On some fossil birds from the Zebbug cave, Malta / by W.K. Parker.

VI. *On some Fossil Birds from the Zebbug Cave, Malta.*

By W. K. Parker, *F.R.S., F.Z.S., &c.*

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[Plate XXX.]

Five years have elapsed since I first examined numerous bony remains from the Zebbug Cave, the "lamellirostral" nature of which was apparent to Dr. Falconer and myself from the first. I transmitted a list of them to that lamented palæontologist for his and Captain Spratt's inspection, the latter gentleman having taken an active part in exhuming these treasures. A fresh examination of them has not changed my views as to their nature; and I can now refer to figures of the most important, drawn side by side with their counterparts in the common Swan (*Cygnus olor*). The specimen of this species, the bones of which I have used for comparison, was a fine old female, 5 feet long from the tip of the beak to the end of the tail, not so large as the male, but a large bird notwithstanding. As half or more of the fossil bones evidently belonged to a Swan about one-third larger than my specimen of the tame kind, it must have been a noble creature, and its extinction is to be deplored as much as that of the Dinornis and the Dodo.

Many of the bones belonged to a smaller kind than even the common mute species: it was about the size of a male Bewick's Swan, or the female of the Common Hooper (*C. musicus*); some, however, belonged to a bird as large as the male Hooper. There were also some bones of much smaller dimensions; these appear to have belonged to a small Bernicle, such as the *Bernicla brenta*.

On June the 10th, 1861 (the next summer), I received, through Professor Rupert Jones, another parcel of these bones; and last autumn Mr. Busk put into my hands the hinder part of the skull of the largest kind, which, with a few thigh-bones of the same species, he had received from Dr. Leith Adams, of Malta.

Altogether there are in my hands about three pounds' weight of fragments, amounting to several dozen in number. About one-fifth of these are indeterminable, on account of their worn and comminuted condition. The only bones quite perfect are phalanges; and, with the exception of the lower part of a *tibia* of the largest kind, which is $6\frac{1}{2}$ inches long, the pieces are from 1 to 4 inches in length. Mr. Erxleben suggests that they are the remains of feasts held by foxes—a very good suggestion, as far as I can see.

The specimens of bones belonging to the largest kind of Swan, which I propose to call *Cygnus falconeri*, in honour of the great palæontologist whose loss we have so lately suffered, are as follows:—

Skull (posterior fragment)	2 specimens.
Ribs (upper part)	3 „
Ulna (middle)	1 specimen.
Femur (various parts)	12 specimens.
Tibia (various parts)	20 „
Tarso-metatarse (various parts)	20 „
Phalanges (perfect)	3 „

Of the smaller kind of Swan (*Cygnus musicus*?) there are—

Cervical vertebra (2nd or 3rd)	2 „
Sternum (anterior part)	1 specimen.
Scapula (proximal part)	7 specimens.
Humeri (various parts)	18 „
Ulna (various parts)	7 „
Radius (various parts)	7 or 8 „
Metacarpus (various parts)	5 „
Phalanx (proximal, perfect)	1 specimen.
Phalanx (distal, perfect)	2 specimens.
Sacrum (various)	3 „
Femur (shaft-part)	2 „
Tibia (various)	3 „
Tarso-metatarse (various parts)	4 „
Phalanges (perfect)	5 „

Of the small Goose-bones (*Bernicla* ——?) there are—

Coracoid (head)	1 specimen.
Radius (distal and middle portions)	2 specimens.
Ulna (middle)	1 specimen.
Metacarpus (almost perfect)	1 „
Femur (nearly perfect)	1 „
Tibia (lower end)	1 „

Some of these bones are of a beautiful ferruginous dark brown; others are of a light colour, like the clay in which they were imbedded.

Cygnus falconeri, Parker. Skull.

Dr. Leith Adams's specimen of this part of the great Swan came to hand too late to be figured; I was able to make out that it belonged to a Swan nearly one-third larger than *Cygnus olor*, and to see the occipital plane, foramen, and condyle, as well as part of the parietal and temporal regions. With this specimen of the skull there were two or three fine "ossa femoris," which corroborated the conclusion I came to as to the skull be-

longing to *C. falconeri*; for the thigh-bones were the exact counterpart of those which had come earlier under my notice.

