SUPPLEMENT III

MEMOIR

ON THE

EXTINCT WINGLESS GROUND-DOVE, OR SOLITAIRE

(PEZOPHAPS SOLITARIA, Strickland).

Since the preceding 'Supplement' was printed off, osseous remains collected in the Island of Rodriguez during the "Transit-of-Venus Expedition," and now in the British Museum, have supplied materials for the articulation of the skeletons of both the large and small examples of the Solitaire (Pl. IV.).

Both varieties being extinct, their relation to sex cannot be anatomically determined. The affinity of the Doves (Columbaceæ, Gemitores) to the Rasores, with the combative habit and carpal weapon of the larger variety (ib. fig. 1, ii), lead me to refer it to the male sex.

In the skeleton of both male (Pl. IV. fig. 1) and female (ib. fig. 2) Pezophaps, the number of cervical vertebrae is 12, that of the dorsal 6, a 7th free-rib-bearing vertebra being made "sacral" by ankylosis with the rest of that coalesced group of bones.

So much of the vertebral formula thus accords with that of Didunculus 1. As in that dove, also, the three middle dorsal vertebrae (third, fourth, and fifth) have coalesced, and their square truncate spines form a strong bony crest. Four pairs of ribs are connected, by ossified hæmapophyses, with the sternum; and this bone deviates mainly from the columbaceous type by the minor development of the keel, in relation to the atrophy of the chief muscles of flight.

Sixteen coalesced vertebrae constitute the sacrum of Pezophaps, as of Didus; and seven free vertebrae beyond the pelvis support the tail-feathers. Thus the vertebral formula of Pezophaps is:—

C. 12, D. 6, S. 16, Cd. 7, = 41.

There is one free-rib-bearing vertebra less, and one sternal rib less, than in Didus; and this difference accords with the larger proportional trunk of the heavier Ground-Dove of the Mauritian island.

1 See the figure of the skeleton of the didiform species of the Samoan Isles in my 'Memoir on the Dodo,' 4to. 1866, pl. iii. fig. 2.
In the atlas and third vertebra the interzygapophysial bar, with the foramen it defines, is present. The neural spine subsides to a pair of tuberosities in the fifth cervical; and this bifid condition is traceable to the beginning of a ridge leading to the hyperapophysis. This process, conspicuous and large on the axis and third vertebra, subsides in the following, but rises from its rudimental state in the ninth and following cervicals.

The protuberance from the underpart of the par-pleurapophysis of the fifth and sixth cervicals shows as the "catapophysis" of Mivart in the seventh; and converging towards its fellow, the pair of inferior processes become distinct in the ninth, approximate in the eleventh, and blend into the single median hypapophysis in the twelfth cervical vertebra. This process increases in vertical and fore-and-aft extent to the middle of the three coalesced dorsals, and almost disappears in the hindmost (fifth dorsal); it is similarly represented as a low mesial ridge in the last free dorsal (sixth).

The sternum of *Pezophaps*, as of *Didus*, accords with the didunculine modification of the Dove's breast-bone, in the breadth, for example, of the ectolateral processes and the absence of entolateral ones. The median hinder end of the sternum is narrower, more "xiphoïd" in character, than in *Didunculus*. The four articular ridges and depressions in each costal border are close-set up, especially the third and fourth.

The costal process is both broad and thick, presenting a trihedral subconcave facet towards the ribs. The thin ectolateral plate overlaps the two hinder haemapophyses joining the sternum. The mesial pneumatic fossa at the anterior part of the sternal concavity communicates by a canal with the convex or outer surface. The convex contour of the sternal keel is due to the suppression of the anterior subangular extension which is present in the volant Didlet.

The first and obvious character in which the great extinct Ground-Doves differ from the smaller existing volant kinds is in the small proportion of the brain-case to the rest of the skull. If the length of the cranium be taken from the back of the occiput to the front of the frontal bone, it is in *Pezophaps* rather more than half that of the skull; in *Didus* it is little more than one third.

