

## Notes on Some Neognathous Bird Bones from the Early Tertiary of New Zealand.

By B. J. MARPLES.

Department of Zoology, University of Otago.

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WITH the exception of a few penguins and moas, apparently no Tertiary fossil birds have previously been described from New Zealand. It seemed, therefore, that the following specimens, though fragmentary, are worthy of brief notice.

Amongst the bones of a fossil penguin recently discovered in the Maerewhenua Greensand, near Duntroon, North Otago, was a portion of a furcula which is quite unlike that of any recent penguin. As the penguin skeletons from Duntroon differ only in minor details from recent ones, it is probable that this bone, though found with those of a penguin, actually belongs to a bird of a different group. This is supported by the fact that a penguin skeleton of comparable geological age, now in the Otago Museum, has a well preserved furcula similar to those of recent penguins and quite unlike the bone now under consideration.

The specimen is a furcula of which the symphysis together with 76 mm. of one ramus and 19 mm. of the other are preserved. Its most striking characteristics are the wide angle between the rami and their slight curve. In these respects it differs from the penguin bone, and it also differs in that the broadening of the rami takes place in a direction inclined some  $45^\circ$  to the plane of the furcula instead of perpendicular to it. In general appearance the furcula resembles that of an albatross.

In describing the furcula the symphysis will be regarded as ventral, the free ends of the rami as dorsal, the convex aspect of the rami as anterior, and the concave aspect, that is the one nearest to the thorax, as posterior. At the symphysis a slight ridge is present on the ventral extremity, and on the anterior side there is an elevation, somewhat eroded but apparently never large. There is no tubercle on the posterior side, and in the vicinity of the symphysis the bone is rounded and without sharp edges or ridges. Roughly 15 mm. from the symphysis the rami are oval in section, being narrowest in the anterior posterior direction. The rami become broader and thinner in their more dorsal regions as far as preserved, but the longer one is broken off and eroded some 76 mm. from the symphysis. The plane of flattening becomes progressively rotated in such a way that the lateral margin lies anterior to the median one and the plane of the ramus inclined at an angle of about  $45^\circ$  to the plane of the

furcula as a whole. The width of the ramus at the widest part preserved is 14 mm.

The Maerewhenua Greensand is a glauconitic deposit of Duntroonian age, which is said to belong to the Middle or Upper Oligocene. It is highly fossiliferous, and contains among the vertebrates the remains of sharks, penguins and both toothed and whalebone whales. In such a locality the most likely flying birds would be members of the Procellariiformes or the Pelicaniformes. The specimen was compared with as many skeletons as were available of these and other orders and seemed most closely to resemble the furcula of the albatross. Examples of the principal groups of petrels were examined, but only the albatrosses showed any resemblance to the present specimen. Specimens of *Diomedea exulans*, *D. epomophora*, *Thalassarche cauta*, *T. melanophrys* and *T. chrysostoma* were available from this group. The nearest in size to the present specimen is that of *D. exulans*, though this has a slightly greater angle between the rami.

With the exception of *D. epomophora*, in which there is a slight expansion near the dorsal end, the furculas of all these albatrosses have rami which are more or less the same breadth throughout the greater part of their lengths and end dorsally in sharp points. The ramus of the fossil specimen, however, increases in breadth from 6 to 14 mm. In the albatrosses the anterior surface of the symphysis is somewhat concave and has two low ridges or tubercles on its ventral margin. Its dorsal margin is a sharp edge which is continued dorsally as the median margins of the rami. In the fossil bone the anterior surface of the symphysis has a distinct tubercle. Its summit is eroded but it does not appear to have been very high. The ventral margin is rounded and has a low keel in the middle line. The posterior surface of the symphysis of the albatross furcula has a well-developed tubercle, which in *D. melanophrys* extends across the whole height of the symphysis but in the others is confined to its ventral half only. There is a slight erosion in this region of the fossil but clearly no tubercle was present. The posterior surface of the ramus is flat in the albatross, but distinctly curved in the fossil. In the albatross that lateral margin of the ramus is rounded for a short distance from the middle line, 27 mm. in *D. exulans*, and then has a low posteriorly directed ridge presumably marking the margin of the clavicular origin of pectoralis major. The condition is similar in the fossil, the ridge beginning 32 mm. from the middle line.

