It is possible to form an estimate of the minimum size of the Stonesfield Pterosaurian, on the assumption that all the remains which have been described are of one species; for, as all the bones of the long finger and its metacarpal have been obtained, it is clear that the finger and the hand must have been at least as long as the sum of the measurements of these detached bones. Now, as there is a

Distal phalanx	$6\frac{1}{2}$	inches long
3rd phalanx	$7\frac{3}{4}$	„ „
2nd phalanx	$7\frac{3}{4}$	„ „
Proximal	$7\frac{3}{8}$	„ „
Metacarpal	2	„ „ it is clear
that finger and hand attained at least	$31\frac{3}{8}$	inches in length.

Then, as in *Rhamphorhynchus* the fore-arm is more than twice as long as the metacarpal, and as there is a humerus $3\frac{1}{2}$ inches long, 40 inches will not be far from the length of one wing, and 7 feet may be safely assumed as the minimum distance between the extremities of the two wings, of the largest *Rhamphorhynchus Bucklandi*, any of whose remains have yet been found.

DESCRIPTION OF PLATE XXIV.

Fig. 1 *a*. Part of the mandible of a *Rhamphorhynchus* (*Bucklandi*, or *depressirostris*) in Lord Ducie's Collection, viewed from below.
Fig. 1 *b*. The same, viewed from the side and below.
Fig. 2. Right ramus of a mandible of *Rhamphorhynchus Bucklandi*, in Prof. Quekett's Collection.
Fig. 3. Part of the mandible of *Rhamphorhynchus Bucklandi* (?), in the Museum of the Geological Society.
Fig. 4. Part of the coraco-scapular bone in the Museum of Practical Geology.
Fig. 5. Internal view of a left coracoid, with part of the scapula, of *Rhamphorhynchus Bucklandi* (?), in Dr. T. Wright's Collection.
Fig. 6 *a*. Entire coraco-scapular bone of *Dimorphodon macronyx*, in the British Museum.
Fig. 6 *b*. Outline of the proximal end of the coracoid.
Fig. 6 *c*. Profile of the glenoid cavity.
Fig. 7. A right humerus of *R. Bucklandi* (?), in the Geological Museum of Oxford.
Fig. 8. Dorsal view of a left fifth metacarpal of *Rhamphorhynchus Bucklandi*, in Dr. Wright's Collection.
Fig. 9. Part of the proximal phalanx of a fifth or long finger, in the Rev. Mr. Witt's Collection.

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3. *On a* Fossil Bird *and a* Fossil Cetacean *from* New Zealand.

By Thomas H. Huxley, F.R.S., Sec.G.S., Professor of Natural History, Government School of Mines.

Some time ago, my friend Mr. Walter Mantell submitted to my examination two fossil bones from tertiary deposits at Kakaunui and Parimoa in New Zealand.

Of these, the one is the right tarso-metatarsal bone of a Bird belonging to the Penguin family, the other the humerus of a Cetacean of small size.

Fossil Bird.—The former bone (of which a front view is repre-

sented in fig. 1, and a back view in fig. 2) measures two inches and a half in extreme length, and rather more than an inch and a quarter across its proximal end. The precise width at the distal end cannot be given, as the innermost part of this extremity of the bone has been broken away; what remains measures $1\frac{1}{16}$ inch.

The proximal end of the bone presents two articular facets,—the one internal, an oval, shallow concavity, looking upwards and a little inwards; the other, external, quadrilateral, slightly convex from before backwards, slightly concave from side to side, and inclined more obliquely upwards and outwards. The two facets are separated by a stout median ridge, which rises into a conical tuberosity anteriorly, but dies away posteriorly into a shallow triangular pit. The posterior edges of both facets are rather more raised than the anterior ones; and marked transverse depressions separate both from the upper extremities of the four strong calcaneal ridges which project from the upper part of the posterior face of the bone (fig. 2).

Of these, the innermost is the strongest and longest; and a deep groove divides it from the two middle ones, which are separated by only a very shallow concavity. The outermost ridge prolongs the outer edge of the outer articular facet, with which it is continuous, downwards and inwards, upon the posterior aspect of the tarso-metatarse. Continuing the direction of this ridge, but in addition passing into the outer of the two median ridges, is a strong oblique "linea aspera" which passes downwards and inwards to the proximal end of the broken-off inner division of the distal end of the bone. On the distal side of this ridge, and in the same line with the outer median calcaneal ridge, is the posterior end of an oval foramen about $\frac{1}{8}$th of an inch in diameter, which completely traverses the metatarse. Below the ridge, internally, is a shallow, but broad, depression or fossa, which separates it from the middle of the three trochlear condyles into which the distal end of the bone, when entire, was divided.

