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An aberrant Mosasaur from the Upper Cretaceous of North-Western Nigeria. Preliminary report

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Paleontologia. — *An aberrant Mosasaur from the Upper Cretaceous of North-Western Nigeria.* Preliminary report. Nota di AUGUSTO AZZAROLI, CLAUDIO DE GIULI, GIOVANNI FICCARELLI e DANILO TORRE, presentata (*) del Corrisp. A. AZZAROLI.

RIASSUNTO. — Un cranio di mosasauro del Cretaceo superiore della Nigeria differisce dagli altri mosasauridi per l'allungamento della porzione neurale, le arcate postorbitarie largamente espanse e i mascellari allungati posteriormente. La mobilità interna del cranio doveva essere limitatissima. Il fossile è attribuito al nuovo genere *Goronyosaurus* e non rientra in alcuna delle sottofamiglie note dei Mosasauridi.

The present report is based on the results of two palaeontological missions to the Sokoto province, NW Nigeria. The first mission was organised by the Italian Embassy of Nigeria, with the help of Italian residents in the country and of the "Consiglio Nazionale delle Ricerche", in December 1969–January 1970, and was composed of prof. D. Torre, dr. G. Ficcarelli and dr. C. De Giuli. The second mission was organised and sponsored by the "Accademia Nazionale dei Lincei" and took place in February–March 1971; it was composed of prof. A. Azzaroli, dr. G. Ficcarelli and dr. C. De Giuli. All persons involved work presently in the Geological and Palaeontological Institute of the University of Florence.

Both missions were genereusly assisted by the Geological Survey of Nigeria and by the Government of NW Nigeria, which provided local staff and transport.

We wish to thank the Federal Government of Nigeria, the Italian Embassy, the Government of NW Nigeria, the Accademia Nazionale dei Lincei and the Consiglio Nazionale delle Ricerche; we especially thank the Director of the Geological Survey of Nigeria dr. Olowu and his collaborators drs. F. Beltaro, M. Ricci and M. Offodile, and Mrr. Ojo and Salami. We are particularly grateful to Mr. E. D'Alberto, Italian Consular Agent in Kaduna, whose assistance has been greatly appreciated. Finally we would like to express our sincerest thanks to Alhaji Yahaya Ahmed Rufai, chief of Goronyo district, for his hospitality, and to Mallam Faruku K. Taloka for his collaboration.

In the Sokoto province fossil vertebrates occur in two horizons: the Dukamaje member of the Rima formation and the Dange formation. Both horizons belong to a flat-lying sequence of continental and marine deposits overlying a cristalline basement. They are mainly made of gypsiferous marls and shales, locally exploited for their gypsum content. Fossils occur as scattered bones; only in few instances restricted numbers of bones were

(*) Nella seduta dell'11 marzo 1972.

found in connection. The Dange formation is overlaid by the marine Kalambaina formation, with a fauna of Molluscs, Echinoids and Corals of Paleocene age (Reyment, 1965). The Dukamaje member of the Rima formation contains remains of fishes, mosasaurs, crocodiles, turtles and few molluscs, and is considered of Maastrichtian age (Jones, 1948; Reyment, 1965). The Dange formation yielded fish remains, turtles and crocodiles, and is considered provisionally of Paleocene age. The present report deals with the most significant mosasaur remains.

Occurrence of fossils. – Fossil reptiles in NW. Nigeria were first recorded by Baron F. Nopcsa in 1925 (quoted by Swinton, 1930) and more fully described by W. E. Swinton (1930). At this time only isolated vertebrae, a femur and some fragments of jaws and teeth of mosasaurs were known. Swinton based on them his new species *Mosasaurus nigeriensis*.

During our missions, the Dukamaje member was explored in several localities in the Goronyo district: Taloka, Shinaka, Bago, Tunga, Dan Tudu, Masari, Gidan Hashimu, Kadi, Kwaurma Alkali and Kwakwazo. With the only exception of Bago, these localities are placed on the escarpments flanking the alluvial plain of the Rima river. Beside a large number of isolated vertebrae, also some humeri, portions of pelvis, fragments of jaws and a nearly complete skull were collected. Most of this material belongs to a medium-sized species of mosasaurid and correspond to Swinton's description. For this reason, and because our material comes from nearby localities and from the same stratigraphic horizon as the fossils studied by Swinton, we consider it highly probable that they belong to the species *nigeriensis*. The skull also conforms in size with this species. There are in addition three much larger dorsal vertebrae, which provide evidence for the occurrence of a large mosasaurid, approximately of the size of *Hainosaurus bernardi* or *Tylosaurus proriger*. They were found at Tunga, on the Northern side of the Rima plain.

