

AN ACCUMULATION OF BONES OF LARGE LATE TRIASSIC REPTILES AT KRASIEJÓW, OPOLEAN SILESIA, POLAND

*Nagromadzenie kości dużych późnotriasowych gadów
w Krasiejowie na Śląsku Opolskim*

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ABSTRACT: There are two fossiliferous horizons in the Krasiejów outcrop. The age determination of the lower horizon as Carnian is based on the occurrence of *Paleorhinus* remains (Dzik et al. 2000, Dzik 2001). The recent discovery of a fragmentary phytosaur rostrum with the diagnostic features of *Paleorhinus* in the upper horizon indicates that it is of Carnian age as well. The long bones of large reptiles are preserved in two azimuthal orientations, nearly at right angles to one another.

KEY WORDS: fossil tetrapods, Phytosauria, palaeoenvironmental reconstruction, fresh-water deposits, taphonomy, Triassic, Silesia.

Introduction

A bone-bearing layer containing remains of Late Triassic tetrapods was discovered in an outcrop near Krasiejów in 1993 (Dzik et al. 2000). Skulls and postcranial elements in an excellent state of preservation were found in the red claystone in two main horizons. The lower layer assemblage is dominated by an amphibious labyrinthodont, *Metoposaurus diagnosticus krasiejowiensis* (Sulej 2002a), and a phytosaur, *Paleorhinus* sp., which is represented by perfectly preserved, complete skulls (Lubka 2002). Less numerous are large terrestrial labyrinthodonts *Cyclotosaurus* sp. (Majer 2002) and aetosaurs *Stagonolepis* sp. (Dzik 2001), the latter represented mainly by isolated scutes.

During the excavation season in 2000, a second fossiliferous horizon was found about eight meters higher in the profile. The upper horizon has yielded fossils of strictly terrestrial animals including *Stagonolepis* sp. and a primitive dinosaur relative, *Silesaurus opolensis* (Dzik, 2003). Labyrinthodonts (mainly *Cyclotosaurus*) and phytosaurs are much less numerous in comparison to the lower horizon. In addition, one

fragmentary specimen of the rauisuchian *Teratosaurus* sp. was unearthed between the upper and the lower levels (Sulej 2002b).

The abundance of unionid bivalves and gyrogonites (characean oogonia) shows that both fossiliferous horizons were formed in a freshwater environment. The bones must have been accumulated by a river (Dzik et al. 2000), but the direction of its flow has not yet been determined.

The Late Carnian age of the lower horizon was established mainly on the combined presence of *Paleorhinus* and *Metoposaurus* (Dzik et al. 2000, Dzik 2001). The age of the upper horizon could not be confirmed directly since no indisputable *Paleorhinus* fossils were found.

Materials and methods

A great accumulation of reptilian bones was discovered in July of 2002 in the upper horizon. It has not yet been completely unearthed and continues underground to the north. Based on a preliminary identification, the bones belong mainly to actosaurs and phytosaurs. All fossils are housed in the Chair of Biosystematics, University of Opole (UOBS).

Out of 181 bones found on the area of four square-meters (fig. 3), 84 have well-defined long axes, the azimuths of which were measured. The obtained set of angles was ordered and subdivided into nine sections of 20° (0°-20°, 21°-40°, 41°-60°, ... 161°-180°), and the percentages of occurrences were calculated for each section. A rose diagram was drawn as a final result (fig.4).

Results and discussion

Among the fossils found in the accumulation, there are well preserved right and left premaxillae and maxillae of a primitive phytosaur (UOBS 00308, UOBS 00224), founded side by side and undoubtedly belonging to the same animal (figs. 1, 2.). Anterior margin of their nasal openings, that can be seen on premaxillae, shows that the nares are placed entirely in front of the antorbital fenestrae, although the nasals are not preserved. This position of nasal openings is characteristic of *Paleorhinus* (e.g., Gregory 1962). In all other, later phytosaurs the nasal openings are placed more backward, at least partially between the antorbital fenestrae. The overall proportions are also comparable to the *Paleorhinus* skulls from the lower horizon of Krasiejów and from other localities. Thus, we presume that the upper horizon is of the Late Carnian age (*Paleorhinus* biochron of Hunt & Lucas 1991), as is the lower horizon. The age determination of this bone-bearing layer is important, since a dinosaur relative, *Silesaurus* was discovered there (Dzik, 2003).

