Understanding Ocean Acidification and Hypoxia

Oregon Department of Fish and Wildlife, 10/9/2015
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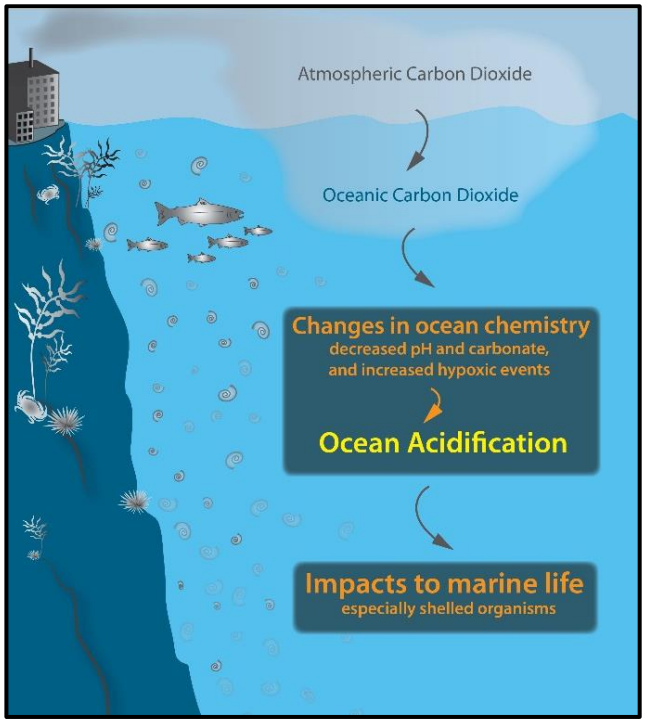
The problem*:* Ocean acidification and hypoxia (OAH) is already occurring on our coast. Oregon and the West Coast are seeing acidification levels that will not be seen globally for another 50 years. **The take-home: There is mounting evidence of existing and anticipated harm to marine species and our economy.**

Oregon is on the front lines. OAH events impact ocean health worldwide. Oregon has the dubious honor of being the locale that first documented OA impacts – the ***Whiskey Creek Shellfish Hatchery*** story that is now renowned world-wide. The good news is Oregon's universities and agencies have premier scientists working at the forefront of OAH research, focused on understanding why, when and how OAH events and their impacts occur. The bad news is that economic impacts have already occurred in our oyster culture industry and we anticipate – but cannot yet predict – impacts to Oregon's precious wild ocean fisheries in coming decades.



As atmospheric carbon dioxide dissolves in the ocean, it undergoes a chemical change. This process is referred to as "Ocean Acidification," and leads to corrosive conditions that can impact marine life. Shelled organisms are particularly vulnerable to these changes.

Oregon's nearshore waters are critical to resources and the economy—*and* are especially vulnerable. We are observing extreme OAH events in Oregon's highly productive nearshore waters (0-12 miles offshore) and estuaries. This region is home to major fisheries (eg., crab) all of the State's mariculture operations, and contains critical nursery grounds for economically important species (rockfish, salmon, pink shrimp and Dungeness crab, among others). The dynamic and variable nearshore environment makes it a uniquely challenging area for conducting research, and has typically pushed coast-wide studies further offshore (e.g. NMFS' annual trawl survey). The result is a precarious ***information gap*** for the area that is currently experiencing OAH.

West Coast leaders and researchers are strengthening cross-jurisdictional partnerships. Universities and state, provincial, and tribal governments in Oregon, Washington, California, and British Columbia have responded to our region's acute vulnerability to OAH and research challenges by pulling together to seek proactive, solution-oriented approaches to this issue. Forums for these discussions include: West Coast Ocean Acidification and Hypoxia ***Science Panel*** (includes 5 researchers from Oregon), the Pacific Coast Collaborative, the West Coast Governors Alliance on Ocean Health, and the nascent West Coast Regional Planning Body. Partners include many research institutions, universities, and local federal representatives.

