Riv. Mus. civ. Sc. Nat. "E. Caffi" BERGAMO, 20 (1999), pp. 127-130 ISSN 0393-8700

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A COMPLETE PHYTOSAUR (REPTILIA, ARCHOSAURIA) FROM THE NORIAN (LATE TRIASSIC) OF LOMBARDY (NORTHERN ITALY)

The scientific interest of the vertebrate fauna collected from the Calcare di Zorzino (Zorzino Limestone Formation, has been enhanced by the finding of a complete skeleton of a phytosaur (Tintori et al., 1996). This event is closely related to this meeting as the find of the fossil appened while one of us (A.T.) was on the Endenna (Zogno-BG) site together with W.Bausch to sample the section.

Due to financial problems, the preparation has been delayed, but now the skeleton has been mostly cleared from matrix and even if further preparation is required for a detailed study, available characters allow some preliminary considerations about taphonomy, morphology and mode of life of this reptile.

The newly discovered phytosaur is approximately four meters long and shows a narrow rostrum, rather short limbs and a very long tail, consisting of up to 75 vertebrae.

Available details of the skull, especially of the region posterior to the orbits suggests close affinities with the narrow snouted genus *Mystriosuchus* Fraas (Renesto & Lombardo, 1999) but the length of the rostrum is somewhat shorter than that usually reported for this genus (Westphal, 1976) and the premaxillae lack the spoon shaped expansion at their anterior tip. Surprisingly, the lower jaw seems to be longer than the upper one. Teeth are robust and conical. Premaxillary teeth are, as usual, stouter and longer than those borne by the maxilla and by the dentary. Cheek teeth are gently fluted, rounded in section and lacking carinae.

The cervical and dorsal vertebrae cannot be counted yet, while at least 75 caudal vertebrae are present. As already suggested (Renesto & Lombardo, 1999) the tail is very long with respect to usual reconstructions of phytosaur skeletons (Mc Gregor, 1906, Westphal, 1976; Chatterjee, 1978). Furthermore, it shows a peculiar pattern: the caudal vertebrae, after the 50th one, (Fig. 1) have very long neural spines which are sharply bent posteriorly, rendering the end of the tail rather stiff. In addition, the haemal arches of the same vertebrae are fan shaped, as in many aquatic reptiles like marine crocodiles, but also nothosaurs (Sander, 1989). The degree of ossification decreases significantly toward the tip of the tail, where the vertebrae are very thin. The stiffening of the posteriormost portion of the tail, with reduced mobility, suggests the possibility that this region acted as a unit during swimming (Renesto & Lombardo, 1999) but the efficiency of this structure should have been decreased by the low profile due to the strong inclination of the neural spines, unless a sort of fin-like dorsal expansion was present in order to increase the area and improve efficiency.

At present, little can be said about the appendicular skeleton. The sole element of the pectoral girdle which has been cleared from matrix is, so far, the left scapula revealing that the scapular blade is less developed than in other phytosaurs in which this structure is known. In the pelvic girdle, both ilium and ischium are posteriorly elongate and with a low

