ON SOME REPTILIAN REMAINS FROM THE DINOSAUR BEDS OF NYASALAND.

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(With Plates II–V and two Text-figures.)

As a result of his field work in the Mwakasyunguti area of Nyasaland, Dr. F. Dixey sent for identification and description a large consignment of bones of Sauropodous Dinosaurs. Examination of these bones has proved disappointing. Nearly all of them are weathered and fragmentary, and in very few instances was it possible to fit pieces together in order to make fairly complete bones. There are numerous vertebral centra, mostly from the tail region, several parts of humeri, of femora, and of tibiae, and fragments of ilia. The fragments indicate the presence of several animals of differing size ; but, except in one instance, where several bones were found in association, there is no evidence from the field as to the relationships of the various finds. Except in the one case mentioned, it seems unsafe, therefore, to attempt specific identification, especially in view of the mass of material from the neighbouring Tendaguru area which yet awaits publication, and with which it is probable the Nyasaland forms can most closely be compared. The procedure has therefore been adopted of figuring some of the bones, without naming them, in the hope that interest may be aroused in the discovery, and arrangements made for further and more extensive systematic search.

Dr. Dixey's collection contains nothing so gigantic as the bones of *Brachiosaurus*, but they are full of interest as being evidence of the presence, in the beds which yielded them, of a land fauna comparable with that occurring at, or near, the Jura-Cretaceous boundary in the former German East Africa and in Madagascar. The incomplete Chelonian carapace and plastron described in this paper is the first Chelonian from beds of this age in Africa.

DESCRIPTION OF FORMS.

TESTUDINATA.

Platycheloides nyasae, gen. et sp. n.

One of the most interesting specimens collected by Dr. Dixey is the weathered carapace and plastron of a small Chelonian, preserved in a coarse brick-red sandstone which came from the Sauropod-bearing beds of Mwakasyunguti.

The chief features of the specimen can be discerned from the figures. The plastron is almost smooth. The bridge is short. The entoplastron is elongate-rhomboidal in shape. The mesoplastra are small and placed laterally. The marginal bones bear the same relation to the plastron as in *Pelomedusa*. The hinder end of the humeral scute lies well behind the posterior corner of the entoplastron, as in *Pelomedusa*, but the plastron differs from that of *P. galeata* in not possessing a median fontanelle.

The hypoplastron meets the seventh marginal bone in a suture. The inguinal buttress is fairly strong.

The chief measurements are—

Length as preserved	125 mm.
Probable greatest length	about 175 ,,
Greatest breadth	160 ,,
Length of humerals in the middle line	35 ,,
,, pectorals ,, ,,	25 ,,
,, abdominals ,, ,,	19 ,,
,, femorals ,, ,,	27 ,,
,, bridge	61 ,,
,, entoplastron	39 ,,
,, hyoplastron in the middle line	(41) 39 ,,
,, hypoplastron ,, ,,	(38) 40 ,,
,, mesoplastron	28 ,,
Breadth of entoplastron	23 ,,
Greatest breadth of right hyoplastron	69 ,,
,, ,, ,, mesoplastron	27 ,,
,, ,, ,, hypoplastron	64 ,,

It is somewhat difficult to estimate the exact systematic position of this form. The presence of mesoplastra places it definitely either in the superfamily *Amphichelydia* or in the *Pleurodira*. In the former mesoplastra are always present; in the latter they may be present or absent.

The Amphichelydia were represented in Upper Jurassic times; in Europe by *Pleurosternon* and *Platychelys*, in North America by *Glyptops*

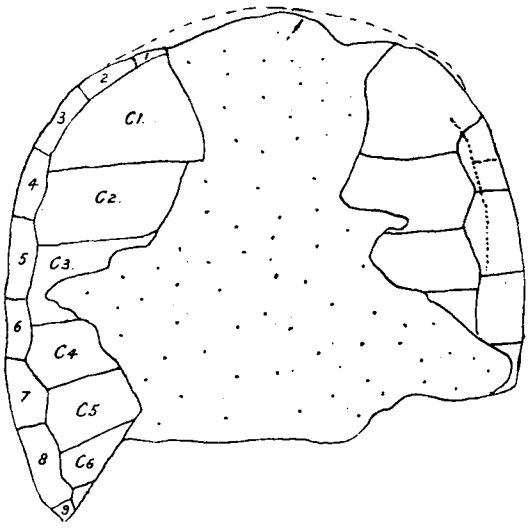


FIG. 1.—Carapace of type of *Platycheloides nyasae*, gen. et sp. n.