The anterior face of the bone (fig. 1) presents a very different aspect. Its upper fourth or fifth overhangs the rest, especially on the inner side, where two short parallel ridges are seen running downwards and inwards. The outer and weaker of them ends superiorly in the anterior interarticular tuberosity which was mentioned above. Below it gives off a transverse crest inwards, which subsides before it reaches the inner of the two ridges. On the outer side of, and extending below this for about $\frac{1}{4}$th of an inch, is a deep narrow pit, which, however, penetrates but a very little way into the substance of the bone. From the inner margins of this pit, three or four thin sharp ridges arise and pass spirally downwards and inwards, the lower ones being much more inclined than the upper; the uppermost ones extend on to the inner surface of the bone, the lower stops short on its front face. Immediately below the interarticular tuberosity the face of the bone is greatly excavated; and this excavation ends below in a very deep groove, which extends through the whole length of the bone, to the fissure which separates the outer and middle condyles. At the superior end of the groove, an oval aperture leads into the canal

Fig. 1.—*Front view of the right tarso-metatarse of* Palæeudyptes antarcticus. Nat. size.

Fig. 2.—*Back view of the same bone* (fig. 1.). Nat. size.

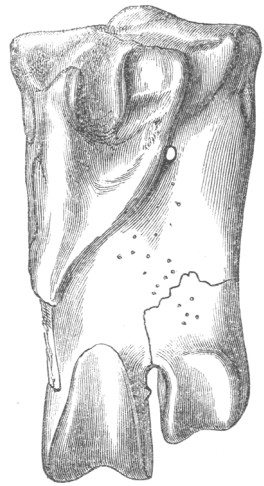


Fig. 3.—*Anterior face of the left humerus of* Phocænopsis Mantellii. Nat. size.

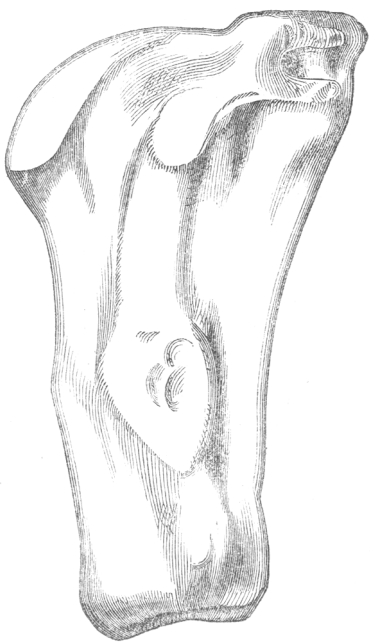
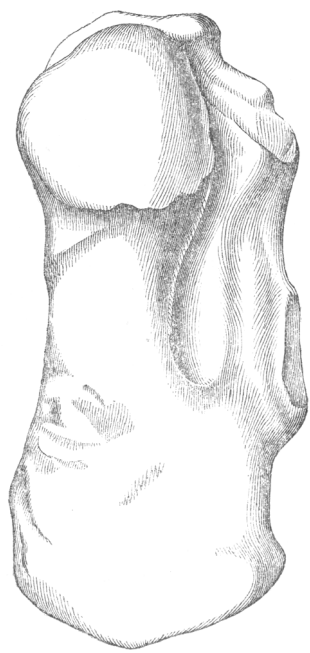


Fig. 4.—*Inner face of the same bone* (fig. 3.). Nat. size.



which terminates in the foramen seen on the posterior face of the bone. The middle part of the groove is deep, but not perforated, while its distal end is shallower. The upper end of the groove is on the same level as the deep pit to which I have previously referred; a somewhat narrow, but strong, bony partition separates the two, and is continued down into the substance of the middle metatarsal bone, which constitutes the inner wall of the groove. Just below the pit and foramen this wall presents an oval roughened space $\frac{1}{4}$th of an inch long, for the insertion of the tendon of the *tibialis anticus*. The outer wall of the groove is more prominent than the inner, and has the form of a strong bony column, which ends above in the outer articular facet; below this, however, it presents a rough transverse ridge, descending lower on the outer than on the inner side, while superiorly and internally it arches over the summit of the groove towards the two inner vertical ridges which have been described.

