COLLECTED PAPERS, VOL. I, PP. 267-287: THE STRUCTURE AND HABITS OF ARCHAEOPTERYX

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649237609

Collected papers, Vol. I, pp. 267-287: The structure and habits of archaeopteryx by C. Herbert Hurst

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

C. HERBERT HURST

COLLECTED PAPERS, VOL. I, PP. 267-287: THE STRUCTURE AND HABITS OF ARCHAEOPTERYX

Trieste

COLLECTED PAPERS

of

C. Herbert Hurst

Volume I
(1895)

Manchester 1895

1

THE STRUCTURE AND HABITS OF ARCHÆOPTERYX.

By C. H. Hurst, Ph.D.

Plates XIV., XV., XVI.

1.—The Skeleton of Archæopteryx.

Apart from a single feather, only two specimens of *Archæopteryx* are known, and it is possible that these may not be identical in species or even in genus. So far as we know them, the differences between the two appear, to those who are best qualified to judge, to be too small to justify separation into two species. Though both were found in Bavaria, I shall refer to them as the "Berlin specimen" and the "London specimen" respectively.

It is not convenient to begin with a description of the external form of the bird, as is customary with recent species, for that external form can only be guessed at with reasonable chance of guessing accurately after a careful consideration of the structure of such parts as are still preserved. This is even more conspicuously true of the habits of the animal.

Of the skeleton, if we assume the two specimens to be so nearly related that the characters exhibited in either may be taken as true of both, we have quite an extensive knowledge.

The *vertebral column* is readily divisible into four regions: cervical, trunk, sacral, and caudal. Whether the vertebræ are fully ossified or not it is difficult to say. I can find no justification for the statement that they are amphicœlous. Professor Dames tells me that his statement to that effect is a mere slip of the pen, and that he intended only to say that, so far as can be seen in a specimen in which the vertebræ are still in their natural relations with one another, the ends are flat and not as in most birds, saddle-shaped. The central or internal part of each vertebra in the London specimen is stated by Owen to be represented by a deposit of crystalline "sparry matter" in the caudal region, while the outer "crust" has adhered to the upper slab or

"counterpart." Whether this really shows that the vertebræ (of the tail) were mainly cartilage or other soft tissue with only a crust of bone or not, may be open to question. The perfectly-fitting joints, the large transverse processes of the anterior caudal vertebra, and the slenderness and stiffness—as shown by the straightness of the tail in both specimens—of this region of the vertebral column are strong evidence that the bones were *well-ossified*.

Of the nine *cervical vertebræ*, only eight are well-preserved, the first being almost unrecognisable. Measuring the lengths of the centra of these on a large photograph (scale $\frac{1}{1}\frac{8}{8}\frac{9}{7}$), I make the sum of the eight in the Berlin specimen to be about 75 mm.; but Professor Dames gives numbers which together make only 60·5. A glance at Plate XV. will show the position of the neck in this specimen. It is very strongly arched so as to bring the head almost into contact with the back of the animal in the region of the thorax. It is difficult to make these measurements accurately in either the specimen or the photograph, but the discrepancy between the two measurements is too great to be accounted for by this difficulty, and I suspect that Professor Dames' measurements have been made along the inner curve—*i.e.*, through the neural spines—while mine were made near the ventral curve, *i.e.*, through the centra of the vertebræ. I suspect, therefore, that when the animal's neck was straightened out it would be 75 mm. long in addition to the length of the atlas, which may be taken to be a very small quantity as in modern birds. Of the nine cervical vertebræ the middle ones are longer than those nearer the ends of the neck, the fifth being the longest.

Cervical ribs, apparently movably articulated, may be made out, and there appear to be eight pairs of them. The neural arches and spines are well-developed and strong, the spines being 2 to 3 mm. high.

The *trunk vertebræ* being somewhat displaced, and the vertebral column distorted, it is not very easy to make sure of their number. There appear, however, to be ten, measuring together about 70 mm. The vertebræ appear to be almost equal in size, and nine of them bear *ribs*. There are also *ventral ribs*, resembling the "*abdominal*" *ribs* of the geckos and chamæleons, and clearly showing the ventral boundary of the abdominal cavity (*see* 14 in Plate XV.).

The *sacrum* is hidden in the Berlin specimen except at its ends,

It measures 26 mm. in length. It is probable that there are about seven sacral vertebræ.

The *vertebræ of the tail*, twenty in number, measure together about 170 mm.—slightly less perhaps. The first few are very short and stout, each measuring about 4 mm. in length and 4 mm. in height. The first four have well developed transverse processes; in the fifth this process is not well preserved, and the vertebræ behind this have no transverse processes, but only a ridge. The vertebræ are longest nearer the middle of the tail, the eleventh measuring nearly 12 mm. The tail as a whole seems to have had little flexibility, for it is almost perfectly straight in both specimens. The tale of the London specimen has apparently only eighteen vertebræ and measures 180 mm.