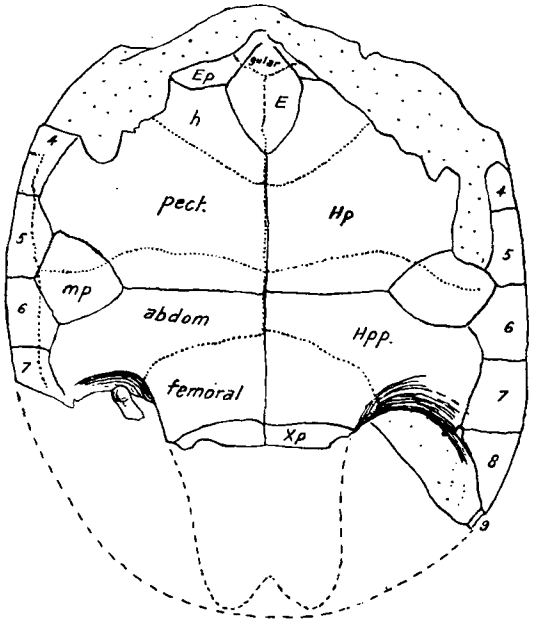


FIG. 2.—Plastron of type of *Platycheloides nyasae*, gen. et sp. n.

and *Probaëna*. The Pleurosternidae, to which *Pleurosternon* and *Glyptops* belong, have the inguinal buttresses feebly developed, and the mesoplastra meeting broadly in the mid-line and separating the hyoplastra from the hypoplastra. In *Probaëna sculpta*, regarded by Hay as an ancestral Baënid, there is a considerable fontanelle between the inner ends of the mesoplastra. *Platychelys* (from the Upper Jurassic of Europe) agrees with our form in that the mesoplastra do not meet in the mid-line, but it has a highly sculptured carapace.

It must be noted that the relations of the mesoplastra are not considered by Hay as of generic importance; his figure of the type of *Baëna riparia* shows that species to differ from the other members of the genus in having mesoplastra which do not meet one another.

The Pleurodiran genus *Podocnemis* agrees with our form in the possession of small lateral mesoplastra, but it differs in that the humero-pectoral sulcus cuts the entoplastron in the Tertiary genus. The earliest pleurodires described occur in the Upper Cretaceous of North America and were placed by Baur in the family Bothremydidae. These also possess small mesoplastra as in the Pelomedusidae. Hay points out that these probably descended from some primitive Pleurodiran ancestor close to the Amphichelydia; and the discovery of this form *Platycheloides* in Nyasaland, containing as it does features common to both the Amphichelydia and the Pleurodira, is one of great interest.

There are in the collection two other fragments of plastra, one indicating an animal larger than the one here described, but both are too fragmentary for effective description.

Sauropoda.

Gigantosaurus dixeyi, sp. n.

According to Dr. Dixey, certain bones were found in contact with one another, or were within two or three feet laterally of one another. These bones proved to be a right pubis, an anterior caudal vertebra, half of a cervical vertebra, an incomplete scapula, and two plate-like bones which can only be interpreted as sternal plates. With the exception of the cervical vertebra, it is probable that these bones are part of a single skeleton, and they will be described as such. They are numbered 7405 in the South African Museum Collection.

Caudal Vertebra.—Comparison with the series of tail-vertebrae of *Camarasaurus* figured by Osborn and Mook (1921) shows that this specimen comes from the anterior part of the tail, and probably from the region occupied by the 7th to 10th caudals. The centrum is procoelous, much more

markedly so than in *Camarasaurus*. The lower surface is somewhat flattened.

The chief measurements are—

Total height of vertebra	244 mm.
Spread of caudal ribs (estimated)	202 ,,
Total length of centrum	95 ,,
Anterior width of centrum	124 ,,
,, height of ,,	116 ,,
Posterior width of ,,	108 ,,
,, height of ,,	112 ,,

Compared with *Camarasaurus* the centrum is thus much more robust in this Nyasaland form.

