible	2	1	Metacarpus	1	2
Pelvis	—	1	Phalanx	—	1
Vertebra	—	3	Femur	2	1
Sternum	—	1	Tibia	2	$2\frac{1}{2}$
Coracoid	—	2	Fibula	—	1
Scapula	—	2	Metatarsus	4	4
Humerus	2	4	Phalanx	—	3

Carine murivora (*A. M.-Edw.*)

(Plate XLI., Figs. A.–F.)

M. A. Milne-Edwards (Ann. Sc. Nat. Zool. t. xix., art. 3, p. 12) recognized two tibiæ and one metatarsus as belonging to two species of Owls, one of which he named *Strix* (*Athene*) *murivora*, the other (represented by one tibia only) he left unnamed. This last was 6 mm. longer than that of *C. murivora*, and said to be distinguished by a shorter and less projecting peroneal crest. Having this individual bone before us, together with a considerable number of tibiæ of the shorter and longer kind, we have been able to ascertain that a great portion of the peroneal crest is broken away, that in perfect specimens the crest of the longer bones is as much developed as in the shorter ones, and that, in fact, the former are evidently those of females and the latter of males, according to the difference in size which obtains between the sexes of nearly all the nocturnal birds of prey.

After having satisfied ourselves that all the Strigine remains from Rodriguez are referable to one species only, *Carine murivora*, we hoped to be able, with the aid of so much more material than was at the disposal of M. Milne-Edwards, to throw more light on its generic affinities. In this we were not successful, chiefly for the reason that the genera of Owls adopted by some ornithologists do not by any means coincide with osteological modifications, and that the Rodriguez Owl shows a combination of osteological characters which we have not found in any of the numerous skeletons of *Striges* with which we have compared it (*Bubo, Scops, Surnia, Carine, Ninox, Glaucidium, Asio, &c.*).

Of the *cranium* (Fig. A.), the frontal region, with a portion of the parietal region, has been preserved. The frontal bone is not swollen at the root of the bill, as, for

instance, in *Carine boobook* or *C. hirsuta*, but rather concave, as in *C. infuscata* and *C. noctua*. The orbit appears to have been of an unusually short diameter, and the eye is not protected by the long supraorbital process of *C. noctua* and *C. infuscata*, this process being reduced to a very short prominence, as in *C. novæ-zelandiæ*, *C. boobook*, and *C. hirsuta*. The margin of the orbit in front of the supra-orbital protuberance is longitudinally grooved. Width of anterior part of frontal region, 13 mm.; least width of interorbital space, 15½ mm.

The *mandible* (Fig. B.) does not show any peculiarity; one of the rami is 40 mm. long.

The form of the *pelvis* (Fig. E.), particularly of the postacetabular portion, differs from that of all other Owls with which we are acquainted. The anterior iliac blades are of moderate width, presenting a deeply excavated outer surface, the lower portion of which is nearly horizontal, a small pointed tubercle projecting on its outer margin (as in *Scops rutilus*). The convergent dorsal edges of this part of the ilium do not coalesce into a crest, but are connected by a flattened lamina, which forms the roof over the large longitudinal vacuities on each side of the sacral crest. In its middle the pelvis is but moderately constricted. The postacetabular portion is broad, chiefly owing to the great width of the sacrum, which is of rhombic shape, dorsally slightly depressed in the median line. The post-iliac crest is unusually prominent and more strongly curved, in an S-shaped line, than in any other Owl with which we are acquainted.

There exist considerable modifications of the configuration and arrangement of the foramina for the sacral nerves in the various species of Owls, even in such as are referred to the same genus. The Rodriguez Owl resembles in this respect *Carine noctua*, and still more *Scops rutilus*, the three anterior foramina being equidistant from each other, of nearly the same width, and separated by the strong pleurapophyses, all of which are perpendicular to the axis of the vertebral column. The fourth foramen is much constricted by pleurapophyses, which are much stronger than the preceding, and situated at a different level, opposite to the point of the greatest constriction of the pelvis. The deep anterior and posterior renal excavations are separated from each other by a pair of slender pleurapophyses. On the whole, the pelvis of this bird is of an unusually strong build, and well adapted to form the base of the powerful muscles of the trunk and hind limbs by which this small-bodied bird was enabled to keep down the rats with which the Island was infested, as Leguat informs us, and later to overpower "les petits oiseau et les petits lézards" as the author of an old manuscript says it did.*

* Professor Newton has published the abstract of this MS. "Relation de l'Ile Rodrigue," in Proc. Zool. Soc. 1875, p. 39; and the entire MS. has been published by Professor A. Milne-Edwards in Ann. Sci. Nat. (6) ii. art. 4, pp. 20.

The passage runs as follows:—"On voit une oiseau qui est à peu près comme la chouette, et qui mange "les petits oiseau et les petits lézards."

The pelvis does not appear to vary much in size.

—	Carine murivora.	Carine boobok.	Asio accipitrinus.
Length of pelvis (to end of sacrum)	36 mm.	34 mm.	40 mm.
Greatest width of anterior part -	21 „	22 „	21 „
Least width of anterior part -	14 „	14 „	13½ „
Greatest width of posterior part -	29 „	23 „	25 „

The single *limb-bones* do not show any characteristic features, and very little need be said about them beyond the general conclusion at which we have arrived from comparative measurements of those of other Owls. The *coracoid* (Fig. C.) is a little weaker than in *C. boobook*, and 30 mm. long, its sternal extremity being 10 mm. broad. The *foramen nutritium* of the shaft of the *humerus* (Fig. D.) is generally (but not constantly) nearer to the distal than to the proximal extremity. The *ulna* shows elevations for the secondaries. In the *femur* (Fig. F.) all the lines and grooves for muscular insertions are strongly marked; the outer inferior condyle is very prominent, and provided with a deep groove for the tendon behind. The *tibia* and *metatarsus* have been described by M. Milne-Edwards.

