

47. On MACRUROSAURUS SEMNUS (Seeley), a LONG TAILED ANIMAL with PROCELLOUS VERTEBRÆ from the CAMBRIDGE UPPER GREENSAND, preserved in the Woodwardian Museum of the University of Cambridge. By HARRY GOVIER SEELEY, Esq., F.L.S., F.G.S., &c., Professor of Geography in King's College, London. (Read June 21, 1876.)

ABOUT twelve years ago the Woodwardian Museum acquired from Mr. W. Farren a series of some 25 associated and successive caudal vertebræ, found at one of the deeper phosphatite washings on Coldham Common, Barnwell. At the same date, the Rev. W. Stokes Shaw, M.A., Caius College, obtained from a similar working at Barton, a locality a few miles westward, another associated series of 15 smaller vertebræ showing identical characters, and of such size as to exactly join on to the first series and complete the tail. These latter vertebræ, not improbably part of the same individual, being presented to the Museum, I arranged both sets in a continuous series. Very few appear to be missing in any part of the sequence, though the extremity of the tail is probably not preserved, and there are no means of estimating how many vertebræ may have intervened between the last of the sacral region and the earliest caudal which is preserved. The tail probably included 50 vertebræ, and may have reached a length of 15 feet, which would have amounted to one half the length of the animal if the proportions of modern crocodiles obtained. A few isolated vertebræ have also been collected; but no distinctive portions of the skeleton have come under my notice. The affinities of the animal are at present somewhat obscure; for the only available data from which a determination could be made are the following facts:—The articulation of the earlier vertebræ is procelous; this character gradually changes till the articulations of the centrums are nearly flat; then they become biconcave, and towards the end of the tail are irregular. There are no chevron bones; and the centrum becomes elongated and rounded like a dice-box, after the pattern of *Cetiosaurus* and *Laelaps*. The neural arch in the greater and earlier part of the tail was supported on pedicles rising from the centrum; it was depressed, and devoid of neural spine.

The procelous character in the caudal region has never before been recorded, so far as I remember, in combination with an absence of chevron bones in an animal of this size; and though the tail as a whole is more in harmony with the Lacertian type than with any other order of true Reptiles, yet we must look to future discoveries for evidence of the systematic position of the animal to which it belonged. In my 'Index to the Secondary Reptiles,' &c.\* I classed the animal doubtfully with the Dinosauria. If it is allowed

\* Pp. xvii, 45.

to remain there, I do not see my way to placing it in any one of the subdivisions of that group.

The vertebrae are in different states of mineralization—some showing no indications of phosphatic infiltration, while in others this process has gone on to a considerable extent.

The preservation of the specimens is occasionally such that I cannot feel certain that all are arranged in exactly their true order of succession. The first vertebra preserved is an early caudal much decomposed on one side, and considerably abraded, with only the base of the neural arch preserved, and an indication of the antero-posterior extent of the fractured transverse process. Its imperfect preservation is due to the fact that the bone is open and cellular, and but slightly mineralized with phosphate of lime.

The articular surface of the centrum is deeply cupped anteriorly, and is more expanded in front than behind, where it forms a large hemispherical ball. The sides of the centrum are compressed, and converge towards the ventral surface, where they form a median rounded ridge. The length of the centrum is 8 inches, and of this the unarticular side of the centrum measures  $5\frac{1}{2}$  inches; the depth from the neural canal to the base of the hinder part of the centrum, as preserved, is fully  $5\frac{1}{2}$  inches, and in front was probably more. The side is smooth, with some longitudinal vascular impressions, gently concave from front to back. The basal keel is well rounded from side to side, and gently concave from front to back.

The transverse process appears to have been  $3\frac{1}{4}$  inches in antero-posterior extent at its base, where fractured. It was strong.

The neural canal was smooth and narrow.

What are probably pedicles for the neural arch extend to the anterior border of the cup. This process on the right side is compressed, less than half an inch thick, with an antero-posterior extent of  $2\frac{1}{2}$  inches.

The worn fragment of the next vertebra is  $7\frac{1}{2}$  inches long. On the third the transverse processes have disappeared. The anterior cup of this vertebra, as preserved, is  $5\frac{1}{4}$  inches wide; and the centrum does not exceed that length; but the ball and the margin of the cup are both broken. The neural canal is more than an inch wide. On each side of it the centrum gives off strong compressed pedicles 2 inches in antero-posterior length, half an inch thick, inclined a little towards each other, and approaching to within half an inch of the anterior border, as preserved. These pedicles are not much more than half an inch high, and were probably separated from the neural arch by a horizontal suture.

The centrams now become rapidly smaller in diameter and flattened on the visceral surface. The articular cup remains as deeply marked; but the ball appears to have a depressed, flattened margin an inch wide around the elevated central boss, as in existing crocodiles. That numbered 8 is  $6\frac{1}{2}$  inches long and has the cup  $4\frac{1}{2}$  inches deep. No. 11 is  $5\frac{1}{4}$  inches long, has the cup much less deep, but the ball is not at all preserved. The centrum has now acquired a dice-box form. No. 12 is as long, but the centrum is smaller, the cup

