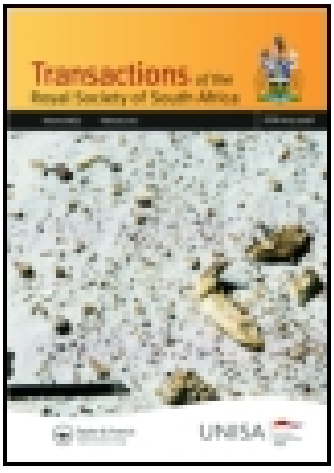

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OBSERVATIONS ON SOME SPECIMENS OF SOUTH AFRICAN FOSSIL REPTILES PRESERVED IN THE BRITISH MUSEUM.

By R. Broom, M.D., D.Sc., F.R.S.S.Af.

(Read October 20, 1909.)

The British Museum can still claim to have a larger collection of South African fossil reptiles than any other museum, and this collection is specially valuable in that it contains all Owen's types and most of Seeley's. As it is over thirty years since the large majority of Owen's specimens were described, and as much new light has been thrown on the Karroo reptiles in recent years, it seemed necessary to re-examine a number of the less well-known types.

When recently in London I was enabled, through the kindness of Dr. Smith Woodward and Dr. Andrews, to examine all the specimens I wished to see, and to settle a number of points on which there was some doubt.

Galesaurus.

In 1859 Owen described, under the name *Galesaurus planiceps*, a fairly good skull of a small Cynodont reptile from the Sneeuwberg. In the "Catalogue of the South African Fossil Reptiles," published in 1876, a small, very imperfect skull of a somewhat similar Cynodont is described under the name *Nythosaurus larvatus*. In 1887 a very fine new skull was described by Owen as another specimen of *Galesaurus planiceps*. Seeley, in 1894, pointed out that this last specimen differed in many points from the original type, and proposed for it the new name *Thrinaxodon liorhinus*. Recently two other specimens have been procured, which have not been described but which manifestly belong to the same species as the 1887 specimen.

When the various specimens are carefully studied it becomes clear that Seeley was right in deciding that the specimen described by Owen in 1887 is a very different animal from *Galesaurus planiceps* as represented by the 1859 type. The recently procured specimens, while belonging to the same species as the 1887 specimen, show that the imperfect skull described as *Nythosaurus larvatus* also belongs to the same species. We

must thus regard all the specimens grouped under the name *Galesaurus* as belonging to two genera. The original form is a flat-headed animal, with apparently a dental formula of $i\,\frac{5}{3}$, $c\,\frac{1}{1}$, $m\,\frac{12}{12}$. All the other specimens, which must take the name *Nythosaurus larvatus*, have a deeper, narrower skull, and a dental formula of $i\,\frac{4}{3}$, $c\,\frac{1}{1}$, $m\,\frac{7}{7}$. The difference seen in the teeth of the different specimens of *Nythosaurus larvatus* is due to those in some specimens being of the first set and in others the replacing set.

In *Galesaurus planiceps* 10 molars occupy 20 mm.; in *Nythosaurus larvatus* 7 molars occupy 20 mm.

Scaloposaurus.