The tetrapod bones at the Krasiejów locality were undoubtedly deposited in a freshwater environment (Dzik et al. 2000). The distribution of bones suggests that they were transported by water, but the direction of currents is unknown. A preliminary analysis of the accumulation of *Cyclotosaurus* bones (Sulej & Majer, in prep.) in the upper horizon shows that the predominant orientation of long axes is close to east-west (fig. 4B). However, the predominant orientation of reptilian long bone fragments (figs. 3, 4A) suggests different direction of flow as most bones are oriented NW-SE. The

second most frequent orientation of reptilian bones is nearly perpendicular to the previous one and close to NE-SW. Such striking differences in the orientation of long bones may mark major shifts in the depositional environment or taphonomic differences. Since both sedimentology of the Krasiejów outcrop and taphonomy of its vertebrates are yet to be studied, no explanation of the observed differences in the orientation of bones is offered at the moment.

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Streszczenie

Artykuł przedstawia wstępne wyniki badań nagromadzenia późnotriasowych kręgowców odkrytego w Krasiejowie na Śląsku Opolskim. Rostrum fitozaura *Paleorhinus* sp. pozwala na datowanie górnego poziomu kościonośnego na późny karnik. W poziomie tym uwidaczniają się dwie orientacje kości.

Bibliography

- D z i k, J., 2001: A new *Paleorhinus* fauna in the early Late Triassic of Poland, *Journal of Vertebrate Paleontology*, 21, 625-627.
- D z i k, J. 2003: A beaked herbivorous archosaur with dinosaur affinities from the early late Triassic of Poland, *Journal of Vertebrate Paleontology*, 23(3), 556-574.
- D z i k, J., S u l e j, T., K a i m, A. & N i e d ź w i e c k i, R., 2000: Późnotriasowe cmentarzysko kręgowców lądowych w Krasiejowie na Śląsku Opolskim, *Przegląd Geologiczny*, 48: 226-235.
- G r e g o r y, J.T., 1962: The genera of phytosaurs, *American Journal of Science*, 260, 652-690.
- H u n t, A.P. & L u c a s, S.G., 1991: The *Paleorhinus* biochron and the correlation of the non-marine Upper Triassic of Pangea, *Palaeontology*, 34, 478-501.
- L u b k a, M., 2002: Fitozaury – morfologia, rozprzestrzenienie, ewolucja, *Przegląd Zoologiczny*, 46, 7-18.
- M a j e r, D., 2002: Charakterystyka kapitozaurów (Capitosauroida) jako przedstawicieli płazów tarczogłowych, *Przegląd Zoologiczny*, 46, 7-18.
- S u l e j, T., 2002a: Species determination of the Late Trassic temnospondyl amphibian *Metoposaurus diagnosticus* *Acta Palaeontologica Polonica*, 47, 535-546.
- S u l e j, T., 2002b: New material of the only known Late Triassic rauisuchian archosaur from Europe, 8th International Symposium on Mesozoic Terrestrial Ecosystems, Cape Town, Conference Abstract Book, Appendix, Cape Town, 19.

