

39. NOTE on a REPTILIAN TIBIA and HUMERUS (probably of *Hylæosaurus*) from the WEALDEN FORMATION in the ISLE OF WIGHT. By J. W. HULKE, Esq., F.R.S., F.G.S. (Read June 10, 1874.)

[PLATE XXXI.]

I AM indebted to Dr. Wilkins, of Newport, who has already so frequently afforded me valuable materials for the study of the fossil Reptilian fauna of the Isle of Wight, for the opportunity of bringing two very remarkable limb-bones before this Society. They were obtained several years ago, in Brixton Bay, by a fisherman since dead. The soft and brittle state of their tissues, the complete substitution throughout them of the red oxide of iron for the pyrites with which bones in this locality are usually impregnated, their envelopment in a concretionary matrix of this oxide and clay, and their incrustation with recent zoophytes and algæ concur in making it very probable that they had been long exposed to the waves and winds upon the shore between high- and low-water marks before they were discovered. The horizon of their *gisement* cannot be fixed more nearly than somewhere in the mottled purple and grey clays, therefore in the beds west of Cowleaze Chine, below the *Hypsilophodon*-bed. It is not even known that they were found lying so close together as to justify the inference from juxtaposition that they originally formed part of one skeleton. Dr. Wilkins informed me, when I first saw them in 1870, that he believed they were so associated when discovered; and the close agreement of their general facies, of their texture, of their mineralization, of the matrix about them, and of their algal and zoophytic crusts concur in rendering this extremely probable, and dispose me to regard them as members of one individual.

Remarkable shortness relatively to their bulk, singularly dwarfed shafts, and as notably expanded articular extremities characterize both bones.

Tibia (Pl. XXXI. figs. 1 & 2).—The general resemblance of this bone to the tibiæ of such typical Dinosaurs as *Iguanodon Mantelli* and *Megalosaurus Bucklandi* leaves no doubt of its place in the skeleton; but its proportions make it impossible to mistake it for the tibia of either of these Sauria.

Its total length is 16 inches.

The proximal end is so very massive that it greatly overhangs the slender shaft. An inner and an outer condyle, the latter separated behind by a wide, deep, roundish notch from a stout prænemial process, are obscurely mapped on the upper or articular surface. Its antero-internal surface, and the prænemial process into which the former is prolonged outwards, are rough as if for the attachment of muscles and ligaments; and a rather strong tuberosity marks the junction of the internal and anterior portions. The long diameter of this end, passing through the inner condyle and the base of the prænemial process, measures about 7 inches; and when the back of the condyles rests upon a flat surface it includes with this surface

an angle of about 35°; and it crosses the long axis of the distal end at an angle which in this specimen I estimate roughly at about 118°. Below the knee the tibia contracts quickly to a very short and slender shaft, in its unexpanded part not more than 2½ to 3 inches long, and with a minimum girth of 7·5 inches, the girth of the proximal articular end measuring 21·5 inches. The cross section of the shaft is subtriangular. The cortex of this part is compact, externally smooth, and finely grained. No large medullary canal is present, as in *Iguanodon Mantelli*, but a moderately fine cancellated tissue nearly fills the interior.

Downwards, the shaft expanding and becoming flattened, merges into the broad triangular ankle end, one angle or malleolus of which is antero-internal, the other postero-external, while the surfaces are respectively directed outwards and forwards, and backwards and inwards. The antero-external surface is undivided and nearly plane, while the postero-internal surface is broken by an angulated ridge into a smaller inner and a wider outer part. The under surface of this end is pulley-shaped, having a long, narrow, postero-external and a shorter, wider, antero-internal division. Its broad, shallow, trochlear groove ascends upon the posterior surface, external to the angulated ridge lately mentioned; and opposite to it, on the anterior surface, is a prominent tubercle. This trochlear part, with its anterior tubercle, is evidently homologous with the *Iguanodon's* separate astragalus. The condition of the specimen does not allow me to say whether this representative of the astragalus and the distal end of the tibia had become confluent during life, or whether they have simply become undistinguishably blended by post-mortem pressure and mineralization. The fact that the inner division of this trochlea stops short of the antero-internal angle or inner malleolus, and is not now coextensive with the entire under surface of this part of the tibia, is suggestive of a post-mortem displacement, and, if so, of the absence of a genuine bony ankylosis.