According to Lambrecht (1933) the only fossil albatross is a species of *Diomedea* described from a tarsus from the Middle Pliocene of England. (Lydekker, 1886). In addition to the bone described here fragments of the shafts of an ulna and a radius of a flying bird were found in the Maerewhenua Greensand, which might have belonged to the same or a slightly smaller species.

**Manu antiquus.** gen. et sp. nov. Plate 6, Figs. 7, 8, 9.

Maerewhenua Greensand. Duntroonian. Upper Oligocene. Bird about the size of a large albatross. Furcula with slightly curved rami. Rami rounded ventrally, broader and flatter dorsally. Measurements of ramus as follows:—

Distance from Symphysis.	Greatest Breadth.	Thickness.
20 mm.	6.3 mm.	4.5 mm.
40 mm.	7.0 mm.	4.1 mm.
60 mm.	10.5 mm.	3.4 mm.
72 mm.	13.9 mm.	—

Symphysis region with rounded margins, a median tubercle on the anterior surface, little or no tubercle on the posterior surface, and a low anterior-posterior keel on the ventral surface.

Type: Incomplete furcula, in the Otago Museum. No. C.45.7.

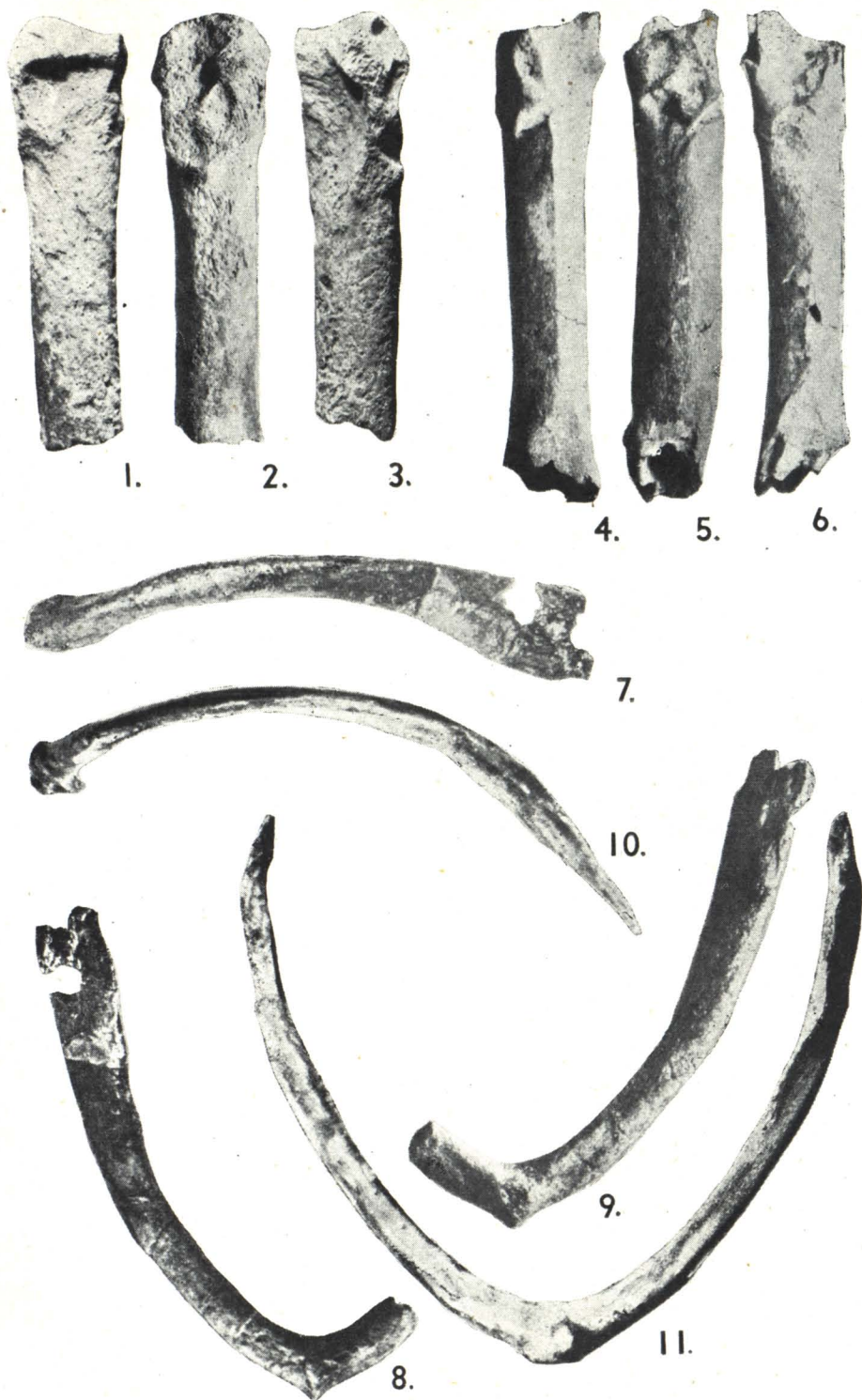
Two fragmentary femora are perhaps worth recording as they apparently do not belong to penguins. Both are in the Otago Museum.