The difference is not due to the small relative size of the orbits, but to the great relative length of the beak, especially of the narial part, in *Didus*. This part, which includes the lateral bony external nostrils, is relatively shorter in *Pezophaps* than in *Didus*.

The interorbital septum is entire in both genera.

In both *Didus* and *Pezophaps* the upper grooved border of the foramen magnum extends further back than the condyle. The occiput, in *Pezophaps* (Pl. V. fig. 3), is vertical, feebly convex vertically and transversely, divided by a pair of arched inser-

1 Anté, p. 396, fig. 11, r, s, third cervical of *D. maximus*.
2 Anté, p. 394, fig. 4, hp.
tional depressions from the rugose, somewhat overhanging hind tract of the parietal region (ib. 7). The temporal fossa is larger, relatively and absolutely, in Pezophaps than in Didus; it resembles that of Treron. The elevation of the frontal region is due, in Pezophaps, as in Didus and Treron, to excess of bony cellular diploë, and takes place in advance of the orbits in all Columbidae. The interorbital tract of the cranium (Pl. V. fig. 1, 11) rises from the premaxillo-nasal platform (ib. 15, 22) more abruptly in Pezophaps than in Didus; but it sooner subsides, and the fronto-parietal tract, or vertex, is flatter. This tract is smooth, but surrounded by a broad rugose elevated border, continued from the superorbital ridge backward over the temporal fossa, then across the postparietal region (ib. 7) to meet the ridge on the opposite side. The superorbital tracts converge forward to form the frontal convexity. This, however, is mesially cleft, exposing a deeper-seated smooth tract, over which a bony fringe projects on each side. This structure exists in a minor degree in the female: the superorbital tract is more rugose in the male than in the female Pezophaps.

The chief difference between Didus and Pezophaps in cranial structure is the degree in which the cancellous tissue is developed between the outer and inner "tables," the minor quantity of that tissue in Pezophaps causing less elevation and convexity of the frontals above the orbits as compared with that part of the cranium in Didus.

The lacrymal, coalesced with the prefrontal part of the frontal, curves down and back in front of the orbit; it is impressed by a deep, wide, smooth, longitudinal channel externally, conducting the duct to the naso-lacrimal orifice anterior to the orbit.

To view the neurapophyses of the nasal vertebra, the nasals, premaxillary, and coalesced part of the frontals must be removed; and then the homologue of the "os en ceinture" of batrachotomy and of the "æthmoid" of anthropotomy is brought into view, with part of the confluent olfactory capsules.

The essential elements of the anterior terminal segment have undergone extreme modification, and travelled far from the almost typical condition which they present in most fishes 1.

In the bird strong processes answering to diapophyses are extended outwards from the neurapophysial or essential parts of the prefrontals; and to these the name "prefrontal" is restricted by some who retain the term "æthmoid" for the plates transmitting the olfactory nerves from the rhinencephalon. In Macropus and most other marsupials the corresponding extension is grooved longitudinally, as in Didus and Pezophaps; but the fissure transmitting to the nose the lacrymal duct, anterior to the grooved lacrymal bone, in the bird, is reduced to a fossa with one or two foramina in the implacental mammal.

The maxillary sends up a strong nasal process confluent with the outer branch (15') of that bone, which articulates with the swollen fore part of the frontal, outside the base of the inner division (15) of the nasal bone. The common coalesced bases of the

