



Staff Recommendation

February 23, 2022

Consideration of Authorization to Disburse Funds for Projects that Improve Understanding of Ocean Acidification and Hypoxia Vulnerability and Impacts

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RECOMMENDED ACTION: Staff recommends that the Ocean Protection Council approve the disbursement of up to \$2,707,752 to California Sea Grant (CASG) and Southern California Coastal Water Research Project for projects that were selected through the competitive Prop 68 solicitation administered by CASG. The following grantees and projects were selected to address acidification and hypoxia (OAH) research, monitoring, and synthesis priorities that will ultimately provide state resource management agencies and local jurisdictions with data necessary to protect marine biodiversity and water quality, advance coastal adaptation efforts, and support climate-ready fisheries:

- 4a. \$995,055 to Humboldt State University for “Advancing OAH Science off Northern California: A Critical Expansion of Monitoring and Research to Quantify OAH Exposure, Assess Ecosystem Impacts, and Support Model Development”
- 4b. \$563,321 to California State University Monterey Bay for “Assessing the Potential for Rapid Adaptation to Climate Change in Rockfish”
- 4c. \$450,379 to Monterey Bay Aquarium Research Institute/Central and Northern California Ocean Observing System for “A California OAH Portal to Enable Synthesis and Understanding of State-wide Status and Trends”
- 4d. \$499,946 to Southern California Coastal Water Research Project for “Multi-stressor Tools to Interpret Effects of Acidification, Hypoxia, and Warming on Southern California Current Marine Calcifiers”

LOCATION: Statewide

STRATEGIC PLAN GOALS AND OBJECTIVES: Goal 1: Safeguard Coastal and Marine Ecosystems and Communities in the Face of Climate Change; Objective 1.2: Minimize Causes and Impacts of Ocean Acidification and Hypoxia; Goal 3: Enhance Coastal and

Marine Biodiversity; Objective 3.3: Support Sustainable Marine Fisheries and Thriving Wildlife Populations; Objective 3.6: Accelerate Collaborative Accountability

EXHIBITS:

Exhibit A: Letters of Support

FINDINGS AND RESOLUTION:

Staff recommends that the Ocean Protection Council (OPC) adopt the following findings:

“Based on the accompanying staff report and attached exhibit(s), OPC hereby finds that:

- 1) The proposed projects are consistent with the purposes of Division 26.5 of the Public Resources Code, the California Ocean Protection Act;
- 2) The proposed projects are consistent with OPC's Proposition 68 Grant Guidelines, adopted May 2019, and Environmental License Plate Funding Guidelines (Interim Standards and Protocols, August 2013);
- 3) The proposed projects are not ‘legal projects’ that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section, section 15378.”

Staff further recommends that OPC adopt the following resolution pursuant to Sections 35500 *et seq.* of the Public Resources Code:

“OPC hereby approves the disbursement of up to \$2,707,752 to the following grantees to address acidification and hypoxia research, monitoring, and synthesis priorities:

- \$995,055 to Humboldt State University
- \$563,321 to California State University Monterey Bay
- \$450,379 to Monterey Bay Aquarium Research Institute/Central and Northern California Ocean Observing System
- \$499,946 to Southern California Coastal Water Research Project

This authorization is subject to the condition that prior to disbursement of funds, grantees shall submit for the review and approval of the Executive Director of the OPC detailed work plans, schedules, staff requirements, budgets, and the names of any contractors or grantees intended to be used to complete the projects, as well as discrete deliverables that can be produced in intervals to ensure the projects are on target for successful completion. All projects will be developed under a shared understanding of process, management and delivery.”

EXECUTIVE SUMMARY:

Staff recommends that OPC approve the disbursement of \$2,707,752 to fund four ocean acidification and hypoxia research, monitoring, and synthesis projects that will ultimately provide state resource management agencies and local jurisdictions with data necessary to protect marine biodiversity and water quality, advance coastal adaptation efforts, and support climate-ready fisheries. At its June 15, 2021 meeting, the [Council authorized](#) the disbursement of up to \$2,000,000 to CASG to support a competitive solicitation to identify the highest priority projects; staff is now bringing the individual recommended projects to the Council for approval. Additionally, the four projects total more than the initial authorization; therefore, the request is to also increase the original authorization from \$2,000,000 to \$2,707,752.

