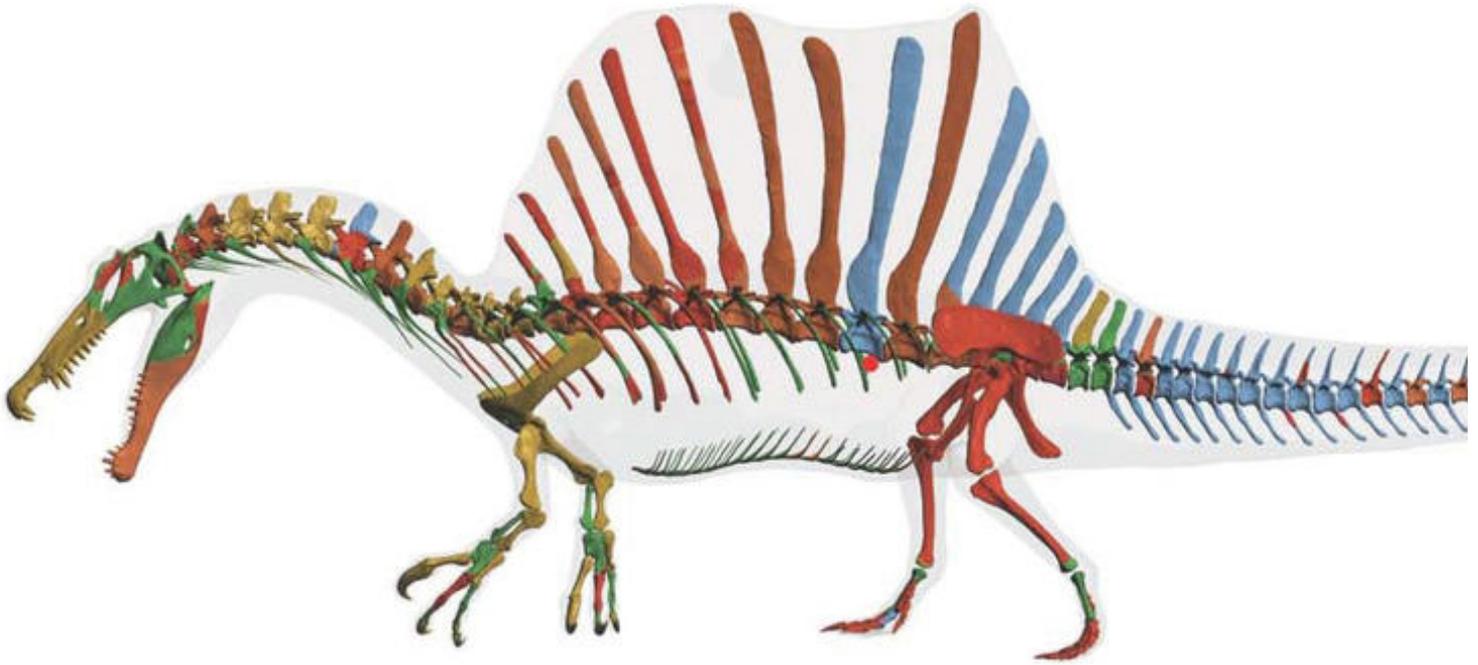


Spinosaurus: A huge predatory dinosaur, built to swim



A digital skeletal reconstruction and transparent flesh outline of *Spinosaurus aegyptiacus*. The bones suggest this dinosaur was built to swim. Color codes show the origin of different parts of the digital skeletal model. (Model by Tyler Keillor, Lauren Conroy and Erin Fitzgerald, Ibrahim et al., *Science/AAAS*)

By **AMINA KHAN**

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Dinosaurs ruled the land for millions of years. Now scientists have discovered a fearsome species that could have wreaked havoc in its prehistoric waters.

An unusual fossil whose parts were flung across two continents appears to be the first known semi-aquatic dinosaur, according to a report published Thursday by the journal *Science*.

Measuring 9 feet longer than a *Tyrannosaurus rex*, the 95-million-year-old *Spinosaurus aegyptiacus* would have been the largest predatory dinosaur to walk the Earth. But it had several features that strongly suggest a life spent largely submerged in the water, including nostrils pushed toward the top of its skull and diagonally jutting teeth ideal for snapping up fish.

“It was not a balancing, two-legged animal on land,” said study coauthor Paul Sereno, a paleontologist at

the University of Chicago. “It would have been something very peculiar.”

