The discovery of large reptile fossils in Silesia

Dawn of the Dinosaurs

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Polish scientists have made a spectacular discovery in Silesia region: the remains of a large predatory dinosaur and of the youngest-known gigantic mammal-like reptile

Our planet's long history is generally rife with vicissitudes, but there is no period in the Earth's past that can compare to the Triassic - when biological innovations were commonplace and never before or since have so many unique evolutionary phenomena occurred at the same time. The kinds of animals now dominant, mammals and birds, got their start back in the Triassic, and even the conifers and ferns also saw significant change during the period. It was in the Late Triassic, around 200–210 million years ago, that a great many land-based tetrapod faunas went through a series of transformations, giving rise to both the archosaurs and the majestic dinosaurs, while the mammal-like reptiles (therapsids) began to drop out of the evolutionary struggle.

Until recently, Polish paleontologists mainly headed abroad in search of dinosaur fossils. Polish expeditions to Mongolia have yielded valuable discoveries of large dinosaurs, as well as unique remains of Mesozoic mammals. Meanwhile, since the area of Poland was covered by a shallow sea back in the Mesozoic (the era of dinosaurs), excavation work in Poland itself was expected mainly to yield the remains of marine animals. But fossils of ancient land-based vertebrates recently proved to be waiting for discovery here, too. A few years ago a team led by Prof. Jerzy Dzik discovered the earliest-known primitive dinosaur (*Silesaurus opolensis*) and the bones of other Triassic reptiles and amphibians at a now well-studied paleontological site in Krasiejów in Silesia.

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The bones of a gigantic dicynodont, discovered in Lisowice in August 2008

Spectacular find

Yet an even more unexpected find was unearthed in 2008 in the latest-Triassic deposits of the Lipie Śląskie brickyard in Lisowice, situated 25 km west of Krasiejów: the partially preserved skeleton and individual bones of a gigantic mammal-like reptile (dicynodont) the size of a modern-day rhinoceros. Aside from the dicynodont bones, bone elements of a large predatory dinosaur and the remains of other exceptional animals were found: pterosaurs, lungfish, sharks, and large amphibians. Large and well-preserved bones were noticed at the Lipie Śląskie brickyard for the first time in 2005 and 2006 (by the mineral collector Robert Borzęcki). The bones are preserved inside limestone nodules within the grey and greenish rocks, which acted like stone sarcophagi, protecting them from destruction for many millions of years.

The Lisowice find represents an intriguing mixture of evolutionarily advanced organisms (dinosaurs and pterosaurs) and primitive forms known from older Triassic layers (like the giant dicynodont or large amphibians). The present authors estimate the strata from Lisowice to have formed before ca. 200–210 million years ago, recording the makeup of the ecosystem in the Rhaetian stage (the transition between the Triassic and Jurassic).

Last mammal-like reptile

Until recently it was thought that the mammal-like reptiles, which had dominated the Earth prior to the dinosaurs, were no longer present in the Rhaetian. The eminent paleontologist Prof. Michael Benton from the University of Bristol classed the dicynodonts among the group of reptiles that went extinct at the transition between the Carnian and Norian, stages preceding the Rhaetian. The dicynodont from Lisowice therefore seems to represent the Earth's last surviving mammal-like reptile. The Polish paleontological discovery suggests that at the end of the

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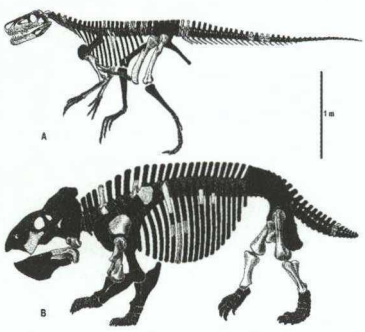
Late Triassic, fossil-bearing clay deposits at Lipie Śląskie near Lisowice



Preliminary reconstruction of the skeletons of the large reptiles from Lisowice: (A) predatory dinosaur, (B) the dicynodont, a mammal-like reptile. The precise bones actually discovered are illustrated in the drawings

Jerzy Dzik

Triassic the dicynodonts reached the dimensions of a large rhinoceros and most likely began to dominate among the land-based herbivores.

This discovery also proves that the latest-Triassic dicynodonts survived in Eastern Europe until the late Norian and early Rhaetian. Perhaps dicynodonts occurred in southern Poland throughout the whole Late Triassic. That is suggested by research now being carried out on smaller forms occurring in older strata in Silesia. The bone-bearing clay rocks of Lipie Śląskie offer numerous well-preserved plant fossils as well. Like for the flora of the Rhaetian and early Liassic in Europe, the dominant plant species in these strata is a coniferous plant similar to the order Hirmeriella. Excavations at Lisowice have also yielded well-preserved tissue fragments of seed ferns and Lepidopteris ottonis, which are typical for the Rhaetian.

The Dragon of Lisowice

In 2007, our team's excavations unearthed the jawbone and other skull fragments of a mysterious predatory reptile. The first indications of the existence of large predators in this area had been found in the form of fossilized tracks, when two large (40–45 cm long), three-toed footprints were identified in Lisowice in 2006, offering some notion of the size and appearance of their makers. The morphology of the hind-limb prints is very similar to those reported from Jurassic deposits, when great predatory dinosaurs were already a permanent part of the world of "terrible lizards." The large predator bones discovered at Lisowice most likely represent the skeletons of two different specimens, and clearly indicate that this was a massive animal, around 5 m in length, with a strong jaw and large 7 cm teeth. We provisionally dubbed this huge predator "the Dragon of Lisowice." Its braincase is highly reminiscent of the skull of an allosaur, a predatory dinosaur from the late Jurassic.

All the signs were that we had discovered the remains of a large predatory dinosaur. Initially that seemed hard to believe: paleontologists the world over had discovered predatory dinosaurs dating from the Triassic, but no one had come across an ancestor of the largest predators, including the allosaurs and the famous tyrannosaurs. That group seemed to have appeared on the Earth some 30 million years after the layers containing our find. Detailed investigation revealed that "the Dragon of Lisowice" may have initiated the evolutionary line that would eventually culminate in the famous super-predator *Tyrannosaurus rex*.

Intriguing times

The Triassic was a time of innovations and so-called "experiments" by nature. If natural history can be likened to a technological process, the progress made during the Triassic can be compared to shifting from the research stage into the product-testing stage. The appearance of new forms of animals (dinosaurs or early mammals) in Triassic ecosystems was an event that had a significant impact on the character of today's natural world. ■

Further reading:

Dzik J., Sulej T., Niedźwiedzki G. (2008). A dicynodont-theropod association in the latest Triassic of Poland. *Acta Palaeontologica Polonica, 53*, 733–738.

Sulej T. (2005). A new rauisuchian reptile (Diapsida: Archosauria) from the Late Trassic of Poland. *Journal of Vertebrate Paleontology, 25*, 75–83.