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iliac blade. The posterior limb is rather short and slender, and tarsal elements are small.
Many of the characters stated above point to an high level adaptation toward aquatic life, so far unknown for phytosaurs. It may be hypothesised that this reptile lived in shallow water, swimming by caudal undulation and feeding upon fishes and, possibly, other aquatic reptiles such as the one meter long *Endennasaurus* Renesto (1992). It had to be the top active predator of the Zorzino Limestone basins as the second largest predor is the fish *Saurichthys*, which could reach the maximum length of 170 cm.
The presence of a fully articulated skeleton is the rule for the Zorzino Limestone fauna: the rather deep anoxic bottom at the center of the basins allowed the preservation of any skeletal remains reaching the bottom itself (Tintori, 1992, 1995, Renesto 1995). Very few fishes are preserved with scattered bones, much less than 1%. In a few cases, skeletons, though articulated, are uncomplete, but no isolated bones are found around the main remain, implying a post-mortem floating and the loss of the more distal and/or heaviest dermal elements.
In the case of this phytosaur, we can assume that it reached the bottom soon after the death. The dive was quite fast and oblique (Fig. 2), as we can observe an important curling of the previously deposited laminae in a single sector external to the posterior part of the trunk. The body was bent with the ventral surface down (ventral arrival of Martill, 1993). The impact with the bottom had to be rather impressive as the bottom itself was already though, with 3-4cm of still plastic laminae lying on an already hardened mudstone bed. Below the body, the plastic laminae were compressed, bones being almost exposed at the base of the bed, leaving no impression on the underlying bed. The rebound should have caused the fracture of the right femur, and probably of some of the pelvis bones, as well as some disturbing of the proximal vertebrae of the tail. As further result of the impact, the skull broke off to lie almost right angle with the neck. Possibly, also the caotic pattern of ribs and gastralia is also due to the crushing impact.
Another taphonomic peculiarity of this phytosaur is the build up of a very hard, not laminated, calcareous 'concretion' all along the skeleton. This concretion is asymmetrically developed, being present only above the fossil, and it is thicker around the hips and the proximal region of the tail, as well as at the shoulders level. Thus, were the major muscle mass were present, decomposition of the organic matter enanced the quick calcification of the new sediment, leaving unalterate the previous laminae. Soon after this process, the deposition of laminated mudstone, the normal sedimentation in this fossiliferous level, resumed. Build up of this concretion allowed the skeleton to remain almost uncompressed.

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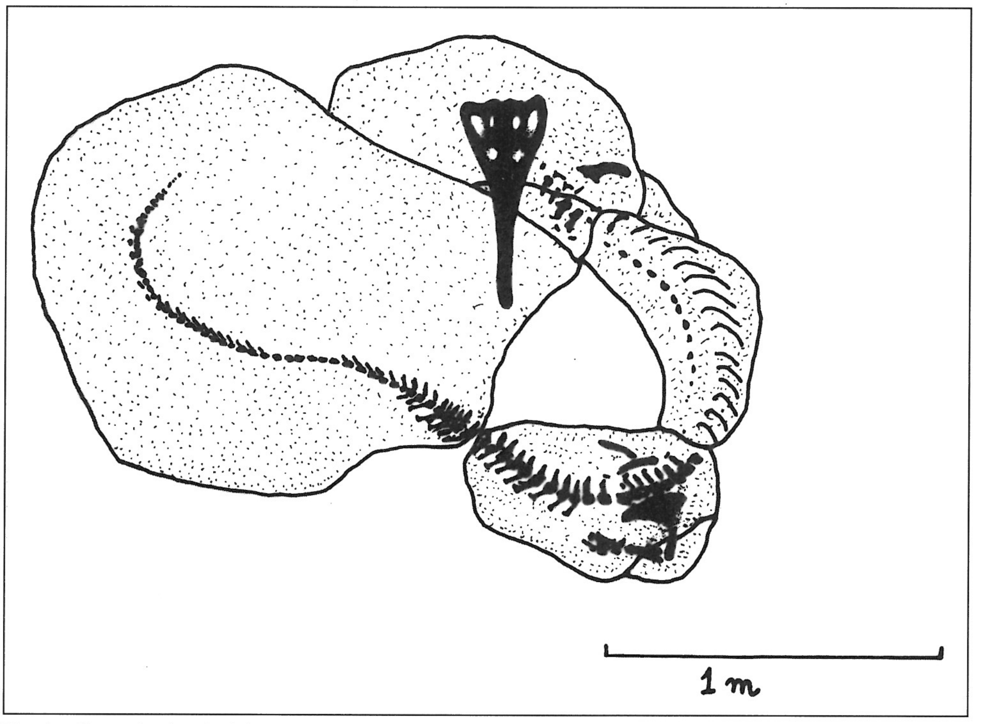

Fig. 1 – Skematic sketch of the slabs in which the specimen is preserved.