Its outer and front surfaces exhibit several spiral markings like those on the inner division. Below, this outer column of bone, which is narrow from before backwards ($\frac{5}{16}$ths of an inch), suddenly widens to nearly $\frac{3}{4}$ths of an inch, and presents a semicircular inferior contour when viewed laterally. Its distal end, in fact, is converted into a subcylindrical articular condyle, slightly concave from side to side, and having its anterior and posterior faces oblique to the plane of the bone and to its transverse axis. It is like a portion of a cylinder whose axis is directed upwards, outwards, and backwards, so that its inner edge is more prominent anteriorly, its outer edge posteriorly, and its inner edge inferiorly. A deep broad cleft, corresponding in length with the articular surface, separates this condyle from a second, developed from the middle of the distal end of the bone. This middle condyle is wider than the outer, measuring fully half an inch transversely; it is also deeper, having an antero-posterior diameter of fully $\frac{3}{4}$ths of an inch; and it is longer, for, though its proximal end is on the same level as that of the outer condyle, its distal end extends a quarter of an inch beyond it.

The transverse excavation of the articular surface is also greater; the articular surface itself extends over $\frac{3}{4}$ths of a circle, and is narrower superiorly than inferiorly; while its inner lip projects a little beyond the outer, in front and above. For the rest, the median plane of the condyle is parallel with the axis of the bone; and its articular surface might be represented by a grooved segment of a cylinder whose axis should be perpendicular to the axis of the whole bone. Of the third or inner condyle, nothing remains but a rough space indicating where it has been broken off. There is an irregularly tuberculate area on the upper part of the inner face of the bone, which perhaps marks the attachment of a rudimentary inner toe.

Those acquainted with the osteology of birds will entertain no doubt that this is the tarso-metatarsal bone of an animal of that class; while the short, stout, proportions of the bone and the deep grooves, pits, and foramina, which indicate the lines of division of the primitively distinct metatarsals, demonstrate that it belonged to one of the squamipennate or Penguin tribe.

Of the Penguins several genera are found in the southern hemisphere, ranging from New Guinea to within the antarctic circle. The proportions of these birds are such, however (the tarso-metatarse being always very short in comparison with the length of the body), that the bone that I have described in all probability belonged to a Penguin of larger dimensions than any living species which have been observed, massive as some of these birds are.

Sir James Ross states that the largest "Emperor Penguin" (*Aptenodytes Forsteri*, Gray, the largest species of the group) caught during his expedition weighed seventy-eight pounds; but he does not give its length. Specimens of some of these birds, obtained during the voyage of the "Erebus" and "Terror," are to be seen in the British Museum; but the largest does not stand 3 feet 6 inches high. The fine skeleton of an Emperor Penguin in the same collection measures, as it is set up, about 2 feet 5 or 6 inches in height; and I do not suppose that the bird to which it belonged could possibly have stood more than three feet high. Now the right tarso-metatarse of this skeleton measures only $1\frac{3}{4}$ inch in length; so that, in this dimension, the fossil is to it as 10 : 7, or nearly half as long again, and its owner might have stood between four and five feet high, supposing that the general proportions of the two animals were alike.

On making a careful comparison of the fossil bone with its homologues in other Penguins, I found that it differed in many respects from the tarso-metatarse of *Aptenodytes*, which is broader in proportion to its length, is traversed by two distinct interosseous foramina, has a much less-marked external longitudinal groove on its anterior face, and has only two distinct calcaneal ridges, of which the inner arises from the whole width of the upper end of the inner component of the metatarse. Furthermore there is no posterior oblique "linea aspera"; and the surfaces of the bones are altogether smoother. In these respects I find that the skeletons of both of the large Penguins (*A. Forsteri* and *A. Pennantii*) which I have examined agree with one another, and differ from the fossil.

The tarso-metatarse of a smaller member of the same family, the Crested Penguin (*Eudyptes chrysolophus*), much more nearly approximates to the characters of the fossil bone. The tarso-metatarse of *Eudyptes* measures $1\frac{1}{4}$ inch in length by $\frac{5}{8}$ths of an inch wide at its proximal extremity (the same proportions as in the fossil), while the distal end has a width of $\frac{13}{16}$ths of an inch.

