Fish can recognize a face based on UV pattern alone

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Cocoa damselfish. Image: Wikipedia.

Two species of damselfish may look identical -- not to mention drab -- to the human eye. But that's because, in comparison to the fish, all of us are essentially colorblind. A new study published online on February 25th in *Current Biology* reveals that the fish can easily tell one species from another based entirely on the shape of the ultraviolet (UV) patterns on their faces.

Although scientists have long known that some animals have UV vision, the new findings suggest that this sense can be keener and perhaps more useful as a "communication channel" than had been anticipated, according to the researchers.

"Researchers have been assuming for a long time that UV vision is not very good—and that it is only useful for detecting the presence and absence of UV light, or objects in front of UV bright backgrounds," said Ulrike Siebeck of the University of Queensland in Australia. "The exciting thing is that we can show that these fish can tell the difference between intricate UV patterns—something that was not expected based on previous assumptions."

In fact, researchers had some good reasons to doubt the precision of UV vision. The short wavelengths of light that characterize UV are prone to scattering in air and water. And even animals that can see in the UV range usually don't have all that many UV cones, or photoreceptors, in their eyes. But apparently nobody told that to the damselfish.

In the new experiments, Siebeck's team presented the very aggressive fish with two intruders, representing different species that vary in appearance only in their UV patterns. Those initial choice tests showed that the fish always attacked one species over the other. But, when the researchers took away the fishes' ability to see in UV, that preference between species disappeared.

The researchers next transferred the two species-specific UV patterns onto otherwise blank pieces of paper. They trained the fish to swim up to and nudge one of the patterns by offering food rewards. When the fish were later presented with both patterns, they still selected the pattern they had been trained on.

Put together, the two lines of evidence support the notion that the UV patterns are both necessary and sufficient for the fish to tell the two species apart.

The ability to see in this visual field is likely quite convenient for the fish, Siebeck said. "If you think about it in simple terms, fish have to be

inconspicuous if they want to go undetected by their predators and prey, but at the same time, they have to be conspicuous if they want to attract the attention of potential mates, for example. Using UV patterns to do this is a clever way to maximize both at the same time—they are still inconspicuous to predators but very conspicuous to other fish with UV vision."

The researchers say the new findings now call for more detailed investigation of UV vision in damselfish and other UV-sighted animals, to find out just how well animals can see in this range, and over what distances. The researchers are also testing whether fish can tell different individuals—as opposed to whole species—apart based on fine-scale variation in their UV facial patterns.

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