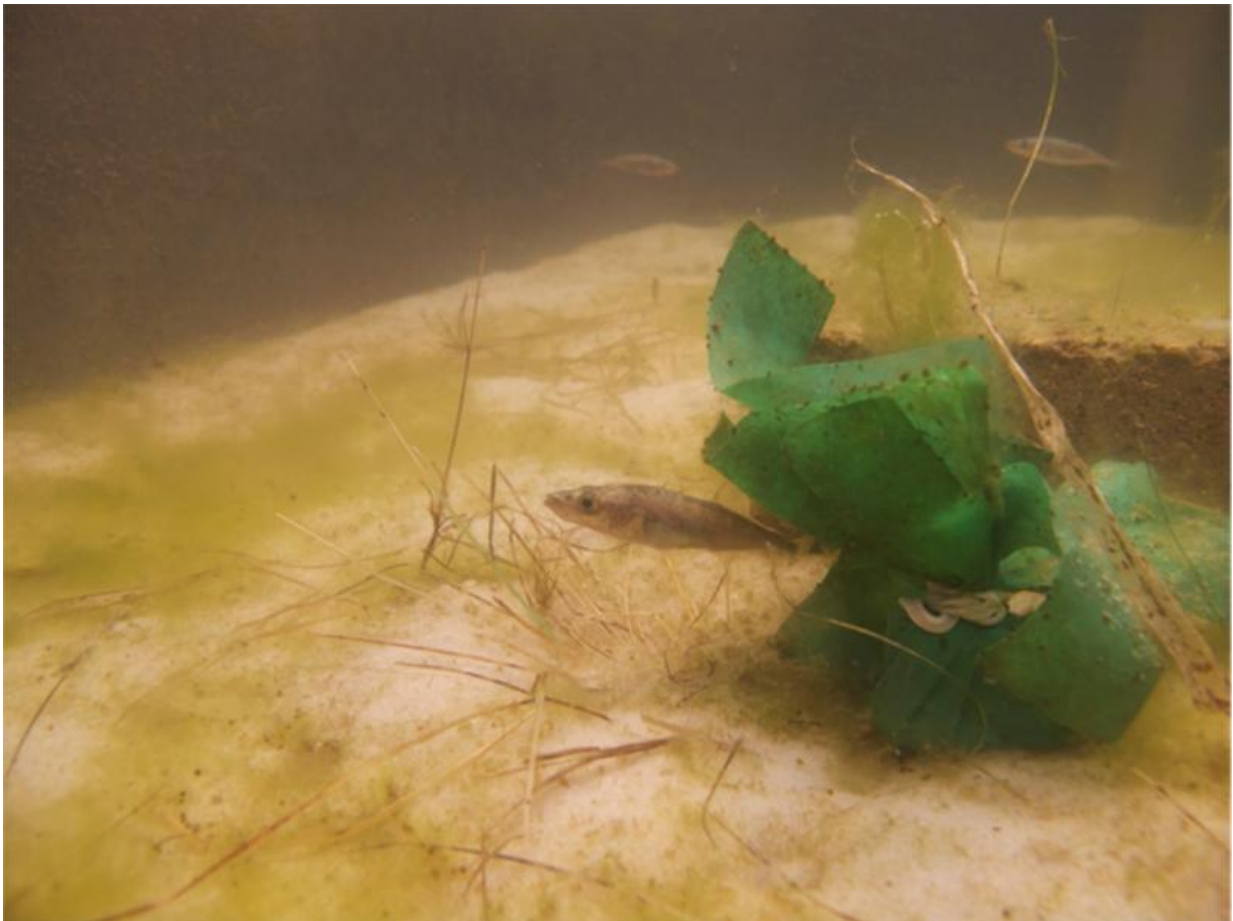


New finding shows that males can drive creation of new species

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Michigan State University research shows that males can drive creation of new species. Credit: MSU

Evolutionary biologists often debate on whether sexual selection can lead to new species. Most studies have focused on natural selection or, for the few studies that considered sexual selection, on how picky females select mates and drive evolution.

Researchers at Michigan State University, with the help of some [stickleback fish](#), have shown that intense competition among [males](#) most definitely has a big say in creating new [species](#). The results, featured in the January issue of *Ecology Letters*, also show that such competition can reverse the process, actually erasing boundaries between species.

"Our paper is of special interest because this is the first time that researchers have shown that intense competition between males for the chance to mate with females can have this kind of influence on splitting populations in two or fusing them together," said Janette Boughman, MSU integrative biologist and the paper's senior author.

The battle can be likened to a basketball game. One species of stickleback, the limnetic, is mostly blue, has a red throat, and is nimble and quick like a guard. A second species, the benthic, is all black, large and lumbering like a 7-foot center.

Rather than a basketball court, though, these games take place around nests. Females will mate only with males that have nests. Sometimes a male benthic fish stands tall in the lane and blocks his opponent's shot, and protects his nest. Other times, an agile male limnetic does a crossover dribble, flies past the defense, and destroys his opponent's nest while protecting his own. Both approaches can work, allowing males from both of the species to win the contest for females.

Although hybrids, a combination of the two species, were tested, each combination of winning traits, also known as fitness peaks, is the same as the pure species. What's interesting is that all of this is happening well

before the females enter the picture or have any influence in the mating process, said Boughman, who conducted the research with lead author Jason Keagy and Liliana Lettieri, fellow MSU integrative biologists.

"We show that [sexual selection](#) causes speciation in an unexpected way," she said. "It's happening by male-directed competition - fighting with each other and essentially deciding which males are able to enter the mating pool. Our results show that male competition is a key driver of speciation—by a factor that is five times greater than results on which other, more-traditional theories of natural selection causing speciation are based."

These effects do not depend on natural selection, either. In these observations, literally thousands of hours of watching stickleback fish guarding nests and mating, there weren't any changes in food sources, environment or predation—factors involved in natural selection.

This is unusual because stickleback fish have long been held as the poster children for [natural selection](#), Boughman added.

In addition to advancing species evolution, battling males can be responsible for the decline or disappearance of the species. Continuing the basketball analogy, sometimes an aggressive forward—like Michael Jordan—with unparalleled skills of a small guard and a large center, successfully wins the nest.

This is what happened in a lake in British Columbia. Invasive rusty crawfish, introduced by fishermen, overran the lake, eliminating environmental divides between two species of stickleback fish. Hybrids began winning the battle for the nests and took over the lake, thus eliminating benthic and limnetic fish.

Changing environments and disappearing species aren't limited simply to

sticklebacks, of course. Other fish in Africa, such as populations of cichlids, are being eliminated due to changing agricultural practices. In other places, pollution has altered species of whitefish in the Great Lakes and Switzerland.

While the fate of white fish in the Great Lakes is still undecided, many species of white fish in Switzerland are on the rebound, thanks to strict pollution controls that have been in place for more than 15 years to protect the water, Boughman added.

"How do we get [new species](#)? What's their source?" Boughman asked. "Understanding speciation and biodiversity are fundamental for understanding the world around us."

Provided by Michigan State University

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