

## Sea life in peril -- plankton vanishing Usual seasonal influx of cold water isn't happening

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Oceanic plankton have largely disappeared from the waters off Northern California, Oregon and Washington, mystifying scientists, stressing fisheries and causing widespread seabird mortality.



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The phenomenon could have long-term implications if it continues: a general decline **in** near-shore oceanic **life**, with far fewer fish, birds and marine mammals. No one is certain how long the condition will last. But even a short duration could severely affect seabird populations because of drastically reduced nesting success, scientists say.

The plankton disappearance is caused by a slackening of what is known as "upwelling:" the seasonal movement of cold, nutrient-rich offshore water into areas near shore.

This cold water sustains vast quantities of phytoplankton and zooplankton, which are the basis of the marine food web. During periods of vigorous upwelling and consequent plankton "blooms," everything from salmon to blue whales fattens and thrives on the continental shelf of the West Coast.

The larger fish and baleen whales eat mostly krill: free-floating, shrimp-like crustaceans ranging from one to two inches, the upper size limit of the zooplankton realm.

When the water is cold, krill swarm off the Northern California coast by the tens of thousands of tons. Now that they are largely absent, fisheries and wildlife are feeling the effects.

**In** perhaps the most ominous development, seabird nesting has dropped significantly on the Farallon Islands off San Francisco, the largest Pacific Coast seabird rookery south of Alaska.

Bill Sydeman, the director of marine ecology for the Point Reyes Bird Observatory, a science and conservation organization that maintains a research station on the Farallones, said the collapse of the nesting season is unprecedented **in** the three decades the group has monitored the islands.

Cassin's auklets -- a relatively rare seabird that feeds almost extensively on krill -- have been particularly hard hit, Sydeman said.

"Normally they breed **in** March," Sydeman said. "They got started late this year, and by May they had virtually disappeared. We expect zero nesting success for them this year, or close to it. We've never seen anything like it."

Sydeman said other seabirds are also showing the effects of the reduced marine productivity.

"We have little or no nesting of pelagic cormorants (at the Farallones), and Brandt's cormorants are nesting at reduced numbers," he said. "Double-crested cormorant nesting is down by 50 percent (**in** the Bay Area)."

Upwelling cessation is typically caused by El Niño events -- warm water intrusions from the equatorial Pacific. But what is happening off the coast right now is not a true El Niño, Sydeman said.

"We really don't have a clear idea of what it is," Sydeman said, noting that standard El Niños can be tracked as they progress from the equator to temperate waters, something that hasn't occurred **in** the current case.

"Some are calling it an El Niño Norte; others think it's some sort of anomalous intrusion of warm offshore blue water onto the continental shelf," he said.

A recent study indicated the phenomenon may be long term, and linked to global warming.

Last week, Fisheries and Oceans Canada -- the federal agency dealing with Canada's marine and inland waters -- released a report saying 2004's spring and summer ocean surface temperatures **in** the Gulf of Alaska and off British Columbia were the warmest **in** 50 years.

The study concluded the record high temperatures were caused by abnormally warm weather **in** Alaska and western Canada, as well as "general warming of global lands and oceans."

Some pulses of upwelling occurred off Northern California **in** June, Sydeman said, but they're unlikely to significantly increase marine productivity.

"Upwelling has slackened along all the West Coast, except for a little bit of recent activity off Northern California," Sydeman said. "At this point, it's too little and too late. Things aren't going to turn around. For krill predators **in** this system, it's a very serious situation."

Juvenile rockfish numbers are also way down.

"We annually survey (juvenile rockfish) from San Diego to Cape Mendocino, and this is the lowest catch we've recorded **in** the 23 years we've been doing it," said Stephen Ralston, a supervising research biologist at the Santa Cruz office for the National Marine Fisheries Service, the federal agency that oversees fisheries **in** federal waters.

Like krill, young rockfish are a significant food source for seabirds, large fish and marine mammals; they are also essential to maintaining healthy stocks of mature rockfish, esteemed by commercial fishermen and sport anglers.

Off the coast of Oregon, abnormally warm marine water is continuing unabated, affecting local birds and salmon.

"Things are pretty grim up here," said Bill Peterson, an oceanographer with the National Marine Fisheries Service office **in** Newport, Ore.

Peterson said a major die-off of double-crested cormorants recently occurred **in** Oregon, and juvenile salmon numbers have dropped precipitously. Both events, he said, are likely due to the warm water.

"We do salmon surveys every spring and summer," he said. "Normally, we catch several hundred salmon **in** the spring. This year we caught eight. And we usually get several thousand fish **in** the summer. This year, it was 80."

Peterson said the water temperature off Oregon in late June is normally 10 degrees Celsius (about 50 Fahrenheit), "and this year it's 16 degrees (about 61 F). Our (upper layer of warm water) is normally 15 meters thick, and this year it's 30 meters. Krill numbers are down, and the plankton we are seeing are as unusual as can be -- warm water species that you'd find off San Diego or Monterey."

Peterson said it is unlikely Oregon waters will cool significantly this summer.

"It takes an enormous amount of (offshore wind) energy to push that much warm water offshore, which is what we would need to see for significant upwelling," he said. "I don't see that happening anytime soon."

Near San Francisco, salmon have switched from krill to bait fish, and appear to be holding their own -- at least for now.

"The fishing is terrific," said Roger Thomas, the president of the Golden Gate Fishermen's Association and the owner of the recreational angling boat the Salty Lady.

"It's true there's not much krill, but there're lots of anchovies and sardines," Thomas said, "and the salmon are filling up on those."

Thomas acknowledged that the bait fish wouldn't benefit many coastal and offshore birds.

"Sardines are too big for the auklets, and even for other species like common murrens," he said. "They rely on smaller prey species."

**In fact**, say scientists, krill are the keystone forage species for almost everything that swims off Northern California.

"It's the krill that drive the food web dynamics off this coast," said Ellie Cohen, the executive director of the Point Reyes Bird Observatory. "Their absence has tremendous implications for everything out there, right up to the humpback and blue whales. We don't know if this is a result of global warming or some natural cycling, but without the krill, you could be looking at a food web collapse."

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