Warmer and acidified oceans can lead to 'hidden' changes in species behavior

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The peppery furrow shell (Scrobicularia plana) on the seabed. Credit: Carl Van Colen

Projected ocean warming and acidification not only impacts the behavior of individual species but also the wider marine ecosystems which are influenced by them, a new study shows.

Research published in *Nature Climate Change* shows that in warmer seawater with lower pH, a common clam—the peppery furrow shell (Scrobicularia plana) – makes considerable changes to its feeding habits.

Instead of relying predominantly on food from within the water column, it changed its behavior to use its tube-like feeding siphon to scrape more of its food from the seafloor.

This in turn led to surface-dwelling invertebrates showing greater tolerance to warming and acidification, most likely due to the stimulatory effect of the clam's altered feeding on their microalgal food resources.

The study was conducted by researchers at Ghent University (Belgium), University of Plymouth (UK) and University of South Carolina (U.S.).

They say it demonstrates that changes in ocean conditions can significantly alter the interaction network among porewater nutrients, primary producers, herbivores and burrowing invertebrates.

They also highlight that mechanistic insights into non-lethal climate change effects are urgently needed to improve the understanding of ocean warming and acidification in predicted future ocean conditions.

This particular species of clam is one of the most common large burrowing bivalves along the northeastern Atlantic, Mediterranean and Baltic sea coastlines, where it is an important prey species for wading birds and affects other sediment fauna and biogeochemistry.

For the study, researchers used pressure sensors to test how the combined effects of experimental warming and acidification influence feeding behavior, which is largely hidden from direct observation. They also analysed how the clam's presence mediated the combined warming and acidification effects on ecosystem interactions and population resilience among other species.

Dr. Carl Van Colen, a researcher at Ghent University, led the study. He said:

"This work demonstrates the importance of incorporating understanding about how species interact with others and their environment to better predict how individual populations will cope with climate change. The big advancement in this research came when we started to use pressure sensors to pick up small changes in sediment porewater hydraulics that we could link to the behavior of the clams. By using this technology we were able to shed light into the 'hidden' life of organisms living burrowed in seafloor sediments."

Mark Briffa, Professor of Animal Behavior at the University of Plymouth and one of the study's co-authors, added:

"This shows how unexpected the effects of human impacts on our environment can be. If the behavior of a given species changes as a result of ocean acidification and warming, what are the implications for other components of that community? Our study illustrates the importance of investigating the consequences of human impacts on the environment at multiple levels including how it affects the way animals behave."

The full study—"Clam feeding plasticity reduces herbivore vulnerability to ocean warming and acidification," by Van Colen et al—is published in *Nature Climate Change*.

More information: Carl Van Colen et al. Clam feeding plasticity reduces herbivore vulnerability to ocean warming and acidification, *Nature Climate Change* (2020). DOI: 10.1038/s41558-019-0679-2

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