OSU scientists detect low-oxygen zones forming off coast for sixth straight year

by Mark Floyd

CORVALLIS, Oregon â€“ A team of Oregon State University scientists monitoring near-shore ocean conditions off Oregon says that oxygen levels in the lower water column have plummeted, thrusting the region into a hypoxic event for the sixth consecutive year.

Hypoxia can lead to significant marine die-offs, the researchers say, depending on the severity, duration and location of the low-oxygen zone.

Although conditions this summer have not yet duplicated the severity of the historic hypoxic event of 2006, the outlook for the remainder of the summer and early fall is uncertain. Measurements taken by the OSU scientists in late June mirrored those of last year, but a shift to a southerly wind pattern in mid-July pushed the mass of low-oxygen water away from the shoreline. A sizeable mass of low-oxygen water remained, however, across much of the shelf from Florence to Newport.

Last week, the winds shifted again and these northerly winds pulled the larger mass of hypoxic water back closer to shore, where it may endanger reef-dwelling sea creatures that have limited mobility.

â€œWe are definitely experiencing hypoxia once again,â€• said Francis Chan, a marine ecologist with OSU and the Partnership for Interdisciplinary Studies of Coastal Oceans, or PISCO. â€œBy the beginning of July, conditions were approaching what we consider â€˜severe.â€™ But unlike last year, a shift in wind patterns in mid-July pushed low oxygen waters offshore and gave us a temporary reprieve.

â€œThe winds have shifted yet again,â€• Chan added, â€œand we are now tracking to see how much further oxygen levels will drop. It is a dynamic system with a lot of uncertainty, which illustrates the need for more research and monitoring of these conditions.â€•

The OSU researchers say the region has not yet fully recovered from last yearâ€™s historic hypoxia. Video monitoring of reefs off the central Oregon coast that were affected by last yearâ€™s hypoxia show a significant loss of species diversity. Most species of sea stars, sea cucumbers and many bottom-dwellers are still absent, said Jane Lubchenco, the Wayne and Gladys Valley Professor of Marine Biology at OSU.

â€œSome rockfish have moved into the area, but the bottom-dwellers that provide the habitat and food for rockfish and a diverse array of other species, are slow to return,â€• Lubchenco said. â€œThe system is showing early signs of rebounding, but a full recovery may be a long way off. This marine ecosystem may take as `long to recover as the terrestrial ecosystem did from the eruption of Mount St. Helens.

â€œMoreover, the current low oxygen conditions may knock the system back to the starting line, delivering another setback to an already stressed system,â€• Lubchenco added.

Last year, the largest and most devastating hypoxic conditions ever observed off the Pacific Northwest coast began with low oxygen levels of 0.5 milliliters per liter of water in July off Cape Perpetua â€“ identical to what the OSU researchers observed this year. During the next two months, strong upwelling-favorable winds persisted, fueling massive phytoplankton blooms, which eventually died and sank to the bottom, leading to some of the lowest oxygen levels ever recorded and killing a variety of marine life off the Pacific coast.

For the first time, some areas of the ocean actually ran out of oxygen altogether, the researchers said.

â€œThe 2006 situation was not only the strongest, most widespread hypoxia event yet seen off the Pacific Coast â€“ it also was the most long-lasting,â€• Chan said. â€œThe oxygen levels were off the charts and they continued through the end of October.

â€œWe have seen nothing to suggest that conditions this summer will be any different,â€• Chan added. â€œIn fact, it is eerily similar to last year.â€•

The OSU scientists have been monitoring offshore conditions this year since April, deploying instruments, taking survey cruises and working with the Oregon Department of Fish and Wildlife on video surveillance of reefs affected by last yearâ€™s hypoxia. By the end of June 2007, the oxygen levels on those reefs had decreased dramatically, to an average of 0.5 milliliters per liter. Any level of dissolved oxygen below 1.4 milliliters is considered hypoxic for most marine life; a normal midsummer reading may range from 1.5 to 3.0 milliliters.

The next few weeks are critical, says Jack Barth, a professor of physical oceanography at OSU. If upwelling-favorable winds are strong and persistent, the already-low oxygen levels may continue to decline to dangerous levels.

â€œLast year, summer winds were more intense than normal, and led to upwelling that was twice as strong as usual,â€• Barth said. â€œSummer upwelling winds are a vital part of the system, but they can become too much of a good thing. Strong and persistent upwelling winds fuel intense biological production, leading to hypoxia in near-bottom waters as plankton sink and decompose at depth.

Barth said it is too early to say with any certainty that the ongoing hypoxic conditions are a direct result of

global warming, but adds that the symptoms are consistent with global warming models.

â€œThere are many variables such as the Pacific Decadal Oscillation that seem to run in 10- to 15-year cycles,â€• Barth pointed out. â€œBut this marks the sixth consecutive year that we have documented significant hypoxia and observed changes in the circulation and winds that may be responsible.â€•

The OSU-led research team is enlisting a number of other resources in collecting dissolved oxygen data in near-shore waters as it seeks to determine the extent of hypoxia along the West Coast. Stephen Pierce, an OSU oceanographic research associate, is aboard a vessel that is conducting a biannual hake survey for the National Marine Fisheries Service (NMFS). Heâ€™ll be testing water samples for dissolved oxygen from Monterey, Calif., to Vancouver Island.

Already, Pierce and his colleagues have just discovered hypoxic waters with oxygen levels of about 0.75 milliliters per liter in the near-shore from Coos Bay to Florence. These are some of the first recent recordings of hypoxic water along the southern Oregon coast, which has not been well-monitored, and will provide important baseline data for the future.

Researchers including NOAAâ€™s Bill Peterson, who works at OSUâ€™s Hatfield Marine Science Center in Newport, are taking dissolved oxygen measurements while conducting a Bonneville Power Administration-sponsored salmon survey off the Oregon and Washington coast.

OSU scientists also are working with the Olympic Coast National Marine Sanctuary and researchers at the University of Washington to expand hypoxia detection efforts up through the northern Washington coast.

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