The discovery of a part of the cranium and the pelvis enabled us to obtain a pretty accurate idea of the size of the Rodriguez Owl. Its body was rather larger than that of *C. boobook*, but considerably smaller than that of *Asio accipitrinus*. The wing was clearly somewhat shorter and a little less developed than in either of those Owls, though the power of flight of this bird cannot have been much impaired. On the other hand, the length and strength of its legs, as compared to the size of the body, and especially to the length of the wing, was much more than in any of the species of Owls, the skeletons of which we have been able to compare, as will be seen from some of the measurements which we have taken, and which we tabulate thus :—

—	Humerus.	Ulna.	Metacarpus.	Femur.	Tibia.	Metatarsus.
	longest. shortest.			longest. shortest.	long. short.	long. short.
Carine murivora - -	69 × 64	74	36	54 × 50	76×69	46×41
„ boobook - -	69	76	36	48	74	41
„ infumata - -	49	28	58	39	58	36
„ noctua - -	51	28	56	41	59	37
„ hirsuta - -	56	30	64	39	60	32
„ castaneoptera -	48	55	24	33	49	23
„ connivens - -	115	137	60	65	109	—
Spiloglaux novæ-zelandiæ -	58	30	65	41	64	35
Asio accipitrinus - -	81	90	42	54	77	40
Scops rutilus - - -	47	54	23	32	50	28
Bubo virginianus - -	163	178	85	101	146	75
Ketupa zeylonensis - -	76	121	68	120	129	54

Necropsar rodericanus, Slater.

(Pl. XLII., Figs. A.–G.)

The discovery of an extinct Starling in Rodriguez, allied to the *Fregilupus* of Réunion, which appears to have held out a little longer in struggling for its existence within so narrow limits, is undoubtedly one of the most interesting results of Mr. Slater's labours. He recognised and determined the affinities of the remains found by him, and says, in preliminary manuscript notes appended to his general report: "Professor Newton prophesied, as it were, the existence of this bird (Proc. "Zool. Soc. 1875, p. 41) when, alluding to a bird mentioned in a manuscript "'Relation de l'Ile Rodrigue,' he said, 'I am at a loss to conjecture what these birds "were, unless possibly of some form allied to *Fregilupus*.' *Necropsar* is altogether a "smaller bird than *Fregilupus*, to which it is most closely allied. If it were a "mammal, I should not make a separate genus of it; but as it is a bird, I think I "cannot do less."

After a close scrutiny of all circumstances, we quite agree with the discoverer of this bird in questioning the propriety of generically separating two species, on what appear to us very slight modifications of the osteological frame; and we retain the name *Necropsar* merely from the wish of conforming with the present ornithological practice.

In the following notes more especially those points will be mentioned in which the Rodriguez Starling differs from that of Réunion, the latter having been fully described in Dr. Murie's excellent paper in Proc. Zool. Soc. 1874, p. 474, to which we have to refer for other details. The skeleton of *Fregilupus* itself, which is unique, has been lent to us by Professor Newton.

Of the *skull* of *Necropsar* (Fig. A.) the cranium with the maxilla and mandible has been preserved; but all the bones of the palatal region and the tympanic have been lost. It is extremely similar to the skull of *Fregilupus*, and more especially possesses a postorbital muscular impression above the temporal fossa, which is very conspicuous in *Fregilupus* and *Acridotheres* (*cristatellus*), and faintly visible also in the common Starling (*Sturnus*). But it differs from *Fregilupus* in having not only the supraoccipital ridge conspicuously more developed, but also in showing, besides, an additional line of muscular insertion (biventer *) running across the parietal region, subconcentric with the supraoccipital ridge. The development of these ridges indicates a corresponding increase of strength in the muscles of the neck and articular end of mandible. The maxilla is a little shorter, and decidedly less curved, and less slender at the extremity than in *Fregilupus*, the nasal aperture being longer and generally larger. The mandible † is on

* See Owen, Anat. Vert. II., p. 85, fig. 35. 18.

† The articular facet of the mandible is figured on Pl. XLII., Figs. *a* and a^1, half as large again as the natural size. Fig. *a* represents its configuration as it appears in two of the specimens before us; but in

the whole of a stouter build, and about the middle of its length (at the angle of the mouth) more bent, in the fashion of the corresponding part of the Starling. Peculiarities all of which indicate that *Necropsar* had to use greater force than *Fregilupus* in searching and perhaps digging for its food, and that it possessed in an eminent degree the capability found in several species of Starlings and Crows, of removing objects or forcing an entrance in their search for food, by first inserting their wedge-shaped bill and then opening the mandibles.

The greater strength of the bill would also be fully accounted for, if *Necropsar* be the bird described in the old manuscript previously mentioned as feeding on eggs and dead tortoises, "qu'ils savent assez bien déchirer." *

The fenestra in the interorbital septum is wider than in *Fregilupus*.

——	Fregilupus.	Necropsar.			
		A.	B.	C.	D.
Length of cranium (measured from occipital condyle) -	26 mm.	—	—	28 mm. or	29 mm.
Greatest width of cranium - - - -	23 „	—	—	21 „	21 „
Width of interorbital space - - - -	7½ „	—	—	8 „	8 „
Length of bill - - - - -	41 „	—	—	39 „	36 „
„ nasal aperture - - - -	11 „	—	—	13 „	12 „
„ mandible - - - - -	58 „	59	53	53 „	—
Greatest depth of mandible - - - -	5 „	5	5	4½ „	—

Of a *sternum* only the fore part has been preserved, which does not show any difference from the corresponding bone of *Fregilupus*, except in the foremost part of the keel being 1 mm. lower.

The *coracoid* (Fig. B.), 27½ mm. long, is otherwise identical with that of *Fregilupus* (29 mm.).

Such of the wing and leg bones as have been preserved differ nowise from those of *Fregilupus*, *Acridotheres*, or *Sturnus*. Figures, half as large again as the natural size, are given of the *humerus* (C.), *metacarpus* (D.), *femur* (E.), *tibia* (F.), and *metatarsus* (G.). The ulna is distinctly marked with elevations for the secondary quills. All these bones vary in size; but as far as we can judge (with any amount of

the third specimen (Fig. *a*) the angular developes a transversely extended process directed inwards, which is entirely absent in the two other specimens. One of the authors (E. N.) is inclined to consider this process as an individual malformation.

