

# The West Coast Ocean Acidification & Hypoxia Science Panel



*A coast-wide collaboration advancing across academic and political landscapes*

## Overview of the Panel's emerging findings and products

---

### Introduction

#### Ocean acidification & hypoxia: Shared challenges and opportunities

Ocean acidification and hypoxia (OAH), two phenomena often coupled due to biological and oceanographic processes, are leading to concerns among decision makers and the public along the West Coast about the potential threats to marine ecosystems, industries, and communities. These issues are shared challenges among the region, thus require cooperation across academic and political landscapes. At the nexus of this challenge is the West Coast Ocean Acidification and Hypoxia Science Panel (Panel), an interdisciplinary collaboration of [20 esteemed scientists](#) representing California, Oregon, Washington, and British Columbia.

#### Foundation of the West Coast Panel

In November 2012, the [Washington State Blue Ribbon Task Force on Ocean Acidification](#) issued its final report documenting the current state of scientific knowledge on the effects of ocean acidification, and recommending actions to respond to increasing acidification, reduce harmful effects on Washington's shellfish and other marine resources, and adapt to the impacts of acidified waters. The knowledge base established in Washington is the foundation of the work of the Panel.

#### Putting science first

The West Coast region recognized an opportunity to build on the momentum generated in Washington to expand our understanding and develop more science-informed actions in the face of OAH. The Panel is charged with addressing priority science needs identified by managers, regulators, and policymakers across jurisdictions and at multiple levels of government. The Panel has been asked to take a sober look at the drivers and impacts of OAH and, through its products, envision how our rapidly evolving knowledge on these complex topics can better serve decision-makers and society. Panel facts

- The Panel was convened in 2013 by the [California Ocean Science Trust](#), a boundary organization committed to advancing science in decision-making, at the request of the [California Ocean Protection Council](#).
- Recognizing the value of a coast-wide collaboration, the governments of Oregon, Washington, and British Columbia joined California in calling for the Panel.
- The Panel will be convened through November 2015.
- The Panel's core goal is to collaborate with decision-makers across the state, regional and federal levels on these complex issues. The Panel provides a credible foundation upon which to build more thoughtful, integrated management and policy action.

## Emerging findings of the Panel

1. Ocean acidification is a regional intensification of a global problem that requires a coordinated regional approach.
2. The global problem is elevated ATM CO<sub>2</sub>. Must reduce emissions of CO<sub>2</sub>.
3. There are things you can do now, locally and regionally, to reduce the stress.
4. Support resilient ecosystems.
5. Accelerate the development and integration of knowledge required to improve decisions.
6. There is a cost to inaction.

## Current and forthcoming Panel products

Because of the complex nature of OAH, these issues intersect with multiple management and policy jurisdictions. In order to scope salient products, Ocean Science Trust in collaboration with the Institute for Natural Resources at Oregon State University, interviewed state and federal decision-makers about their priority science needs. Based on these conversations, the Panel has pursued a range of product types from scientific publications and technical white papers, to translational ‘science-to-policy’ products. To keep up with product release, visit <http://westcoastoah.org/panelproducts/>.

### Now available

[Ocean acidification science needs for natural resource managers of the North American west coast](#) – Oceanography 28(2): 170-181, Boehm et al. 2015

- Management action at local to regional scales can lessen the exposure to, or limit the impacts of, of ocean acidification. This paper describes existing management frameworks and identifies science needs that will assist managers in making decisions about whether, and how best, to address local OA. Despite the diverse categories of decision-makers with a role to play in responding to OA, some commonalities emerge in their information needs, including comprehensive monitoring programs and models that identify areas that are most and least vulnerable to future changes due to OA.

[The need for a coast-wide approach](#) – Translational product

- The challenges ocean acidification poses to marine ecosystems extend beyond shellfish, are larger than any one state, and will require concerted efforts across jurisdictional boundaries. This document explores how the West Coast Ocean Acidification and Hypoxia Science Panel is considering west coast ecosystems, drawing together knowledge and resources across typical jurisdictional and management boundaries.

[Envisioning a future science landscape](#) – Translational product

- Looking 5, 10 and 20 years forward, this product envisions scenarios for the role of science in decision making, including the state of scientific knowledge, the functioning of the scientific community, and how science interfaces with industry and management so that research and monitoring are more salient, credible, and efficient.

