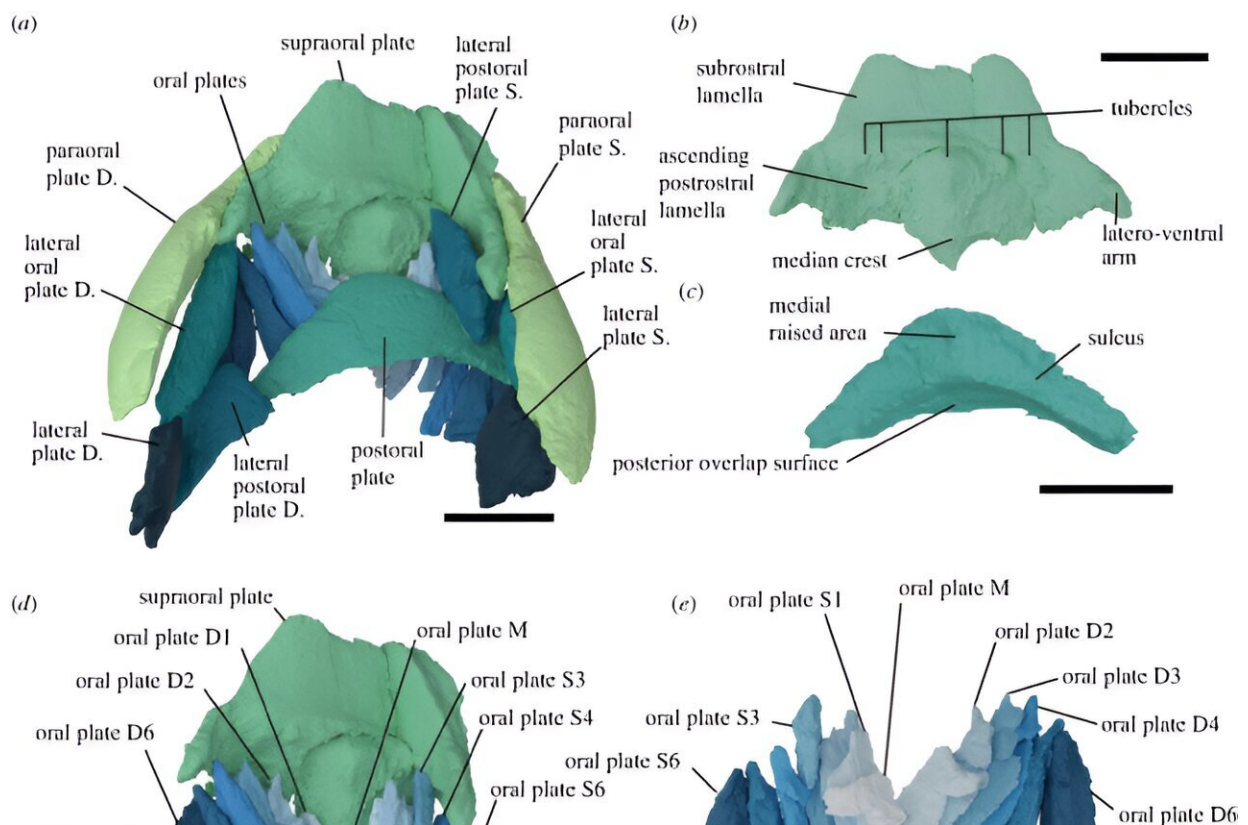


# 3D mouth of an ancient jawless fish suggests they were filter-feeders, not scavengers or hunters

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*Rhinopteraspis dunensis* NHMUK PV P 73217 oral region. (a) Oral apparatus and surrounding plates as preserved, in ventral view, (b) ventral view of supraoral plate with three fragments rearticulated, (c) postoral plate in dorsal view, (d) oral apparatus as preserved with ventral plates removed, (e) dorsal view of oral plates as preserved, (f–i) oral plate R4 in aboral, (f) lateral, (g) adoral (h) and medial (i) views, alongside drawings depicting the inferred extent of dermal ornament in

gray, based on comparison with isolated plates of *Loricopteraspis dairydinglensis* [25,45,59]. S, sinistral (left), D, dextral (right). Scale bars represent 1 cm in (a–e), 0.5 cm in (f–i). Credit: *Proceedings of the Royal Society B: Biological Sciences* (2024). DOI: 10.1098/rspb.2023.2258

Early jawless fish were likely to have used bony projections surrounding their mouths to modify their mouth shape while they collected food.

Experts led by the University of Birmingham have used CT scanning techniques to build up the first 3D pictures of these creatures, which are some of the earliest vertebrates (animals with backbones) in which the mouth is fossilized. Their aim was to answer questions about feeding in early vertebrates without jaws in the early Devonian epoch—sometimes called the Age of Fishes—around 400 million years ago.

Scientists commonly use feeding behaviors to help piece together the early evolution of vertebrates, and different jaw shapes and constructions can suggest a broad range of feeding strategies. In the absence of jaws, many competing theories have been developed, ranging from biting and slicing to filtering food from sediment or water.

In a new study, [published](#) in *Proceedings of the Royal Society B*, an international team of paleontologists have been able to visualize the mouth parts of one of these [jawless fish](#), called *Rhinopteraspis dunensis*, in detail. The images revealed the structure and arrangement of finger-like bones that project from the lower 'lip' of the animal's mouth, which the scientists believe acted to control the mouth's size and shape as it captured [food particles](#) from surrounding water.

Senior author and project lead Dr. Ivan Sansom said, "The application of CT scanning techniques to the study of fossil fish is revealing so much

new information about these ancient vertebrates and giving us the opportunity to study precious and unique specimens without destructive investigation."

Lead author Dr. Richard Dearden explained, "In this case, these methods have allowed us to fit all of the small bones of this animal's mouth together and try and understand how it fed from this integrated system rather than by using isolated bones. Instead of a steady trend towards 'active food acquisition'—scavenging or hunting—we see a real diversity and range of feeding behaviors among our earliest [vertebrate](#) relatives."

The reconstruction produced by the team shows that the bony plates around the mouth would have had limited movement, making it unlikely that the animals were hunters capable of "biting." In combination with an elongated snout, they would also have found it difficult to scoop and filter sediment directly from the bottom of the sea. However, these plates would have allowed it to control the opening of the mouth and perhaps strain food from the water in a way also used by animals such as flamingos or oysters.

The findings offer a new perspective on theories of vertebrate evolution since current hypotheses argue that long-term evolutionary trends move from passive food consumption to increasingly predatory behavior. In contrast, the work outlined in this paper suggests that in fact, early vertebrates had a broad range of different feeding behaviors long before jawed animals started to appear.

**More information:** Richard P. Dearden et al, The three-dimensionally articulated oral apparatus of a Devonian heterostracan sheds light on feeding in Palaeozoic jawless fishes, *Proceedings of the Royal Society B: Biological Sciences* (2024). [DOI: 10.1098/rspb.2023.2258](https://doi.org/10.1098/rspb.2023.2258)

Provided by University of Birmingham

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