The proportions of this tibia are, within my knowledge, only repeated in the tibiæ of *Hylæosaurus* and *Polacanthus Fovii*. The materials for comparison are limited to a single example of each; and the account of the tibia of the latter in the Rev. W. Fox's narrative of his discovery of a great part of the skeleton of this remarkable armour-clad Saurian, communicated by him to the British Association in 1866, as also the short memorandum, with a sketch of a few of the bones, which appeared in the 'Illustrated London News' of that year, are rather "Preliminary Notices," which scarcely claim to afford the details so necessary to the anatomist who cannot study the actual specimen.

Table of Measurements.

	inches.
Length of tibia, including distal epiphysis or astragalus	16
Long diameter of proximal end.....	7
Girth of ditto	21·5
Girth of shaft.....	7·5
Long diameter of distal end	8·25

Mr. Fox (*loc. cit.*) described the tibia and fibula of *Polacanthus* as being 13 inches long, with broad ends, like those of *Hylæosaurus*, the diameters of the distal end $7\frac{1}{2}$ and $3\frac{1}{2}$ inches. I am not certain whether the larger of these latter numbers applies to the breadth of the tibia alone, or includes the still connected fibula, and also whether 13 inches is the length of the tibia, or of this with its lower epiphysis or astragalus. The extensive ossification of the tendons made it probable that the skeleton was that of a fully grown individual. Mr. Fox has verbally informed me that the bones of his *Polacanthus* have a coarse texture, and that the femur is devoid of a medullary canal. The impression which I retain from a cursory view of Mr. Fox's tibia two years ago is of a much less bulky bone than this specimen.

The tibia of *Hylæosaurus* obtained by Dr. Mantell at Bolney, now in the British Museum, probably represents the size of the adult shin-bone of this Saurian, if it actually formed part of the same skeleton with the associated scapulæ; for these (if their much larger size, greater massiveness, and stronger features than those in the well-known Tilgate-forest slab are trustworthy criteria) very likely belonged to an old fully grown individual. Its length is the same as that of Dr. Wilkins's specimen. Its proximal end is similarly massive, and its distal end is as remarkably expanded; the shaft also is strongly twisted. The condyles are better marked, and the lower end, owing to the disassociation of the astragalus, has the usual Dinosaurian notch instead of the distal trochlea of Dr. Wilkins's bone. With these close resemblances I prefer to refer this tibia to the same genus, though there are differences of detail which may possibly denote another species than Mantell's, possibly also may merely be the expression of differences of age or sex.

Humerus (Pl. XXXI. figs. 3 & 4).—The bone which I regard as a left humerus shows in an extreme degree the dwarfing of the shaft, the expansion of the extremities, and the massiveness relatively to length exhibited by the tibia. The total length is 16.5 inches, the breadth of the proximal end 8 inches, and that of the distal end rather under 7 inches. The shaft is as short as that of the tibia. The girth of the proximal end is 20 inches, that of the distal end is 18.5 inches, and that of the shaft 9 inches. The proximal border, very thick and rounded, swells out at about 3 inches distance from its ulnar end, and assumes a roughly trigonal convex form, the outer limit of which falls where the proximal and radial borders meet. The base of this sessile articular caput falls in the ventral lip of the proximal border; and its rounded dorsal apex marks the stoutest part of the border, where its thickness reaches 3.6 inches. The radial border, at first thinner than the proximal, descends straight for the space of 3 inches, and then expands into a knob-like swelling, from which it abruptly declines, ending in a ridge which is lost on the ventral or anterior surface of the short and slender shaft above the radial tuberosity. The ulnar or posterior border is strongly concave. The ventral or anterior surface of the expanded proximal part is very hollow transversely, having the shape of a wide trough.