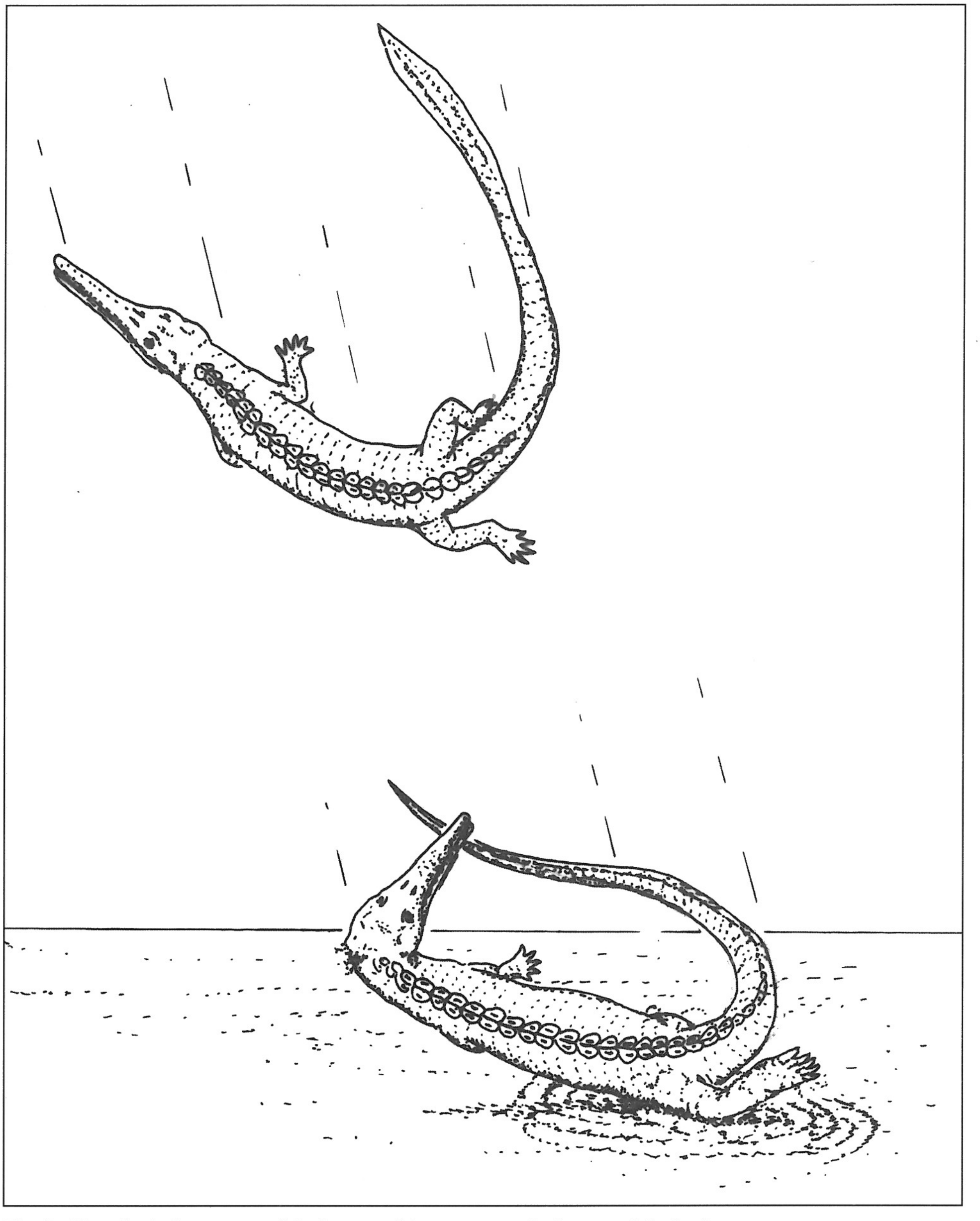

Fig. 2 - Hypothetical sequence of the impact of the carcass at the bottom of the basin.