

Article X.— THE OSTEOLOGY OF THE MANUS IN THE FAMILY
TRACHODONTIDÆ.

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The general osteological characters of this family were briefly stated in the description of *Claosaurus* (= *Trachodon*) *annectens* by Marsh, American Journal of Science, 3d series, vol. 44, 1892, pages 171–173, accompanied by a restoration of the skeleton. In his description of the skeleton, which was copied later in 'The Dinosaurs of North America,' 16th Annual Report of the U. S. Geological Reports, 1896, Marsh says:

"The humerus is comparatively short, and has a prominent radial crest. The radius and ulna are much elongated, the latter being longer than the humerus, and the radius about the same length. The ulna has a prominent olecranon process, and is a stouter bone than the radius. The carpal bones were quite short, and appear to have been only imperfectly ossified. The fore foot, or manus, was very long and contained three functional digits only. The first digit was rudimentary, the second and third were nearly equal in length, the fourth was shorter and less developed, and the fifth entirely wanting, as shown in Plate II, figure 1.

"In the functional digits (II, III and IV) the phalanges are elongate thus materially lengthening the fore foot. The terminal phalanges of these digits are broad and flat, showing that they were covered with hoofs and not with claws. The limb as a whole was thus adapted to locomotion or support, and not at all for prehension, although this might have been expected from its small size and position.

"The elongation of the fore arm and manus is a peculiar feature, especially when taken in connection with the ungulate phalanges. It may, perhaps, be explained by supposing that the animal gradually assumed a more erect position until it became essentially a biped, while the fore limbs retained in a measure their primitive function, and did not become prehensile, which was the case in some allied forms."

This description was based on a practically complete skeleton found by Mr. J. B. Hatcher in the Lance formation of Converse County, Wyoming. Although the bones were all associated at the time of discovery it seems quite evident that in extracting it from the matrix or in subsequent handling the bones of the manus were changed. This fact is clearly established by a nearly complete skeleton of the same species from the same

formation and general locality recently purchased from Mr. Chas. Sternberg and now exhibited in the American Museum, No. 5060. In Marsh's restoration four digits are shown, three bearing hoofs which were considered to be the II, III and IV. I is shown as rudimentary with two phalanges and without terminal hoof. Two complete lines of ossified carpals are introduced, and the phalangeal formula, according to this restoration, is as follows:

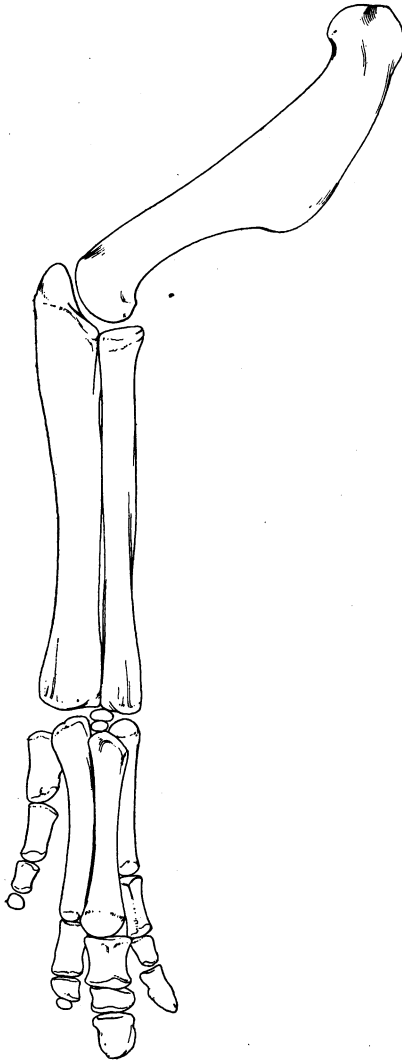


Fig. 1. Manus of *Trachodon* correctly assembled. Position of phalanges determined from skeleton No. 5060.

Digit I, two phalanges without hoof.

Digit II, three phalanges, the third a hoof.

Digit III, three phalanges, the third a hoof.

Digit IV, three phalanges, the third a hoof.

This reconstruction was followed in mounting the skeleton erected in the Yale University Museum, also in a skeleton of the same species mounted in the National Museum, Washington, also in the two skeletons of *Trachodon mirabilis* in the American Museum of Natural History.

The manus in each of these mounted skeletons is incorrectly assembled as shown in this new skeleton (Fig. 1), the skin characters of which are now being published by Professor H. F. Osborn. In this specimen there are only two ossified carpals present, one above

the other, apparently in normal position as they are found in the same position in each foot. This specimen shows conclusively that digit I is absent. The phalangeal formula (Fig. 2, p. 108) is as follows:

Digit II with three phalanges, the third a hoof.

"	III	"	"	"	"	"	"	"
"	IV	"	"	"	"	no	hoof.	
"	V	"	"	"	"	"	"	

The metacarpals are distinct in form and cannot be confused. Mtc. V is very short, massive and divergent. The other three are closely appressed throughout their length and are not divergent.

Mtc. IV is curved transversely and its proximal end is greatly enlarged. The distal end is quite small and round.

