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SECTION B
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OCEAN MYSTERY



Karina Nielsen (left) and Brian Grantham from Oregon State University measure ocean water temperature, salinity, oxygen levels and particles. NICOLE DeVITO / The Register-Guard

Researchers puzzle over sea water

■ **Biologists:** Deadly water has caused an unprecedented fish die-off that scientists are intensely studying.

By SUSAN PALMER
The Register-Guard

NEWPORT — The mystery of the dead zone continues.

Oregon State University researchers chasing a swatch of water that's so low in oxygen it's smothering fish off the central Oregon coast found more

surprises Wednesday: colder water at the surface and still-lethal water moving closer to shore.

Led by OSU marine biologist Jane Lubchenco, six scientists on board the 54-foot OSU research vessel Elakha spent the day measuring water conditions from Strawberry Hill, just south of Yachats, all the way back to Newport, where the vessel docks at the Hatfield Marine Science Center.

While the cloudless day was beautiful, north winds kicked up a healthy 5- to 6-foot chop that kept the boat bobbing like a cork. With the deck rolling and shifting under them, researchers Francis Chan and Karina Nielsen lowered an empty

tube over the side, filled it with water, then snapped the ends shut with a special weighted sinker. Then they hauled in the tube and did spot checks of temperature and oxygen levels with a hand-held probe.

Researcher Brian Grantham, meanwhile, dropped a bigger probe off the stern that was capable of more precise measurements, lowered it to the ocean floor and pulled the 75-pound device back to the surface. The probe continuously measures water conditions as it sinks and rises.

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Normally, a winch on the back of the boat does the hauling, but it failed unexpectedly Wednesday. "Today, I'm the winch," Grantham said.

Scientists had expected the recent windy days to alleviate the low-oxygen problem. Instead, they found that while the amount of oxygen in the water had increased slightly in some areas, in others it was still lethal for fish, crustaceans, invertebrates and any other creatures that don't swim out of the region.

The deadly water had been sitting about a mile from shore but appears to be moving toward shore, said Chan, an OSU post-doctoral researcher with the Partnership for Interdisciplinary Studies of Coastal Ocean (PISCO).

"It's continuing to be pulled from very deep," he said.

Chan was referring to upwelling, the annual ocean push that brings water from as deep as 2,000 feet to the surface. The water is pulled toward the Oregon coast when

warmer surface water is driven offshore by a combination of north winds and the spin of the planet.

The cold deep water has much less oxygen than the warmer coastal water.

Wind normally mixes the colder and warmer waters together, balancing out the oxygen levels. But this year, the water stratified, sitting in layers that didn't mix and making for lethal bottom conditions in an area stretching from Waldport south to Heceta Head.

Crabbers and researchers first noticed dead fish, crabs and worms about July 8. The unprecedented die-off caught everyone by surprise.

In 25 years of studying rocky intertidal areas, Lubchenco said she'd never seen anything like it. She said she'd heard of at least one case of an unexplained fish die-off, but until recently there wasn't an easy way to gauge whether ocean conditions were to blame.

Five years ago, marine biologists and oceanographers began taking their first close look at a region of

the ocean long ignored: the so-called near shore, from the coast out to about six miles.

Oceanographers have preferred studying the open ocean and marine biologists have looked mainly at the shoreline, Lubchenco said, partly because the near shore is such a chaotic confluence of ocean currents, land mass and weather patterns.

"The physics is pretty messy when you get this close," she said, adding that figuring out ways to measure things such as temperature, salinity and oxygen levels in near-shore waters seemed like a practical nightmare.

But Lubchenco and other scientists wanted to try it when they ran up against surprises in their tidal-zone research.

Why, for example, do similar areas — such as Strawberry Hill south of Yachats and Boiler Bay north of Seal Rock — sport such different ocean populations? Strawberry Hill is dominated by "filter feeders" such as mussels and

barnacles, while big brown kelp and red and green algae are more common at Boiler Bay.

Lubchenco said scientists realized that to understand such differences they needed to look in the messiest part of the ocean.

With \$20 million in funding from the David and Lucile Packard Foundation, she and other researchers from OSU, Stanford, the University of California at Santa Cruz and the University of California at Santa Barbara have been taking a closer look at more than 50 sites that span 1,200 miles of coastline from Washington to California.

In one of the PISCO researchers' more surprising discoveries, they learned that the "ear bones" of fish and invertebrates contain the trace chemicals of surrounding seawater, which varies from place to place, thus providing a record of where fish have been.

With the PISCO study in place, coming up with the data to answer questions about the current die-off has been much easier, Lubchenco

said.

But what Wednesday's measurements mean is still murky, Chan said.

OSU scientists have asked researchers on two larger research vessels to take some oxygen measurements for them.

The vessels — from the Scripps Institute of Oceanography — are working in the region but are farther out at sea.

"If that deep water looks regular, then we'll think this is a one-episode phenomenon" and something unlikely to last, Chan said. But if the water measurements from farther offshore are also unusual, it will require closer study, he said.

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