Researchers find some species can adapt to rising acidification from CO2

Lauren Morello, Environment and Energy Publishing, 9-26-12

MONTEREY, Calif. -- One hundred twenty-five scientists met in Paris in 2004 for the first major global meeting on ocean acidification. This week, more than 540 are gathered here in Monterey to hear about the latest research in this rapidly expanding field -- so many that conference organizers warned there were more attendees than seats in the main auditorium.

And the work those researchers are doing has quickly moved past early studies that placed small numbers of mussels or clams or sea snails in tanks of water rigged to simulate more acidic ocean conditions for a few hours or a few days. Now the study of ocean acidification encompasses forays into complex genetic analysis, the development of new regional and global networks to monitor ocean pH and technology that allows scientists to crank up the acidity in small slices of the actual seafloor.

"It's been a great journey that ocean acidification research has taken," said Ulf Riebesell of the Helmholtz Center for Ocean Research in Kiel, Germany, the meeting's chief organizer.

The world's oceans have absorbed about a third of the carbon dioxide humans have released into the atmosphere since the beginning of the Industrial Revolution, making seawater 30 percent more acidic than it was then.

As the tools for studying the outcome of that shift have grown more complex, so have the questions scientists are asking. The first wave of ocean acidification studies suggested that marine animals that build chalky shells and skeletons -- corals, clams, mussels and tiny plankton that sit at the base of the food chain among them -- would falter as the acidity of seawater rises.

But more recent work has found exceptions to that rule, evidence that some shell-building species can cope with humanity's acid test. Other studies suggest that within species, the ability to adapt to changing ocean conditions can vary widely.

Young anemonefish were able to cope with water that is warmer and more acidic than today's conditions if their parents were exposed to those conditions as young adults, before they spawned, experiments conducted by Australian researchers found. But the offspring of adult anemonefish whose parents did not undergo the same test were shorter, lighter and less able to survive the hot, acidified water.

"What this tells us is, where your parents come from matters," said Gabrielle Miller, a zoologist at James Cook University.

More scientists join to probe oceans' acid test

Along the United States' Pacific Coast, researchers are plumbing genetic variation in populations of the purple sea urchin.

The species' range extends from Alaska south to Baja Mexico in coastal waters fed by the California Current, one of the planet's richest marine ecosystems. A natural upwelling circulation pattern pulls water and nutrients from the deep ocean onto the continental shelf each spring.

the journal Science found evidence that the water stirred up by the annual upwelling has reached levels of acidity that scientists once believed would not occur until 2050.

Genetic analyses by researchers at Stanford University's Hopkins Marine Laboratory suggests purple urchins that grow along the Oregon coast, where shoaling of upwelled water is most dramatic, have a greater capacity to adapt to acidification than their counterparts in relatively mild environments farther south in California.

"The bottom line is that among genetic variations in the sea urchin, there is a lot of capacity to respond to differences in CO2," said Steve Palumbi, director of the Hopkins lab. "But that doesn't tell us these populations will be able to infinitely adapt as CO2 changes."

The work is part of a larger project to study ocean acidification at six points along the California Current where scientists are also monitoring ocean chemistry and temperature, a massive undertaking that is one of the first ecosystemwide studies of carbon dioxide's effect on marine life.

It is part of an new breed of experiments trying to move the study of acidification out of laboratory tanks and into the wild, aided by new technology.

A 'time machine' probes the Great Barrier Reef

An international team of researchers recently set up a tiny "lab in a box" that allowed them to control acidity at their study site on the Great Barrier Reef.

"We can dial in different levels of CO2 and look at the response," said David Kline, a coral reef ecologist at the Scripps Institution of Oceanography. "We see it as an underwater time machine, where we can click forward levels of CO2 predicted for the future and see organisms' response."

Kline is one of many scientists gathered in Monterey this week who said they feel real work on ocean acidification is only beginning, as they scramble to understand the effect of shifting ocean chemistry on food security, commercial fisheries and iconic seascapes like the Great Barrier Reef.

"I think the real challenge is to bring people together -- molecular biologists, ecologists, engineers -- to understand what's happening at different scales," he said, "and doing it in laboratories, doing controlled experiments, doing experiments at natural CO2 seeps. The challenge will be to create an atmosphere where people can collaborate and go at this complex problem in a way that will lead to deeper understanding."

A smaller group of scientists is scheduled to stay here this weekend to discuss new approaches to studying ocean acidification's effects on marine environments, not just individual species in isolation, a project funded by the British and American governments.

The goal, said organizer Steve Widdicombe, a marine ecologist at Britain's Plymouth Marine Laboratory, is "to make real strides toward understanding how ecosystems respond -- not just bits of them."