* The passage runs as follows:—

"On trouve un petit oiseau qui n'est pas fort commun, car il ne se trouve pas sur la grande terre ; on en voit su l'ile au Mât, qui est au sud de la grande terre, et je crois qu'il se tient sur cette île à cause des oiseaux de proie qui sont à la grande terre, comme aussi pour vivre avec plus de facilité des œufs de ces oiseaux de pêchent qui y pondent, car ils ne mangent autre chose que les œufs ou quelques tortues mortes de faim qu'ils savent assez bien déchirer. Ces oiseaux sont un peu plus gros qu'un merle et ont le plumage blanc, une partie des aîles et de la queue noire, le bec jaune aussi bein que les pattes, et ont un ramage merveilleux ; je dis un ramage quoiqu'ils en aient plusieurs, et tous différents, et chacun des plus jolis. Nous en avons nourri quelques uns avec de la viande cuite hachée bien menu, qu'ils mangeaient préférablement aux graines de bois."—Proc. Zool. Soc. 1875, p. 41.

safety) by comparing their average length with that of *Fregilupus*, the length of the forearm of the latter was relatively to that of the humerus somewhat greater than in *Necropsar*, while the proportionate lengths of *tibia* and *metatarsus* were exactly the same, as may be ascertained from the following measurements :—

—	Necropsar.		Fregilupus.	Sturnus vulgaris.
	longest	shortest		
Length of humerus - -	35	32	38	27
„ ulna - - -	40	37	47	34
„ metacarpus - -	22½	—	24	—
„ femur - - -	34	32	37	26
„ tibia - - -	59	52	65	46
„ metatarsus - -	41	36	45	—

Necropsittacus rodericanus, M.-E.

(Pl. XLII., Figs. H.—N.)

As more parts of the skeleton of this extinct bird are discovered, its affinity to *Palæornis* (which has been maintained by M. Milne-Edwards, in his second treatise on this bird, p. 134,) becomes more and more apparent. The most peculiar portion of the skeleton (as far as we know it at present) is the cranium (Fig. H.), which is singularly depressed, the occipitals being low, the occipital foramen wider than deep, the parietals but slightly convex, and gently sloping behind towards the occipital region. This depressed form of skull we have not observed in any other genus of parrots except in *Ara*, but the birds of that genus have a complete suborbital arch, while in *Necropsittacus*, as in *Palæornis*, the uncinate bone is not anchylosed to the squamosal process. To judge from the figure of *Lophopsittacus mauritianus* (Encyl. Brit. Ed. 9, iii., p. 732), that bird may have had a similarly flat and depressed cranium.

—	Necropsittacus.	Palæornis (alexandr).	Ara militaris.
Length of base of cranium (without bill).	50 mm.	35 mm.	59 mm.
Width of cranium - - -	38 „	28 „	48 „
Depth of „ - - -	24 „	21 „	34 „

The several limb-bones vary considerably in size and length, in a similar manner as those of the other extinct birds of Rodriguez; but this variation does not seem to indicate a sexual difference, as there are intermediate specimens between the longest and shortest. Such of the bones as have been preserved do not show any noteworthy feature; we have given figures of the natural size of the *coracoid* (J.), *humerus* (K.), *femur* (L.), *tibia* (M.), and *metatarsus* (N.) A comparison of

their relative lengths with those of *Ara* and *Palæornis* appears to be of direct interest.

—	Necropsittacus.		Palæornis (alexandri).	Ara militaris.
	longest	shortest		
Length of coracoid - - -	—	35	31	53
,, humerus - - -	53	49	43	79
,, ulna - - -	—	57	52	99
,, femur - - -	49	46	37	60
,, tibia - - -	63	59	50	83
,, metatarsus - -	—	22	18	31

If we considered the skull as a safe guide to obtain an estimate as to the size of the bird, we should infer that the length of the wing as well as of the leg had been diminished in this bird, as compared with *Palæornis* and *Ara*. But we believe that the pelvis affords a much surer basis for such calculation, and are, therefore, contented to leave this question undecided for the present, merely maintaining that in the extinct Rodriguez Parrot all the limbs were smaller relatively to the size of the head than in *Ara* and *Palæornis*, and that the fore-limbs were relatively to the hind-limbs not less developed in the Rodriguez bird than in those two genera.

Palæornis exsul, A. Newton.

The fragments of the skeleton collected by Messrs. Jenner and Slater have been mentioned at the beginning of this paper. As, however, a nearly complete skeleton of a freshly killed bird has been obtained, a description of the isolated bones in their collection would be obviously superfluous.

Columba rodericana, M.-E.

M. Milne-Edwards has described this Pigeon from a single sternum so different from that of other members of this family (as far as they are known), that we cannot refer it, at present, to any particular genus. A metatarsus seemed to him to afford evidence of the existence of a second species, which he believed to be *Turtur picturatus* of Madagascar, Réunion, and Mauritius. We have before us two metatarsi, not differing from that examined by M. Milne-Edwards, and do not see the reason why they should be separated from *C. rodericana*, to which, evidently, all the other bones of our series belong.

All the limb-bones (*humerus*, *femur*, *tibia*, and *metatarsus*) vary not inconsiderably in size, but there is a gradual passage from the shortest specimen to the longest, so that this difference is not likely to be sexual. The only evidence we have found of the possible existence of a second larger species of Pigeon is a femur in Mr. Jenner's collection which is 42 mm. long, and comparatively more slender than that of *C. rodericana*. The line of muscle-insertion on the front of the shaft starts from the very margin of the bone below the trochanter, as in a

Pigeon, and not inwards of the margin as in a Parrot. But no definite conclusion can be safely arrived at from this single bone.