There are two interosseous foramina, as in *Aptenodytes*; but the outer is the longer and narrower, and the groove prolonged from it on to the anterior face of the bone is the deeper,—in both which respects *Eudyptes* approaches the fossil and differs from *Aptenodytes*. Again, there are two short oblique ridges on the upper part of the anterior face, above the inner foramen, in *Eudyptes*; and there is a small tuberosity on the inner side of the outer foramen, which, if broken or worn, would give rise to just such an oval rugose area as that I have indicated in the fossil.

On the other hand, the latter differs from the corresponding bone of *Eudyptes* in the division of the calcaneal ridges into four, in

the more slender and crest-like form of the inner one, in the cæcal ending of the inner foramen and in the "linea aspera" on the posterior face, and in indicating a bird of twice the size of any *Eudyptes* that I have seen.

I have further compared the tarso-metatarsal bones of *Spheniscus demersa* and *S. minor* in the Museum of the College of Surgeons with the fossil one. Their proportions are like those of *Eudyptes*; they have a tubercle on the outer side of the middle metatarsal bone very like that in the fossil; and the form of the upper part of the anterior face of the bone, in *S. demersa*, is very similar to that exhibited by the bone from New Zealand; but there is a completely open inner interosseous foramen, and the inner and middle metatarsals are separated by a deep, though narrow, groove as long as the outer one. There is the same absence of spiral ridges and of a "linea aspera" as in the *Eudyptes*.

On the whole, therefore, the fossil is less like *Spheniscus* than *Eudyptes*.

In view of the resemblances and differences which I have pointed out, I cannot regard the fossil bone as a part of a Penguin belonging to any known genus; and I therefore propose to institute the new genus *Palœeudyptes* for it. The present species may be termed *P. antarcticus*.

This is not the first time that the remains of the Penguin have been found fossil, Dr. Mantell having briefly alluded to their occurrence in his paper "On the Remains of Birds from New Zealand," published in the Journal of this Society in 1850; but, so far as I know, no particular description of such fossils has hitherto been given.

The bone which I have described was found by a native in the limestone* of Kakaunui, and was brought to Mr. Mantell imbedded to some extent in a matrix which was readily recognizable as that particular limestone. Mr. Mantell informs me that the Kakaunui limestone is overlain by a mass of blue clay, that upon the blue clay is superimposed a bed containing freshwater shells, and that upon this, again, lies the alluvium in which the remains of the *Dinornis* are found,—the last, in Mr. Mantell's opinion, having unquestionably coexisted with, and been killed and eaten by man.

The marine shells contained in the blue clay and in the limestone are different from those now living in the seas of New Zealand. It would appear, therefore, that the Kakaunui Limestone is at least of Pliocene age, if not, as Mr. Mantell suspects, much older.

Whatever be the precise age of the fossil, it is not a little remarkable to find in strata of such antiquity the remains of a bird the whole of whose congeners are at present absolutely confined to the Southern Hemisphere, and therefore, in a broad sense, to the same great distributional area. If the strata be of Pliocene age, the fact is in accordance with the relations which have been observed to obtain between the recent and Pliocene faunæ of the Northern Hemisphere. On the other hand, the little that is at present known respecting

* See Quart. Journ. Geol. Soc. for August 1850, vol. vi.

the distribution of Birds in time is not inconsistent with the ascription of a far greater antiquity to a genus as closely allied as *Palœeudyptes* to those which now exist.

Fossil Cetacean.—The Cetacean bone (figs. 3 & 4) is a left humerus, which was obtained at Parimoa, about five miles north of Kakaunui, from the blue clay above referred to, and is therefore of more recent date than the *Palœeudyptes*. It measures $3\frac{1}{4}$ inches in total length; $1\frac{1}{2}$ inch in depth, from before backwards, at its distal end; about 2 inches in extreme width at its proximal end. In the middle of its length it measures $1\frac{1}{8}$ inch in width and $1\frac{3}{8}$ inch in depth. The middle of the shaft is therefore a good deal compressed from side to side; but its preponderating depth arises, in great measure, from a thick protuberant ridge which occupies the two upper thirds of the outer half of its anterior face (fig. 3). Superiorly, this ridge is bounded by a wide transverse groove, which marks the great tuberosity of the humerus in front, and is continued downwards upon the inner side of the ridge, terminating, above its inferior end, in a sort of *cul-de-sac*. Inferiorly, the ridge ends in a roughened oval protuberance, which occupies the lower of the two median fourths of the longitudinal diameter of the bone; and, as this tuberosity is abruptly truncated below, the lower fourth of the bone is considerably narrower than its middle part, when viewed laterally.

