Ocean Acidification Exacerbated by Coastal Upwelling: Monitoring of CO2 and O2 on the California Shelf, and Studies of Their Effects on Red Sea Urchins, California Mussels and Abalone

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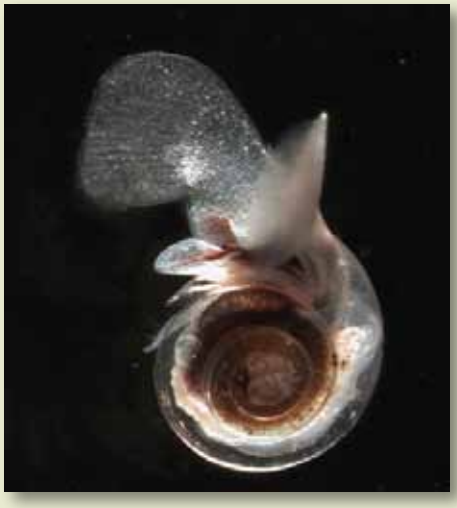

R. Hopcroft/NOAA Fisheries

A swimming planktonic mollusk known as a pteropod (Limacina helicina) *forms a calcium carbonate shell. These shells are vulnerable to corrosion caused by ocean acidification.*

Summary

In California's coastal waters, carbon dioxide levels are rising in rough concert with atmospheric carbon dioxide concentrations. The chemistry of seawater is such that the added carbon dioxide is lowering the ocean's pH. More acidic seawater can, among other things, corrode the calcium carbonate shells of organisms such as corals, oysters, sea urchins, lobsters and abalone. Shell-building organisms are particularly vulnerable to corrosion during their larval and juvenile stages. Above and beyond the effects of rising carbon dioxide on ocean pH, decomposing organic matter also releases carbon dioxide. Because of this, deeper waters off California are more acidic than the rest of the water column; upwelling further exacerbates acidification along the shelf.

This project will explore these concepts and their implications for shelf ecosystems in the California Current. In particular, a multi-disciplinary team will conduct field and laboratory experiments to: (1) investigate the extent of ocean acidification at a site in coastal California; (2) examine the effects of elevated carbon dioxide on calcification rates in red sea urchins, mussels and abalone at different life stages; (3) use molecular tools to link calcification rates with gene expression, and (4) document changes in gene expression at elevated seawater carbon dioxide levels. Findings will be published in peer-reviewed journals and shared with the public through exhibits at California aquariums.