1 See, e. g., the prefrontals of Xiphias in my 'Archetype of the Vertebrate Skeleton,' pl. i. fig. 5, 14.
nasals and nasal process of the premaxillary rise as a transverse bar (Pl. V, fig. 2, x), with a convex anterior border, above the rostral divisions of these bones: in this character Pezophaps resembles Treron and Didunculus; while in Didus the premaxillary and nasal portions of the elevated basal tract are indicated by grooves therein. In both genera, as in recent doves, 15 and 22\textsuperscript{'} are confluent with 11. Beyond the confluence the divisions of the nasal pair are separated by the nasal process of the premaxillary (22). The inner division or normal part of the nasal is 1 inch 8 lines in length; it extends forward for half that length along the outside of the premaxillary, then inclines mesial beneath that bone, coming into contact with its fellow for six lines extent of their terminal pointed end; they underprop the nasal process of the premaxillary; and thus we have, in the extreme variation of an extreme segment of the vertebral axis, the hæmal spine closing the tubular series by overlapping the neural spine of its own segment. The under surface of the nasal process of the premaxillary is impressed by the shallow channel receiving the underpropping fore part of the midnasals.

The nasal process of the premaxillary retains its primitive or normal character as a pair of bones in a greater degree than in Goura, and much greater than in Didus. In the male Pezophaps an interspace of 4 millims. separates their basal portions; and the narrower fissure in the female skull extends halfway towards the tip of the bone. The anterior confluent portions of the premaxillaries terminate in the "core" of the beak, the shape of which, more columbaceous than in Didus, is shown in Pl. V., 22. The "maxilla," or upper mandible, formed, as in other birds, by the nasals, premaxillaries, maxillaries, and palatines, inclusive of the vomer, here magnified, with parts of the molars, and of the turbinals, constitutes, as in Goura, one half of the length of the skull.

The excavated under surface of the core (Pl. V. fig. 5) is divided by a mesial septum, which expands into a longitudinal channel prior to the separation of halves of the premaxillary (ib. 22). The wall of the excavation is reticulate, as in Didus. The inner surfaces of the "halves," 22, are at first channelled, and then become transversely convex. The line of their confluence with the similarly long and narrow palatines, 20, is defaced. The palatal plate, 21, of the maxillary overlies the premaxillo-palatine beam, 20–22. The lateral confluence of the maxillary and premaxillary is obliterated; the maxillary expands vertically as it recedes, and divides into its palatal, jugal, and nasal portions. The jugal part is continued by the confluent jugal and squamosal style to the articular pit at the outer and lower part of the tympanic (28); it is straight beneath the orbit (Pl. V. fig. 1, 27), and has no postorbital rising or process as in Dinornis.

The inner wall of the orbit is formed mainly by the orbito-sphenoids, which deliver the optic nerves to their organs near the back part of the cavity. Though much compressed, as in all birds, they form a complete interorbital septum.

The roof of the orbit is formed by the frontal exclusively; the septum rapidly expands
as it rises to the frontal roof, the breadth of that roof, taken across the postfrontals, being 2 inches 10 lines.

The interorbital foramen for the exit of the opthalmic branch of the 5th nerve and vessels is of equal vertical diameter with the optic foramen, but leads to a canal directed obliquely upward and forward, and so appears rather as a fissure.

The temporal fossa seems to have two boundaries above—the border of the ridge continued from the postfrontal to the parietal, 7, and the arched ridge upon the mastoid, 8, marking the extent of origin of the crotaphyte muscle; the latter may be regarded as the true boundary. The fossa is produced below into three processes: the middle and largest is the "tympanic process" of the mastoid; the hind and smallest process is the "postmastoid" one; the fore process may be a production of the parietal, or of this together with the postfrontal. The relative position of the three descending productions of the temporal fossa agrees with that in Goura and most Doves.

Viewing the coalesced mass of nasals, premaxillaries, and frontals forming the upper part of the base of the beak (Pl. V. figs. 2 & 4), it is hard to suppose that the right and left nasals were not only separated by the interposed premaxillaries (ib. 15, 22), but that the outer and inner divisions of each nasal have not contracted a separate union with the frontals: but no doubt the common base of each nasal is represented by part of the arched transverse bar, \( x \), and its mesial hind production, which is overlapped by the frontal fringes.