is flatter; and there is scarcely any trace of a ball. The greatest diameter of the constricted part of the centrum is  $2\frac{1}{2}$  inches; the neural pedicles become more elongated, measuring  $2\frac{1}{2}$  inches. After the 13th the centrams get rapidly smaller. The 15th is distinctly biconcave; the centrum is somewhat compressed laterally; the neural canal is narrower, with a concave channel in the centrum, margined by shorter pedicles. The 16th is  $4\frac{3}{4}$  inches long. The 20th is 4 inches long, has the centrum  $2\frac{3}{4}$  inches wide posteriorly, and, as preserved, is  $2\frac{1}{4}$  inches deep. The least diameter of the centrum where most constricted is  $1\frac{3}{4}$  inch. The articular ends are greatly flattened, but slightly concave, as in many Plesiosaurs. The pedicles for the neural arch remain at one inch from the anterior margin; the extreme external width across the pedicles is  $1\frac{1}{2}$  inch; the width of the neural canal is  $\frac{1}{2}$  inch; the antero-posterior extent of the pedicles is  $1\frac{1}{2}$  inch. Between No. 23, the last of the Barnwell series, and 24, the first of the Barton series, a few are probably lost. The Barton portion of the animal is in rather better preservation, though a few of the vertebræ, which have been washed with the phosphatic nodules in the mill, show curiously how the circumstances under which fossils are collected may modify their appearance. In No. 24 the centrum is  $3\frac{1}{2}$  inches long, and 2 inches deep in front; the anterior articulation is deeply cupped; and the posterior articulation somewhat approximates to a ball. The least diameter of the middle of the centrum is less than  $1\frac{1}{2}$  inch. The pedicles are now placed nearly in the middle of the length of the centrum. No. 25 is  $3\frac{5}{8}$  inches long, with the articular ends  $2\frac{1}{8}$  inches in diameter; they are deeply cupped with a central deeper depression. The next vertebra has the articular ends much flatter, with a transverse depression which does not appear to result from pressure. No. 28 is  $3\frac{1}{4}$  inches long, and has pits in the neural canal like foramina for blood-vessels. No. 30 has the centrum anteriorly deeply concave; posteriorly it is subconvex with a transverse groove. No. 35 is  $2\frac{3}{4}$  inches long. The posterior articulation is convex with a slight central depression; as preserved it is  $1\frac{1}{8}$  inch wide. The centrum is compressed from side to side, measuring  $\frac{5}{8}$  inch in least diameter; the anterior articulation is very irregular. The neural canal is about  $\frac{3}{8}$  inch wide. The pedicles are compressed,  $\frac{1}{3}$  inch wide and 1 inch long.

A few neural arches are preserved. They are remarkable for great antero-posterior extent, compression from side to side, and absence of a neural spine, the superior margin being concave from front to back, and only rising two inches above the top of the neural canal in the deepest specimen. In that example the posterior zygapophysial facets are preserved. They are  $\frac{1}{4}$  inch in diameter, and are raised like wafers on the inferior margin of the specimen so as to look outward and downward. The median posterior portion of the arch is prolonged for some distance behind the facets; anteriorly the arch is forked. Further back in the tail, where the arch is more depressed, the articular facets are lost; but the posterior process, ovate in section, is still directed for some distance upward

and backward, and terminates in a rounded end. The length of the neural surface on a large neural arch is  $2\frac{1}{5}$  inches.

The irregularity of the articulation of the centrums seems characteristic; for in a second series of three large vertebræ, two are proœlous and the third is biconcave.

Fig. 1.—*Side view of caudal vertebra of Macrurosaurus semnus, probably about the 35th. (Natural size.)*

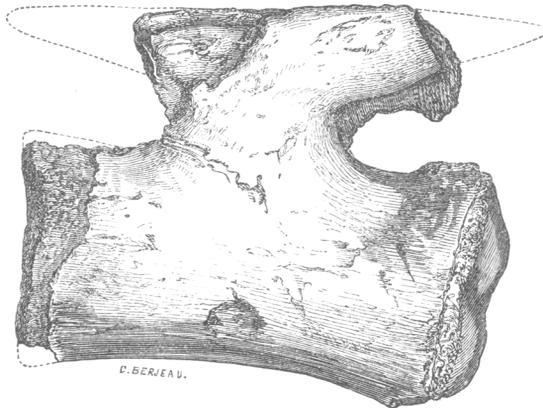


Fig. 2.—*Anterior view of caudal vertebra of Macrurosaurus semnus. (Natural size.)*



Two or three small vertebræ were also found about 1859 at Barnwell. One of these (figs. 1 & 2) retains the neural arch, and shows an indication of the separation between the neural arch and centrum. It is  $2\frac{5}{8}$  inches long at the superior part of the centrum, and a little less at the base. The anterior articulation (fig. 2) is subconcave and

irregular; the posterior is subconvex, with a transverse impressed groove (fig. 1). The articular margin is somewhat worn; but on the base the centrum is somewhat flattened, and on one side posteriorly there is a faint slight ridge such as might indicate a chevron bone, had there been any other reason for suspecting such a structure. The neural arch seen from above (where it is worn) is wedge-shaped, 1 inch wide in front, with the straight sides converging posteriorly in a distance of  $1\frac{1}{2}$  inch to  $\frac{1}{2}$  an inch. The superior surface of the arch is flattened, and rounds into the sides; it is straight and inclined forward; but the extremities of the processes are broken both before and behind. In front the height from the base of the centrum is  $1\frac{7}{8}$  inch;  $1\frac{1}{2}$  inch further back the height is  $2\frac{1}{8}$  inches. The antero-posterior extent of the pedicles of the neural arch between the concave notches in front and behind it is 1 inch. The centrum is  $1\frac{1}{4}$  inch deep at the posterior articulation, while in the middle of the neuro-central suture it is 1 inch deep.

In the 'Annals of Natural History' for November 1871, I described and figured under the name of *Acanthopholis platypus* the metapodium of a large animal. As the middle bone is 6 inches long, and the bones measure 9 inches over their proximal ends from side to side, and there is no other evidence of bones of *Acanthopholis* reaching a corresponding size, I am inclined to speculate on the probability of those bones being a part of the foot of *Macrurosaurus*, probably the metacarpal bones. If the remains both belong to the same genus, then *Macrurosaurus* would probably indicate a gigantic modification of the Crocodilian type of Dinosaurs.