The solicitation was highly competitive. CASG released a request for proposals in July 2021 and received 28 letters of interest totaling \$18,658,724. This resulted in 16 full proposals totaling \$11,614,250. Full proposals were reviewed by a technical review panel composed of academic scientists, subject matter experts, and state and federal agency staff. The review panel recommended a ranked list of projects for funding and project selection recommendations were made collaboratively between OPC and CASG, and in coordination with State Water Resources Control Board (SWRCB) staff. CASG will contribute NOAA Sea Grant funds to fund selected projects, continue its role in administration of the Prop 68 funded grants, and will coordinate closely with OPC staff on deliverables and progress.

These four projects, together with a [series of projects](#) to better connect chemical and biological monitoring efforts that was approved at the June 15, 2021 Council meeting, address the recommendations put forth by the California Ocean Acidification and Hypoxia Task Force in their report [Enhancing California's Ocean Acidification and Hypoxia Monitoring Network; Recommendations to the Ocean Protection Council from the California Ocean Acidification and Hypoxia Science Task Force](#). Together, these OPC and CASG investments will fill critical gaps in spatial and temporal monitoring and modeling, biological impact assessment, and access to high-quality data and information, increasing understanding of the impacts of OAH on marine ecosystems and potential solutions to address these threats. This investment also meets CASG's Strategic Plan Healthy Coastal Ecosystem Goal 2: Support research to understand the drivers and impacts of environmental change and anthropogenic impacts and stressors on coastal and marine species, ecosystems, and environments, such as sea-level rise, rising temperatures, ocean acidification, and increasing hypoxia.

PROJECT SUMMARIES:

4a: Advancing OAH Science off Northern California: A Critical Expansion of Monitoring and Research to Quantify OAH Exposure, Assess Ecosystem Impacts, and Support Model Development

Project Description:

This project aims to fill a critical gap in OAH and ecosystem monitoring off California’s North Coast and to address several priorities. This project will implement routine OAH measurements to augment observations on existing ship-based ecosystem surveys along the Trinidad Head Line (THL) offshore Humboldt County. THL starts at approximately 0.75 nm offshore and extends to 20.5 nm west of Trinidad Head (this includes both state and federal waters). In addition to these measurements along THL, this project will extend similar surveys into State waters and establish the Trinidad Head Ocean Observing Node (THOON) to monitor OAH and oceanographic dynamics at a mid-shelf station. In collecting this data, the project will increase understanding of the origins, timing, duration, and intensity of OAH exposures (and related biological stressors, especially harmful algal blooms) affecting ecosystems and natural resources in coastal waters north of Cape Mendocino, including those of Humboldt Bay.

In addition, this project will assess potential OAH exposure risks for krill, larval fish, larval crabs, and other zooplankton; connections between OAH and phytoplankton blooms, including harmful algal blooms; connections between OAH and eDNA-based measures of marine biodiversity; and direct OAH impacts on sensitive species. Moreover, this project will build on these data sets to develop real-time statistical forecasts of OAH exposure affecting shelf and nearshore ecosystems, while developing, curating, and delivering rigorous data sets to support the development, testing, and application of coupled physical-biogeochemical models as decision-support tools for northern California.

Importantly, this project will engage and serve several traditionally underserved, under-resourced, and under-represented communities, and seek to support robust co-management with Tribal governments to lead to economically, socially, and culturally beneficial outcomes. The project will directly engage students in marine sciences at Humboldt State University (HSU), a designated Hispanic/Minority Serving Institution with the highest enrollment of Native and Indigenous students in the CSU system, and recruit students from Native and other under-represented communities to work on the project.