The spine is of moderate height, broadened at the summit, where it is rugose, and sloping slightly backward. Its antero-posterior diameter is relatively greater than in *Camarasaurus*. Its anterior face has a strong median ridge, and two lateral ridges which arise at the prezygapophyses and die out superiorly. The posterior face is a deep vertical broad groove flanked by postzygapophysial laminae.

The postzygapophyses face largely outward and slightly downward. The transverse processes have strong bases, are fairly short, and curve outwards and backwards.

Compared with the anterior caudal of *Barosaurus robustus* (Fraas, 1908) this vertebra shows some points of similarity. The convexity of the posterior face of the centrum is about the same in the two forms, but the dorsal spine is broader and heavier—according to information given me *in litt.* by Professor Janensch ; and the centrum is much longer in relation to its width than in the Tendaguru form. Moreover, the Nyasaland bone is considerably smaller. There are also certain resemblances to the bone figured by Thevenin as the 2nd caudal of *Bothriospondylus madagascariensis*.

Scapula.—There are two portions of a right scapula, forming a fairly complete bone with the exception of a short length of the shaft and the anterior process of the proximal end.

The measurements are—

Greatest length	prob. 660 mm.
Length of glenoid surface	135 ,,
Maximum thickness of shaft	43 ,,
Minimum width of shaft	about 120 ,,
Width of proximal end as preserved	220 ,,

The bone is relatively longer and more slender than that of *Camarasaurus*. The posterior side of the shaft is thicker than the anterior, the

posterior outer side having a prominent longitudinal swelling in the lower half. The inner surface of the blade is flat dorsally, and concave in its lower half. The posterior border differs from that of most of the other described Sauropods in the possession of a prominent short supraglenoid spine which lies on the inner side. This spine is indicated in the figure of the scapula of *Brachiosaurus fraasi* described by Janensch. The hinder border of the shaft is less straight than in *Brachiosaurus*.

As far as comparison is possible, the bone differs from that figured by Fraas as a scapula of *Gigantosaurus* sp. in being more slender.

Sternal Plates.—A number of plate-like fragments have proved to belong to the sternal plates, and have been fitted together to form a pair of nearly complete bones. The plates approximate more closely in shape to the elongate form displayed by *Triceratops* and *Monoclonius* than to the more rounded plates of *Brontosaurus*.

The greatest length of the more complete bone is 510 mm., the greatest breadth about 300 mm. The inner edge is thin and straight, the outer edge convex and thicker. The outer anterior corner of the bone is strongly thickened for articulation with the coracoid, with a broad rounded ridge on the ventral surface. The anterior end is the broadest part of the bone. The posterior edge is but slightly thickened, and is somewhat irregular.

Sternal plates have not been described from the Sauropod material of Tendaguru, but these plates show certain points of similarity with those of *Diplodocus* as figured by Hatcher (1906).

Pubis.—The right pubis is fairly complete, lacking the ischiac prominence at the proximal end. In general appearance it is typically Sauropodous, but slightly lighter in build and longer than the pubis of *Camarasaurus* or of *Diplodocus*. The maximum length is 595 mm., the breadth at the distal end 197 mm., and the maximum thickness of the distal end 52 mm. The shaft is somewhat slender, expanding considerably distally, but not thickening to any great extent. The proximal end is imperfect. The inner surface of the bone is flat; the outer surface has a strong rounded ridge passing downwards and forwards from below the large oval pubic foramen. The bone is less elongate than the pubis of *Dicraeosaurus*.

The fragmentary nature of these remains and the incompleteness of the hitherto described Sauropods of the Tendaguru region make accurate comparisons impossible; but the ascription of these bones to the genus *Gigantosaurus* Fraas is not an impossible one, and it is proposed therefore to make them the type of a new species, which can be called *G. dixeyi*, sp. nov.

It must not be overlooked, however, that—as far as comparisons are possible—the form shows points of similarity with the genus *Titanosaurus*. According to the latest review of the Sauropoda (von Huene, Mem. Queensland Mus., ix, 1927) the family Titanosauridae is characterised by the

following features among others: "First caudal biconvex, the following caudals procoelous. Neural arch in middle and posterior caudals fixed only in anterior part of centrum. Two long, narrow sternal plates. Pubis broad plate in whole length with small foramen. Processus lateralis in humerus only little prominent." The bones under discussion could be fitted into this definition; we are promised far more knowledge of the Titanosauridae in a forthcoming paper by von Huene on the Sauropods of Patagonia. *Titanosaurus* is already known from the Lower Cretaceous of Madagascar, and it would not be surprising to find such a widespread genus occurring in Nyasaland.

