

# Research cruise off California finds life lacking in parts of the ocean

August 7 2019, by Deborah Sullivan Brennan

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In parts of the California Current this summer, the ocean was clear, azure and almost empty.

The high water clarity and low biological productivity were some of the defining features that struck scientists returning from a cruise with the California Cooperative Oceanic Fisheries Investigation (CalCOFI) program, a 70-year study of West Coast waters.

Although the lack of life sounds ominous, scientists said it's neither good, nor bad, but an interesting observation that will add to their knowledge of the California Current.

"I have never seen the water so blue in my life," said Dave Griffith, a fisheries biologist with the National Oceanic and Atmospheric Administration. "It was beautiful. It looked like Lake Tahoe out there. You don't have [upwelling](#), which is what brings the nutrients up to the surface."

A joint venture of Scripps Institution of Oceanography, the National Oceanic and Atmospheric Administration, and the California Department of Fish and Wildlife, CalCOFI was launched in 1949 as a way to understand the collapse of the once prolific sardine industry in California.

It soon expanded to become an exhaustive catalog of fisheries, [marine ecosystems](#) and water chemistry. Its quarterly research cruises capture a trove of data about what the ocean is like now, and how it compares to conditions decades ago.

The ocean serves as a vast factory for manufacturing life, with plankton nourishing crustaceans and small fish, which in turn support marine mammals, seabirds, sharks and tuna. This summer, that production system seemed to be on pause, researchers said.

"Productivity conditions were very low, we weren't capturing high biomass in any of our nets," said Natalya Gallo, a postdoctoral researcher

with the program, who volunteered on the cruise. "Marine mammal observations were low. That makes sense, because you have more animals when you have more food."

Without the churning of nutrients from the [ocean floor](#), the system stalls and ocean productivity—the amount of life produced at all those levels—declines.

That's normal in the summer, when warmer water slows up-welling of nutrients from the sea floor, but researchers said ocean productivity seemed lower than usual, even for the season.

The ability to observe, measure and compare ocean chemistry and biology from year to year is the chief benefit of CalCOFI, which scientists said is the longest running set of marine data in the world.

"There was very little biomass at all, at all tropic levels, from (plankton) all the way up to marine mammals," said CalCOFI Director Brice Siemons. "That is an observation, and we can put that in perspective in our time series, and compare it to all of the last 70 years."

That's why the 70-year time series of the California Current is so valuable, they said. The ability to maintain a running tally of ocean measurements allows researchers to sort out whether an event, such as this summer's biological scarcity, is a short-time curiosity, or a long-time trend.

Over a 16-day cruise of the Southern California Bight and California Current, researchers took samples of water chemistry, plankton, fish eggs, [marine mammal](#) and seabird sightings, and other variables, at 70 research stations in a grid off the coast. Scientists with Scripps, in charge of oceanographic testing, lowered a device fitted with metal cannisters that measures water temperature and chemical properties at depth.

NOAA researchers study fisheries by sampling fish eggs and larvae, using four different types of nets. This time, it was slim pickings, particularly in the sea beyond the California Current—the open waters that scientists refer to as an "ocean desert."

"This was exceptional," Griffith said. "We weren't seeing many eggs in the water, which is not uncommon, but there were areas where we were not seeing anything. It was pretty sparse."

It's unclear why the samples were so scanty as the ocean's physical conditions didn't seem out of the norm, said Dan Schuller, chief scientist for the cruise.

"There was nothing crazy anomalous in any of the parameters we were looking at," he said. "Physical parameters—temperature, salinity, oxygen, chlorophyll—were pretty standard for a Southern California trip."

Researchers said they'll have to test their observations of low productivity against the data they get from analyzing their samples in the lab. It may turn out that there was more abundance of life than it appeared at first glance. And even if the ocean was less productive this summer, that could be part of cycles of boom and bust in marine populations.

Warm waters in recent years have suppressed some fish populations, but also led to favorable conditions for other species popular with fishermen.

"Fishes, especially near-shore commercial fishes—kelp bass, rock bass, the marine species that everybody likes to catch—they can't particularly pick up and leave," Siemens said.

Other migratory fish, such as yellowfin and bluefin tuna, are drawn to

the balmy, near-shore waters, to the delight of San Diego fishermen.

"Somewhat counterintuitively, when the water's warm, and production is low, you get some of the best commercial fisheries, which is really good for our economy," he said.

Although their biological samples were low overall, scientists did find creatures, including small crustaceans called copapods, as well as euphausiids, or krill, a shrimplike crustacean. They pulled up chaetognaths, a transparent predatory worm that "should probably be featured in the next 'Aliens' movie," Gallo said.

They also found pyrosomes, a bizarre, colonial organism made up of many small tunicate worms, stitched into a translucent tube that can grow to an imposing 60 feet in length. Gallo said CalCOFI researchers found many smaller ones in their bongo nets—circular nylon nets shaped, as their name suggests, like bongo drums. The apparent abundance of these otherworldly creatures is exactly the sort of thing that CalCOFI data can put in perspective.

"Talking to some of the NOAA fisheries scientists, they said that pyrosomes used to be quite rare, and they didn't see many," Gallo said. "So that's one of the things we can do with our data, and compare to (data from) the 1950s."

Despite high waves, strong winds, storms and seasickness, the cruises are indelible experiences for the scientists on board. For Gallo, the chance to help write a chapter in a one of the most enduring stories of marine science was a professional milestone.

"I was out at sea with NOAA scientists who have been doing CalCOFI cruises since before I was born," she said. "It's almost three whole (generations of scientific) careers that have been dedicated to this time



series that gives us this phenomenal understanding of the dynamics of the ecosystem off the West Coast, and how it has changed in the past, and how it may change in the future with climate change."

For Griffith, a veteran of the CalCOFI cruises, the hard work and long hours are the price of perpetual wonder.

"The ocean is a very powerful thing," he said. "It's a very resilient source. It's just a curiosity. We'll see something different next year. We see fish populations explode and then collapse, but they never go away ... . It's fascinating to watch."

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Citation: Research cruise off California finds life lacking in parts of the ocean (2019, August 7) retrieved 23 April 2024 from <https://phys.org/news/2019-08-cruise-california-life-lacking-ocean.html>

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