PALEONTOLOGY

Giant mammal cousin rivaled early dinosaurs

Ancient plant eater grew as large as today's elephants

By **Gretchen Vogel**

Imagine if you crossed a rhino with a giant turtle and then supersized the result: You might get something like *Lisowicia bojani*, a newly discovered Triassic mammal cousin that had a body shaped like a rhinoceros, a beak like a turtle, and weighed as much as an African elephant, about 9 tons. Paleontologists say this startling creature offers a new view of the dawn of the age of the dinosaurs. "Who would have ever thought that there were giant, elephant-sized mammal cousins living alongside some of the very first dinosaurs?" marvels Stephen Brusatte, a vertebrate paleontologist at The University of Edinburgh.

Researchers had thought that during the Late Triassic, from about 240 million until 201 million years ago, early mammals and their relatives "retreated to the shadows while dinosaurs rose up and grew to huge sizes," Brusatte says. "That's the story I tell my students in my lectures. But this throws a wrench into that simple tale," suggesting the same evolutionary forces that favored giant dinosaurs were at work on other creatures as well.

The new fossil, a partial skeleton described online this week in *Science*, is an ancient plant eater called a dicynodont; the name means "two dog tooth," referring to the characteristic tusks on the upper jaw, which resemble oversize canines. Apart from the tusks, dicynodonts were mostly toothless, with a horny beak like modern-day turtles. They're part of the large evolutionary group called synapsids, which includes our mammal ancestors, and they were some of the most abundant and diverse land animals from the mid-Permian period into the Middle Triassic, from 270 million until about 240 million years ago.

Dicynodonts "are the first group of vertebrates that were successfully able to eat plants," says Tomasz Sulej, a paleontologist at the Polish Academy of Sciences's Institute of Paleobiology in Warsaw.

Dicynodonts evolved a striking range of forms: One burrowed like modern-day moles, another is the first known vertebrate to live in trees. Some grew as large as today's hippos, which weigh about 1.5 tons. However, the fossil record suggests the group was in decline by the time *L. bojani* lumbered into view. And even in dicynodonts' heyday, they did not come close to early dinosaurs in size.

Sulej, with the Institute of Paleobiology's Jerzy Dzik and Grzegorz Niedźwiedzki, a paleontologist at Uppsala University in Sweden, discovered the new fossil in a clay pit, once quarried for brickmaking, in the village of Lisowice, about 100 kilometers northwest of Krakow in southern Poland. In 2006, the team got a tip that someone had found bone fragments at the site. On their first visit, they found fossils within 15 minutes; during 11 years of fieldwork, they excavated more than 1000 bones.

They didn't immediately recognize the new dicynodont as such—in part because it is so big, Sulej says. "Our first idea was that it was a sauropod," which were the largest known herbivores in this period, reaching 11 meters long. But skull fragments and limb bones identified the animal as the biggest, most recent dicynodont ever found. The team named it after the village and 18th century comparative anatomist Ludwig Heinrich Bojanus; they estimate it was more than 4.5 meters long and 2.6 meters tall.

Most dicynodonts had a posture that seems awkward to the modern eye: Their hind limbs were straight, like those of today's mammals, but their forelimbs sprawled, lizard-style, with a bend at the elbow. The team suggests that because of the way *L. bojani*'s upper arm bone connected with its shoulder, its front legs must have been oriented vertically, giving it a more erect stance than in modern reptiles. This posture, like that of sauropod dinosaurs and modern mammals, might have helped support its massive weight. But others caution that reconstructing posture without soft tissue can be difficult.

L. bojani's bones also lacked the lines that, in most dicynodont fossils, mark periods when bone growth slowed. The animal may have grown unusually quickly, or wasn't yet full grown when it died. Given the "truly amazing" size of the creature, "it likely grew fast," says paleontologist Jennifer Botha-Brink of the Bloemfontein Palaeosystems Centre and the National Museum in South Africa. But she adds that lines signaling slower growth might have been erased when the bone was remodeled during adulthood, which happens in elephants today.

Researchers have hypothesized that sauropods grew big to avoid getting eaten. That may have been true for *L. bojani*, too, Sulej says. The Lisowice bone bed also contains the remains of a 5-meter-long predator—likely a dinosaur—and coprolites (fossilized feces) containing dicynodont bones.

The researchers will seek more specimens farther east in Russia and Ukraine. "There is definitely more to discover," Niedźwiedzki says. "How many surprises are still waiting for us in the rocks?" ■

This elephant-size mammalian relative, *Lisowicia bojani*, walked on Earth in the Late Triassic, just when dinosaurs were evolving to giant sizes.

ILLUSTRATION: KAROLINA SUCHAN-OKULSKA

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