SAUROPODA gen. incert.

Caudal Vertebrae.—There are several weathered centra of caudal vertebrae which agree with *Gigantosaurus* and *Titanosaurus* in being markedly procoelous. They differ from the vertebra of *G. dixeyi* in being longer in proportion to the height, and in having a larger neural canal. At least four of them come from the anterior part of the tail, as the centra carry transverse processes (caudal ribs). The centra are not pleurocoelous; the neural arches arise from the anterior half or two-thirds of the centrum, leaving the posterior half or third bare. In the more anterior centra the upper surface of the transverse process passes directly into the side wall of the neural arch, as in the figured specimen of *G. dixeyi*; in those further back, it is separated from the wall of the arch by a distinct groove.

From the variation in size presented by these vertebrae, it is probable that they are parts of more than one skeleton, and possibly of more than one form. But their specific identification is a matter of great difficulty, partly because of their incompleteness, and partly because of the lack of description of the corresponding parts of named species.

Humerus.—The largest and most complete humerus in the collection (S.A.M., Cat. No. 8735) is in two parts, which almost fit together. It was whole in the field, but, according to Dr. Dixey's notes, the central part of the shaft was so decayed that it crumbled away and could not be collected. There cannot, however, be much missing from the shaft. The proximal articular surface is also not present.

The approximate measurements of the bone, which is a left humerus, are—

Length	990 mm.	
Breadth, proximal end . . .	330 ,,	(33 per cent. of length)
,, distal end . . .	270 ,,	(27·5 ,, ,,)
Minimum breadth of shaft . .	115 ,,	(11·6 ,, ,,)

Thus, although the ends are more greatly expanded than in *Brachiosaurus brancai*, the proximal end bears to the length nearly the same relation as in *B. altithorax*; and the humerus is definitely of the Brachiosaurid type and not of the short type seen in *Camarasaurus* and in *Gigantosaurus*. The bone displays marked similarity, too, to the humerus of *Titanosaurus australis* figured by Lydekker.

The deltoid crest is not very massive, but it stands at right angles to the main plane of the face of the bone, so that the muscular fossa is very deep. Near the proximal end of the inner face of the bone there is a prominent rugosity which passes distally into a low rounded ridge which dies away above the middle of the bone.

The distal condyles are distinct and rounded; the groove separating them is wide and shallow. On the posterior face, the distal half of the bone shows the same broad longitudinal depression as is seen in *Titanosaurus australis*.

This bone came from an horizon about 150 feet higher than the type of *Gigantosaurus dixeyi*.

The proximal half of a slightly smaller right humerus (Cat. No. 8736) shows the articular surface and head of the bone. The maximum width of this bone is 270 mm., while the maximum thickness across the articular surface is 100 mm. In end view the anterior edge of this surface is regularly concave; the posterior edge is saddle-shaped. The contour of the proximal end differs somewhat from that of *Titanosaurus australis*, and approximates more to that of *Brachiosaurus*.

Femur.—The most complete femur in the collection lacks the proximal end, and has the distal condyles somewhat weathered. It is, moreover, considerably flattened, so that the shaft is now much thinner than it must have been in life.

The bone is from the right side. Its greatest length was probably about 102 cm., its present length being 85 cm. The distal width as preserved is 24 cm., and the minimum width of the shaft 16·5 cm. The middle of the fourth trochanter was about 65 cm. above the bottom of the bone, the trochanter thus being higher on the bone than in *Amphicoelias*, with which it agrees in the slenderness of its proportions.

The proximal end of another femur indicates a bone of much greater size than the foregoing. Its maximum width is about 39 cm., and the probable length of the whole bone, therefore, would have been about 136 cm. If the largest humerus and the largest femur can be considered as bones of the one species—and there is no field evidence in support of, or against, such a view—then we must recognise a form in which the forelimb was very considerably shorter than the hind-limb, a form far removed from *Brachiosaurus* and closer to *Gigantosaurus* or to *Barosaurus*.