The basi-presphenoid (Pl. V. fig. 5, 5, 9) is 2 inches long in the male; it has no pterapophyses.

There is, as is well known, no "maxillo-palatine" or "prevomerine bone" in the bird's skull distinct from the proper maxillary or proper palatine. The latter bone (ib. ib. 20) speedily coalesces with the premaxillary in front, and the maxillary (21') above, as does this with the premaxillary in front and with the malar bone behind. Their respective limits are definable by their unconfluent condition in the immature bird.

In Pezophaps the persistent linear suture between the palatal part of the maxillary and the palatine commences 1 inch 10 lines from the tip of the beak; it defines a linear tract of the maxillary of 1 inch 3 lines extent. External to this suture is the palatine tract, coalesced with the maxillary, in breadth 2 lines, in length 10 lines; when the palatine becomes free, it is twisted on itself, forms a vertical plate of 3 to 4 lines depth, and sends off from the mesial side of the hinder part the horizontal plate, which bends mesiad. Between these right and left mesial plates of the palatines is an interval of 2½ lines. The interpalatine vacuity in advance of the horizontal plates is 4½ lines across. The upper parts of the hinder five lines of the palatines are applied to the convex sides of the presphenoids. The pterygoids (24) abut against the basisphenoid immediately behind the palatines, each pterygoid diverging and expanding to abut against the tympanic. The maxillo-palatal cleft is long and of moderate and uniform width; the interpalatal cleft is wider until the inner plates are developed.
The beak of the bird serves as both hand and mouth; the apex of the wedge, in these functions, is driven against resisting bodies sometimes of considerable hardness. In all birds the opening and closing of the bill are acts of prehension. In many birds these latter movements are not limited to the lower jaw, but a mechanism exists for raising the upper jaw as well. The joint between the base of the bill and the cranium is made flexible by diverse modifications. The tympanic is fashioned in relation therewith; it is connected by two beams or columns of bone, on each side of the skull, with the fore part of the upper jaw. The outer beam, commencing forward at the side of the maxillary, is continued by the malo-squamosal style to the outer side of the transversely expanded lower part of the tympanic. The inner beam, commencing by the palatal process of the premaxillary, is continued backward by the palatine and pterygoid bones to the inner side of the lower end of the tympanic. Any swinging to and fro of this bone upon its single or double upper ball-and-socket joint is transferred to the “core” by the four beams converging thereto. The action of the outer beam upon the maxillary is conjoined with that of the lower beam upon the premaxillary by the overlapping broad palatal plate of the maxillary, which is more or less confluent with the palatine and premaxillary bones beneath.

The movements of the mandibular part of the bill are transferred by the long bar-like rami of the lower jaw to the lower end of the tympanic, with which those rami are movably articulated by a combined double ball-and-socket and also trochlear articulation.

When the tympanics are swung forward they communicate that motion by their six converging bony bars to the upper and lower cores, raising the former, depressing the latter; in short, opening the mouth. When the tympanics swing backward, opposite movements are transferred forward by the connecting bars, and the beak is shut.

But when in this state it is used (as by the Woodpecker) as a pick or wedge, the strength of the blow transferred backwards by the three divergent pairs of bars is met, not by a rigid basis, which might have involved fracture of those bars or of some of them, but by a yielding one, as in the butts with elastic buffers terminating a railway line, for arresting and receiving the shock of a train.

The beak as a whole, and especially its outward and visible portions, have suggested to ornithologists characters of groups with good and accepted descriptive terms: the modifications of a part of the mechanism, a single beam, seem inadequate to sustain a new nomenclature.

The basisphenoid (Pl. V. fig. 5, 5) in advance of the ridge or process which underhangs the bony outlets of the Eustachian tubes loses breadth, and seems narrowest where impressed by the abutting ends of the pterygoids (24).

