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Science & Technology

# What Triggers Male Rage? Betta Fish May Hold Clues

A Columbia neurobiologist fishes for an aggression gene.

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|
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**Beloved by aquarium owners** for their gorgeous colors and flowing fins, betta fish are also aggressive and territorial — put two males together in a tank and they will attack each other mercilessly. But bettas, also known as Siamese fighting fish, weren't always so beautiful and ill-tempered. The bettas sold in pet stores today have been shaped by hundreds of years of selective breeding, first by seventeenth-century Thai gamblers, who pitted the fish against one another in contests akin to cockfights, and later by European hobbyists, who bred the same seasoned brawlers to exhibit eye-catching ornamentation.

Because of their unusual evolutionary history, betta fish are ideal research subjects for Columbia neurobiologist Andrés Bendesky, who studies how genes influence animals' physiology and social behavior. Bendesky is particularly interested in the genetic basis of violent aggression and has for years been analyzing and comparing the genomes of various lineages of bettas. These include much less combative wild bettas that he and his students plucked out of ponds in rural Thailand as well as exceptionally vicious bettas that the Columbia scientists acquired from breeders who still raise the fish to fight.

"We're looking for genes that are unique to the most hostile fish so that we can understand what drives their behavior," says Bendesky, who is an assistant

professor in Columbia's Department of Ecology, Evolution, and Environmental Biology and also a principal investigator at the Zuckerman Institute.

Bendesky and colleagues recently achieved a breakthrough, identifying several genes that may be associated with aggressiveness in bettas, causing the fish to puff up their gills at passersby and bite rivals. To confirm their findings, which they have presented at scientific conferences but have not yet published, the researchers will use the gene-editing technology CRISPR to remove these genes and see how the bettas' behavior changes.

"We'll put these genetically modified fish into a tank with a robotic betta fish that we've built using a 3D printer to see how they react," Bendesky says. "Will they still try to intimidate the robot and bite it? Or will they ignore it and swim away?"

He anticipates that his team's work will ultimately yield insights into the social behavior of animals beyond the aquatic kingdom, possibly including humans. "Our goal is to learn something fundamental about the nature of violent impulses," he says.

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