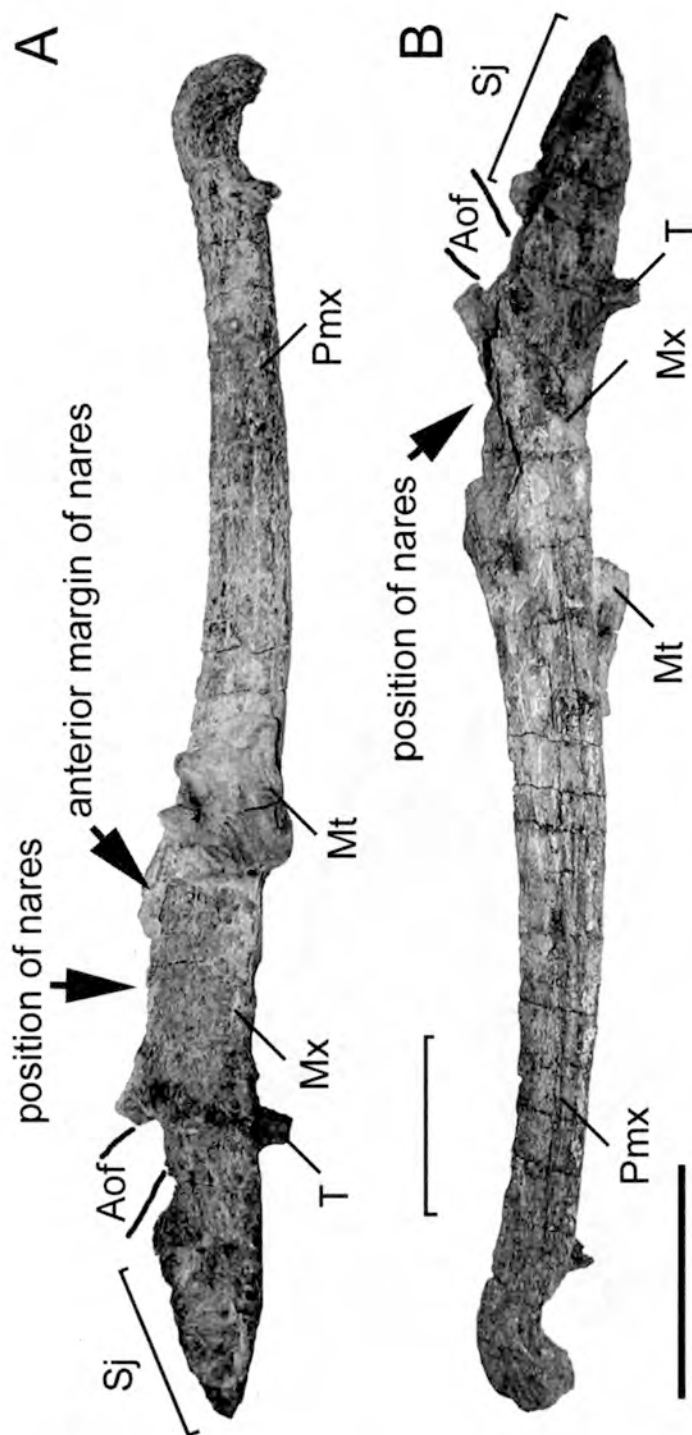


FIG. 1. Fragmentary rostrum UOBS 00224 of *Paleorhinus* from the upper bone-bearing horizon at Krasiejów locality in lateral (A) and medial (B) view. Abbreviations: Aof – antorbital fenestra, Mx – maxillare, Mt – fragmentary metatarsal, Pmx – premaxillare, Sj – sutural surface for jugale, T – broken maxillary tooth. Scale bar = 10 cm.