Skull. – The skull we have reconstructed (fig. 1) was found at Taloka, on the Southern escarpment of the Rima plain, about two miles East of Goronyo, and is made of four fragments. The largest fragment (Plate I) includes the muzzle, the frontal and part of the parietal and of the jugal arches, and is highly crushed. A second fragment (Plate II, fig. 1), including the occipital and basisphenoid region and part of the parietal, seems to represent the missing part of the larger fragment, but was obviously detached from it before deformation took place. The other two fragments (Plate II, fig. 2) are the pterygoids with ectopterygoids, all incomplete. From these fragments the skull may be reconstructed; only the hinder part of the jugal arches, the temporal region and the quadrates are lost.

The total length of the reconstructed skull from the tip of the muzzle to the occipital condyle is approximately 80 cm.

The Taloka skull shows highly aberrant characters; there can be little doubt that it belongs to a mosasaurid, but at the same time it does not fit

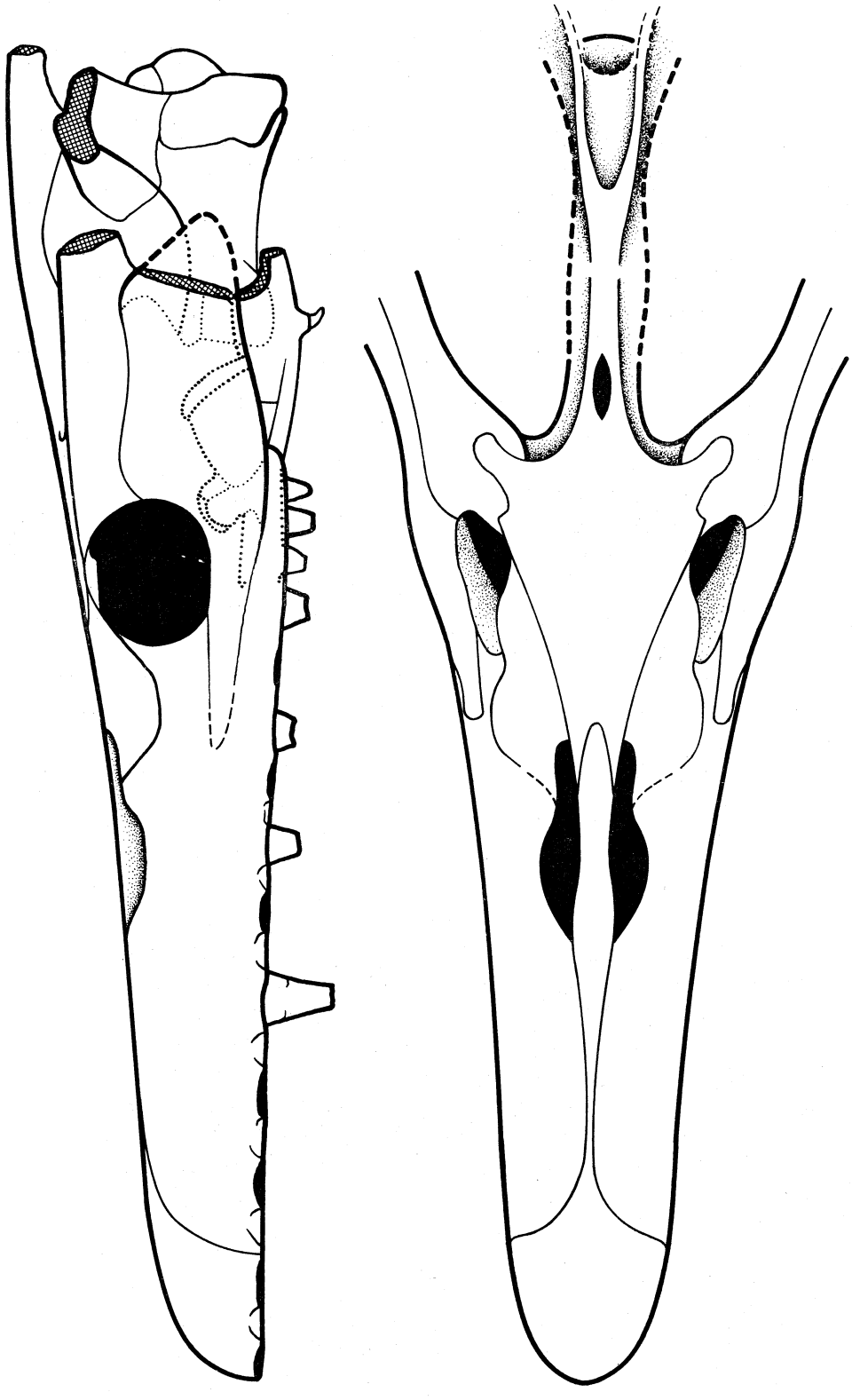

Fig. 1. – *Goronyosaurus nigeriensis* Swinton sp.. Reconstructed skull. (1/4×).