The *skull* has been much further exposed since the photograph was taken. It is large and fairly massive, the jaws are stout, and teeth are very easily made out in the upper jaw. Those of the lower jaw are, however, hidden by those of the upper, and it is impossible to say at present how many there were. The sclerotics are ossified. The hinder part of the skull is destroyed in the Berlin specimen, and it is worthy of note that the cranial cavity was not filled with matrix. No part of the skull is recognisable with certainty in the London specimen, though it may be that the supposed cast of the brain (!) is a portion of the skull.

The *ribs*, both vertebral and ventral, are very slender. There are no uncinate processes visible.

Of the *sternum* nothing is known, though much has been written. In the Berlin specimen it probably lies still hidden in the matrix. The position of the ventral ribs shows that it must have been small.

The *scapulæ* in the Berlin specimen were broken in exposing the specimen. The right one is easily recognisable in Plate XV. They are flat curved bones, not unlike those of a modern bird. Their length is 43 mm. or thereabouts, according to Dames. In the photograph only a portion is seen.

The *coracoids* are in the Berlin specimen largely hidden. I have not specially examined what portion is exposed in the London specimen. The dorsal ends are exposed in the Berlin specimen and possess a furcular tuberosity as in other birds.

Of the *furcula*, a small portion is seen at the left shoulder of the Berlin specimen. It was, however, imperfectly exposed at the time when the photograph was taken. A larger portion is seen in the London specimen. It is a characteristically avian furcula, U-shaped ventrally, and articulating with the furcular tuberosity of the coracoid at each shoulder.

The *humerus* is a well-developed bone in each wing. Its form and dimensions may be seen in Plates XIV. and XV. It differs from that of other birds in being devoid of the pectoral crest or ridge for the insertion of the great pectoral muscle. As Dames points out, this confirms his view that the sternum must have been small, as must also the great pectoral muscle. In Plate XIV. the proximal end of the humerus is covered by a portion of the matrix, which has since been removed (at 11 in Plate), and that plate consequently gives an impression of a humerus which is slightly shorter than the true length.

The bones of the fore-arm, seen in Plates XIV and XV, are a straight *radius* 55 mm. long, and a *curved ulna* 56 mm. long.

The *carpus* offers great difficulties. Owen figures two bones, one of which is visible in the London specimen. Why he should ignore the enormous ulnar carpal, which is a conspicuous object in the London specimen, need not here be discussed. It is conspicuously shown in Fig. 2 and in Plate I of Owen's memoir, where it is numbered 56′ and described (presumably with the radial carpal) as "left carpus" (it being probably a part of the right carpus), and something wholly unlike it is put in its place, in dotted lines, in his second plate (Fig. 2).

Of these bones I have seen two clearly, one being the radiale (4 in Plate XIV), which is visible in both the specimens, the other the "ulnare," visible only in the London specimen. In the Berlin specimen the carpus lies radial side uppermost, and it is not surprising that, like some other parts, the ulnar portion of the carpus lies still embedded in the matrix. This is even admitted by Dames. The little bone called "ulnare," and drawn from imagination by Owen, and also drawn by Dames, may or may not be present. I have tried, and failed, to make it out in the Berlin specimen, and I have also tried, and failed, to make sure that it is not there. One thing only I can say of it, viz., if present it is probably the *intermedium*, and not the ulnare. The "ulnare" is the enormous and conspicuous bone shown

at the distal end of the right radius and ulna. It is for a carpal bone, of enormous size, and I am not prepared to believe that it played no part in the support of the metacarpals.

Of the distal row of carpals it is only possible to say that they are not recognised in either specimen. Whether they have fused with the metacarpals, as they do in modern birds, or were cartilaginous and so not preserved, or were fused with the bones I have referred to as belonging to the proximal row; or whether the two figured by Owen and Dames are the proximal row, and the large bone I have called "ulnare" is really, as the London specimen suggests, a fused mass representing the whole or part of the distal row of carpals, can only be decided, so far as I can see, by one of two consummations "devoutly to be wished"—(1) the excavation of the exceedingly thin and fragile Berlin slab *from the back*, or (2) the discovery of fresh specimens. The first of these involves too great a risk to what it is hardly an exaggeration to say is the most valuable palæontological specimen in any museum in the world.

To admit that one does not know what that bone is, is one thing; to ignore its existence is another. Whether it be right or wrong, I shall for the present call it the *ulnare*. Subsequent proof that it is something else, *e.g.*, a crocodilian "lenticulare," or, as seems not improbable, *unciforme*, will not invalidate my argument.

The *hand* has been much misrepresented both in words and in drawings. There are *five digits* and no fewer, and I never suspected that it would be necessary for me to give further proof than that already given in my essay on errors. This conclusion, however, having been controverted, I will venture now to prove it over again by three distinct proofs, each of which is in itself conclusive.

(1.) Three *long*, *slender* fingers on each hand are plainly seen on the Berlin slab. They are made up of two, three, and four phalanges respectively, in addition to a metacarpal each. Each bears a claw, which, though not easily made out in the photographs, especially in the smaller photographs, is perfectly distinct in most cases in the slab itself. There can be no doubt, and nobody does doubt, that these three correspond to the digits I, II, and III respectively of the normal pentadactyle reptilian fore-limb. The lengths of the various metacarpals and phalanges in the Berlin specimen are as follows, beginning at the proximal end, *i.e.*, with the metacarpal, in each case:—