

NOTES ON GWYNEDDOSAURUS

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RECENTLY Dr. W. Bock wrote an interesting paper on *Gwyneddosaurus* from the Lockatong formation of the upper triassic Newark Series of eastern Pennsylvania. He kindly gave me some additional photographs of the specimen which I appreciated very much. As I could not quite agree with his suggestion that *Gwyneddosaurus* might be a Coelurosaurian, we exchanged letters and I am much indebted to him for his permission to publish a different interpretation.

The bones of the very small skeleton are completely mixed up. Some of the bones are so characteristic that, as it seems to me, the order can be determined.

Two posterior cervical vertebrae (Fig. 1-2) are well preserved (No. 4 and 3 in Bock's Fig. 1). The centra are somewhat elongated. The height of the whole vertebra is about

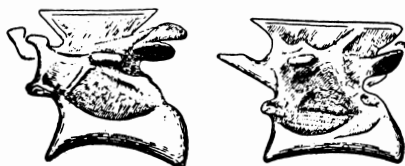


Fig. 1 and 2. Two posterior cervical vertebrae. X 2.

equal to the length. The parapophysis is situated near to the upper border of the centrum. The fairly broad diapophysis is strengthened from below by two buttresses. The origin of the short diapophysis is little lower than the zygapophyses. The prezygapophyses extend a good deal forward. The dorsal spine is low, but is as long as the vertebra. Its upper border forms a straight line, but its base is shorter so that its anterior and posterior upper corners form acute angles.

No. 6 (in Bock's Fig. 1) seems also to be a cervical vertebra. In a photograph made before preparation its shape is more clearly visible. Its centrum is low and much elongated. It is a little longer (8 mm) than the posterior cervicals discussed above (7.5 mm). Probably it is an anterior cervical, possibly the epistropheus. No. 5 (Bock's Fig. 1) is the dorsal aspect of a cervical neural arch. This vertebra has the same length

as No. 6. No. 13 is probably also a cervical with centrum and arch lying parallel to each other.

No. 9 is possibly an elongated distal caudal vertebra, 4 mm long, with a small remaining part of a neural spine. No. 39 includes three slender, forked haemapophyses.

The numerous visible dorsal ribs (Fig. 3) are all single headed, strong and much curved. Several thinner, straight



Fig. 3. Dorsal rib. X 2.

ribs probably belong in the cervical region, but no articulation is visible. There are also many straight or slightly curved gastrals.

Both halves of the shoulder girdles, Nos. 17 (Fig. 4) and 18 (Fig. 5) are well preserved, but the interclavicle is not present. There is a relatively large coracoid fused along its whole breadth with the exceptionally short scapula, as in

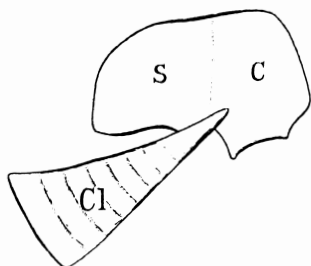


Fig. 4. Left shoulder girdle, C = Coracoid, S = scapula, Cl = clavicle. X 2.

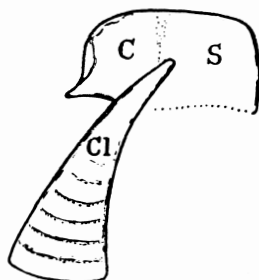


Fig. 5. Right shoulder girdle, abbreviations as for Fig. 4.

Adelosaurus and similar to *Microcnemus*. Both scapulae are in contact with the medially broad clavicle, best seen in the photograph taken before preparation.

No. 19 is an ilium (Fig. 6) with short and acute anterior spine and with large and broad posterior process. Its length is 10 mm. The lower contour of the bone is not very clear. It seems that below it there is a plate-like ischium extending posteriorly, but this, also, is not very clear. It is obscure

whether an indistinct impression in front of the probable ischium may be a pubis, but the upper part of the ilium is very characteristic.

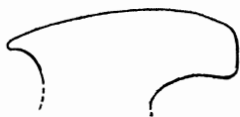


Fig. 6. Upper part of left ilium. X 2.

The best of the leg bones is a femur 23 mm in length (Fig. 7). It is straight and slender. At the distal end (near No. 28) both of the condyles are visible. At the proximal end

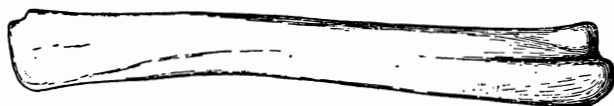


Fig. 7. Femur. X 2.

the inner trochanter is recognizable as a crest, similar to that of *Microcnemus*. It does not quite reach the top of the caput femoris.

It is possible that above the distal extremity of the femur (photograph before preparation) there is the beginning of a slender (2 mm broad) proximal end of a fibula (Fig. 10).