into any of the three subfamilies of this family. The main features distinguishing it from all the mosasaurids hitherto known are the following: the maxillaries extend backwards as far as the hinder margins of the orbits; the infratemporal opening is in part closed by an unusually broad lamina formed by the greatly extended ascending ramus of the jugal; the parietal region is very long as compared with the frontal and the muzzle; the inner surface of the frontal bears a canal, completely closed ventrally, for the olfactory tracts; in the pterygoids the origin of the ectopterygoidal processes and quadratic branches are placed widely apart and the ectopterygoid articulates at the hinder margin of the base of the ectopterygoidal process; the dental plane of the pterygoid is placed nearly at the same level as the articulation of the ectopterygoid. Other features of the Taloka skull are: muzzle elongated, nares rather small and placed backwards, orbits fairly small.

As stated above, the fossils so far collected provide no evidence for the occurrence of more than one species of medium-sized mosasaurid, i.e. the species already described by Swinton as *Mosasaurus nigeriensis*. Swinton's generic attribution however can no longer be retained and we propose the new generic name *Goronyosaurus* (from Goronyo, the chief town of the district), with type *G. nigeriensis* Swinton sp.

The functional significance of the anomalous features of *Goronyosaurus* is not easily understood. It seems that the effect of the posteriorly elongated maxilla and of the broadly extended jugal was to restrict almost to nil the internal mobility of the skull, characteristic of other mosasaurs. A fuller discussion of this point and of relationships with other mosasaurs will be given after a more complete elaboration of our material.

Postcranial skeleton. – The few limb bones at our disposal do not differ appreciably from those of the other mosasaurs. The pelvis (Plate II, fig. 3), represented by ten specimens of various ages, is however peculiar: the acetabulum is a well-shaped pit and the three bones of the pelvis, which are usually free in other mosasaurs, in our species are always fused, though their sutures remain clearly visible.

Goronyosaurus n. gen.

Type species: *Goronyosaurus nigeriensis* Swinton sp.
Neotype: skull N.G. 1.
Type locality: Taloka (Goronyo district, NW Nigeria).
Stratigraphic horizon: Dukamaje member of the Rima formation.
Age: Maastrichtian.

Diagnosis: Mosasaur with a narrow skull, flattened dorso-ventrally; no rostrum anterior to praemaxillary teeth; maxillary bones extended backwards as far as the hinder margin of the orbits; external narial openings small and placed backwards; frontal small, with a completely closed canal

for the olfactory tracts; orbits fairly small; jugals with the full horizontal ramus in contact with the maxillary bone, and with the ascending ramus enlarged posteriorly into a broad lamina; pterygoids with quadratic ramus originating widely apart from the ectopterygoidal process; ectopterygoid articulating on the posterior margin of the base of the pterygoidal process; main body of the pterygoid dorsoventrally compressed, with the lower face of the base of the ectopterygoidal process nearly at the same level as the dental plane; parietal fairly elongated. The basioccipital shows no canal for the basicranial artery.

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EXPLANATION OF PLATES I–II

Plate I

Goronyosaurus nigeriensis Swinton sp.. Skull N.G. 1; neotype. Loc. Taloka. (1/4×).

Plate II

Fig. 1. – *Goronyosaurus nigeriensis* Swinton sp.. Fragment of braincase N.G. 2. Loc. Taloka. (1/3×). *a*, *b*) lateral views; *c*) posterior view.

Fig. 2. – *Goronyosaurus nigeriensis* Swinton sp.. Pterygoids and ectopterygoids N.G. 3 & N.G. 4. Loc. Taloka. (1/3×). *a*) dorsal view; *b*) ventral view.

Fig. 3. – *Goronyosaurus nigeriensis* Swinton sp.. Fragment of pelvis N.G. 15. Loc. Taloka. (1/3×).