The limb-bones of the Rodriguez Pigeon do not show any perceptible noteworthy peculiarities. The *humerus* has a deep semi-globular pneumatic cavity, and a small tubercle on the ulnar margin just above the condyle. The *femur* is slightly bent forwards, with the line of muscle-insertion starting from the margin of the bone, and running inwards along the middle line of the front side of the shaft. The following are the measurements :—

	Shortest.	Longest.
Length of humerus - - -	34 mm.	37 mm.
,, femur - - - -	36 ,,	37 ,,
,, tibia - - - -	44 ,,	48 ,,
,, metatarsus - - -	25 ,,	26 ,,

Aphanapteryx and **Erythromachus**.

(Plate XLIII.)

The classical paper "Sur les affinités zoologiques de *l'Aphanapteryx*," in which M. A. Milne-Edwards, with the most convincing precision, demonstrates the Ralline characters of a few ornithic remains sent from Mauritius, recognizing their connexion with the picture so fortunately and opportunely discovered by Von Frauenfeld, offers such a sure base for all succeeding workers that scarcely more remains to be done than to supplement his memoir by description of those parts of the skeleton with which he was not acquainted.

At a somewhat later period M. Milne-Edwards received a metatarsus and sternum from Rodriguez, in which he recognized the representative of the Mauritian *Aphanapteryx*, but misled (as we think) by Leguat's description, he believed that the Rodriguez bird differed by having a straight bill and shorter legs, referring it to a distinct genus which he named *Erythromachus* (Ann. des Sc. Nat. Zool. t. xix. art. 3, p. 6). These differences do not in reality exist, the bill of the Rodriguez bird is as much curved as in the Mauritian, and their legs have the same proportion. The wings were clearly more developed in the species inhabiting the smaller island, and certainly lack the power of flight, but this can scarcely be relied upon as a generic distinction, and, therefore, we prefer looking upon the Rodriguez bird as a smaller species of *Aphanapteryx* with somewhat longer wings, and to treat of it as *Aphanapteryx leguati*.

The search for further evidence of *Aphanapteryx* in Mauritius, subsequent to M. Milne-Edwards's memoir, has resulted only in the discovery of some more or less broken metatarsals, besides fragments of other portions of the leg which do not admit of determination. From the small size of the former bones, it is clear that *Aphanapteryx broecki* varied considerably in size, or that two races existed, which is not very probable.

The *cranium* of *A. leguati* (Fig. A.) is, in general appearance, extremely similar to that of *Rallus* (*aquaticus*) and *Ocydromus*, being slightly elongate, equally convex in every direction, and with the processes and ridges but slightly projecting. The orbital edge of *Ocydromus* is truncate nearly in its whole circumference (perhaps for the attachment of a glandular band), but in *A. leguati* it is rounded off, as in *Rallus*. The frontal region is narrow, long, with the lateral margins slightly diverging in front. All the bones belonging to the palate and the lachrymals are lost, but so much of the jaws has been preserved as to give a perfect idea of the form of the bill, which is curved in exactly the same manner and to the same degree as in *A. broecki*. It is very feeble, and varies extraordinarily in length, being in some specimens one third shorter than in others. The extremity of the longer beaks (Fig. A.) is more conspicuously curved than that of the shorter ones (Fig. B.) Besides, we may state at once that throughout the series of bones at our disposal a marked difference in size may be traced; but whether the short bills belong to the smaller individuals, or whether the difference in length of beak and in size generally is attributable to sex, we are unable to say. The culmen of the bill above the nostril is almost straight; the nasal aperture of extraordinary length, slightly longer than the cranium. The extremity of the bill is provided with a deep and narrow groove along its under side.

The *mandible* (Figs. A., C., C[1]) is identical with that of the Mauritian species in every respect, except in size, more especially it has the three postarticulary apophyses (C.) arranged in exactly the same manner, but less projecting, as may be expected in the smaller species:—

Length of cranium measured from occipital condyle	38 mm.
Greatest width of cranium	20 ,,
Least width of frontals	6·5 ,,
Length of bill	77 ,,
,, nasal aperture	43 ,,
,, lower jaw	98 ,,
Greatest depth of lower jaw	8 ,,

The *pelvis* (Fig. D.) is large, very strongly built relatively to the size of the bird, and has thoroughly Ralline characters; its præacetabular portion is narrow, with the iliac blades scarcely divergent, and dorsally confluent into a high crest, the profile of which is much more strongly curved than in *Ocydromus;* a strong crest runs along the median line of the back of the sacrum. The postacetabular portion is dilated, much broader than in *Ocydromus* or *Rallus*, with deep and capacious renal excavations, and with the outer descending surface of the os ischium formed into a deep broad short hollow, bordered by an upper (postiliac) projecting crest, and by the lower reverted margin of the bone. The postiliac crest is not continuous, but interrupted above the ischiatic foramen as in *Rallus* and *Ocydromus*.

The ischiatic foramen is circular, about equal in extent to the acetabulum. The slender pubic rods are not dilated posteriorly or attached to the ischium, so far as we can judge from a single specimen, in which the pubic bone is preserved, with only a very small portion of its extremity broken off.

Length of pelvis to end of sacrum - - -	57 mm.
Greatest width of anterior part - - - -	20 „
Least width of anterior part - - - -	13 „
Greatest width of posterior part - - - -	36 „

A single *scapula* (Fig. E.), which we are inclined to refer to this bird, is imperceptibly dilated behind the middle of its length, and tapering in its posterior third. The articular surface for the shoulder-joint is very small. The whole bone is 45 mm. long, with a greatest width of 4 mm.

The *humerus* (Fig. F.) resembles much that of *Ocydromus*, its shaft being straight, somewhat compressed, and moderately slender. The projecting process behind the head is almost hamate; and there are no pneumatic foramina. Notable is the great difference in the size of this bone, the largest specimens being 50 mm., the shortest 45 mm. long. The larger and smaller specimens are represented in about equal numbers in the series before us; and several are intermediate between the extremes mentioned.

