

Snowflake morays can feed on land, swallow prey without water

June 8 2021, by Tim Stephens



Researchers trained seven snowflake moray eels over a period of more than five years in order to demonstrate how the eels can eat on land. Credit: Rita Mehta/UC Santa Cruz

Most fish rely on water to feed, using suction to capture their prey. A new study, however, shows that snowflake morays can grab and swallow prey on land without water thanks to an extra set of jaws in their throats.

After a moray eel captures [prey](#) with its first set of jaws, a second set of "pharyngeal jaws" then reaches out to grasp the struggling prey and pull it down into the moray's throat. Rita Mehta, an associate professor of ecology and [evolutionary biology](#) at UC Santa Cruz, first described this astonishing feeding mechanism in a 2007 *Nature* paper.

The new study, published June 7 in the *Journal of Experimental Biology*, shows that these pharyngeal jaws enable at least one species of moray to feed on land.

"Most fishes really need water to feed," Mehta said. "This is the first example of a fish that can feed on land without relying on water."

Reports of snowflake morays coming out of the water to grab crabs on the shore prompted her to take a closer look, she said. "These particular moray eels tend to eat hard-shelled prey like crabs, and I would see reports in the literature of them moving out of the water and lunging for crabs, but it was unclear what happened next."

Even fish well adapted to an amphibious lifestyle, such as mudskippers, need water to swallow their food. "Mudskippers come up onto mudflats and grab prey like small crabs and insects. They get around the challenge of swallowing on land by sucking up water and then using the water they have reserved in their mouth to swallow," Mehta said.

Snowflake morays can do it without water because of their unusual feeding mechanics.

"They have highly moveable pharyngeal jaws in their throat," she said. "Once the moray captures prey in its oral jaws, the pharyngeal [jaws](#) grab onto the prey again and move it further back into the esophagus. This mechanical movement does not rely on water."

Demonstrating that snowflake morays can eat on land, however, was no easy task. It took Mehta and a team of undergraduates over five years to train seven snowflake morays to slither up a ramp onto a platform, grab a piece of fish, and swallow it before returning to the water.

"They feel safer in the water, so at first they would just grab the [fish](#) and go straight back into the water with it," she said. "I relied on a team of dedicated and enthusiastic undergraduate researchers to work on training them."

Coauthor Kyle Donohoe was especially helpful, she said, because of his animal training experience from working with marine mammals as a research assistant at the Pinniped Cognition and Sensory Systems Laboratory next to Mehta's lab at UCSC's Long Marine Laboratory.

Once the eels were trained to feed on the platform, Mehta documented this unusual feeding behavior on video. She said the feeding performance of young snowflake morays is as good on land as it is in [water](#).

"As a result, these particular morays can utilize very different environments for food resources," she said.

More information: Rita S. Mehta et al, Snowflake morays, *Echidna nebulosa*, exhibit similar feeding kinematics in terrestrial and aquatic treatments, *Journal of Experimental Biology* (2021). [DOI: 10.1242/jeb.234047](https://doi.org/10.1242/jeb.234047)

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