About the Grantee:

Humboldt State University (HSU) is a public university that houses the Humboldt Marine & Coastal Sciences Institute (MCSI). Located in Trinidad, California, MCSI has been a leader in research and monitoring efforts for Northern California’s fish and oyster populations, subtidal reefs, and kelp forests. HSU also has long-established relationships with the National Oceanic and Atmospheric Administration (NOAA), the Central and Northern California Ocean Observing System (CeNCOOS), and many northern California Native American Tribes that have resulted in a robust set of oceanographic and meteorological data for California’s northern coastal and offshore waters.

Project Timeline:

This project will be completed over three years (March 2022 – March 2025).

Project Financing:

Staff recommends that OPC approve disbursement of up to \$995,055 to Humboldt State University for Advancing OAH Science off Northern California: A Critical Expansion of Monitoring and Research to Quantify OAH Exposure, Assess Ecosystem Impacts, and Support Model Development. This amount includes subawards to other institutions that will be managed by the grantee.

4b: Assessing the Potential for Rapid Adaptation to Climate Change in Rockfish

Project Description:

This project will focus on how rockfish offspring respond to OAH based on the environmental history experienced by their parents. This mechanism has not yet been explored in long-lived, late to mature species, and may be especially important for rockfish and other groundfish in the California Current. The project will investigate the possibility of transgenerational plasticity (TGP), which occurs when the environment experienced by a parent affects the development and traits of the offspring. This is an understudied but potentially rapid means by which species could adaptively respond to climate change within a single generation. Proposed lab experiments will examine the possibility of maternal effects and TGP in response to low pH and hypoxia. Complementary field studies will monitor reproductive status during natural OAH exposure (prior to and during upwelling), directly linking natural changes in OAH with species response data. Both field and lab studies will measure impacts of maternal traits on offspring vulnerability to OAH. Results will be incorporated into a stock assessment model to project how climate change will affect future fishery yields.

It is anticipated that the California Department of Fish and Wildlife, NOAA, and the Pacific Fishery Management Council will benefit from a comprehensive evaluation of the effects of OAH on reproductive output, productivity, and future potential yield of ecologically and commercially important fish species to inform future fisheries management strategies that better support climate resilient fisheries.

The project will train three graduate and 10+ undergraduate students from three Hispanic Serving Institutions and impact approximately 700 middle and high school students annually from underserved schools in Monterey County through an ocean acidification outreach program.

About the Grantee:

California State University Monterey Bay (CSUMB) is a public university that routinely conducts critical scientific research in order to provide direct linkage between ecological phenomena and best management practices. Their work in local California waters, polar regions, and their archive of undersea video imagery has informed marine policy within California, across the US, and throughout the world.

Project Timeline:

This project will be completed over three years (March 2022 – March 2025).

Project Financing:

Staff recommends that OPC approve the disbursement of up to \$563,321 to California State University Monterey Bay for Assessing the Potential for Rapid Adaptation to Climate Change in Rockfish. This amount includes subawards to other institutions that will be managed by the grantee.

4c: A California OAH Portal to Enable Synthesis and Understanding of Statewide Status and Trends

Project Description:

There is currently a critical need for a centralized repository of OAH data and synthesis products, including status and trends information. This project will build a California OAH Portal (Portal) that will serve as a simple, user-friendly interface for the scientific and management communities. The Portal will integrate standardized, quality-controlled data from diverse sources and platforms, incorporate existing data layers from models and satellites, and support state and West Coast regional efforts to serve additional data streams and curated synthesis products. Data and products will be downloadable and shareable for a variety of uses, including the OPC Ocean and Coast Report Card as well as other state and federal partner efforts.

This new hub for California OAH information will sit within the California Coastal Ocean Observing Systems (CalOOS) Data Management and Cyberinfrastructure (DMAC) system, putting it alongside an extensive catalogue of oceanographic, estuarine and atmospheric data. The Central and Northern California Ocean Observing System (CeNCOOS) is well positioned to lead this effort. CeNCOOS already works across institutions and partners on a range of different ocean observing technologies and parameters and prioritizes accessibility and quality control procedures. This effort expands on the CeNCOOS-led project previously approved at the June 15, 2021 OPC meeting that is working to enhance data management and collection among ongoing monitoring OAH programs by providing access to quality-controlled chemical and biological data in a standardized format.