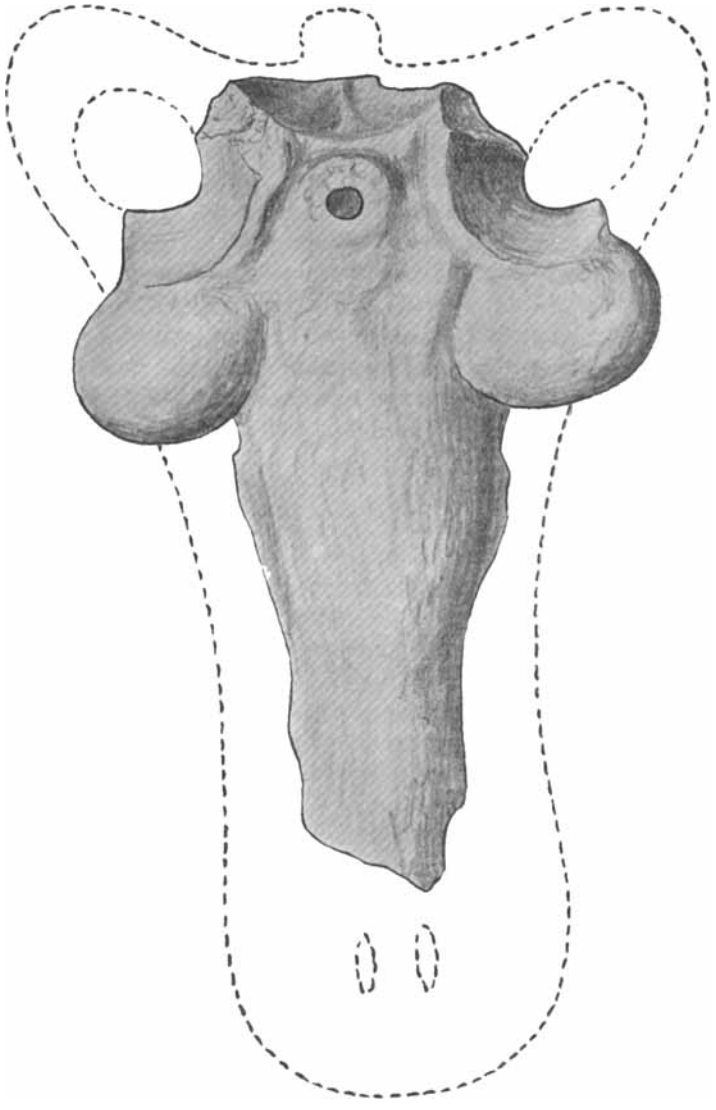
Among the many forms described by Owen in 1876 few are more interesting than the small skull described as *Scaloposaurus constrictus*. No other specimens have ever been discovered of the form, and the original type has apparently never been re-examined since Owen's time. The skull proves to belong to the Therocephalia, but it differs in many ways from any other known Therocephalian. The canines are only slightly enlarged, and there appear to be three—two small ones followed by the main canine. The jugal arch is very slender, and the postorbital arch does not seem to be complete—in this resembling the condition in *Bauria*. Dr. Smith Woodward has kindly had the palate partly cleared at my suggestion, and so far as displayed it is typically Therocephalian, but there appear to be no teeth on the pterygoids. The lower jaw is mainly formed by the dentary, which is remarkable for the small development of the coronoid process. The angular and surangular, though smaller than usual, are quite Therocephalian in structure. *Scaloposaurus* is particularly interesting in being the smallest known Therocephalian. In the small coronoid process and the feebly developed canines it approaches *Galechirus*, but in the imperfect development of the postorbital arch it differs from all other known Therapsidans except the Cynodont *Bauria*. The dental formula is probably $i\,6$, $c\,3$, $m\,9$.

Gorgonops.

In 1876 Owen described a very remarkable skull under the name *Gorgonops torvus*. Though somewhat like other "Theriodont" skulls Owen recognised in it some distinctive characters, and placed it in a special group, the Tectinarialia. Lydekker, who regarded the skull as completely roofed, believed *Gorgonops* was somewhat intermediate between *Pareiasaurus* and the "Theriodonts." On re-examining the skull it appears that though the parietal region is broad there is a distinct temporal fossa, and the condition is very similar to that seen in *Titanosuchus*, which appears to be its nearest ally.

Titanosuchus.

Titanosuchus ferox was described by Owen in 1879 from a very fragmentary specimen. Fragments of jaws are known, and a few limb bones



Skull of *Titanosuchus ferox*, Owen. (Greatly reduced.)

and vertebræ, but practically nothing of the skull structure has hitherto been revealed. In the Seeley collection there is the top of a large skull

with a fragment of the maxilla, and it seems fairly certain that the skull is that of *Titanosuchus ferox* or a closely allied form. Though very imperfect, the fragment is sufficient to give a fair idea of the skull. The parietal region is very broad and the temporal fossæ small. The pineal foramen large, and surrounded by a marked thickening of the bone. The occiput slopes downwards and backwards. The orbits are very far apart, and over each is a huge rounded boss of bone, which completely overhangs it. The snout is relatively very long, and on the upper nasal region is a large median thickening as if covered by a horny plate. An attempted restoration is made in the figure. The temporal arches are evidently weaker than in *Tapinocephalus*, and the quadrates are not carried much forward, being probably situated more as in Therocephalians. Few of the sutures are distinct, but it is manifest that the large supraorbital bosses are postfrontal, and that the inner walls of the temporal fossæ are postorbital. The low median boss is mainly frontal but partly nasal.