The dorsal surface of the same part is transversely sinuous, being laterally hollow, and rendered centrally convex by a stout ridge-like continuation of the shaft, which, expanding upwards, largely supports the sessile, trigonal, articular caput. The distal end has less perfectly preserved its form. A trochlear groove, wide and shallow distally, prolonged also as a wide shallow trough on the dorsal surface of the shaft, and deep and notch-like ventrally, very distinctly mark out an ulnar and a radial condyle. The latter is ventrally surmounted by a tuberosity, the perfect form of which is now lost. The short and slender shaft has a roughly trigonal cross section; it is most convex dorsally, where one of the rounded angles falls, and less so laterally and at its ventral surface. The shaft is smooth, while the rest of the surface of the bone, especially towards the articular extremities, is very rough.

If, disregarding the hint derivable from the very probable association of this bone with the tibia just described, we look around amongst the contemporary Sauria of the Wealden formation for the owner of such a humerus, we find *Iguanodon Mantelli* and *Megalosaurus Bucklandi* immediately excluded, because their humeri are well known and very different. There remain for our scrutiny the *Streptospondyli* (*S. major* and *S. recentior*), Owen, the (Wealden) *Cetiosauri*, Owen, *Polacanthus Foxii*, and *Hylæosaurus* of Mantell. Of these, *Streptospondylus major* has still a doubtful individuality. Prof. Melville, if I mistake not, long since suggested, with much probability, that the vertebræ, then and still the only evidence on which this species was founded, belonged to the cervical and pectoral series of *Iguanodon Mantelli*; and although this may not be conceded, the individuality of *S. major* has not, I think, been so demonstrated as to render it impossible that these vertebræ may actually belong to one of the Sauria included in the genus *Cetiosaurus* as exemplified in the Wealden fauna—for instance to *C. brevis*, Owen, *Streptospondylus recentior*, Owen, *Ornithopsis Halkii*, Seeley. *Eucamerotus*, mihi, has, as I have pointed out in a former paper, strong formal resemblances, as regards its vertebræ, to those of *Cetiosaurus oxoniensis*; but the texture of these bones is very different. Until recently only vertebræ had been found; but last autumn portions of limb-bones were recovered by the Rev. W. Fox and by myself; and as these have the same large-celled texture as the vertebræ, it is presumable that the humerus is similarly constituted, which this humerus is not. With these Sauria, and with the *Cetiosaurus brevis*, Owen, of the Wealden, and also with *Pelorosaurus* no comparison can be instituted. Turning to *Hylæosaurus* and to *Polacanthus Foxii*, the fore limb of the latter was missing from Mr. Fox's find, and no part of its shoulder-girdle has been recognized; but in the scapula of the former we observe an extraordinary massiveness of its articular end, and the large characteristic transverse crest—conditions which harmonize well with the great expansion of the proximal end of this humerus. This obvious suitability, coupled with the strong resemblances of the tibiæ, constitute better grounds for referring the humerus also to *Hylæosaurus* than to any

of its contemporaries. I need hardly say that the bone which Mantell originally regarded as the humerus of *Hylæosaurus* was shown by Prof. Owen to be its tibia. There is also in the National Collection a bone labelled "Humerus of *Hylæosaurus*;" but both extremities are so mutilated that the determination is more than doubtful; if correct, the bone must have belonged to a very immature individual.

Supposing that Dr. Wilkins's specimen should prove to be the genuine humerus of *Hylæosaurus*, it is evident, on the assumption that it and the tibia belonged to one individual, that the proportions of the fore and hind limbs must have been very different from those which obtain in *Iguanodon* and *Megalosaurus*, in both which the fore limbs are, relatively to the hind limbs, remarkably reduced.

EXPLANATION OF PLATE XXXI.

Reptilian Tibia and Humerus.

- Fig. 1. Front view of tibia: *pr.* proximal, *d.* distal end; *o. m.* outer malleolus; *i. m.* inner malleolus; *prc.* prænemial crest.
2. Back view of the same tibia.
3. Oblique view of ventral surface of humerus: *c.* capitulum; *r.* radial condyle; *d.* deltoid border.
4. Dorsal surface of the same.

Fig. 3.