I annex a Table of measurements of the bones of *C. falconeri*, as compared with those of the large female *C. olor*:—

	C. olor.		*C. falconeri.*	
	inches.	lines.	inches.	lines.
Middle thoracic rib—				
a. Across the neck	0	5	0	6
b. Width of outer edge	0	3	0	4
Ulna—				
Diameter of shaft	0	5	0	7
Radius—				
Diameter of shaft	0	3	0	4
Femur—				
Across head and trochanter	1	1	1	5
Width of middle of shaft	0	5½	0	8
Width across lower condyles	1	0	1	5½
Tibia—				
Fore-and-aft width of head	1	5	1	9
Thickness of head	0	9½	1	2
Width of shaft	0	5½	0	8
Width across lower condyles	0	11	1	4½
Tarso-metatarse—				
Extreme length	4	3	5	3
Width across head	1	0	1	2½
Width across shaft	0	5	0	6
Width across condyles	1	0	1	4
Phalanx (proximal, middle)—				
Length	2	2½	1	7½
Thickness of proximal end	0	5⅔	0	7½
Thickness of shaft	0	3	0	4½

Mr. Erxleben's figures show very faithfully the perfect agreement, in everything but size, between the great extinct Swan and *Cynus olor*. The largest bones of *C. falconeri* are not, however, displayed in the Plate, for this reason, that the most perfect bones for figuring were apparently those of *females*; but there are bones still larger in the collection, most likely those of male birds.

The coarseness of these bones is well shown when the diploë is displayed (see Pl. XXX. figs. 10, 11 & 12), and the walls of the tibial diaphyses are a line and a half (one-eighth of an inch) thick in the stoutest specimens.

The Ribs.—The coarseness of the bones, and their great size as compared with those of the tame species, are well seen in the three fragments of ribs; they are, altogether, one-fourth larger than their counterparts in the living Swans.

The Ulna (Pl. XXX. figs. 4 & 5).—The diameter of the ulna, as seen in fig 5, is as 7 to 5 compared with fig. 5 *a*; and the strength of the shaft is well shown in fig. 4. The oblong quill-knobs, confluent by means of an elevated ridge, are well shown to be precisely alike in the extinct and the tame species.

The Femur (Pl. XXX. figs. 6, 7, 8, 9, 10 & 11).—These figures of the left femur, although not of the most massive specimens, give a good idea of the stoutness of this lost bird: its head, trochanter, shaft, and lower condyles are seen to be most exactly like those of the tame kind, save and except such intensification of the ridges and general surface-marking as is due to the origin and insertion of the muscles of a much mightier bird.

Tibia (Pl. XXX. figs. 12, 13, 14 & 15).—This, again, is evidently the bone of a female, as there are considerably larger specimens, although not so perfect, in the collection. Fig. 12 shows the strength of the shaft; fig. 13 is an anterior view of the distal end of the right tibia, showing the broad tendon-bridge and groove, the space for attachment of the fibula, and two depressions in the space for the precalcaneal knob, which are but faint in the tame kind. Fig. 14 shows the extent of the lower condyle as seen laterally on the inside, and fig. 15 its division into an inner and outer lobe.

Tarso-metatarse (Pl. XXX. figs. 16, 17, 18 & 19).—The length of this right shank is seen to be greater in proportion to its thickness than in the tame Swan; but their general agreement is most accurate.

The low precalcaneal knob, the postcalcaneal ridges, grooves, and bridge, and the form and relative proportions of the lower bifid condyles are well seen. There is, however, a passage, shown in the head of the shank of the tame Swan (fig. 19*a*), which does not appear in fig. 19: this mistaken *foramen* escaped me when examining the proof-plates; it was made by me in the tame Swan's bone for the purpose of syringing out the marrow.

The bony bridge uniting the outer and middle condyles (figs. 16, 17, 18) is seen to correspond beautifully in the two birds; the perfection of the figures exonerates me from detailed description.

Phalanges (Pl. XXX. figs. 20, 21 & 22).—There are only three phalanges which I can safely refer to the largest Swan; but they are very remarkable, being quite unlike what we see in the species of Swans still living; for fig. 20, as compared with fig. 20*a*, is seen to be full one-third thicker, and but little more than two-thirds the length. This is the case with the proximal phalanx of the great or middle toe; and the other two are quite similar in shortness and robustness.

If this shortness of the toes be remembered, along with the fact that the shank is

longer in proportion than in the recent kinds, we shall see that the great extinct Swan was rather generalized in character, being somewhat of a Goose, possessing, as he did, longer legs and shorter toes than the typical Swans.

It would appear, however, that, like the gigantic Adjutant among the Storks, this bird had its wings of the full relative size: the immense ulna shows this (see Pl. XXX. figs. 1, 4 & 5).

As the feet were shorter, it is probable that the extinct bird was not so expert at *rowing* as the smaller but more elegant kinds; on land he may have shown better; and perhaps he was altogether more terrestrial.