Mtc. III is equal in length to Mtc. IV. It is enlarged at each end with the distal end considerably larger than the proximal end. In position it extends below II and IV a distance equal to the thickness of the lower carpal bone.

Mtc. II is considerably shorter than III and IV, and is nearly uniform in diameter throughout its length with the ends slightly enlarged.

The phalangeal formula is remarkable considering the development of the digits. The proximal row is longest and that of digit III is largest of the series. Those of the second row are irregular in form; in digits III and IV they are slightly triangular. Of the terminal row II and III are well formed hoofs, while IV and V have deteriorated into small rounded bony nodules.

In none of the phalanges are the articular ends developed to the degree of articulating perfection seen in the pes.

The extreme elongation of the metacarpals, the loose articulation of the phalanges, and the reduction of the unguals to two functional hoofs indicate that the manus was no longer used to any extent in progression.

In the European *Iguanodon* and its American representative *Champtosaurus* the manus still functioned to considerable extent in progression.

The integument in this specimen extends over all the phalanges but the terminal hoofs of digits II and III are as well formed as those in the pes and were undoubtedly covered by a nail. In life the integument was probably continuous over all the phalanges with exception of the terminal hoofs of digits II and III.

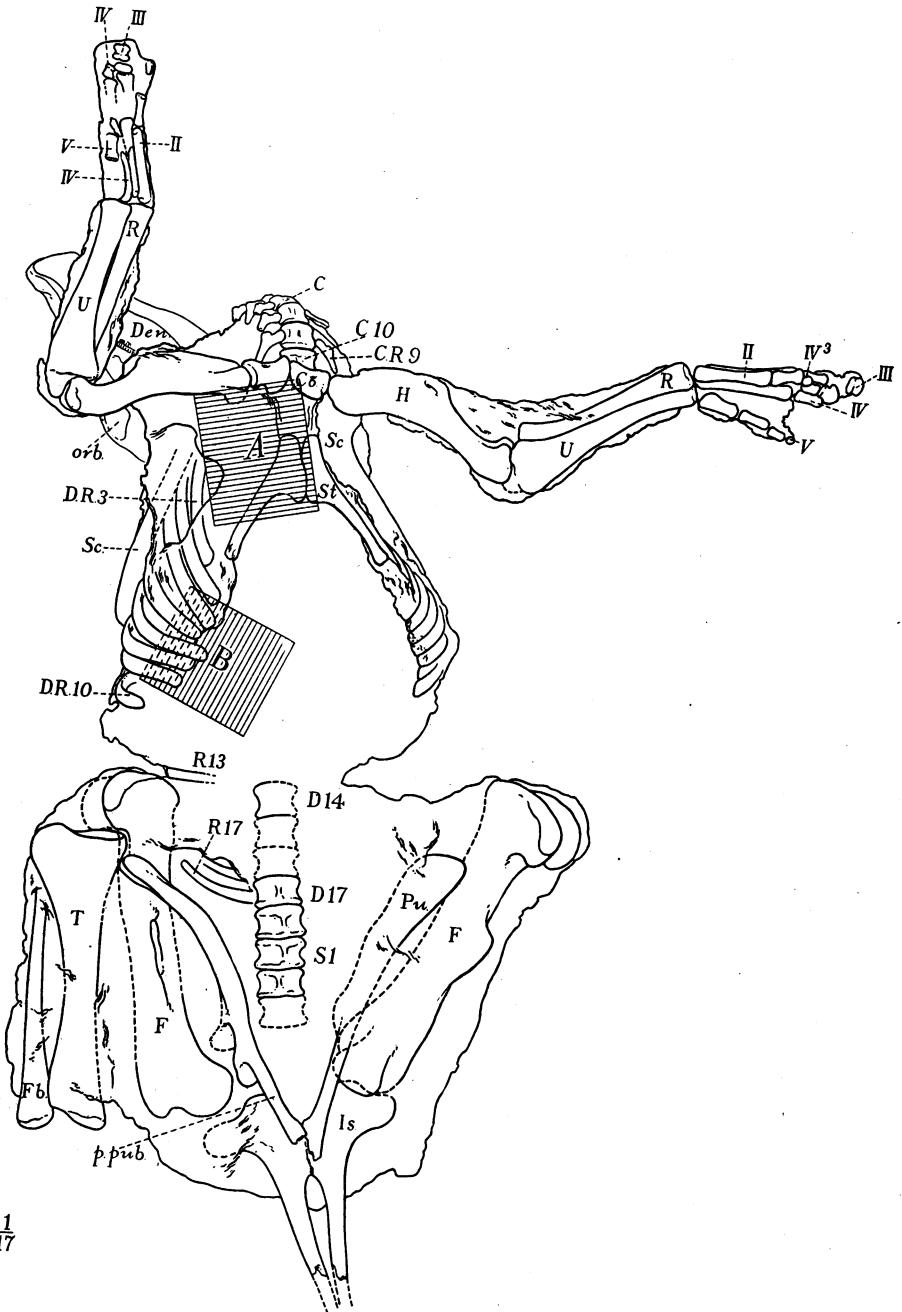


Fig. 2. Ventral view of skeleton No. 5963, *Trachodon annectens*. Phalanges partly embedded in skin.