The *ulna* is considerably bent, in some specimens rather more so than others; relatively to its length it is stout, with a conspicuous ridge running from the inner side of the elbow joint along the greater part of its length; some faint elevations for the attachments of the secondary quills are visible. As regards length, it varies to a similar extent as the humerus, the longest specimen being 42 mm., the shortest 37 mm., long.

The *radius* is much more slender and weaker than in *Ocydromus*.

In the *metacarpus* (Fig. G.), the imperfect development of the wing is still more apparent than in the proximal bones; its constituent parts being very slender, and the middle and annular bones anchylosed at the extremities only, leaving a large vacuity between them. A minute tubercle is situated on the side of the middle bone which is opposed to the annular. The two specimens before us measure 16 and 14 mm. in length, the larger being as long as the metacarpal of *Ocydromus*, and not much longer than that of *Rallus aquaticus*.

The *femur* (Fig. H.) is, relatively to its length, stouter than in *Ocydromus*; the trocharterian ridge well marked. The shaft is slightly bent, with a faint ridge for the insertion of muscles along its anterior and posterior side. As regards length, the specimens vary from 56 to 63 mill.

The *tibia* (Fig. I.) and *metatarsus* (Fig. K.) are, in every detail of their conformation, identical with those of *A. broecki*, so that any description would be merely a repetition of that given by M. Milne-Edwards. The shaft of the tibia

seems to be a little more elliptical in a cross section in the Rodriguez bird; and its middle trochlea projects somewhat less beyond the outer ones. The great extent of variation in size of the Rodriguez Rail is clearly shown by our series of these two bones; specimen A (from Mr. Slater's collection) must have belonged to an individual of unusually large size; but the passage from specimen B to C is very gradual, as is also the case between the extreme sizes of the metatarsus.

	Spec. A.	B.	C.
Length of tibia - - -	101 mm.	96 mm.	84 mm.
Width of middle of tibia - -	6 „	$5\frac{1}{2}$ „	$4\frac{1}{2}$ „

	Longest.	Smallest.
Length of metatarsus - - - -	60	52
Width of middle of metatarsus - - -	$5\frac{1}{2}$	5
Width of trochlear extremity - - -	$11\frac{1}{2}$	11

It is not by any means certain that the tibia and metatarsus of *A. broecki* described by M. Milne-Edwards belonged to the same individual, although the state of their preservation, the same deep black colour with which they are stained, the circumstance that they were found in the same locality, and the corresponding size of their condyle surfaces, would seem to lead to that conclusion. Neither have the femur and metatarsus of the same individual of *A. leguati* been found, or at least preserved. It is therefore impossible to state with precision the relative lengths of these bones in either species. But taking such examples of bones of *A. leguati* as appear to be of an average size, and comparing them with those of *A. broecki*, we come to the conclusion that in all probability the Rodriguez species did not differ from the Mauritian as regards the relative lengths of the long leg bones.*

Nycticorax megacephalus, (*Ardea megacephala*, M.-E.).†

(Pl. XLI., Fig. G.)

Researches made subsequently to M. Milne-Edwards's description of this bird, have brought to light several bones with which that author was not acquainted, viz., the penultimate and antepenultimate cervical vertebræ, the fifth dorsal vertebra, the pelvis, the scapula, ulna, and radius, the second phalanx of the inner toe, and the first of the hind toe. These bones need scarcely any description, as they are

* Note on *Fulica newtoni*, M.-E.

Like the other birds indigenous to the Mascarene Islands, the Coot of Mauritius varied considerably in size. The tibia described and figured by M. Milne-Edwards is 144 mm. long. Two others which are now before us, and which like the former were found in the Mare aux Songes, and are now in possession of Mr. Lucas, of Upper Tooting, measure 140 and 124 mm., the shortest specimen being that of a full-grown bird.

† Ann. des sc. nat. Zool. t. xix. art. 3, p. 10.

of the same form as those of the birds of this family, and especially of *Nycticorax*, but they are important additions, assisting us essentially in arriving at safe conclusions as to the relative development of the various parts of the skeleton, and the real affinities of this bird.

M. Milne-Edwards had considered it to be a true *Ardea;* finding the fore part of its frontal region flat as in a Heron, whilst this part is concave in *Nycticorax*, he dismissed the question of the affinity to the latter which to us appears to be undeniable. The distinctive features of the skull common to the European and Rodriguez Night-Herons are:—first the great width of the occipital region; then the mastoid processes, which are as distant from each other as the temporal: the relative distances between the mastoid, temporal, and postorbital processes are the same in both birds. The temporal fossa is nearly of the same width; the foramen occipitale is broader than deep, more as in the Rodriguez species than in *N. griseus;* the arch of the supra-orbital margin is in both much more open than in the Heron; the prænasal groove is equally deep, and extending equally far forwards; the bill of the Rodriguez species is not less curved downwards than in *N. griseus*, though the bill is equally slight in either. The bill of *N. megacephalus* is much stronger than in the European bird, but not more so than in other species of this genus. The principal difference between these skulls is that that of the Rodriguez species is much more depressed, with scarcely any transverse and longitudinal depression near the base of the bill; it is also a little longer.

The evidence gathered from a comparison of the *pelves* leads to the same conclusion. The præacetabular portion is nearly equally narrow and constricted; the anterior iliac blades coalesce for a short distance only, leaving a great part of the sacral crest uncovered. The width of the postacetabular half, and the arrangement of the foramina, pleurapophyses, &c. are nearly the same.

	N. megacephalus.	N. griseus.
Length of pelvis - - - -	63 mm.	61 mm.
Width in its narrowest part - - -	15 „	14 „
Greatest width above acetabulum - -	35 „	33 „

The pelvis of *Ardea cinerea* has a length of 82 mm., and a greatest width of 39 mm., and is therefore in general shape (as well as in other details of configuration) widely different from that of *Nycticorax*.