It is worthy of remark, that the most generalized type of all the "Lamellirostres," viz. the *Palamedea*—that in which the lamellæ of the beak are arrested in their growth, and which has no webs to connect the toes—has the digits longer even than the Swans. This bird, however, is not unrelated to the Grallatorial "Macrodactyli."

Cygnus musicus (?).

The most important bone of those belonging to the smaller Swan, which, as the foregoing list shows, are very numerous, is the front part of the sternum. This fine fragment is well shown in Pl. XXX. figs. 1, 2, 3; and, besides exhibiting the separated coracoid grooves, anterior part of keel, costal process, condyles for sternal ribs, ridge for middle pectoral, &c., is especially interesting because of the well-displayed anterior part of the cavity for the wind-pipe. Fig. 3 shows the smooth, rounded cavity; fig. 2 part of its left wall; and fig. 1 the eminence caused by it on the midline of the sternum: the two rows of wind-passages are also well seen.

This, then, is the sternum of one of the Wild Swans, perhaps the greater species (*C. musicus*), perhaps *C. bewickii*, or, it may be, some species nearly allied to these. At any rate it is interesting to find that *C. musicus* is still to be found in lands bordering the Mediterranean, the Rev. H. B. Tristram having, in his last travels, received it from Solomon's Pool, near Jerusalem (see Proc. Zool. Soc., 1864, p. 453).

The similarity of the bones in the species of Swans is so great that I feel it to be unnecessary to describe the rest of the bones of the smaller kind; they are nearly all fragmentary, like those of *C. falconeri*, and the fragments are in the same good condition. The birds which owned these bones varied in size from that of a small female tame Swan to that of a medium-sized Black Swan; yet the difference is scarcely more than *varietal* and *sexual*. There may have been more than two species buried in the Zebbug Cave; but we lack positive evidence.

The smallest "lamellirostral" bones are intermediate in size between those of the Wild Goose (*Anser cinereus*) and those of the Mallard (*Anas boschas*); so that they may have belonged to a small female Bernicle, such as the black-faced kind (*Bernicla brenta*).

But, few as these are, they probably belonged to two kinds; for the femur and tibia

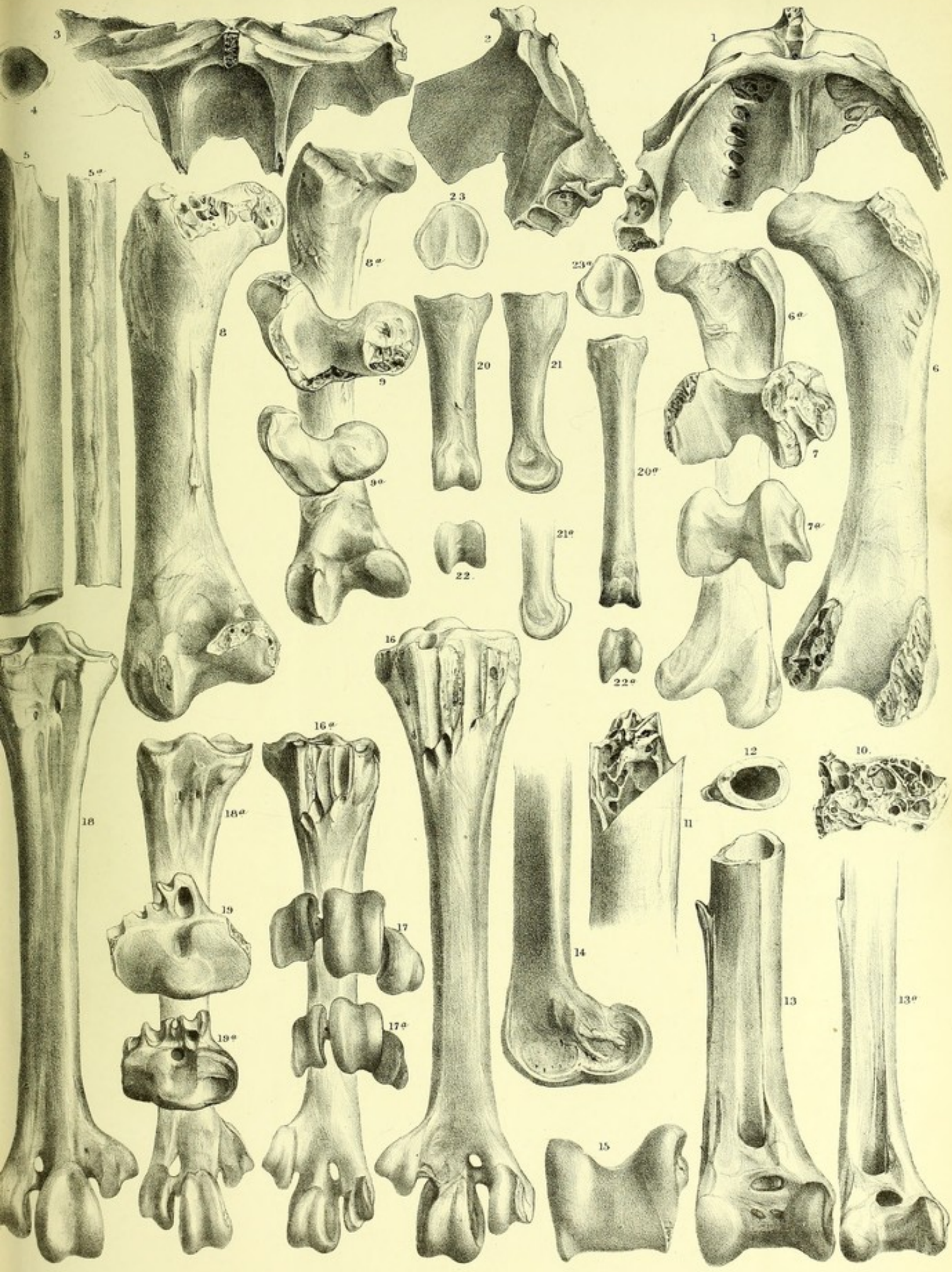
are relatively larger than the coracoid and metacarpus: these latter bones are not larger than those of a good-sized tame Duck (*A. boschas*).