The postarticular end of the mandible of Didus differs from that in most Columbidae in not being abruptly truncated, but produced in the form of a short right or rather open angle with the apex obtuse (Pl. I). That of Pezophaps (Pl. IV. fig. 1) is more
columbaceous; it is produced a short way behind the articulation, and is vertically truncate, without loss of depth. It agrees in this respect with Didunculus.

There is nothing extraordinary in the conformation of the pelvis of Pezophaps. The acetabulum is situated in the anterior half, as in Didus (Pl. I). The ischium (Pl. IV. 63) coalesces with the ilium (62) at two points, circumscribing a moderate subelliptic "foramen ischiadicum," as in Didus. The pubis (64) does not send upwards a process to meet the downward one from the ischium, and so define the "tendinal" from the "obturator" interspace.

The pelvis in the male skeleton shows the whole extent of the entire lower border of the ischium; and its slender hinder termination is produced into contact with the pubis (64), from which bone a rough low tuberosity rises to form the syndesmosis with the ischium (63). On the left side the extremity of the ischium is broken off; but the syndesmotic process of the pubis testifies to an original union like that on the right side.

Here, therefore, we have an acceptable proof of an osteological correspondence with existing doves, which the imperfect examples of the pelvis previously acquired did not exhibit.

The scapula of Pezophaps repeats, in a minor degree, the angular beginning of the hinder thin border above the elongate neck of the bone, but projects less as a process than in Didus 1; the distal or free end expands as in Didus. The straightness of the bone is more marked than in Didus.

The metacarpus of the male (Pl. IV. fig. 1, u.) repeats the tuberous process figured by Prof. Newton in pl. xix. figs. 87–90 of his richly illustrated memoir 2, and testifies, as he shows, to the value of Leguat's record, and to the accuracy of that original observer of the living bird.

If a single specimen of a metacarpal bone of some unknown animal, such as is figured in Pl. IV., u, had previously come to the hands of a palæontologist, he would have concluded the bony tumour to have been of morbid nature and origin, and set it down as an exceptional pathological phenomenon. Any other opinion (above all, one holding such tumour to be a constant structure, functional in the healthy individual, and of moment in guiding to a knowledge of the species or sex) would have hazarded the estimate of such palæontologist's standing in his science.

In the rich collection of bones of Pezophaps, the subject of Prof. Newton's instructive paper (tom. cit.), were not fewer than thirty-two specimens of the metacarpus.

"That it would be very short was a safe inference from what we know of it in other flightless birds; but it could hardly have been expected to obtain from it such a singular confirmation of Leguat's statement regarding a remarkable peculiarity in the 'Solitaire' as observed by him, nor that it should furnish an explanation of the

1 'Memoir on the Dodo,' pl. viii. figs. 6, 9, s.
2 Phil. Trans. 1869.
curious bony growth on the distal end of the ulna and radius already mentioned as presented by the specimens of supposed males. All the perfect specimens of the metacarpal have on the radial side a more or less spherical bony knob or callus-like mass developed immediately beyond the proximal end and the pollex. . . . The appearance of the knob is much that of diseased bone; it has probably been covered by a cartilaginous integument” (ib. p. 342). The author then repeats the quotation given by Strickland in his excellent work:—“L'os de l'ailleron grossit à l'extrémité, & forme sous la plume une petite masse ronde comme une balle de mousquet: cela & le bec sont la principale défense de cet oiseau”¹.

The specimens of metacarpus of the larger, combative sex of Pezophaps in the British Museum show the same structure, which may be seen in the articulated skeleton of the, probably, male Solitaire now there exhibited (Pl. IV. fig. 1).

This hard, irregular, prominent mass, which holds the place of the spine in the Spur-winged Goose, may be compared to a “knuckle-duster;” with it the combative sex delivered his blows, in the hard and well-contested fights to which Leguat testifies:—“Ils ne volent point, leurs ailes sont trop petites pour soutenir le poids de leurs corps. Ils ne s'en servent que pour se battre, & pour faire le moulinet, quand ils veulent s'appeller l'un l'autre.”