Taking the *pelvis* as guide, the body of the Rodriguez Night-Heron was of nearly the same size as that of *N. griseus;* the cranium also was nearly of the same size, whilst the bill and mandible were much stronger, and in accordance with this powerful development of the maxillary apparatus, the cervical portion of the vertebral column was proportionally stouter than in *N. griseus*.

The reduction of the power of flight has been already demonstrated by M. Milne-

Edwards, and we are able to corroborate his opinion by completing the measurements of the sternum and wing in comparison with the European Night-Heron:—

	N. megaceph.	N. griseus.
Length of sternum - - -	64 mm.	69 mm.
Breadth of sternum - - -	34 ,,	37 ,,
Greatest depth of keel - - -	14 ,,	20 ,,
Length of scapula - - -	72 ,,	72 ,,
,, coracoid - - -	55 ,,	60 ,,
,, humerus - - -	114 ,,	126 ,,
,, ulna - - - - -	121 ,,	139 ,,
,, radius - - - - -	117 ,,	132 ,,
,, metacarpus - - -	62 ,,	70 ,,

It will be observed from this table that whilst all the bones of the wing have been reduced in length (and strength), the scapula has not been affected by the diminished amount of exercise taken by this bird. As regards form, it is exactly the same as in other Herons, viz., tapering behind, without dilatation.

With regard to the leg, M. Milne-Edwards, guided in his estimate of the general size of the bird by the length of the skull and femur, inferred that this part of the osseous frame was much reduced in length. Having shown from the pelvis, with which M. Milne-Edwards was not acquainted, that the body of this bird was considerably less in size than he supposed, in fact equal to that of the European Night-Heron, we arrive at the opposite conclusion, viz., that the leg is proportionally much more developed in length and strength. And this will be readily perceived from the following table:—

	N. megaceph.	N. griseus.	Ardea cinerea.
Length of femur - -	86 mm.	82 mm.	89 mm.
,, tibia - -	136 ,,	136 ,,	185 ,,
,, metatarsus - -	93 ,,	89 ,,	139 ,,
Width of metatarsus - -	$6\frac{1}{2}$,,	4 ,,	—
Length of 2nd phalanx of inner toe	20 ,,	19 ,,	26 ,,
,, 1st ,, hind toe	30 ,,	28 ,,	35 ,,

In this table we have added also the corresponding measurements of the Heron, in order to show that the Rodriguez bird agrees with *Nycticorax*, and differs from *Ardea* in the length of the femur as compared with that of tibia and metatarsus. The metatarsus and the phalanges are the parts in which the greatest development has taken place, the thickness of these bones being nearly twice as great as in *N. griseus*, the bird having been clearly of much more cursorial habits than its congeners, chasing rather terrestrial animals (lizards) than aquatic.

Thus the effect of the prolonged isolation on the two vertebrate-hunting birds of Rodriguez, the Owl and the Night-Heron, was precisely the same. Without

losing the power of flight, they became brevipennate; but the increased development of the legs compensated for the reduction of this power, and enabled the one to destroy animals of larger size when the smaller kinds became scarcer, and the other to chase its swift-running prey. In the Night Heron the increase of development was confined to the legs in conformity with its acquired habit; and it was principally the metatarsus which became enlarged to receive and form a base for the tendons of the foot. But the Owl required additional strength for the purpose of mastering and tearing its prey, not only in the muscles of the lower leg, but also in those attached to the trunk, and hence we find in this bird the greatest development in the femur and pelvis.

EXPLANATION OF THE PLATES.

Plate XLI.:—

A.—F. *Carine murivora* (nat. size).

A. Cranium. B. Mandible.
C. Coracoid. D. Humerus.
E. Pelvis. F. Femur.

G. Pelvis of *Nycticorax megacephalus* (nat. size).

H. Pelvis of *Nycticorax griseus* (nat. size).

Plate XLII.:—

A.—G. *Necropsar rodericanus*.

All these figures are half as large again as the natural size, with exception of A. (skull), which is of the natural size.

A. Cranium. a, a^1. Articular surfaces of mandible.
B. Coracoid. C. Humerus.
D. Metacarpus. E. Femur.
F. Tibia. G. Metatarsus.

H.—N. *Necropsittacus rodericanus* (nat. size).

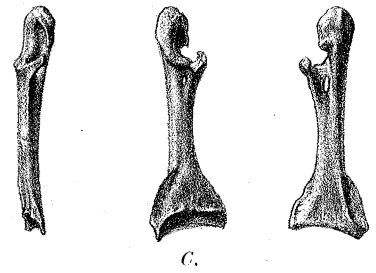
H. Cranium. I. Coracoid.
K. Humerus. L. Femur.
M. Tibia. N. Metatarsus.

Plate XLIII.:—

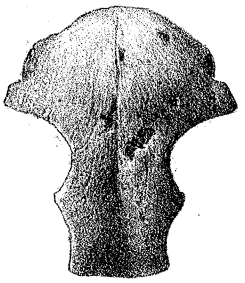
Aphanapteryx leguati.

All the figures are of the natural size, with exception of C. and C^1, which are three times enlarged.

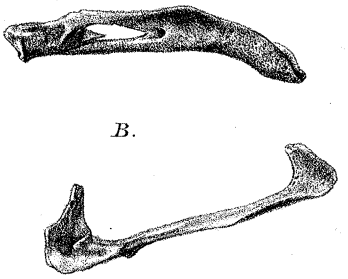
A. and B. Cranium of long and short billed forms.
C. Articular surface of mandible.
C^3. Posterior aspect of end of mandible.
D. Pelvis. E. Scapula.
F. Humerus. G. Metacarpus.
H. Femur. I. Tibia.
K. Metatarsus.



C.



A.