EXPLANATION OF PLATES.

PLATE II.

Right pubis of *Gigantosaurus dixeyi* sp. n.

Fig. 1. Internal view.
Fig. 2. Posterior view.
Fig. 3. External view.

Platycheloides nyasae, gen. et sp. n.

Fig. 4. Carapace of type.
Fig. 5. Plastron of type.

PLATE III.

Caudal vertebra of *Gigantosaurus dixeyi* sp. n.

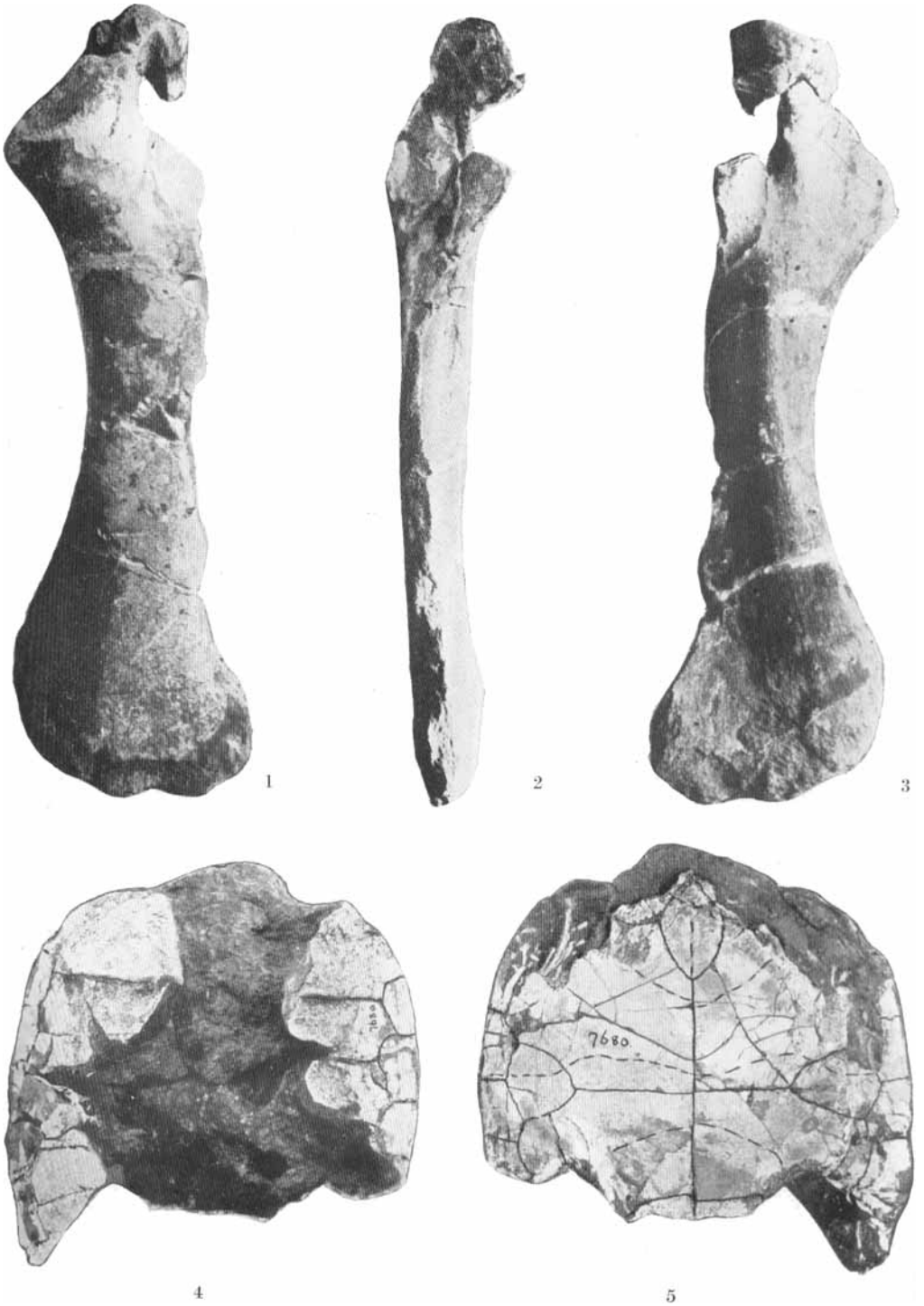
Fig. 1. Anterior view.
Fig. 2. View from right side.
Fig. 3. Posterior view.