About the Grantee:

CeNCOOS is the U.S. IOOS Regional Association for the California/Oregon border south to Point Conception. It is housed at the Monterey Bay Aquarium Research Institute. The fundamental CeNCOOS approach is to develop long-term monitoring of environmental conditions such as water quality, productivity, and connectivity in support of marine protected area management in central and northern California.

Project Timeline:

This project will be completed over three years (March 2022 – March 2025).

Project Financing:

Staff recommends that OPC approve disbursement of up to \$450,379 to Monterey Bay Aquarium Research Institute/Central and Northern California Ocean Observing System for A California OAH Portal to Enable Synthesis and Understanding of State-wide Status and

Trends. This amount includes subawards to other institutions that will be managed by the grantee.

4d: Multi-stressor Tools to Interpret Effects of Acidification, Hypoxia, and Warming on Southern California Current Marine Calcifiers

Project Description:

The California coast is vulnerable to OAH, which are driven by global climate change. Decisions on management of local pollution sources, which can exacerbate these stressors, is a key line of inquiry to address OAH in OPC's Strategic Plan (2020). OPC has previously invested [substantial resources](#) in the development of a coupled physical-biogeochemical OAH model for the entire West Coast as impacted by the California Current System. The National Oceanic Atmospheric Administration has matched the state in this investment as well. The model is now considered a state-of-the-art global example and has resulted in numerous peer-reviewed scientific publications. In the Southern California Bight, this effort has demonstrated that coastal anthropogenic nutrients, mainly from wastewater treatment plant effluent, are having a significant impact on OAH in this region. At the June 19, 2020 OPC meeting, [additional funding](#) was approved to better understand the relative impact of coastal anthropogenic sources and management strategies at different spatial and temporal scales, and to extend this effort to the San Francisco and Monterey Coasts.

Building off these previous and ongoing investments, this project will further the development of biological interpretation and tools to apply to current and future ocean OAH conditions. Dramatic responses to separate OA, hypoxia, and warming stressors have been observed in marine calcifying species that form critical links in the food web, including oysters, foraminifera, pteropods, echinoderms, and decapods. Characterizing ecological vulnerability to these multiple stressors is a critical line of investigation to inform management of fisheries, coastal resources, and water quality. Specifically, this project will develop, validate, and apply mechanistic and eco-physiological multi-stressor indices that evaluate marine calcifier habitat compression in response to OAH and temperature in the southern California Current System. With advances in understanding multi-stressor impacts to key taxa, this will be applied to model hindcast (1997–2017) and forecast (2050-2100) scenarios. Findings from this project will be communicated and tailored to individual management audiences including the SWRCB and Marine Protected Area managers.

About the Grantee:

The Southern California Coastal Water Research Project (SCCWRP) is a public research and development agency that develops and applies next-generation science to improve management of aquatic systems in Southern California and beyond. Since its founding in 1969, SCCWRP has been developing strategies, tools and technologies that the region's water-quality management community relies on to more effectively protect and enhance the ecological health of Southern California's coastal ocean and watersheds. This grant

will also include partnerships with Princeton University and Oregon State University, two universities that are cutting-edge in both climate and marine science research and education.

Project Timeline:

This project will be completed over three years (March 2022 – March 2025).

Project Financing:

Staff recommends that OPC authorize encumbrance of up to \$499,946 to Southern California Coastal Water Research Project for Multi-stressor Tools to Interpret Effects of Acidification, Hypoxia, and Warming on Southern California Current Marine Calcifiers. This funding will be used to amend the [active grant](#) approved at the June 19, 2020 OPC meeting which is administered by OPC staff.