The fragment of the skull as preserved measures 440 mm., and probably the length of the perfect skull would be about 600 mm. The width across the supraorbital bosses is 310 mm.

Theriognathus.

In the British Museum "Catalogue of the South African Fossil Reptiles," published by Owen in 1876, he describes and figures a fairly large but very imperfect skull under the name *Theriognathus microps*. Owen evidently believed it to be an Anomodont, and speaks of it as "seemingly edentulous," but as evidently distinct from *Oudenodon*. Lydekker came to the conclusion that the skull really belonged to *Endothiodon uniseries*, and in his Catalogue of 1890 says: "The teeth are not shown, but from a comparison with the next specimen [*Endothiodon uniseries*] the generic position of the specimen is quite evident. This is especially shown by the great width of the interorbital region and the natural cast of the right orbit, which evidently had a bony roof identical with that of the next specimen."

The specimen is in such a very bad state of preservation that it is impossible to determine its affinities with certainty, but there is, in my opinion, little doubt that it is not in any way nearly related to either *Oudenodon* or *Endothiodon*. No doubt the interorbital region was broad, as pointed out by Lydekker, but so it is in all Therocephalians. The lower jaw of *Endothiodon uniseries* is known; in fact, the mandible of the type individual is in the South African Museum, and it in no way resembles the jaw of *Theriognathus*. This latter jaw so far as preserved is typically Therocephalian. There is a large coronoid process, a development unknown in any Anomodont, while the angular and articular bones

are also quite Therocephalian. So indeed are all the parts of the skull preserved. Owen is in error in fancying that the depressions seen at the front of the specimen are anterior nares. All the snout-like portion preserved is merely the cast of the upper olfactory region, and probably about 3 inches are lost in front.

The skull does not agree with any known Therocephalian, but I do not think there is any doubt that it must be placed in this group. A number of large Therocephalians are known from the same horizon, and this skull is probably that of an immature specimen of one of the large undescribed forms.

ÆLUROSAURUS.

This genus is founded on a very fine little skull which lacks the postorbital portion. In all respects it is a typical Therocephalian, and the missing portion is doubtless similar to that in typical members of the order. The published figures, and especially Seeley's restoration, give a most misleading idea of the skull. Owing to a thin film of lime having been mistaken for bone, the articulation for the jaw has been considered to be below the posterior margin of the orbit. In reality the jugal passes straight back as in other Therocephalians. Lying inside of the supposed deflected jugal can be distinctly seen the surangular and angular bones. On the left side the mandible is nearly complete, and shows the typical Therocephalian structure. The dental formula seems to me to be $i\,5$, $c\,1$, $m\,5$.

LYCOSAURUS.

Under this generic name are grouped a number of specimens in the British Museum, some of which pretty certainly belong to different genera.

The type species *Lycosaurus pardalis* is founded on a very badly preserved skull. The right side is much weathered, and only the anterior part of the lower jaw is preserved. On the left side the bones are better preserved, but the whole skull is greatly crushed, and the published figure gives a very erroneous idea of the structure. The skull is typically Therocephalian, and the dental formula appears to be $i\,5$, $c\,2$, $m\,4$, the 1st canine being small and the 2nd large. The molar teeth do not appear to be serrated posteriorly.

The specimen which has been called *Lycosaurus curvimola* is a much better preserved skull, but I think clearly belonging to a different genus from the former. The parietal region is broader than in most Therocephalians. There appears to be no secondary palate and no teeth on the pterygoids. The molar teeth are simple and strongly serrated posteriorly. The dental formula is $i\,4$, $c\,1$, $m\,5$. The curving of the molar series is probably in part due to distortion.

The specimen which forms the type of *Lycosaurus tigrinus* is badly preserved. It appears to have a dental formula of *i* 5, *c* 1, *m* 4 or 5.

