

ART. VIII.—*The Dinosaurian Genus Creosaurus, Marsh;*
by S. W. WILLISTON.

THE genus *Allosaurus* was proposed by Marsh in this Journal for November, 1877, for the type species, *A. fragilis*, from Colorado, presumably Cañon City. His description was as follows: "This genus may be distinguished from any known dinosaurs by the vertebræ, which are peculiarly modified to ensure lightness. Although apparently not pneumatic, they have the weight of the centra greatly reduced by deep excavations in their sides. Some of them have the centra hour-glass in form, the middle part being so diminished as to greatly reduce the strength. The vertebræ preserved are biconcave, with shallow cavities. The feet bones referred to this species are very slender. A lumbar vertebra has its centrum 105^{mm} in length, and 80^{mm} in least transverse diameter. An anterior caudal, 85^{mm} long, has its centrum so much constricted that its least transverse diameter is 38^{mm}, while its anterior face is 90^{mm} in transverse diameter."

In the following March, Marsh described in this Journal the genus *Creosaurus*, based chiefly, if not entirely, upon a left ilium collected by the present writer at Como, Wyoming. It will be observed that at the time of the erection of the genus, very little was known of the distinctive characters of *Allosaurus*, and, so far as the author of it knew there was no reason for referring the ilium and other bones there described to another genus—or at least Marsh gave no reason. In the following January number of this Journal, occurs the following passage by Marsh, which, taken in connection with subsequent changes, is a little remarkable:

"The genus *Allosaurus* is typical of the family [*Allosauridæ*, later merged into *Megalosauridæ*] which also includes *Creosaurus* and *Labrosaurus* [*Antrodemus* Leidy]. The first named genus presents some very interesting features in the vertebræ and pelvic arch. The vertebræ first described are remarkable for the reduction of the centrum by constriction, so that the necessary lightness is secured without cavities in the interior. This is shown in the lumbar vertebra represented in Plate X, figs. 3 and 4."

From this it would certainly be inferred that the vertebra figured was a type specimen, especially as it agrees in size and form quite with the lumbar vertebra first described, and upon which the genus and species *Allosaurus fragilis* practically rests. In a later paper (this Journal, xvii, Pl. XIV), however,

this same vertebra, used to typify Allosaurus, is figured as Creosaurus.

The interesting fact remains that the author of *Creosaurus* did not and apparently could not satisfactorily distinguish it from *Allosaurus*, and the name has remained in catalogues and text-books as a sort of floating wreckage, that will neither sink nor be cast up. The few characters Marsh gave for *Creosaurus*, it is readily seen are of very slight value. The ilium, it is true, is of somewhat different shape, as figured, but even this difference may be due to imperfect preservation, as Marsh himself suspected. The only other things mentioned by Marsh is the number of vertebræ in the sacrum, of very little value as already demonstrated in other genera of the Wealden dinosaurs; the position of the transverse processes, which I am confident will not prove distinctive; and the number of teeth in the premaxilla. In fact, then, nothing seems to be known as certainly belonging to *Creosaurus*, except the imperfectly preserved ilium first described.

In the Kansas University expedition to Wyoming in the summer of 1899, a number of bones of a carnivorous dinosaur were obtained from a deposit in the Freeze Out Mts., associated with remains of *Morosaurus*, *Diplodocus*, *Stegosaurus* and *Antrodemus*. These remains were at first unhesitatingly referred to *Allosaurus*, and it is possible that some of them may really belong with that genus. The numerous centra preserved certainly agree very closely with the description given of the *Allosaurus* vertebræ—but they also agree equally well with the vertebra referred to *Creosaurus*. Aside from the vertebræ, however, there were two scapulæ obtained that certainly show a generic distinction from *Allosaurus*, as I have convinced myself from inspection of the scapula referred by Marsh to that genus, and figured by him in various places. It remains to be seen, however, whether this scapula of Marsh indubitably belongs with the bones first referred by him to *Allosaurus*. I do not think that there is conclusive evidence of this. Associated with these scapulæ in our quarry, though not in immediate juxtaposition, were two coracoids, a humerus, radius, claw bones, etc., all of which belong I think with the same species, though from two animals. An ilium and femur, obtained later from the same deposit by the Field Columbian expedition, in all probability belong with one or the other of the two animals.

I give herewith a restoration of the shoulder girdle and arm, so far as the bones preserved permit. The portions outlined are reproduced from Marsh's restoration of the corresponding parts of *Allosaurus*.

The striking distinction from *Allosaurus*, at once seen, and clearly of generic value, is presented by the remarkably elongated and slender scapula. Its shape also is distinctively different in the proximal portion. The other bones preserved do not seem to differ very much from the corresponding bones of



Allosaurus. The humerus appears to be somewhat more curved, the radius is stouter, and the hand is probably larger, relatively. This bird-like form of the scapulæ is a feature apparently unique among dinosaurs. Its shaft is of nearly equal width throughout or but slightly widened distally. The

upper half is much flattened, and the edges are thinned, while proximally it is more trihedral in cross-section, the posterior border rather sharp, the anterior one more rounded and the inner surface here more flattened. Longitudinally the external surface is convex, though less so, or nearly straight, in its middle portion.

The age of the beds whence these fossils are derived, the *Atlantosaurus* Beds of Marsh, I have no hesitancy in accepting as Lower Cretaceous. They were first referred to the Wealden by Marsh at the time of the discovery of the rich reptilian fauna in 1877, but afterwards wrongly placed by him in the Upper Jurassic. I have always doubted this reference, and their Cretaceous age it now seems to me to be sufficiently well proven to accept without question. The character of the reptilian forms present sufficient evidence, I believe, to refer them to beds equivalent to the Wealden of Europe, and the evidence from the invertebrates is still stronger: "The Wealden formation of England contains the greater part of the genera which occur in the *Atlantosaurus* Beds and is doubtless of the same age. The two formations have similar lithological characters, and four of the genera—*Unio*, *Valvata*, *Planorbis* and *Viviparus*—which are represented in the two formations by species having practically the same development, are not known from older formations."*

The name *Atlantosaurus Beds*, derived from a synonym, is not available for them, and must be replaced by *Como Beds* as proposed by Scott, unless indeed, the determination is sufficiently exact to allow the name Wealden to be substituted.

* Logan, Kans. Univ. Quart., ix, 132, 1900.