I here infer the writer to mean that one function of their stunted wing was to do battle with each other; and the peculiar development in question I take to have been the combative weapon. The entire wings were in action in executing the amorous pirouettes:—“Ils font avec vitesse vingt ou trente pirouettes tout de suite, du même côté, pendant l'espace de quatre ou cinq minutes.”

Of the bones of the hind limbs, the greater relative length of both femur, tibia, and metatarsus, as compared with the skull and sternum, is first notable in Pezophaps (Pl. IV.) in contrast with Didus (Pl. I.).

The cumbline characters of the metatarsus are manifested in both species. These characters in Pezophaps are recorded in pp. 30–36, and are repeated in that bone of the subject of Plate IV.

The following are admeasurements of the two extinct species of Ground-Doves:—

<table>
<thead>
<tr>
<th></th>
<th>Pezophaps solitaria</th>
<th>Didus ineptus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of vertebral axis, from tip of beak to end of coccyx, following the curves</td>
<td>Mas. 2 11 0</td>
<td>Fem. 2 7 0</td>
</tr>
<tr>
<td></td>
<td>Mas. 2 7 0</td>
<td>Fem. 2 2 0</td>
</tr>
<tr>
<td>Height in easy standing position</td>
<td>Mas. 1 4 6</td>
<td>Fem. 1 1 0</td>
</tr>
<tr>
<td>Length of leg, from proximal end of tibia to sole</td>
<td>Mas. 1 4 6</td>
<td>Fem. 1 1 0</td>
</tr>
</tbody>
</table>

The Solitaires were found living in great numbers by the colony of Huguenots who settled in the island of Rodriguez, under their leader M. François Leguat, in 1691.

Pezophaps, according to the testimony of Leguat, lays but one egg at the breeding-season; and the same was probably the case with Didus, as it is with the existing species of fruit-eating doves (Carpophaga) and the passenger pigeons (Ectopistes).

The Moas appear to have been similarly restricted, as their living representatives, the Kivis, also are, in the number of the eggs of each brood.

The condition of the existence of Pezophaps, and probably that of its flightless structure, was the absence of any extirpating enemy in the island to which the species was restricted. Feeding on the date, the plantain, and other tropical products of a rich vegetation encumbering the soil when ripe and fallen, their flesh was sapid as well as nutritious; and the early Huguenot colonists commenced the work of extirpation, which their successors and the quadrupeds (cats and pigs) which they introduced completed.

In assigning the origin of the species Pezophaps solitaria to the operation of a primary law, by way of direct creation of a primitive pair, the osseous tumour on the wrist of the male, and the fore pair of limbs in both sexes, framed on a pattern fitting them to exercise the faculty of flight and for no other kind of locomotion on land, but of too small a size for that end, are among the incidents of this "thaumatogeny," or inconceivable mode of genesis.

The other alternative is a reference of the species to the operation of a secondary law, by no means implying disbelief in, or involving denial of, the Lawgiver. In speculating on the mode of operation of such law, the following facts present themselves:—

Pezophaps solitaria was the largest kind of land-bird observed by the first settlers in the island of Rodriguez.

It differed in no other respect from the class-characters of the other birds of that island save in the inability to fly by the action of its wings.

There were no enemies native to the island able to take advantage of that disablement.

"Il ne s'y trouve aucun animal à quatre pieds, que des rats, des lézards, & des tortues de terre, desquelles y a trois différentes espèces," writes Leguat in his interesting little book.

The Solitaires had no call for practising or endeavouring to effect that hardest and most strenuous mode of locomotion to obtain sustenance or fulfil any of the conditions of preservation of the individual or of the species; they were never scared into such violent exercise.