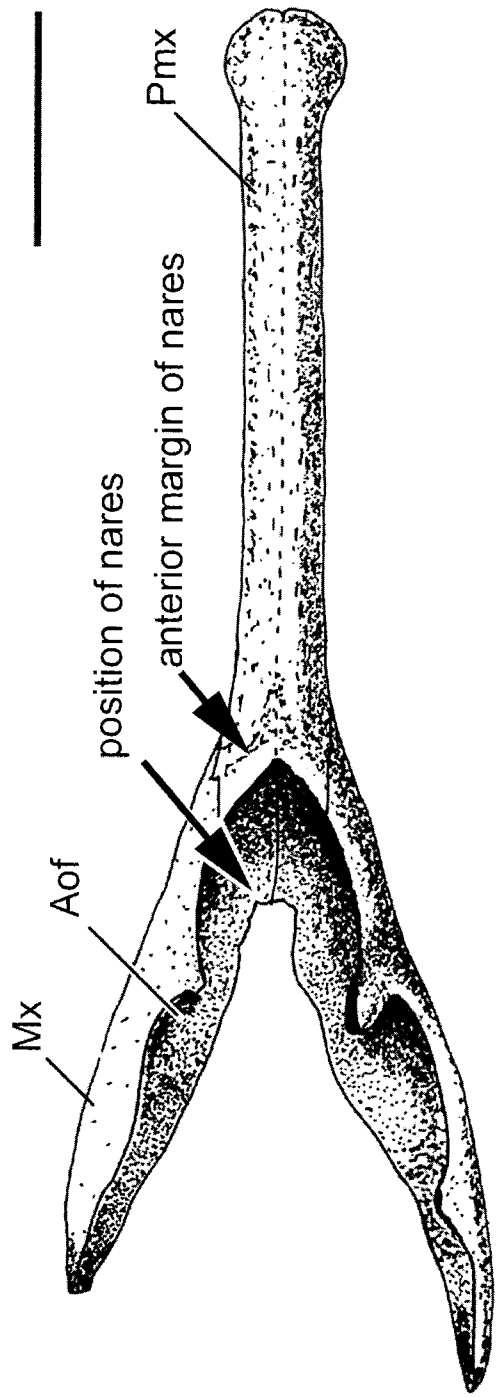


FIG. 2. Rostrum of *Paleorhinus* in dorsal view. A composite restoration based on UOBS 00224 and UOBS 00308. Abbreviations as in Fig. 1. Scale bar = 10 cm

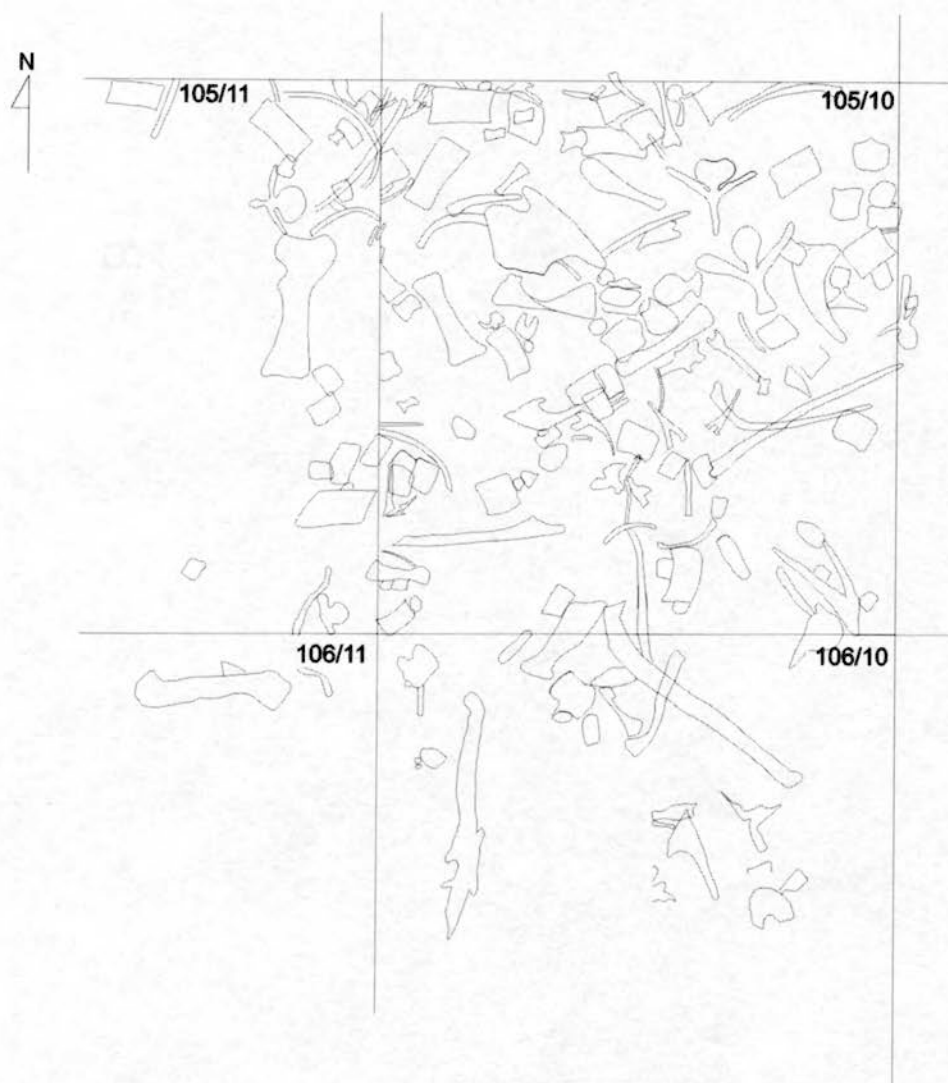


FIG. 3. The reptilian bone accumulation in the upper horizon. Square side = 1 m.