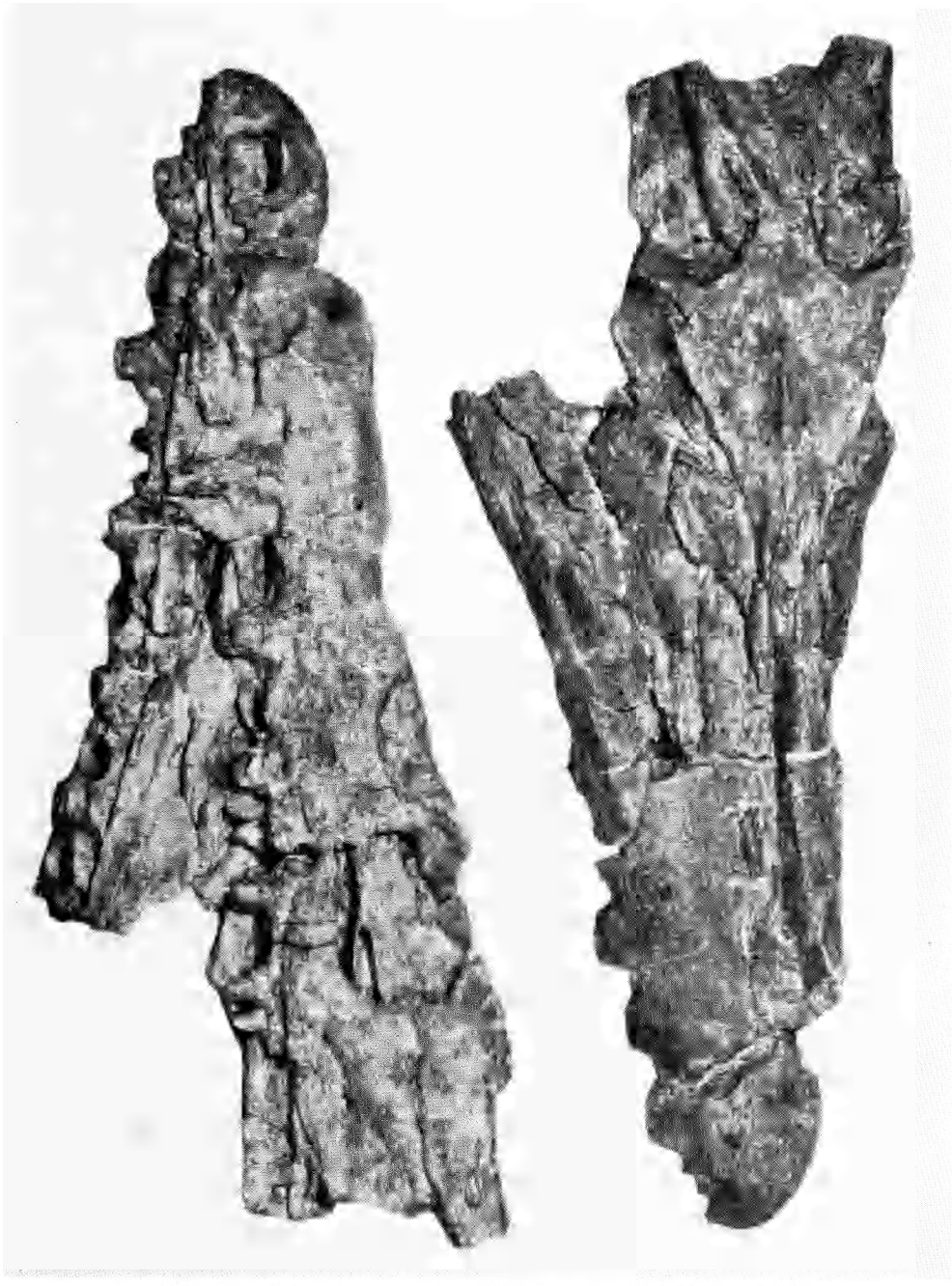

Fig. 1*a*

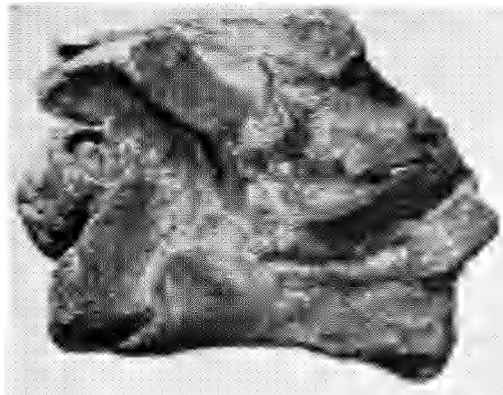

Fig. 1*c*

Fig. 1*b*

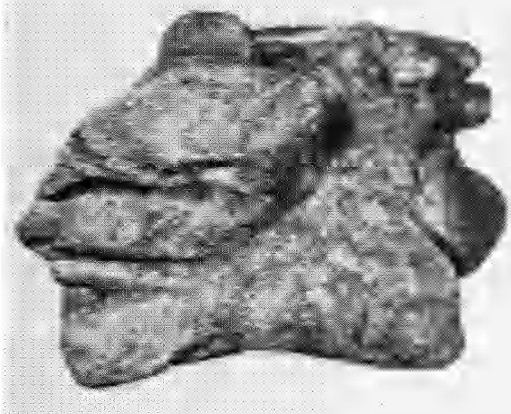

Fig. 3

Fig. 2