DESCRIPTION OF PLATE XXX.

(N.B.—The figures are all of the natural size.)

Fig. 1. Anterior fragment of sternum of *Cygnus musicus* (?); upper view.
Fig. 2. Anterior fragment of sternum of *C. musicus* (?); side view.
Fig. 3. Anterior fragment of sternum of *C. musicus* (?); front view.
Fig. 4. Ulna of *C. falconeri*; end view of fragment.
Fig. 5. Ulna of *C. falconeri*; side view of fragment.
Fig. 5*a*. Ulna of *C. olor*; side view of fragment.
Fig. 6. Femur (left) of *C. falconeri*; front view.
Fig. 7. Femur (left) of *C. falconeri*; lower view.
Fig. 8. Femur (left) of *C. falconeri*; hinder view.
Fig. 9. Femur (left) of *C. falconeri*; upper view.
Figs. 6*a*–9*a*. Femur (left) of *C. olor*.
Figs. 10, 11. Femur of *C. falconeri*; fragments.
Fig. 12. Tibia (right) of *C. falconeri*; end view of fragment.
Fig. 13. Tibia (right) of *C. falconeri*; front view of distal end.
Fig. 14. Tibia (right) of *C. falconeri*; side view of distal end.
Fig. 15. Tibia (right) of *C. falconeri*; end view of distal end.
Fig. 13*a*. Tibia (right) of *C. olor*; front view of distal end.
Fig. 16. Tarso-metatarse (right) of *C. falconeri*; hinder view.
Fig. 16*a*. Tarso-metatarse (right) of *C. olor*; hinder view.
Fig. 17. Tarso-metatarse (right) of *C. falconeri*; lower view.
Fig. 17*a*. Tarso-metatarse (right) of *C. olor*; lower view.
Fig. 18. Tarso-metatarse (right) of *C. falconeri*; front view.
Fig. 18*a*. Tarso-metatarse (right) of *C. olor*; front view.
Fig. 19. Tarso-metatarse (right) of *C. falconeri*; upper view.
Fig. 19*a*. Tarso-metatarse (right) of *C. olor*; upper view*.
Fig. 20. Phalanx (proximal, of middle toe) of *C. falconeri*; upper view.
Fig. 20*a*. Phalanx (proximal, of middle toe) of *C. olor*; upper view.
Fig. 21. Phalanx of *C. falconeri*; side view.
Fig. 21*a*. Phalanx of *C. olor*; side view.
Figs. 22, 23. Phalanx of *C. falconeri*; end views.
Figs. 22*a*, 23*a*. Phalanx of *C. olor*; end views.

* The circular hole in this view is of artificial origin.



J. Erxleben, del et lith.

M & N. Hanhart, Imp.

1_3 CYGNUS MUSICUS ? 4_23. C. FALCONERI, P. 4a_23a_C. OLOR.