PLATE IV.

Fig. 1. Sternal plate of *Gigantosaurus dixeyi* sp. n.
Fig. 2. Right femur of unnamed Sauropod.

PLATE V.

Fig. 1. Humerus of unnamed Sauropod (S.A.M., Cat. No. 8735).
Fig. 2. Proximal end of right humerus of an unnamed Sauropod (S.A.M., Cat. No. 8736).
Fig. 3. Proximal end of a large femur of an unnamed Sauropod.



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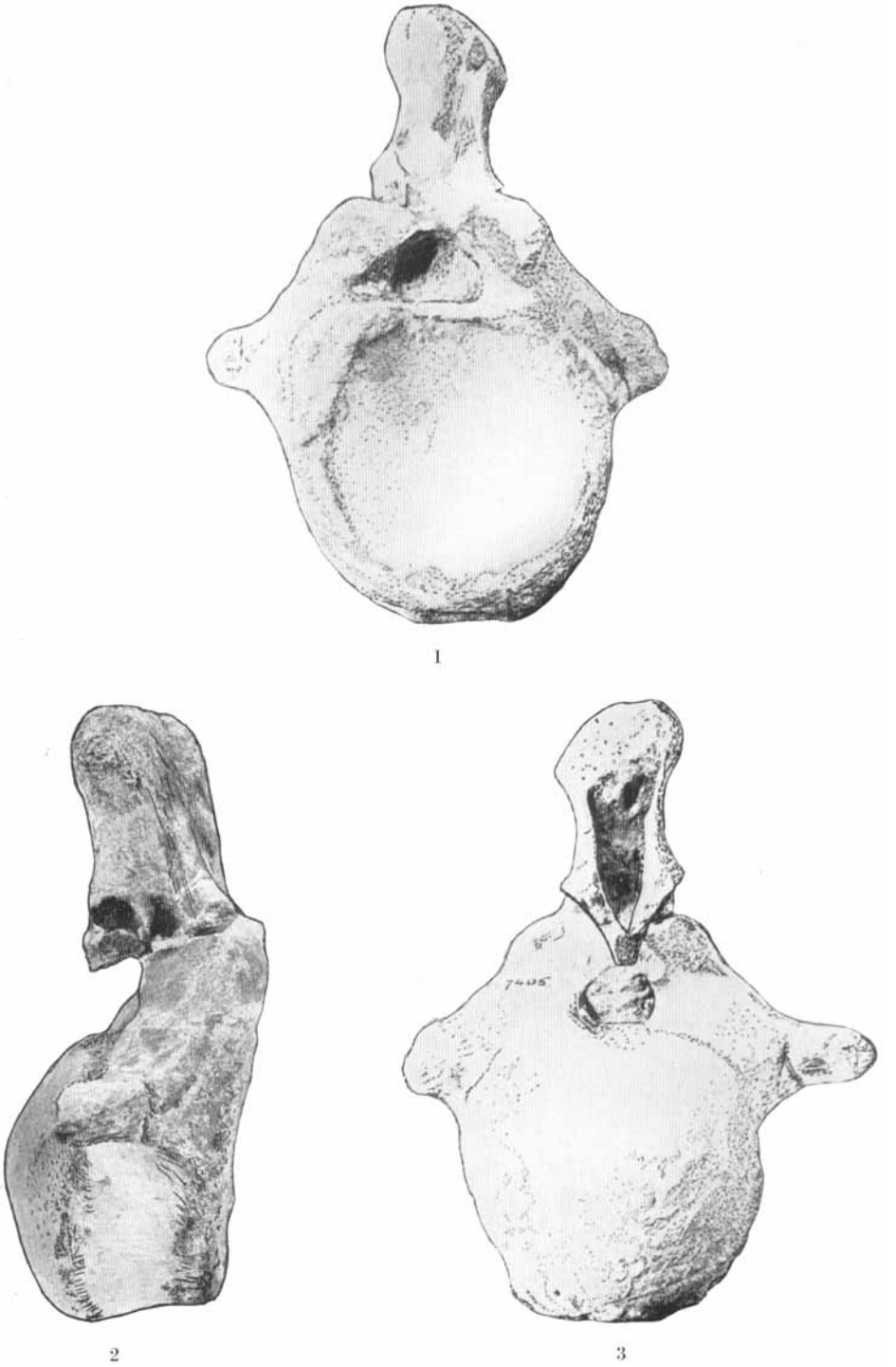