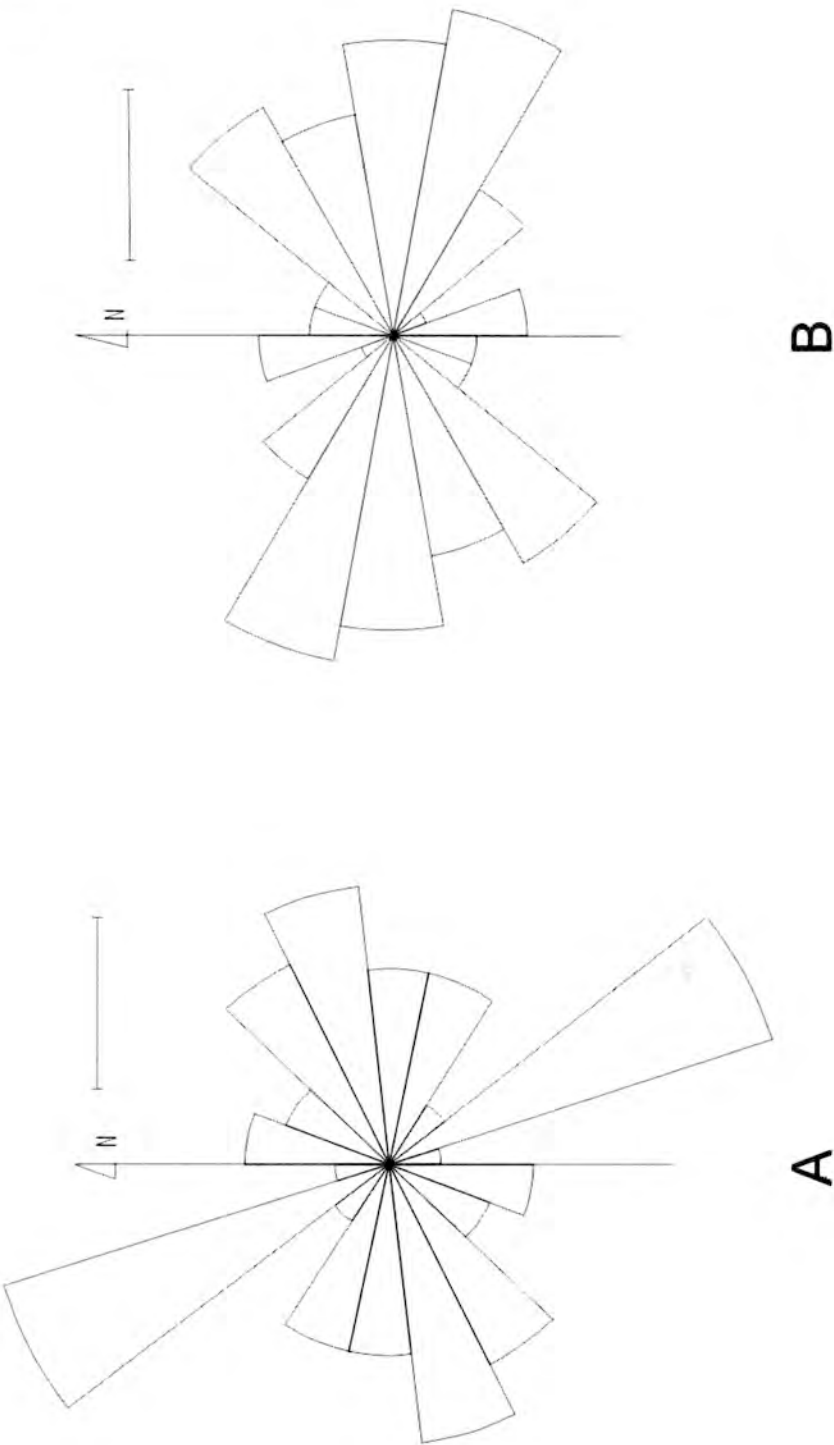


FIG. 4. Rose diagram of orientation of long axes of bones in reptilian (A) and *Cyclotosaurus* bone accumulation (B). Scale bar = 10%.