The two other bones below the proximal extremity of the femur and parallel to it I take as radius (No. 25, Fig. 11) and ulna (No. 45, Fig. 12). The very slender radius is 9 mm long. The ulna (best seen in the picture made before

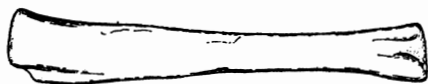


Fig. 8. Femur of second specimen. X 1.5.

preparation) has the same length as the radius. Both of these bones with their proximal ends are lying in the same direction as the femur.

Two short, complete bones I take as metatarsals (better visible in the photograph before preparation than in Bock's Fig. 1). One of them is No. 31, the other at the side of No. 17 in the direction of No. 34. Their lengths are 4 and 2.5 mm.

But it is also possible that these two bones are phalanges (Fig. 13-14) and in that case the metatarsus would be long and slender.

Isolated skull elements are present, but most of these are (on the picture) not reliably determinable. No. 15 may



Fig. 9. Tibia of second specimen. X 1.5.

possibly be a basisphenoid and parasphenoid, No. 16 a squamosal, etc. They do not help much in determination of the order.

Dr. Bock kindly sent me a photograph (in natural size) of another skeleton found near that of the type of *Gwyneddosaurus*. In the matrix are two complete bones which might pos-



Fig. 10. Proximal part of fibula.
X 2.

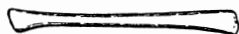


Fig. 11. Radius, upper end
above. X 2.

sibly belong to the same genus and species. One is a femur (Fig. 8) 36.5 mm of length and the other a tibia (Fig. 9) 30 mm of length. Both are quite straight. The femur becomes broader proximally, as in *Macrocnemus*. The inner trochanter does not quite reach to the proximal extremity of the bone. In the distal end both tiny condyles are visible. The bone may



Fig. 12. Proximal part of ulna.
X 2.



Fig. 13 and 14. Probably two
phalanges. X 2.

be structurally identical with that of *Gwyneddosaurus*. The tibia is much larger in diameter proximally than distally. Possibly these two bones belong to a larger individual of *Gwyneddosaurus*.

An attempted reconstruction of the skeletal proportions of *Gwyneddosaurus* would give the following picture. The neck

must have been relatively long, as is seen from a comparison of cervical vertebrae and shoulder girdle. The dorsal vertebrae must have been shorter than the cervicals, because taking 16-18 dorsals of the same length as the cervicals would give an impossible length of the trunk and impossible proportions of trunk and girdles. I therefore infer that the dorsals were short. The ratio of cervical vertebral length to the length of femur is about the same as in *Macrocnemus*. Also the proportional sizes of femur and ilium are about the same as in *Macrocnemus*. If the femur and tibia of the second find also represent *Gwyneddosaurus*, the lower segment of the leg in *Gwyneddosaurus* was a little shorter than the upper segment. But the front leg is very much smaller than the hind leg. From the length of the radius, 9 mm, a humeral length of 10-11 mm may be inferred and the front leg would not even be half as long as the hind leg. From the relatively large size of the slender haemapophyses, a very long tail is to be inferred. All of this would give the proportions of an animal similar to *Macrocnemus*, but with much smaller front legs.

It seems to me possible to determine the order from the cervical vertebrae, dorsal ribs, shoulder girdle, ilium, femur and radius, also the gastrals. In no order except the later representatives of the Protorosauria are structurally nearly similar skeletal elements to be found. The cervicals are very similar to *Macrocnemus* and *Microcnemus*. In no other order is there such close similarity. The Protorosauria also have single-headed dorsal ribs. The shape and relative size of scapula plus coracoid is nearly the same in *Adelosaurus* and similar in *Microcnemus*. All other Protorosauria have more or less short and stout scapula, beginning with *Araeoscelis* and *Protorosaurus*. The upper extremity of the scapula is still broad and with corners in *Protorosaurus*, but in *Microcnemus* it is short and acute, in lesser degree this is also the case in *Macrocnemus* and *Tanystropheus*. The shortness of the scapula in *Gwyneddosaurus* is the same but the end is broad with one acute and one rounded corner, most similar to *Adelosaurus*. The clavicle of *Gwyneddosaurus* suggests *Macrocnemus*, but is broader in its medial portion (cf Peyer 1937, Pl. 58, 1 b). The ilium with small anterior tip and large posterior process is characteristic of Protorosauria. The femur (particularly if the second find is also *Gwyneddosaurus*, as I think) is much like

that of *Macrocnemus*. Furthermore, the long and hardly curved gastrals are quite similar to *Macrocnemus* or *Tanystropheus*.

It thus seems to me that there can hardly be any doubt that *Gwyneddosaurus* is one of the later Protorosauria and the smallest known representative of this order.

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