Assessing Ocean Acidification and Hypoxia Impacts in Oregon Marine Waters

Background

Oregon's coastal waters are part of the California Current Ecosystem, one of the world's most productive ocean regions. However, the upwelling that fuels this productivity also results in dramatic variability in dissolved oxygen and pH, which naturally limits available habitat for marine organisms with calcium carbonate shells and those that need oxygen for respiration.

The ocean absorbs about 30 percent of the carbon dioxide (CO_2) that is released into the atmosphere. As levels of atmospheric CO_2 increase from human activity the amount of carbon dioxide absorbed by the ocean also increases. As excess CO_2 is absorbed by seawater, a series of chemical reactions result in changes in the carbonate chemistry, lowering the pH of ocean waters in a process called ocean acidification. Additionally, there has been increased occurrence of severely hypoxic (low oxygen, less than1.0 mg/L) and even anoxic (zero dissolved oxygen) waters observed on the Oregon coastal shelf during summer upwelling, raising concern for impacts to resident biological communities and habitats.

Water quality impacts related to ocean acidification and low dissolved oxygen are commonly referred to as ocean acidification and hypoxia, or OAH. Localized processes such as seasonal upwelling, freshwater inputs, and in some cases land-based activities have an amplifying effect on OAH conditions related to climate change, making nearshore waters and the animals that live there some of the most vulnerable to early impacts of changing ocean conditions. West Coast states have yet to routinely assess and report on the water quality impacts of OAH on the marine waters in their biennial Integrated Reports.

DEQ's Integrated Report

The Federal Clean Water Act requires Oregon to report on the quality of its surface waters every two years. Surface waters are assessed to determine attainment of protective water quality standards. Oregon uses the Assessment Methodology to document how attainment decisions will be made for reporting purposes. Specifically, the methodology includes scientifically and technically robust procedures to assign data quality and quantity requirements, describe how water quality standards will be interpreted to assess against numeric and narrative criteria (including identifying indicators) and set allowable exceedance frequencies. The result of these assessments is called the Integrated Report because it combines the requirements of CWA section 305(b) to report on the status of all state waters and the requirement of section 303(d) to develop a list of impaired waters. The 303(d) list is submitted to the U.S. Environmental Protection Agency for final approval.

Translation or other formats

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In most instances, placing a waterbody on the 303(d) list initiates the prioritization and development of a Total Maximum Daily Load, or alternative, which is a plan for attaining better water quality. While a TMDL can be an effective approach to identifying and controlling sources of pollutants within a watershed, ocean conditions reflect inputs from global and local sources. As such, TMDLs may not be the most effective tool for controlling pollution contributing to ocean conditions and likely will need to be evaluated on a site-specific basis.

Assessing marine waters

Data and information are evaluated to determine whether the waterbody can support beneficial uses, such as aesthetic quality, fish and aquatic life, fishing (consumption), water supply (public and private), and water recreation by applying applicable water quality standards. Attainment and impairment of water quality standards are assessed using numeric and narrative criteria adopted by the state. For the draft OAH methodologies, DEQ worked for over a year with a technical workgroup of OAH experts to interpret narrative criteria using the best available science by defining environmentally relevant indicators and benchmarks. Both ocean acidification and hypoxia methodologies favor an approach that utilizes multiple lines of evidence to assess water quality impact with a comparison to natural background conditions.

Public process and participation

In consultation with the technical workgroup, DEQ's water quality assessment team has drafted methodologies to interpret existing narrative water quality criteria and assess OAH impacts in marine waters and is holding a public comment period for the documents from May 30, 2023 through July 7, 2023. The following documents can be found on DEQ's Integrated Reports Improvement web page:

- Assessment Methodologies for OAH
- Technical Support Document
- Technical Workgroup Process Overview

DEQ will hold an open call for marine data from June 15, 2023, through Aug. 14, 2023, for a total of 60 days. Information on the call for marine data can be found on the Integrated Report Call for Data web page. In late 2023 DEQ will put the draft 2024 Integrated Report out for public comment. During this time the public will have a chance to review draft findings and data used in the assessment and provide comments. DEQ will evaluate comments received and make updates as needed.

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