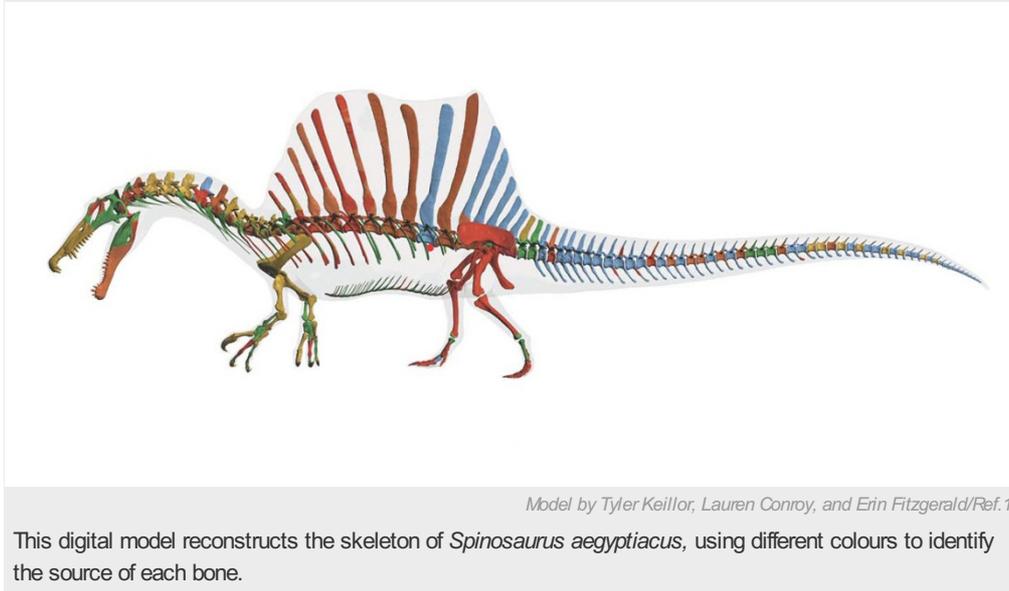


Swimming dinosaur found in Morocco

Sail-backed reptile ruled an ancient river system.

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Palaeontologists are reporting the world's first known swimming dinosaur — a 15-metre-long behemoth with a crocodile-like face, feet well suited to paddling and a sail-like structure rising from its spine.

The creature, *Spinosaurus aegyptiacus*, also had unusually dense bones, possibly to help weigh it down as it hunted its underwater prey, concludes a study in *Science*¹.

"It's the first dinosaur that shows these really incredible adaptations," says team leader Nizar Ibrahim from the University of Chicago in Illinois. "There's no doubt in my mind that *Spinosaurus* would have done most of its hunting in the water."

Researchers have long suspected that some dinosaurs would have occasionally gone for a dip; many modern dinosaurs, in the form of birds, are aquatic. But they have found little evidence of ancient aquatic behaviour, other than possible swipe marks where the foot of a swimming dinosaur may have clawed into a riverbed.

In 2010, geochemists used oxygen isotopes in fossil bones to conclude that *Spinosaurus* and its relatives spent much of their time in the water, as a crocodile or hippopotamus does². But until now, not enough *Spinosaurus* bones were available to reconstruct the skeleton and test this idea. German palaeontologist Ernst Stromer found a partial skeleton in Egypt a century ago, but his fossils were destroyed during an allied bombing raid on Munich in 1944³.

Mystery box

In 2008, while Ibrahim was wrapping up a fossil-hunting expedition in Morocco, a man approached him in the desert town of Erfoud and showed him some bones in a cardboard box. Suspecting that they were important, Ibrahim arranged for them to be sent to the University of Hassan II in Casablanca.

The next year, while Ibrahim was visiting the Natural History Museum of Milan, Italy, colleagues there showed him some more *Spinosaurus* remains from Morocco. "My mind started racing — the colour and texture and size of those bones was exactly like the mysterious bones the man had shown me in the cardboard box," he says.

Ibrahim flew back to Morocco to search for the man, armed with little more than the memory that he had a moustache. "Our second-to-last day in Erfoud, we were sitting at a cafe sipping mint tea, and I thought I would never find the guy," Ibrahim says. "At my lowest

point, this tall, white-clad figure walks past our table, and I recognize his face.” Running after him, Ibrahim convinced the man to show him the cave in which he had found the bones.

There, the research team unearthed more *Spinosaurus* remains and reunited them with the bones from the box as well as those from Milan. From that 97-million-year-old skeleton, along with Stromer’s notes on his destroyed specimens and with related dinosaur fossils, the palaeontologists pieced together the most detailed *Spinosaurus* picture yet.

Among other watery adaptations, *Spinosaurus* has nostrils that are located relatively high on its skull, perhaps so that it could breathe while partly submerged. Its teeth are interlocked like a fish trap, and its powerful forelimbs could have paddled through the water. Its feet may even have been webbed, says team member Simone Maganuco from the Milan museum.

Puzzle pieces

At the time that *Spinosaurus* lived, what is now eastern Morocco was covered with sprawling lakes, rivers and deltas. As a top predator, the dinosaur would have had been among the rulers of an ecosystem teeming with huge crocodile-like animals, massive sawfish and coelacanths the size of cars.

Compared with other dinosaurs in its group — the two-legged, meat-eating creatures known as theropods — *Spinosaurus* has strikingly short rear legs. Ibrahim’s team interprets this as meaning that the dinosaur walked mainly on four legs. Its centre of gravity would have been relatively far forward, helping it to move smoothly while swimming.

John Hutchinson, a palaeontologist at the Royal Veterinary College of the University of London, is less convinced. He worries about the reliability of cobbling together different specimens to create a single picture of an animal. “We have to be careful about creating a chimera,” he says. “It’s really exciting speculation, but I’d like to see more-conclusive evidence.”

Ibrahim says that some of the *Spinosaurus* parts overlap in different specimens, helping to confirm the unusual anatomy.

The bones, which are currently being studied in Chicago, are destined to return to Casablanca by the end of the year to form the centrepiece of the scientific collection at the University of Hassan II.

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