## **Forthcoming products**

### **Executive summary for decision-makers – Expected November**

- The Panel will release an overarching executive summary for decision-makers to highlight their main conclusions. This product will sit atop all of the Panel's products, thus encompassing the breadth of their work and serving as a synthesis of their many technical and translational products.

### **Category #1: Lay a scientific foundation based on decision makers' science needs**

#### **Oceanographic drivers of changing ocean chemistry – White paper; expected September**

- Summary of the drivers of ocean chemistry, along with the relative importance in different locations, highlighting the differences between open coasts, bays, and estuaries. This product will illustrate the particular vulnerability of west coast ecosystems, broadening the suite of needed management actions.

#### **What do exchanges in the carbonate system, oxygen availability, and temperature portend for coastal ecosystems? A physiological perspective – Somero et al.; in review, BioScience**

- The ocean is undergoing changes in temperature, carbonate chemistry, and dissolved oxygen concentration. Here, the Panel examines how single- and multiple stressor effects on physiology may drive changes in individual or species behavior, biogeography and the structure of marine ecosystems. This mechanistic foundation contributes to the California Current Large Marine Ecosystem. This mechanistic foundation may contribute to development of models and other decision-support tools to assist resource managers and policy-makers in anticipating and addressing global change-driven alterations in marine populations and ecosystems.

#### **Managing ecosystem effects of ocean acidification and hypoxia: Perspectives from an early-impact large marine ecosystem – White paper; expected September**

- Ecosystem impacts of OAH will significantly affect economically and culturally important resources and the services and benefits they provide. Although abrupt ecosystem changes can reasonably be expected, predicting the specific timing and how they will manifest is challenging. Sustaining ecosystem resilience, using approaches already embedded in natural resource management, provides a pragmatic path forward and offers opportunities for decision-makers to take action now.

#### **Defining resilience – White paper; expected September**

- In numerous discussions, the Panel has focused on the need to manage for resilient coastal ecosystems in the face of changing ocean chemistry. However, discipline-specific differences in definition and use of the term "resilience" highlight the need to define exactly how the Panel is using the term, and to provide additional specificity in management recommendations concerning resilience.

#### **Multiple stressor considerations – White paper; expected August**

- The ocean is a complex biogeochemical environment. Understanding of ocean chemistry is confounded by the presence of many factors that may co- or counter-vary, with each parameter likely to impact species and ecosystems in diverse ways. This product describes

the need for considering acidification in the context of multiple stressors to marine ecosystems.

### **Category #2: Tailor information to specific agency needs**

#### **Scientific approaches to making a 303(d) assessment for near coastal acidification – White paper; expected September**

- When monitoring data indicate water quality standards are not being met, management agencies have the option under Section 303(d) of the Clean Water Act to list the water body as impaired and shift management emphasis from regulation of individual point source effluents to a more holistic evaluation of cumulative loading to the water body through the total maximum daily load (TMDL) allocation process. The Panel is recommending analytical approaches for water quality standard assessments and improvements to monitoring programs where existing data limit such assessments.

#### **Modeling tools: summary of needs to enhance understanding of ocean acidification and hypoxia in coastal oceans – White paper; expected August**

- Numerous Panel discussions have revealed the need to develop new modeling tools to assess the effectiveness of any potential management action. This document outlines specific modeling needs, including coupled oceanic physical and biogeochemical models as well as ecosystem models. It outlines specific steps to build on existing infrastructure and deepen the coordination and discussion within the modeling community.

### **Category #3: Put together building blocks for considering entire ecosystems**

#### **Monitoring framework: Tracking the impacts of changing ocean chemistry to inform decisions – Translational product; expected September**

- A brief conceptual sketch that forges a path for knitting together existing networks and growing our knowledge to support decisions. This framework is not intended to articulate exact protocols or sampling sites, rather it will recommend strategies for a management-relevant, cost-effective monitoring program across the West Coast.

#### **Exploring research priorities for changing ocean chemistry – Translational product; expected October**

- A strategic, well-founded articulation of the research activities that can provide the knowledge needed to effectively manage our coasts and oceans in the face of multiple stressors. This product will enable federal and state research programs to make more strategic funding decisions by honing in on knowledge gaps that inhibit thoughtful action on OAH.

# OAH PANEL PRODUCTS: From science to decision-making