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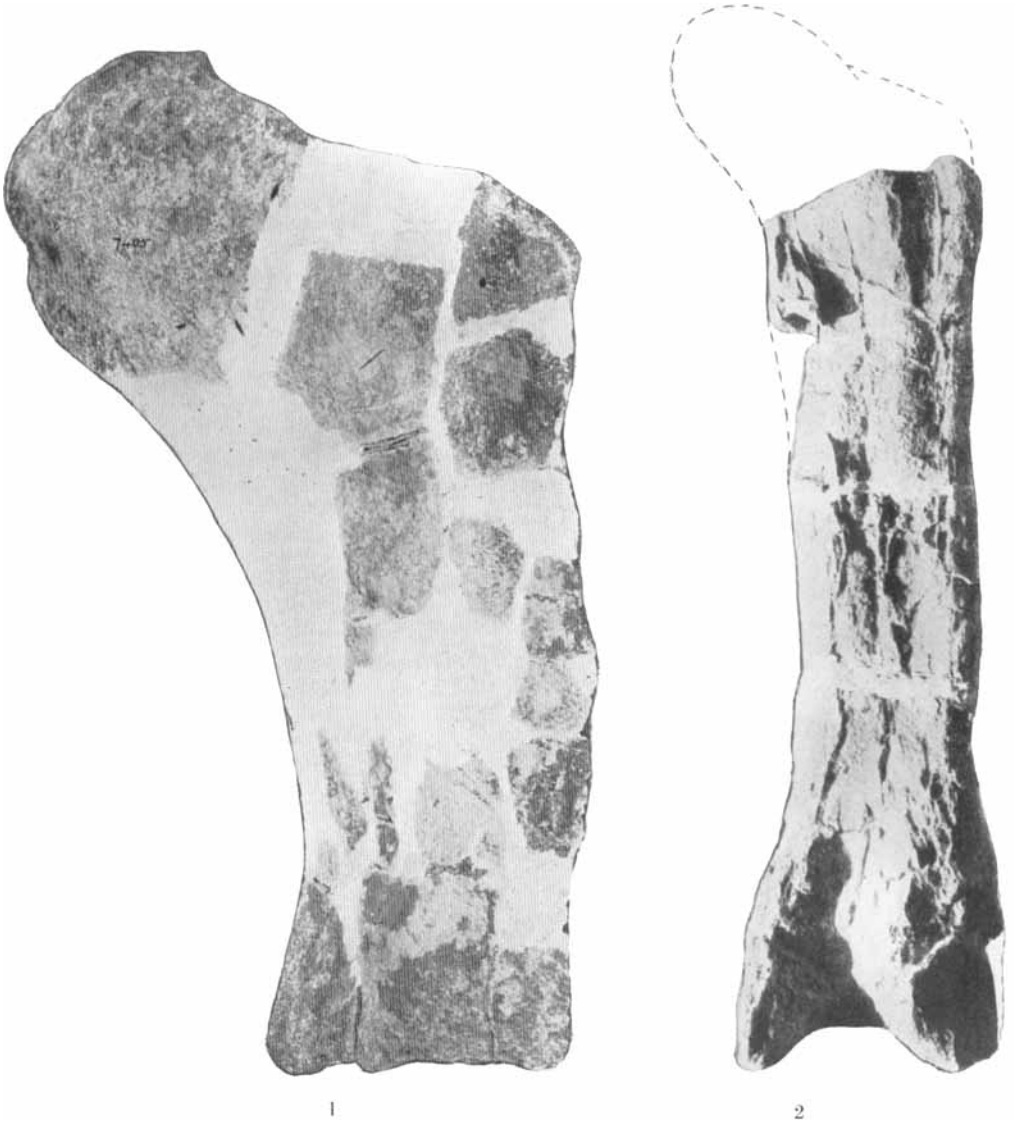

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