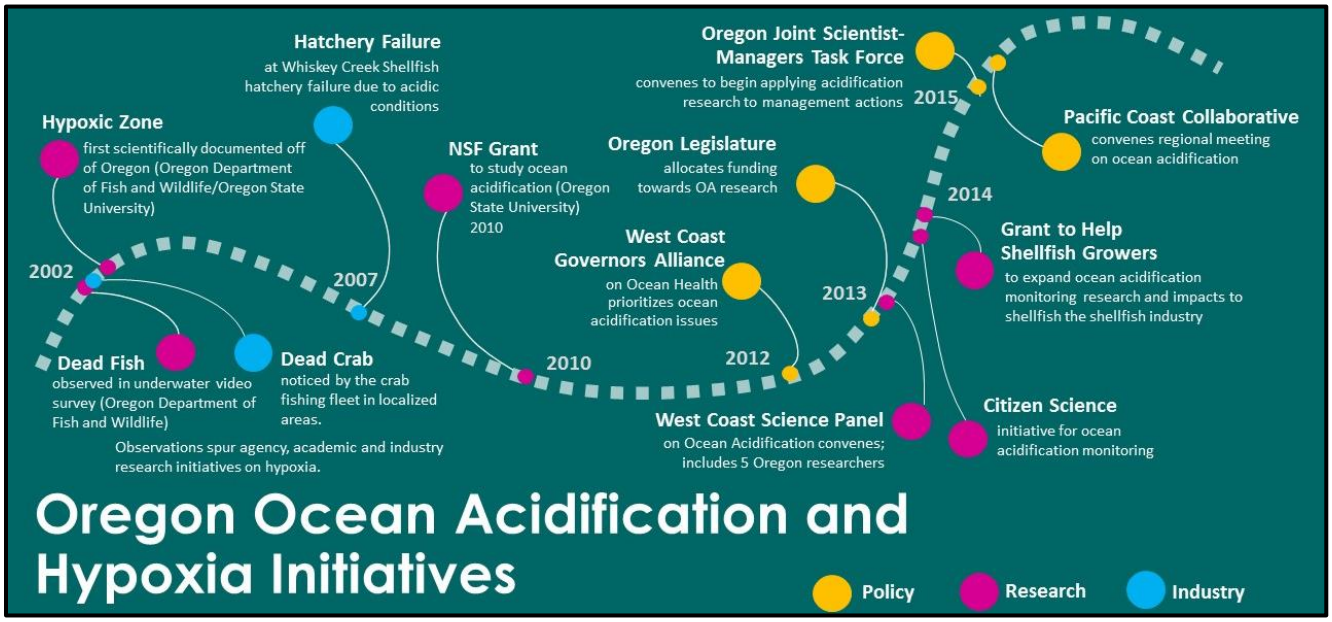
We are advancing the state of the science. West Coast researchers are rapidly expanding our understanding of ocean chemistry. For two years, a 20-member West Coast Ocean Acidification and Hypoxia Science Panel, which includes 5 Oregon-based researchers, has been working to synthesize OAH information to aid decision makers. Their work will conclude in 2015 with strategic recommendations including a ***research and monitoring framework***. These eminent scientists are committed to collaborating with resource managers to apply panel

findings to inform future management decisions and frameworks.

Research is essential to allow us to anticipate and adapt to future increase in OAH. When the OA problem was discovered at the Whiskey Creek Shellfish Hatchery, managers and scientists were able to solve the problem by modifying the chemistry and flow of the hatchery's water system. While this type of solution is practical in a closed system such as a hatchery, we are not able to engineer solutions to OAH in the open ocean. While we cannot stop increasing intensity and frequency of OAH, we can adapt to the effects by altering resource management and dependent industries to minimize the economic effects of OAH. However, this will only be possible if we understand OAH well enough to anticipate and understand potential impacts, through strategic research investment.

Oregon is a prime locus for research, and is poised to employ strategic research investment and turn it into national and global successes in OAH science. Oregon is ground-zero for OAH events and has the cutting edge-technology and top-tier academic expertise to understand the events and their impacts. We are home to the newest Ocean Observatory – one of an elite group of permanent long-term oceanographic and biological monitoring installations that are part of the national Ocean Observatories Initiative, and the largest single ocean monitoring equipment investment in U.S. history. This offshore buoy network collects valuable ocean data, including pH, to track changing ocean conditions. Oregon is also home to a system of world-class marine laboratories (Hatfield Marine Science Center, Oregon Institute of Marine Biology), a system of marine protected areas dedicated to scientific investigation, and long-term ecological monitoring sites both nearshore and offshore.

Alignment of West Coast information needs and federal priorities will result in greater success for both. While OAH is occurring globally, there are hotspots where impacts are strongest. These hotspots, which include coastal Oregon, provide opportunities to focus research efforts and learn about OAH impacts that will affect other U.S. and global marine regions in coming decades. Priority federal investment in hotspot areas, such as Oregon, is vital towards national preparedness for future changing ocean conditions. Federal policy development that provides national and international leadership to address these issues will be essential to advance our understanding of OAH and mitigate its impacts. The OAH "experiment" is unfolding on the West Coast, providing opportunities to strategically monitor this process. Since it is currently impossible to predict how ocean acidification will cascade through food webs, this valuable information can be used to gain a global understanding of future conditions and how to mitigate them.



*For more information on OAH in Oregon:*http://oregonocean.info/