NSF Awards Grants to Scripps Scientists to Study Effects of Ocean Acidification

Diverse projects address concern for acidifying marine ecosystems

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With increasing levels of carbon dioxide accumulating in the atmosphere and moving into marine systems, the world's oceans are becoming more acidic. To address the growing concern of acidifying marine ecosystems, the National Science Foundation (NSF) has awarded 21 grants, including awards to scientists at Scripps Institution of Oceanography at UC San Diego, under the Ocean Acidification theme of NSF's Climate Research Investment. The projects will foster research on the nature, extent and effects of ocean acidification on marine environments and organisms in the past, present and future-from tropical systems to icy seas.

At Scripps, Marine Chemistry Professor Andrew Dickson will use an associated Major Research Instrumentation (MRI) grant from NSF to create a laboratory system that will enable researchers from a broad array of disciplines to study marine organisms under various controlled seawater conditions - including states that they might encounter under various acidification scenarios. "It opens up possibilities for more Scripps scientists to do this kind of research," said Dickson.

The $300,000 project is mostly supported by the NSF grant. Additional funding came from private sources.Animal species from pteropods-delicate, butterfly-like planktonic drifters-to hard corals are affected by ocean acidification, as are the unseen microbes that fuel ocean productivity and influence the chemical functioning of ocean waters. As oceans become more acidic, the balance of molecules needed for shell-bearing organisms to manufacture shells and skeletons is altered. The physiology of many marine species, from microbes to fish, may be affected. A myriad of chemical reactions and cycles are influenced by the pH of the oceans.

Scripps biological oceanographer Lisa Levin will work under an NSF grant to assess pH exposures in living organisms. Levin and her colleagues Ariel Anbar, Gwyneth Gordon and Achim Hermann from Arizona State University will determine if the chemical composition of carbonate structures in squid and mussel larvae reflects changes in seawater chemistry driven by ocean acidification and, in some instances, with associated decline in oxygen levels. "Because squid and mussels (and other mollusks) retain their larval structures as juveniles and adults, we hope ultimately to assess whether their pH exposure as larvae affects later success in life," Levin said. The project will enlist experts in ecology, metal isotope geochemistry and paleoclimatology to identify new proxies for ocean acidification.

"Earth system history informs our understanding of the effects of ocean acidification on the present-day and future ocean," says Tim Killeen, NSF assistant director for geosciences. "For a true comprehension of how acidification will change the oceans, we must integrate paleoecology with marine chemistry, physics and ecology, and an understanding of the past environmental conditions on Earth."

"Ocean acidification likely affects marine ecosystems, life histories, food webs and biogeochemical cycling," said Karl Erb, director of NSF's Office of Polar Programs. "We need to understand the chemistry of ocean acidification and its interplay with marine biochemical and physiological processes before Earth's seas become inhospitable to life as we know it." NSF's ocean acidification award investigators will use diverse approaches such as observational systems, experimental studies, theory and modeling, says Erb, to make important new discoveries about how we're changing the world's oceans. The awards are supported and managed by NSF's Office of Polar Programs, Directorate for Geosciences and Directorate for Biological Sciences.

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