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Upon these facts I found a conclusion as to how the specific character of wings, useless as such, came to be; and this conclusion as to *Pezophaps solitaria* is the same which I have set forth more at length in relation to *Didus ineptus*\(^1\), and which I deem to be applicable to the still larger terrestrial birds discovered, as in the case of *Æpyornis, Dinornis, Aptornis, Notornis, Cnemiornis*, in similar geographical and associated zoological conditions—these birds, like the Dodo and Solitaire, having become extirpated through alterations of the latter conditions, *i.e.* by introduction of species new to their island homes, and with dispositions and powers destructive of such flightless birds. Thus is illustrated the origin of species by a condition of the way of work of a secondary law suggested by Lamarck.

Two alternative hypotheses have been propounded. One, by Mr. Darwin, is discussed and conjecturally exemplified by the authors of the paper “On the Osteology of the Solitaire” (Phil. Trans. 1869, pp. 356–358). The other hypothesis assumes that the *Iguanodon, Megalosaur, Scelidosaurus*, and other Dinosaurian reptiles walked on the hind pair of legs, like birds, and initiated that class by becoming transmuted into the warm-blooded, feathered, but wingless species. No suggestion has been made by the authors or acceptors of this hypothesis as to the way of operation or conditions of the transmutation. But I have been favoured with a photograph from New York of the “Restorations according to Professors Huxley and Waterhouse Hawkins” of the reptilian ancestors of the Moas, now, or to be, placed in the Public Park of that City.

In most of the instances of wingless birds affinity to more favoured or normal members of the feathered class has been traced.

The Penguins (*Impeccies*) cannot be dissociated from the smaller *Urinatores*, which retain the volant function of the wings.

*Alca impennis* is not generically separable, in judicious taxomony, from the smaller swiftly flying *Alca torda*.

The genera *Aptornis* and *Notornis*, with keelless breast-bones, cannot be divorced from the family of Coots.

\(^1\) ’Memoir on the Dodo,’ 4to, 1866, pp. 49–51.


*Cneniornis*, although also with a "ratite" or uncarinate sternum, must stand beside *Cereopsis* in the Anserine group of Anatidæ.

The Didines are but generic modifications of a great natural division of Rasores, the existing members of which, of smaller size, retain their faculty of flight.

*Dinornis* shows the consequence of disuse of wings in a greater degree than does *Apteryx*. But, although the winged forms from which the Kiwi, the Cassowary, the Emu, the Rhea, the Ostrich, and the *Æpyornis* have severally degenerated remain to be determined, the wingless kinds each have structural characteristics encouraging the quest, and testifying against the artificial group (*Megistanes*, Vieillot; *Proceri*, Illiger; *Ratitæ*, Merrem; *Struthionidæ*, Vigors) based upon modifications of the breast-bone and scapular arch, the consequences of disuse and degeneration of the muscles of flight, and with which a loose character of plumage is more or less associated.

The results of the researches which have determined the real affinities of extinct birds with keelless breast-bones and long-angled scapulo-coracoids, devoid of acromial and clavicular processes, support a reasonable expectation that the existing wingless genera, which have been shown to differ from one another considerably in important anatomical structures, in correlation with their distinct and remote habitats, will be ultimately referred to as many distinct natural groups which are now, or which formerly have been, represented by volant and typical members of the feathered class.

**EXPLANATION OF THE PLATES.**

**PLATE IV.**

Fig. 1. Reduced side view of the skeleton of the male Solitaire.
Fig. 2. Reduced side view of the skeleton of the female Solitaire.
Fig. 3. Copy of a figure of the living Solitaire, from the frontispiece to Leguat's work, above cited.

**PLATE V.**

Fig. 1. Side view of the skull of the male Solitaire.
Fig. 2. Top view of the skull of the same.
Fig. 3. Occipital surface of the skull of the same.
Fig. 4. Top view of the skull of the female Solitaire.
Fig. 5. Under view of the skull of the same.

All the figures are of the natural size.