AMERICAN MUSEUM ŏ NATURAL HISTORY

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NEW STUDY IDENTIFIES ANCIENT SHARK ANCESTORS

RESEARCH CONFIRMS THAT SHARKS AROSE FROM BONY FISH GROUP CALLED ACANTHODIANS

New research based on x-ray imaging provides the strongest evidence to date that sharks arose from a group of bony fishes called acanthodians. Analyzing an extraordinarily well-preserved fossil of an ancient sharklike fish, researchers identified it as an important transitional species that points to sharks as ancanthodians' living descendants. The work is published in the journal *American Museum Novitates*.

"Major vertebrate evolutionary transitions, such as 'fin to limb' and 'dinosaur to bird' are substantiated by numerous fossil discoveries," said John Maisey, the lead author of the study and the Herbert R. and Evelyn Axelrod Research Curator in the American Museum of Natural History's Division of Paleontology. "By contrast, the much earlier rise of sharklike fishes within jawed vertebrates is poorly documented. Although this 'fish to fish' transition involved less profound anatomical reorganization than the evolutions of tetrapods or birds, it is no less important for informing the evolutionary origins of modern vertebrate diversity."

In 2003, this question in vertebrate evolution was revitalized by the discovery of a remarkable fossil skeleton of a sharklike fish in New Brunswick, Canada. Named *Doliodus problematicus*, this species lived during the lower Devonian, between about 397 and 400 million years ago. When its discovery was announced, *D. problematicus* was shown to have paired spines in front of its pectoral (shoulder) fins, a feature otherwise known mainly in acanthodians. But in 2009 and 2014, Maisey and colleagues determined that the animal's head, skeleton, and teeth were actually more like those of sharks than acanthodians.

The new study, based on computed tomography (CT) imaging at the French National Museum of Natural History in Paris, uncovered even more spines that are buried

inside the matrix of the fossil. These spines likely lined the underside of the fish, a distinguishing characteristic of acanthodians that confirms the fossil is evidence of an important transitional species.

"The arrangement of these spines shows unequivocally that this fish was basically an acanthodian with a shark's head, pectoral skeleton, and teeth," Maisey said.

Other authors on this paper include Randall Miller, New Brunswick Museum; Alan Pradel and Philippe Janvier, French National Museum of Natural History; and John Denton and Allison Bronson, American Museum of Natural History.

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American Museum Novitates paper:
http://digitallibrary.amnh.org/handle/2246/6701

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The American Museum of Natural History, founded in 1869, is one of the world's preeminent scientific, educational, and cultural institutions. The Museum encompasses 45 permanent exhibition halls, including the Rose Center for Earth and Space and the Hayden Planetarium, as well as galleries for temporary exhibitions. It is home to the Theodore Roosevelt Memorial, New York State's official memorial to its 33rd governor and the nation's 26th president, and a tribute to Roosevelt's enduring legacy of conservation. The Museum's five active research divisions and three cross-disciplinary centers support approximately 200 scientists, whose work draws on a world-class permanent collection of more than 33 million specimens and artifacts, as well as specialized collections for frozen tissue and genomic and astrophysical data, and one of the largest natural history libraries in the world. Through its Richard Gilder Graduate School, it is the only American museum authorized to grant the Ph.D. degree and the Master of Arts in Teaching degree. Annual attendance has grown to approximately 5 million, and the Museum's exhibitions and Space Shows can be seen in venues on five continents. The Museum's website and collection of

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