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## Trying to crack an ocean mystery: What caused killer algal blooms?

By **Craig Welch**  
Seattle Times environment reporter

The mysterious bird-killing algae that coated Washington's ocean beaches this fall with slimy foam was the biggest and longest-lasting harmful algal bloom to hit the Northwest coast.

Now the phenomenon that killed at least 10,000 seabirds — more than any known event of its kind — has scientists consumed by questions: Was it a rogue occurrence, rarely if ever to be repeated, or a sign of some fundamental marine-world shift?

And did we cause it?

Answers may come slowly. "You can think of it as a jigsaw puzzle with 500 pieces, but we only have about 50," said Julia Parrish, a University of Washington fisheries and oceans professor.

This much is known: Toxic blooms of microscopic phytoplankton sometimes called red tides are exploding worldwide, even along pristine waters like the Northwest coast.

And the organisms behind these blooms can behave unpredictably, revealing how little we know about the sea.

The culprit this fall was a mushroom-shaped single-celled species, *Akashiwo sanguinea*, that has bloomed in Puget Sound, Chesapeake Bay and saltwater from Europe to Australia and Japan without incident.

But something here this time caused the cells to multiply rapidly and break open in a toxic foam. It's been recorded happening only once before — on a smaller scale, in Monterey Bay in California, in 2007.

Researchers are trying to gauge whether warming surface waters or more corrosive seas might have played a role in the two blooms, or whether they were caused by a collision of shifting currents and natural atmospheric and weather cycles like El Niño. Or maybe it's all of the above — or something else.

"We haven't ever seen this before and now we've had two events in two years," said Raphael Kudela, an ocean-sciences professor and toxic-algae expert at the University of California, Santa Cruz. "If it happens again, I'll be concerned. Four times and I'll be really concerned."

### Soaplike froth



STEVE RINGMAN / THE SEATTLE TIMES  
Mary Sue Brancato, a marine biologist with the Olympic Coast National Marine Sanctuary, checks the tags on dead seabirds caught in the algal bloom that were found on Hobuck Beach on the Makah Reservation last month.

The incident this fall played like something out of a Hitchcock movie: White-winged scoters and surf scoters staggered and collapsed on Olympic Peninsula beaches in September. Then over the next six weeks, loons, grebes and murre were found dead from Neah Bay to Oregon. Just as in Monterey, a soaplike froth coated the natural oils that protect the birds from hypothermia.

Researchers are still unearthing its effects: Surfers and kayakers who rode through the foam near Westport, Grays Harbor County, complained of sinus problems and a lingering loss of taste and smell; a pathologist inspecting dead birds found a few whose guts lacked any trace of normal bacteria, raising the possibility they ingested something damaging.

Most disturbing to algae experts: The whole incident was unexpected. *Akashiwo sanguinea* isn't even among the species scientists considered harmful, said Mary Sue Brancato, a marine biologist with the Olympic Coast National Marine Sanctuary.

Toxic tides aren't new to the Pacific. A crewman on Capt. George Vancouver's Voyage of Discovery died in 1793 after eating poisoned mussels.

The blooms are produced by two classes of microalgae — dinoflagellates and diatoms, tiny creatures that help fuel the marine-food web.

In Puget Sound, the most problematic is a type of dinoflagellate that produces a neurotoxin that can reside in shellfish. When ingested by humans, it can cause paralysis and even death.

On the coast, the bigger problem is a diatom that blows in from off shore. It can produce domoic acid, which can cause seizures and death in humans.

Since being detected in Washington in 1991, this diatom algae has shown up more frequently, shutting down razor-clam harvests in 1998-99 and 2002-03, and appearing in a giant swath offshore in 2004. Some scientists suspect a diatom bloom caused thousands of birds to spiral and crash into cars in California in 1961, an incident that helped inspire Hitchcock's film "The Birds."

Along the East Coast and the Gulf of Mexico, as in much of the world, blooms like these are becoming more common, getting bigger and lasting longer.

Pollution is believed to influence some events as nutrients drain into the coasts in rivers and as runoff from parking lots and highways. That likely plays a role in the abundant growth of harmful blooms in Puget Sound since the 1950s — but it doesn't appear to be the case along the coast.

"We haven't polluted our coastal waters to the same extent they have in the East," said William Cochlan, a research scientist at the Romberg Tiburon Center for Environmental Studies at San Francisco State University.

But no one disputes that phytoplankton species are showing up in new places or, as the recent bird-killing bloom revealed, responding in new ways. Indeed, no one expected that particular species, a dinoflagellate, to bloom so massively — or disastrously — off the Northwest coast.

And no one knows why it did.

## Broad consequences?

Cracking the secret could prove monumental, helping determine whether we can expect greater economic or biological consequences.

Vera Trainer, who runs the harmful-algal-bloom program at the Northwest Fisheries Science Center in Seattle, helped produce a new study showing that a toxic diatom bloom that hits beaches and shuts a razor-clam season for a year could cost Washington's coastal economy \$22 million. If other harmful blooms start arriving more often, there's no telling what the cost would be.

And that's just for starters. New blooms also could signal a significant shift in the bottom of the ocean's food web that could change the distribution of all sorts of marine and seabird species.

Figuring out the causes won't be easy.

Kudela notes that changes to coastal upwelling patterns, as well as warming ocean-surface temperatures fueled by climate change in response to greenhouse-gas emissions, could alter the West Coast's mix of phytoplankton. And that could allow one type to out-compete others.

Ted Smayda, a phytoplankton expert at the University of Rhode Island, pointed out that a similar foam produced by a related phytoplankton species in Norway does best in waters with a low pH.

Scientists already have shown that Pacific Northwest waters are becoming more acidic — meaning a lower pH — as the ocean absorbs billions of tons of carbon dioxide.

But Smayda also said it's possible that the blooms are part of some natural ocean rhythm we just don't understand — or a combination of all sorts of other factors.

"What if we're just coming into an era where dinoflagellates are coming into their own?" Smayda said.

"The bias among investigators, myself included, is that we tend to look for just one factor. But what we have these days is a jumble of events, and we're left asking, 'What the heck is going on?' "

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