Global warming could lead to more anxious fish, study reports

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Courtesy of the Scripps Institution of Oceanography
and World Science staff

Rising ocean acidity linked to global warming may be making fish more anxious, hunkering down in dark waters rather than venturing into the light, a study suggests.

As the ocean absorbs human-produced carbon dioxide—linked to global warming—its acidity rises. Studies have already found this disrupts the growth of shells and skeletons of some marine animals, but other effects are unclear.

In a study published in the journal *Proceedings of the Royal Society B*, scientists at the Scripps Institution of Oceanography at the University of California San Diego and MacEwan University in Edmonton, Canada, found that rising acidity increases anxiety in young rockfish, an important commercial species in California.

The researchers compared a group of rockfish kept in normal seawater to another group in waters with elevated acidity levels matching those projected for the end of the century. Using camera-based tracking software, they measured each group's preference to swim in light or dark areas of a testing tank, a known test for anxiety in fish.

They found that normal juvenile rockfish continuously moved between the light and dark areas. But those under more acid conditions for a week preferred the dark area, a preference that continued for several days even after their water was normalized.

The scientists said the anxiety is traceable to molecules in the fish sensory systems known as GABA A receptors, also tied to human anxiety. The acidified environment leads to changes in the levels of ions, or electrically charged atoms, in the blood. This reverses the ions' flow through these receptors, which act as tiny gateways. The end result is a change in nerve cell activity, reflected in behavior.

The findings "reveal a potential negative effect of ocean acidification on fish behavior that can possibly affect normal population dynamics and maybe even affect fisheries," said Martín Tresguerres, a Scripps marine biologist and study coauthor.

For rockfish, "if the behavior that we observed in the lab applies to the wild… it could mean that juvenile rockfish may spend more time in the shaded areas instead of exploring around," said Tresguerres. "This would have negative implications due to reduced time foraging for food, or alterations in dispersal behavior, among others."

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