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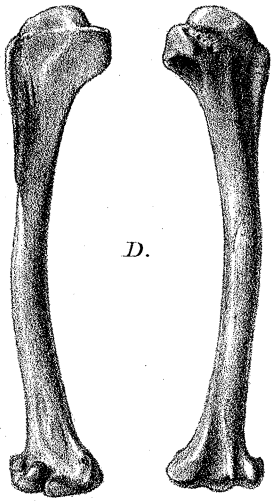

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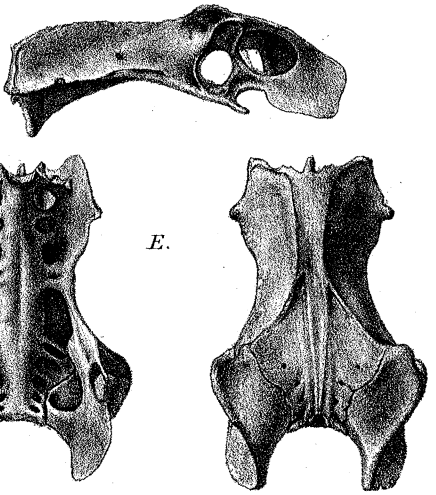

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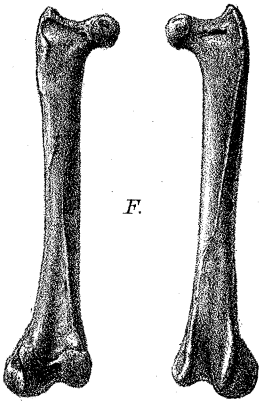

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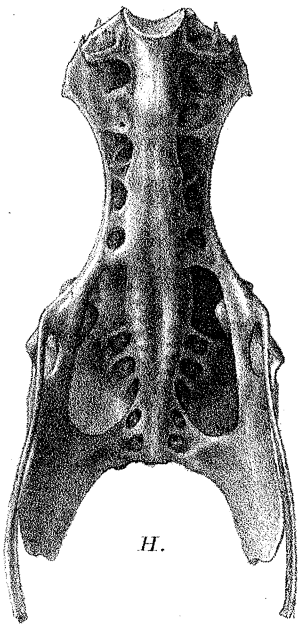

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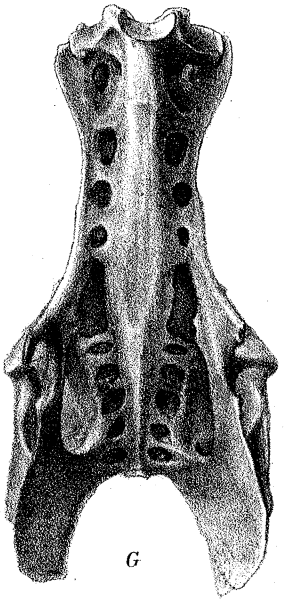

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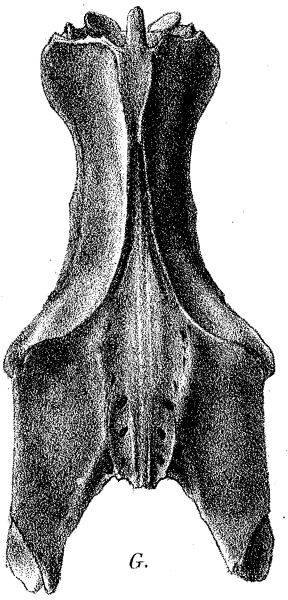

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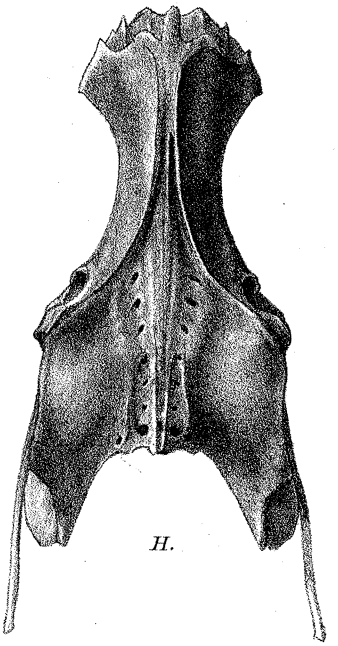
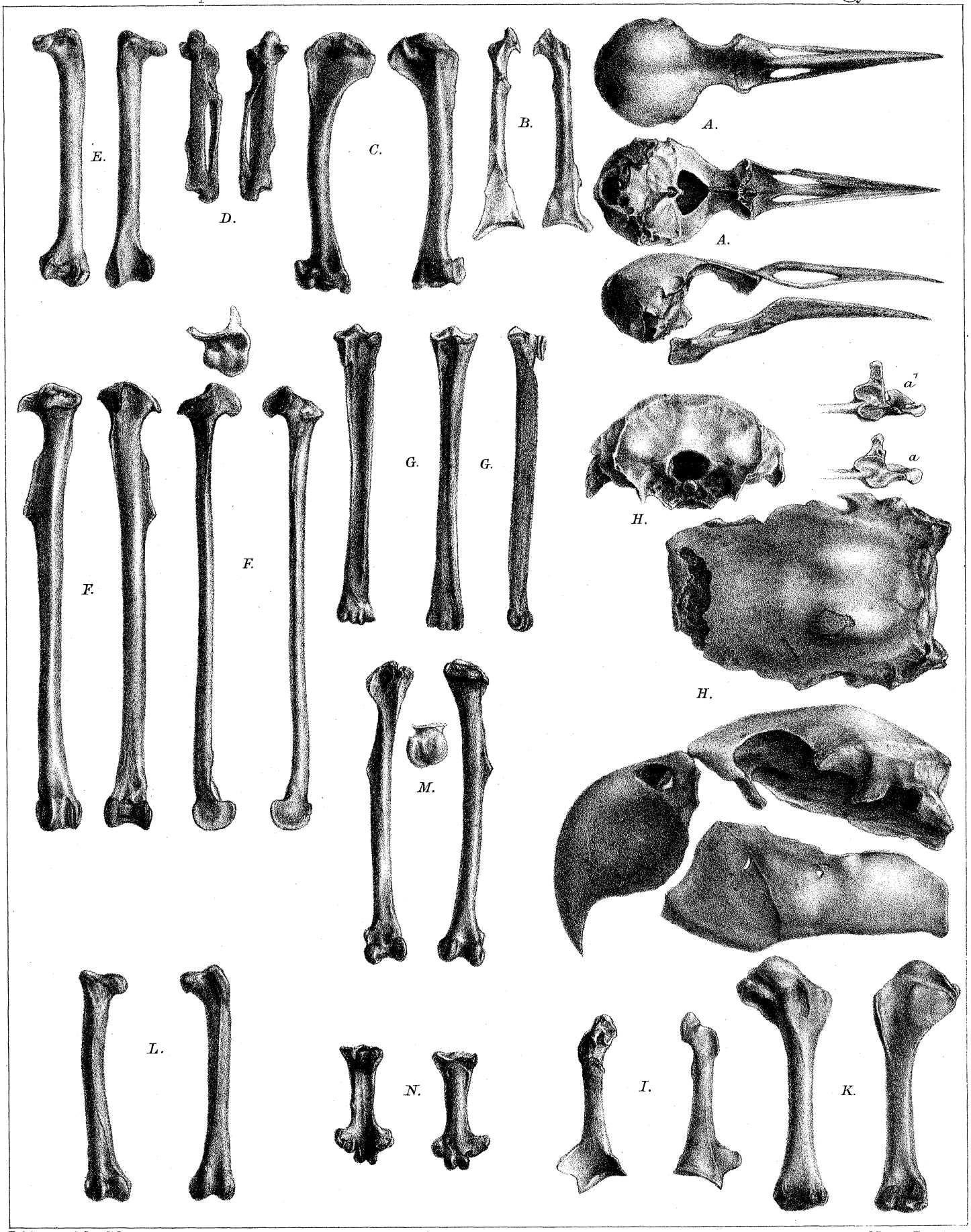