The first, No. C.45.8, was associated with whale and penguin bones from Waimate in limestone of Duntroonian age. It was, however, entirely free from matrix, but it seems probable that it was found together with them. The specimen consists of the shaft only of a right femur, both extremities being broken off. The original length of the bone must have been some 90 mm., the diameter at the centre of the shaft is 12 mm. antero-posteriorly and 10.5 mm. at right angles to this. Its most striking feature is a well marked groove running obliquely across the outer surface of the bone from the proximal end of the ridge which leads up to the trochanter on the anterior surface of the shaft. No such groove has been observed on any other femur. A ridge runs along the length of the anterior surface of the shaft and a more irregular one along the distal half of the posterior surface. This bone has a wide open lumen throughout its whole length. The only signs of cancellous structure are at the ends, the inside of the shaft being smooth as far as can be made out, and it seems likely that the bone was pneumatic.

The second specimen, No. C.45.9, is in the Otago Museum collection but without any matrix or indication as to its origin. It consists of the proximal half of a left femur which is well preserved except for the absence of the articular head. The shaft is straight and cylindrical and without ridges running along it. The antero-posterior diameter 55 mm. from the trochanter is 11 mm., and it is the same in the direction at right angles to this. The diameter of the central cavity is 4 mm. The outer aspect of the proximal end is irregularly covered with hollows where muscles were inserted and does not resemble the corresponding region of the penguin femur. The most striking difference in this region is a well marked impression on the outer posterior part of the trochanter, presumably where obturator internus was inserted. This impression cuts into the border of the articular surface of the trochanter. In penguins this impression is less well marked and the margin of the articular surface is a sweeping curve. In this respect the present specimen resembles the albatross femur, but not very closely in its other details.

#### LITERATURE CITED.

- LAMBRECHT, K., 1933. *Handbuch der Palaeornithologie*. Berlin.  
 LYDEKKER, R., 1886. Notes on Some Vertebrates from the Red Crag. *Q.J. Geol. Soc.* 42, pp. 364-368.



All the figures are natural size.

FIG. 1.—Femur C.45.9, flexor surface. FIG. 2.—Femur C.45.9, lateral surface.  
 FIG. 3.—Femur C.45.9, extensor surface. FIG. 4.—Femur C.45.8, extensor surface.  
 FIG. 5.—Femur C.45.8, lateral surface. FIG. 6.—Femur C.45.8, flexor surface.  
 FIG. 7.—*M. antiquus* furcula, lateral view. FIG. 8.—*M. antiquus* furcula, posterior  
 view. FIG. 9.—*M. antiquus* furcula, anterior view. FIG. 10.—*T. cauta* furcula,  
 lateral view. FIG. 11.—*T. cauta* furcula, posterior view.