The other specimens referred to this genus are all very imperfect.

Cistecephalus.

A number of specimens which have been referred to this genus are in a bad state of preservation. Owen described six species, but these have been reduced by Lydekker to four, and I think it is necessary to still further reduce the number. The type of *C. leptorhinus* seems to me to be merely the snout of a species of *Dicynodon*. Specimen R 1689, which is referred by Lydekker to *C. microrhinus*, is also, in my opinion, the snout of a small *Dicynodon*. The specimens which form the types of *C. planiceps* and *C. bathygnathus* are both in a somewhat unsatisfactory condition, and I do not feel quite satisfied that either is distinct from the type species *C. microrhinus*. The imperfect skull which forms the type of *C. arctatus* should probably be referred to a different genus. The specimen, 47088, pretty certainly does not belong to *Cistocephalus* at all, and more likely to one of the small Endothiodonts, such as *Opisthoctendon*.

Cistecephalus is a very interesting small Anomodont, and is evidently the last stage in the development of the Dicynodonts. It differs from most other genera in the absence of the preparietal bone. It has lost the postfrontal, and the prefrontal is very small. The postorbital, on the other hand, is of very large size. The palate is typically Dicynodont.

Anthodon.

In Owen's Catalogue three specimens are described under the name *Anthodon serrarius*, and all are said to come from "Bushman's River, halfway between Graham's Town and Port Elizabeth, in a marine formation containing teeth of fish, liassic shells, and fossil trees in great quantity." The type specimen consists of a badly crushed and imperfect skull; the second specimen is a jaw fragment with teeth. In Lydekker's Catalogue the skull is said to have come from naar Styl-Krantz, Sneeuwberg Range, Owen's locality being stated to be incorrect. The jaw fragment, however, is given as coming from Bushman's River. As the beds at Styl-Krantz are of Permian Age, and those at Bushman's River Lower Cretaceous, it is pretty certain that there is some mistake somewhere. A re-examination of the specimens seems to me to clear up the confusion.

The skull is evidently that of a small Pareiasaurian, and doubtless rightly referred to the Styl-Krantz horizon. It is too imperfect and too badly crushed to be quite certain of its relationships. It seems, however, just possible it may prove to be a young *Propappus*, but in the meantime it must be kept distinct.

The jaw fragment with teeth seems to me to be entirely distinct and to have nothing whatever to do with *Anthodon*. The teeth have admittedly some superficial resemblance to those of *Anthodon*, but are really very different. In *Anthodon*, as in other Pareiasaurians, the cusps are subequal and the outer side of the tooth is apparently fairly uniformly rounded. In the teeth of the Bushman's River specimen the central cusp is much the larger and there is a very large basal thickening. The manner in which the teeth are being replaced is also unlike that of the Pareiasaurians. From the Bushman River beds being Cretaceous it may be regarded as practically impossible that the teeth can be those of a Pareiasaurian, as there is no evidence that any Pareiasaurian survived the Permian. But when we compare the teeth with those of Cretaceous reptiles of other parts we find that they are strikingly similar to those of some herbivorous Dinosaurs. The teeth of *Stegosaurus* are not unlike the Bushman River teeth, but those of *Palæoscincus costatus* agree so closely as to render it highly probable that the African teeth belong to this genus. I therefore think it advisable provisionally to name the Bushman River specimen *Palæoscincus africanus*. They are manifestly not *Anthodon serrarius* and pretty certainly Dinosaurian.

Saurosternon.

Saurosternon baini is represented in the British Museum by two specimens, neither of which is very satisfactory, and hence little has been known with certainty as to the affinities of the genus. On examining the type I was able to recognise distinctly a precoracoid and coracoid of a type very similar to that of *Procolophon*, and though the head is not well preserved, it agrees, so far as can be seen, closely with *Procolophon*. There is therefore, I think, little doubt that *Saurosternon* must be placed with *Telerpeton* in the *Procolophonia*.

The horizon of *Saurosternon* probably extend from the *Endothiodon* beds to the *Lystrosaurus* beds, though it is very doubtful if the same species is found in each bed.