PROJECT FINANCING:

	OPC		Non-OPC
	Prop 68	ELPF	CASG
4a: Humboldt State University	\$995,055		
4b: California State University Monterey Bay	\$563,321		\$360,166
4c: Central and Northern California Ocean Observing System	\$450,379		\$37,920
4d: Southern California Coastal Water Research Project		\$499,946	
Totals	\$2,508,701		\$398,086

The anticipated source of funds for staff-recommended projects to be administered by California Sea Grant (4a – 4c) is the OPC’s Chapter 10 appropriation pursuant to the California Drought, Water, Parks, Climate, Coastal Protection and Outdoor Access for All Act of 2018 - Proposition 68 (Public Resources Code §80130). Funds may be used “for projects that plan, develop, and implement climate adaptation and resiliency projects”. Section 80133 identifies specific purposes for Chapter 10, which includes “projects that assist coastal communities, including those reliant on commercial fisheries, with adaptation to climate change, including projects that address ocean acidification, sea level rise, or habitat restoration and protection....” The proposed projects are an appropriate use of Proposition 68 funds because they each will improve coastal resiliency and adaptation to climate change, specifically ocean acidification, by providing state resource management agencies and local jurisdictions with data necessary to plan, develop, and implement coastal resilience projects and to inform management decisions that protect

marine biodiversity and water quality, advance coastal adaptation efforts, and support climate-ready fisheries.

The anticipated source of funds for 4d will be from the Ocean Protection Council’s Fiscal Year 2018/2019 appropriation of Environmental License Plate Funds (ELPF). This project is consistent with the OPC’s Grant Program Funding Guidelines for ELPF because it directly investigates ocean and coastal processes to support best available science in decision-making and management; is supported by the public; and has a statewide scope with implications to the health and resilience of fisheries and ecosystems. Additionally, the findings for this project will provide scientific support and evidence so that the SWRCB may support new nutrient loading standards (regulatory loads) that minimize biological and chemical impacts from ocean acidification and hypoxia. The SWRCB’s [2019 Ocean Plan Review](#) identified “Ocean Acidification, Hypoxia, and Climate Change Impacts” as one of its five highest-ranked issues. Further research is needed to evaluate how to develop water quality objectives and improve the resilience of the coastal environment. This project directly supports the priorities of the 2019 Ocean Plan Review.

OPC authorized the use of these funds at its June 15, 2021 meeting through a \$2,000,000 grant to California Sea Grant for the administration of OAH monitoring, research, and synthesis subgrants, pending Council approval of selected projects. \$199,051 of this grant amount is supporting Sea Grant’s administrative costs. The remaining \$1,800,949 is being considered for disbursement to sub-grantees at this Council meeting. An additional \$707,752 is being requested in order to fund all four highly ranked projects. CASG will contribute NOAA Sea Grant funds totaling \$398,086 to fund components of the CSUMB and CeNCOOS projects.

CONSISTENCY WITH CALIFORNIA OCEAN PROTECTION ACT:

The various projects are consistent with the Ocean Protection Act, Division 26.5 of the Public Resources Code, because they are consistent with trust-fund allowable projects, defined in Public Resources Code Section 35650(b)(2) as projects which:

- Improve the management of fisheries and/or foster sustainable fisheries.
- Improve coastal water quality.
- Improve management, conservation, and protection of coastal waters and ocean ecosystems.
- Provide monitoring and scientific data to improve state efforts to protect and conserve ocean resources.
- Address coastal water contamination from biological pathogens.
- Provide funding for adaptive management, planning coordination, monitoring, research, and other necessary activities to minimize the adverse impacts of climate change on California's ocean ecosystem.

COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA):

The various proposed projects are not ‘legal projects’ that triggers the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378. If any were determined to be a ‘legal project’ under CEQA, the proposed project(s) are categorically exempt from review under CEQA pursuant to 14 Cal. Code of Regulations Section 15306 because the projects involve information collection, consisting of data collection, research, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource. Staff will file a Notice of Exemption upon approval by OPC.