Short Paleontological Contributions No. 3: The Probable Dermal Armor of *Compsognathus longipes* WAGNER.*

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translated by Michael Benton, January 18, 1976

Certainly on WAGNER's figure (1) of Compsognathus is striking that the spinal processes of the dorsal vertebrae expand so much upwards. It recalls this in a similar condition in the Crocodilia. The purpose in the case of the latter is that the expanded neurapophyses form a stronger support for the bone plates of the dorsal armor. In Compsognathus an analogous case seems to be present. WAGNER's figure, which is even omitted in many textbooks, no longer completely satisfies the standards of accuracy. He has not only entirely overlooked the embryo, which MARSH only commented on later, he has entirely omitted the coracoid (2), he has also omitted a number of sharp impressions in the chest and belly region as not belonging to it. I hold them for remnants of a dermal armor, in which now I am supported by Prof von ZITTEL (3).

The armor covering in front on the thorax is best preserved in a cavity below the scapula, There, about 15 polygonal, mostly 6-sided, raised scutes are to be recognized. Further back between the 3rd and 6th ribs on the belly side follow once again about 10 similar, but larger scutes and furthermore 12-15 large, square scutes, preserved as impressions, lie in connection, which are arrayed in straight rows corresponding to the longitudinal and transverse axes of the animal. The first named plates have diameter 2-3mm, the latter c. 6mm. The regularity of the arrangement and the overall impression produced by it seems to me to very much support the accepted interpretation, even if the preservation in details, particularly in the posterior part, leaves much to be desired. The position of the plates also speaks for this. The lower edge of the almost connected armor covering coincides with the ventral body contour; only in the abdominal region are the scutes crushed rather downwards by compression of the trunk. On the dorsal side nothing of the armor plates is preserved. Impressions of 2 small scutes still lie just in front of the sacrum, of' which one even shows as sculpture 7-8 grooves.

The neurapophyses of the dorsal and caudal vertebrae are not only considerably expanded in the longitudinal direction, but also much thickened on the upper edge. Thus the suggestion of the armament of *Compsognathus* seems to me to be very likely.

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* Original reference: Huene, F. v. 1901. Kleine Palaöntologische Mitteilungen No. 3: Der Vermutliche Hautpanzer des *Compsognathus longipes* WAGN. *Neues Jahrbuch für Mineralogie, Geologie und Paläontologie* 1901 (1):157-160, Pl. VII.

(1) *Abh. Bayer. Akad. Math.-Phys. Cl.* 9. 1864. p. 94ff, Pl. 3.

(2) ZITTEL, "Handbuch" 1, 3, p. 735, 1890.

(3) I am very grateful to the honorable Herr von ZITTEL for permission to examine and photograph this unique specimen thoroughly. In the photographing Dr. F. PLIENINGER and Dr. BROILI helped me most obligingly.

Among the carnivorous dinosaurs, *Ceratosaurus* must be the only one of which bony dermal plates are known. Also in it the upper spinal processes unite very closely. The -armament of the herbivorous dinosaurs seems in general to have been more complete than that of their flesh-eating cousins. But the latter had other means of protection and thus required such defenses less. Indeed one must probably assume that even those dinosaurs of which a bony armor is unknown, were at least covered with horny scales or plates, which are however not preserved because of lower resistance; for animals 5-6m long could hardly have had a completely naked skin. Probably the armor plates of the small *Compsognathus* were also not bony, but only horny. But in order to preserve these, the suitable conditions were necessary, under which the lithographic slate formed.

On the occasion of the short notice on the dermal armor I might also at the same time give a good, i.e. photographic, figure of *Compsognathus*, which has not yet been done, for an exact knowledge of this specimen is of great importance. Since this is the only dinosaur find which shows a complete skeleton in natural connection, one also will have much to see in this very specimen. The position of the hand, for example, is instructive. While the metatarsals of the foot follow each other from right to left, radius and ulna clearly lie in front of each other, the hand surface thus in the sagittal level. This is the normal position of the "grasping hand" of the bipedal dinosaurs. In the *Iguanodon* skeletons mounted in Brussels the hand was also brought into this position. In the *Compsognathus* perhaps it is not an accidental dislocation of the forearm bones, since they are exactly the same on right and left. Also the great separation of these bones towards the distal end indicates here an uncommonly strong musculature for the forearm and the hand. In this the nature of the forelimb shows up, for much specialization in the extraordinary shortness was not necessary for a simple locomotion organ. The end phalanges of the fingers adapted to claws are comparatively higher in relation to their length than those of the foot; therefore also stronger. This is also the case in many other dinosaurs.

Scapula and coracoid have a rather ancient appearance, for they very such recall the Triassic *Thecodontosaurus* and *Zanclodon*. Also the closely related *Hallopus* is rather similar, certainly the dorsal end of the scapula bends more strongly backwards.

Ischium and pubis are in *Allosaurus* formed almost exactly the same and the ilium, as far as can be recognized, to have been like this. The main part of the ilium seems to have lain in front of the acetabulum and was comparatively as broad as in *Allosaurus*. This is the case, furthermore, in *Hallopus*, ?*Coelurus*, *Ceratosaurus*, and *Ornithomimus* as the closest relatives, further in the Dryptosauridae among the Theropoda in the narrower sense. Among the Triassic genera it is the opposite; there even the pubis is formed entirely differently, while the ischium does not differ so much

Among the Theropoda *sensu stricto*, the femur is always longer than the tibia, In *Ceratosaurus* and *Ornithomimus* the same as the case, but in *Compsognathus*, *Coelurus* and *Hallopus* it is shorter than the tibia. Also the processus ascendens of the astragalus present distinguishes *Compsognathus* from the Theropoda *sensu stricto*; it has this in common with *Ceratosaurus* and *Ornithomimus*.

Explanation of Plate:
Compsognathus longipes WAGNER:

Photograph of WAGNER's original in Munich. Reduced rather more than 2x.

NB. For better understanding of the picture it must be said that the light here fell from the side of the tail. Then the dermal scales are also really seen.

Figure Caption:

Sketch of the distribution of the armor plates of the *Compsognathus*. For orientation scapula, coracoid and femur of the left side are indicated.