Ocean acidification leaves clownfish deaf to predators

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The orange clownfish, Amphiprion percula. Image by Matthew Wittenrich

(PhysOrg.com) -- Since the Industrial Revolution, over half of all the CO_2 produced by burning fossil fuels has been absorbed by the ocean, making pH drop faster than any time in the last 650,000 years and resulting in ocean acidification. Recent studies have shown that this causes fish to lose their sense of smell, but a new study published today in *Biology Letters* shows that fish hearing is also compromised.

Working with Professor Philip Munday at James Cook University, lead author Dr Steve Simpson of the School of Biological Sciences at the University of Bristol reared larvae straight from hatching in different CO_2 environments.

"We kept some of the baby clownfish in today's conditions, bubbling in air, and then had three other treatments where we added extra CO_2 based on the predictions from the Intergovernmental Panel on Climate Change for 2050 and 2100," Dr Simpson said.

After 17-20 days rearing, Dr Simpson monitored the response of his juvenile clownfish to the sounds of a predator-rich coral reef, consisting of noises produced by crustaceans and fish.

"We designed a totally new kind of experimental choice chamber that allowed us to play reef noise through an underwater speaker to fish in the lab, and watch how they responded," Dr Simpson continued. "Fish reared in today's conditions swam away from the predator noise, but those reared in the CO_2 conditions of 2050 and 2100 showed no response."

This study demonstrates that ocean acidification not only affects external sensory systems, but also those inside the body of the fish. The ears of fish are buried deep in the back of their heads, suggesting lowered pH conditions may have a profound impact on the entire functioning of the sensory system.

The ability of fish to adapt to rapidly changing conditions is not known. Dr Simpson said: "What we have done here is to put today's fish in tomorrow's environment, and the effects are potentially devastating. What we don't know is whether, in the next few generations, fish can adapt and tolerate ocean acidification. This is a one-way experiment on a global scale, and predicting the outcomes and interactions is a major challenge for the scientific community."

More information: Stephen D. Simpson, et al., Ocean acidification erodes crucial auditory behaviour in a marine fish, *Biology Letters*, published Wednesday 1 June 2011, doi:10.1098/rsbl.2011.0293

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