H.

R. Mintern del. et lith.

Mintern Bros. imp.

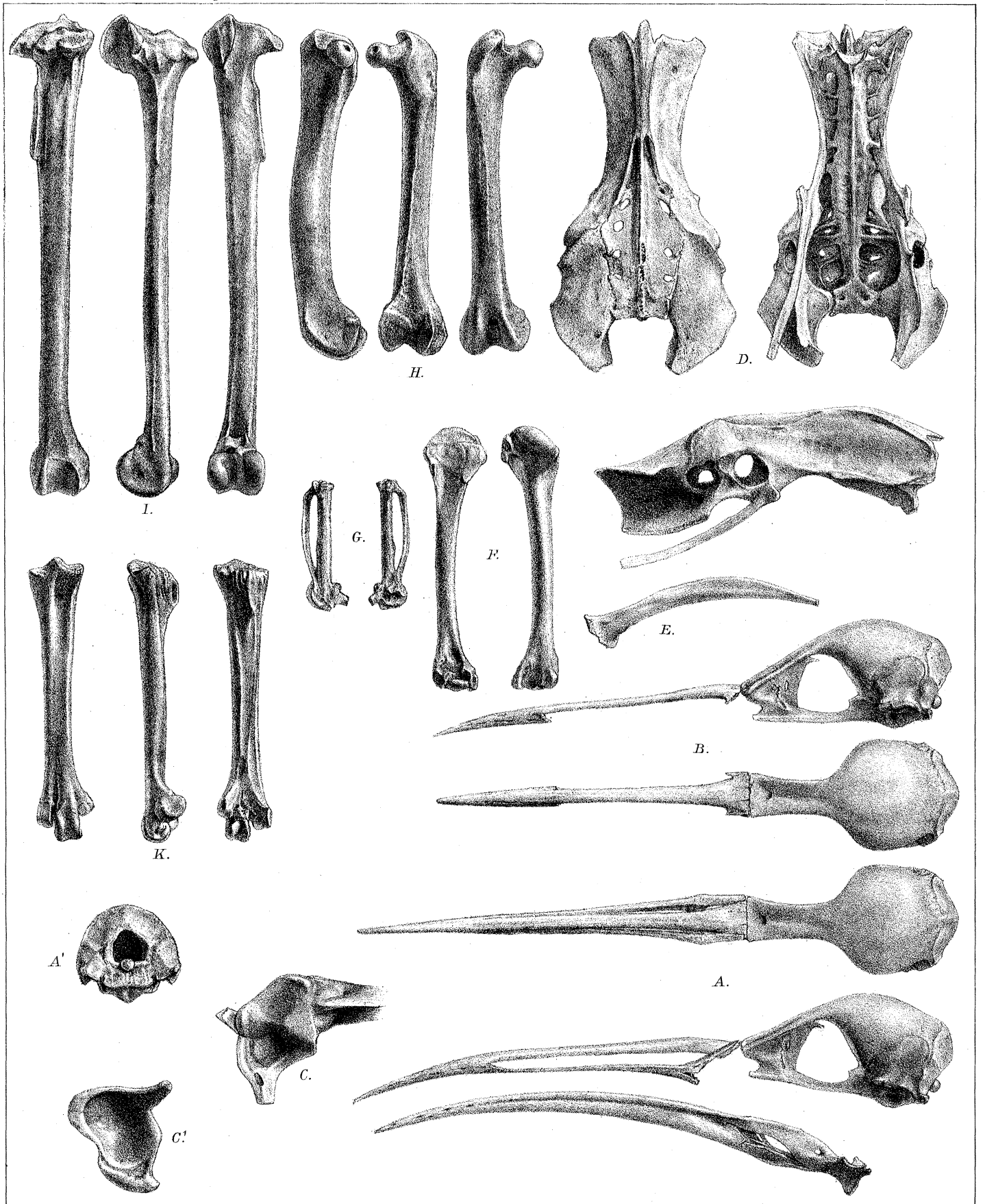
A.–F. Carine murivora. G. Nycticorax megacephalus. H, Nycticorox griseus.



R. Mintern del et lith.

Mintern Bros imp.

A-G. Necropsar rodericanus. H-N. Necropsittacus rodericanus.



R. Mintern del. et lith.

Aphanapteryx leguati.

Mintern Bros. imp.