The differences between this Spinosaurus and other theropods are apparent from head to toe. Most theropods, like *T. rex*, ran on two powerful legs and had small, spindly arms. By contrast, the 50-foot-long Spinosaurus had muscular arms with blade-like claws that could have nabbed slippery prey, and shorter legs that were ill-equipped to walk on land.

The fossil has odd openings at the front of its long, thin snout that could have housed pressure sensors, rather like those on alligators and crocodiles that help them sense movement to hunt in murky waters. The marrow holes in its bones are closed, making them very dense — an adaptation seen in aquatic animals including penguins to control buoyancy in the water.

The dinosaur’s feet were wide and flat and might even have been webbed. And the animal’s center of mass was pushed far forward, terrible for moving on land but excellent for swimming.

“It’s about time that they found a dinosaur that was semi-aquatic,” said Hans Thewissen, an anatomist at Ohio Medical University who was not involved in the research. Considering that dinosaurs were a dominant group during their time on Earth, it would be strange if they ceded the prehistoric rivers and seas to fish and marine reptiles, such as the mosasaur or plesiosaur.

“I’m not surprised,” Thewissen said, “but I’m delighted that they found it.”

Like other known spinosaur species, *S. aegyptiacus* sported a bony “sail” on its back, a dramatic display that would have stayed above the water as it swam. James Kirkland, a Utah Geological Survey paleontologist who was not involved in the discovery, thinks this creature might have used its sail literally, to keep moving without alerting other animals to its massive presence.

The first Spinosaurus skeleton was discovered in Egypt in 1912 and described by a German scientist, Ernst Freiherr Stromer von Reichenbach, in 1915. Stromer took the bones home, only to have them destroyed in an Allied bombing raid in 1944. Aside from the careful drawings he made and the occasional photograph, his discovery was obliterated.

But in 2008, University of Chicago paleontologist Nizar Ibrahim was working in Morocco when a Bedouin fossil hunter approached him with a cardboard box of sediment-encrusted bones. Ibrahim looked in the box, noting a strange bladelike fossil with a red line running through it.

Later, he visited a museum in Italy and heard about some peculiar fossils in the basement that had been sent from Morocco.

“My jaw dropped,” said Ibrahim, the lead author of the Science report. It was a rich collection of leg, foot and rib bones, along with spine pieces marked with the same red line.

Ibrahim had already wondered whether the bones were from a Spinosaurus. Now he suspected the two collections, spread across two continents, had come from the same animal. But he didn’t know where the bones had been found; without that information, it would be impossible to tell when and where the animal had lived.

So Ibrahim set out to find the man with the box. He didn’t have his name or phone number, but recalled

that the man had a mustache. Armed with that paltry bit of information, Ibrahim and his colleagues returned to the Moroccan oasis town of Erfoud and searched for him, with no luck.

“Towards the end of our mission impossible, we were just sitting in a cafe in Erfoud, sipping mint tea and I just saw all my dreams going down the drain,” Ibrahim said. “At that very moment just when everything seemed to be lost, a person walks past our table.”

Sure enough, it was the man with the mustache.

Fossil hunters are loath to reveal their dig sites, for fear that others will try to get a piece of the action. But Ibrahim laid out his scientific credentials and persuaded the man to take him to the spot in the Kem Kem beds.

Ibrahim also traveled to the Stromer family castle in southern Germany, where Stromer’s granddaughter gave Ibrahim the decades-old sketches of the fossil. Ibrahim and his colleagues were able to reconstruct a model of the Spinosaurus skeleton, borrowing bones from related species to fill in the missing pieces.

Lindsay Zanno, a paleontologist at the North Carolina Museum of Natural Sciences in Raleigh, cautioned that the fact that the skeleton was assembled from many different sources casts a little doubt on the accuracy of the reconstruction’s size and shape.

“We have to be very careful about presuming that we know exactly what this animal looked like,” said Zanno, who was not part of the study team.

That said, she added, “I really didn’t expect there to be this much compelling evidence” of an animal adapted for life in the water — and especially one with such a hodgepodge of features. “I find the proportions of this animal to be really bizarre.”

Ibrahim, who is half Moroccan and half German, said he feels that he’s helping complete Stromer’s century-old legacy. The bones will be returned to Morocco, he said, to help jump-start the country’s museum program.

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UPDATE

9:45 p.m.: This report has been revised throughout for additional details and editing. It was originally posted at 12:43 p.m.