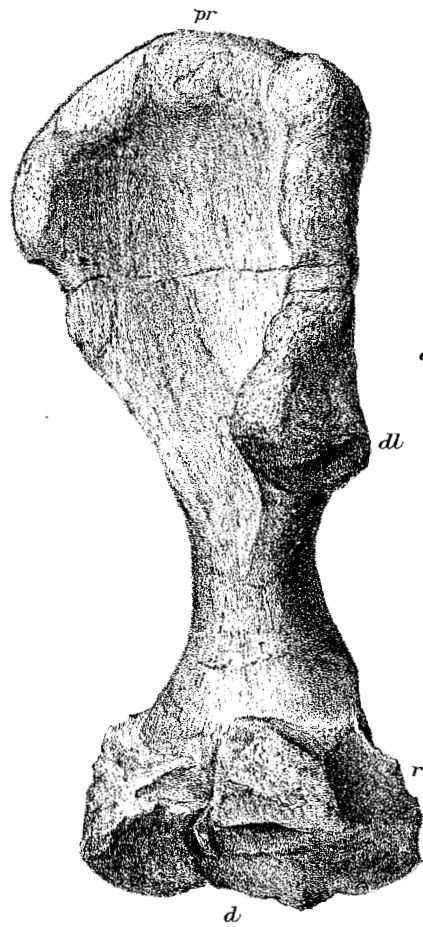


Fig. 4.

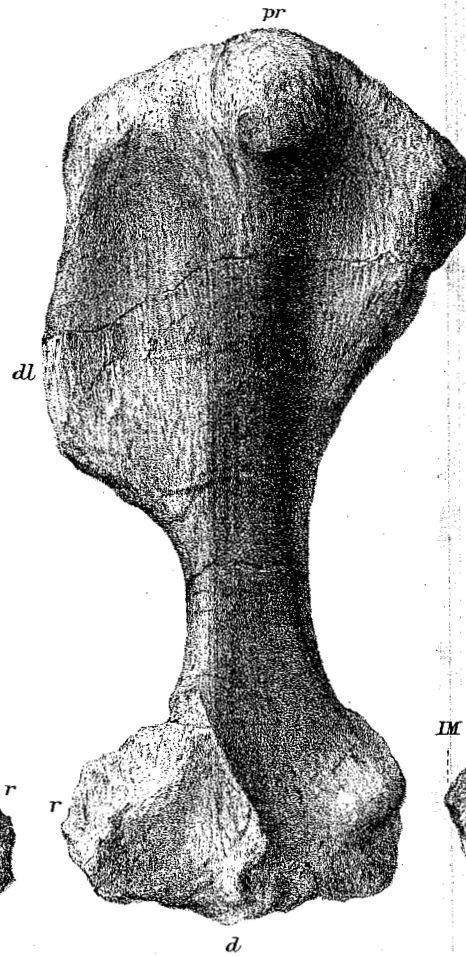


Fig. 2.

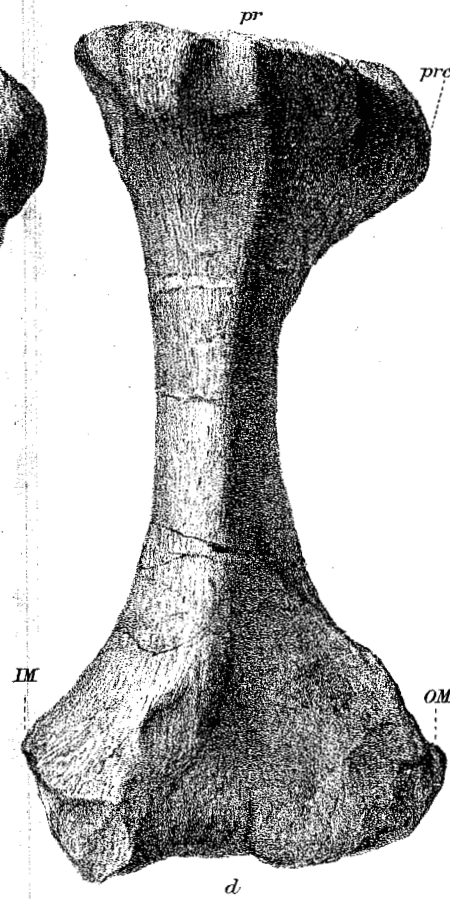


Fig. 1.