The posterior face of the humerus is slightly concave, very wide (1·9 inch) above, where it spreads out into the articular head on the inner side and the tuberosity on the outer, but narrowing below to not more than $\frac{3}{5}$ths of an inch. At this part it is very rough and irregular for a space of $\frac{2}{3}$rds of an inch, forming a facet with which the anterior face of the olecranon was connected. The superior part of the posterior face is excavated by a deep cavity; but I suspect this to be an accident arising from the destruction of the loose, cancellated, bony tissue of this region.

The outer face of the bone is slightly convex from before backwards; concave from above downwards, owing to the great projection of the tuberosity of the humerus outwards.

The inner face (fig. 4) exhibits, above, the articular head, which descends upon it, anteriorly the deep longitudinal groove to which I have referred above, and posteriorly, opposite the lower end of this, a roughened elevation.

Inferiorly, the inner face is flat; superiorly it is concave, owing to the projection inwards of the articular head. This looks upwards and inwards; it is smooth, convex, and pyriform, the small end being turned outwards and upwards. Its greatest length is $1\frac{1}{3}$ inch, its greatest breadth 1 inch. Externally it is separated by a shallow curved depression from the tuberosity.

The distal end of the bone presents two articular facets for the radius and ulna, which might be represented by two half-ovals united by their straight edges, in a ridge which traverses the distal end transversely, and is nearer its posterior than its anterior end. The anterior or radial facet, in fact, measures $\frac{4}{5}$ths of an inch in length, while the posterior or ulnar does not exceed $\frac{3}{5}$ths. The

anterior facet looks downwards and slightly forwards, the posterior downwards and slightly backwards; the latter passes into the olecranar facet, which, looking directly backwards, is of course almost at right angles with the proper ulnar facet.

One of the most remarkable features presented by this bone is its slenderness, the long diameter being to the antero-posterior diameter of the distal end as $2\frac{1}{3}$ to 1.

In *Balæna*, *Balænoptera*, *Delphinus*, *Orca*, and *Hyperoodon*, the antero-posterior diameter of the distal end bears a very much greater proportion to the length of the humerus. Thus, for instance, in a *Delphinus tursio* in the Museum of the College of Surgeons, whose humerus has nearly the same length as that of the fossil, viz. $3\frac{1}{2}$ inches, the antero-posterior diameter of the distal end is $2\frac{1}{2}$ inches, or the two diameters are as $1\frac{2}{5}$ to 1; and the corresponding bones in such species of the other genera mentioned as I have examined have similar or even broader proportions.

In a skeleton of *Monodon monoceros*, between 9 and 10 feet long, in the same collection, the humerus has a length of $4\frac{3}{4}$ inches, and a distal antero-posterior diameter of $2\frac{1}{4}$ inches; in other words, these diameters are as $2\frac{1}{9}$ to 1,—proportions which much more nearly approximate those of the fossil. But then the radial and ulnar facets are nearly equal; there is no distinct facet for the olecranon; and there is no anterior ridge.

The nearest approximation to the fossil, which I have been able to meet with, is the humerus of the common Porpoise (*Phocæna communis*) of our own seas. Its length is to the antero-posterior diameter of its distal end as about 2 to 1. It exhibits an anterior ridge, bounded by a groove on its inner side; its inner face has a slight elevation on the posterior half of its middle region; the radial facet is larger than the ulnar; and there is a distinct olecranar facet. But the plane of this facet is very little inclined to that of the rest of the ulna; the tuberous part of the anterior ridge occupies the lower third of the anterior face, and is separated by but a very small space from its distal end; and the anterior ridge above it is almost obsolete, so that the bone appears much constricted superiorly.

While it presents certain resemblances to the humerus of *Phocæna*, therefore, the fossil bone differs widely from it, and still more from the same bone in any other genus of the *Cetacea* with which I have been able to compare it. I consider it therefore to indicate a distinct genus of *Cetacea*, which may be called *Phocænopsis*, and, after its discoverer, *P. Mantelli*.