

MONTEREY ABALONE COMPANY

July 23, 2018

Dear Sea Grant,

Monterey Abalone Company is an in-ocean abalone farm that has been sustainably culturing red abalone in Monterey for 25 years. As an in-ocean farm, we need to be able to react quickly to oceanic events such as red tides. In 2007, a *Cochlodinium* bloom resulted in a great loss to our inventory when the algae bloomed and their decay lowered the dissolved oxygen concentrations around our abalone cages overnight.

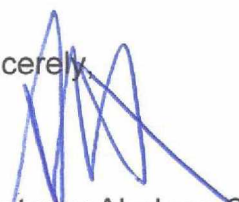
The use of your portable genetic detection device (qPCR) would be very important in informing critical decisions, which could save us from potentially devastating losses. Just this past spring, we were trying to reconcile the absence of *Alexandrium* cells in routine monitoring samples with elevated levels of PSP in bivalves in south Monterey Bay. This would have been the perfect application for the handheld qPCR device, as its rapid run time would have permitted increased temporal and spatial sampling of cells (expanding on weekly routine monitoring), in order to quickly assess potential threats to our cages.

As we look ahead to the future and into possibly expanding our stock to include filter-feeders, the presence of "HAB" phytoplankton communities will need to be more closely monitored, and will be incredibly useful for our industry and for public safety. As HABs and other oceanic events become more frequent, we will need to be able to react to these events more quickly.

In order to help groundtruth the device in the field, we look forward to having you sample around our cages when HAB species have been identified in weekly monitoring and/or when anomalous observations (such as the one this past spring) warrant further investigation.

Monterey Abalone Company finds this type of HAB detection technology to be beneficial for our industry and looks forward to seeing it come online.

Sincerely,



Monterey Abalone Company



The Marine  
Mammal Center

July 15, 2018

Dr. Holly Bowers  
Moss Landing Marine Laboratories  
7544 Sandholdt Road  
Moss Landing, CA 95039

Dear Holly,


We are writing in support of your proposal titled “Advancing portable detection capabilities of Harmful Algal Bloom species in California waters”.

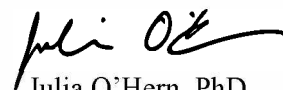
Our mission at The Marine Mammal Center is to “advance global ocean conservation through marine mammal rescue and rehabilitation, scientific research, and education”. We rescue stranded marine mammals from Mendocino to San Luis Obispo Counties, and as you know, many morbidity and mortality cases are due to algal toxin exposure – domoic acid from *Pseudo-nitzschia* in particular. Since January 2017, twenty of 196 sea lion strandings in Monterey and Santa Cruz counties have been linked to domoic acid toxicity. Adding those data to all strandings data for all counties in our response range, we found evidence of domoic acid poisoning in 23% of 506 cases.

Daily sea lion migration patterns make it difficult to understand stranding events in relation to where animals were exposed to toxic prey. The capability to map *Pseudo-nitzschia* populations at a higher resolution, in near real-time, would be an asset to help fill this knowledge gap. To that end, we would be excited to provide opportunities for you to groundtruth your assays in conjunction with our efforts. We would 1) be in communication regarding observations of strandings in and around Monterey Bay and help pinpoint locations for shore-based sampling transects; and 2) have you join us periodically on TMMC small boats as well as partner group boat-based surveys (J. O’Hern, Captain), which would also be a great opportunity to demonstrate your technology to a broader audience of stakeholders.

Looking to the future, this project would provide a proof-of-concept framework for collaborative projects in which we propose broader questions about how HAB populations fit into sea lion ecology.

We look forward to this partnership!

  
Penaya Norris, M.S.  
Marine Scientist

  
Julia O’Hern, PhD  
Monterey Bay Operations Manager

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MarineMammalCenter.org



**UNITED STATES DEPARTMENT OF COMMERCE**  
National Oceanic and Atmospheric Administration  
NATIONAL OCEAN SERVICE  
**Monterey Bay National Marine Sanctuary**  
99 Pacific Street, Bldg 455a  
Monterey, CA 93940

July 12, 2018

Dr. Holly Bowers  
Environmental Biotechnology Lab  
Moss Landing Marine Labs  
8272 Moss Landing Road  
Moss Landing, CA 95039

Dear Holly,

I am writing this letter in support of your SeaGrant proposal entitled, “Advancing portable detection capabilities of Harmful Algal Bloom species in California waters”.

We manage an annual First Flush event where we engage citizen scientists to collect a variety of samples before and after the first major rainfall event of the year for analyses in order to understand the types of pollutants flowing into Monterey Bay National Marine Sanctuary after months of dry weather during which contaminants build up on streets, roofs and parking lots. The results are valuable for a better understanding of potential impacts (including algal blooms) to the marine environment, however they do not always easily correlate to management activities. By coupling First Flush with a Dry Run and source tracking within each watershed, a better understanding of each watershed’s specific characteristics and problem areas can be achieved, providing needed information for decision making and effective storm water programs.

HAB species detection from your portable qPCR device would be a fundamental piece in the Monterey Bay National Marine Sanctuary’s Water Quality Protection Program (WQPP) efforts to understand how the bay responds to land run-off, and we can envision future collaborative work incorporating detection of additional human pathogens. This technology is amenable to increased spatial and temporal sampling at key sites before, during and after the first major rainfall of the year, resulting in an expanded snapshot of how land use impacts coastal ecology.

During this proposed proof-of-concept phase of your work, we invite you to join our citizen scientists during our First Flush and Dry Run events at any of our freshwater or estuarine sites to test for HAB species. Your efforts would serve a dual purpose by generating data that can be incorporated into our annual First Flush reports as a pilot initiative for future work, and providing you with an opportunity to introduce citizen scientists to this type of cutting edge technology – including garnering on-site feedback for feasibility of field-based DNA extraction methods. The First Flush reports have been generated for the past sixteen years and are vital resources for a variety of stakeholders concerned with the health of Monterey Bay.

We look forward to this opportunity to collaborate with your group. If you have any questions, I can be contacted at (831) 647-4217 or [bridget.hoover@noaa.gov](mailto:bridget.hoover@noaa.gov).

Sincerely,

*Bridget Hoover*

**Bridget Hoover,**  
**Director, Water Quality Protection Program**







July 30, 2018

Dr. Holly Bowers  
Moss Landing Marine Laboratories  
7544 Sandholdt Road  
Moss Landing, CA 95039

Dear Holly,

This letter is in support of your proposal: “Advancing portable detection capabilities of Harmful Algal Bloom species in California waters.”

As you know, we are interested in advancing mobile platforms for near real-time detection of organisms and their analytes, including human pathogens, harmful algal bloom species (HABs) and their associated toxins. Our group recently concluded a Proposition 84 project that funded the development of a custom platform for in-field DNA extraction specifically for supporting qPCR assays used for water quality assessments. We are actively seeking opportunities to assess its performance across a broad range of applications – from detecting pathogens, HABs, and eDNA associated with managed and invasive species. With that in mind, we are excited to learn more about the capabilities of the Freedom4 handheld qPCR device you recently acquired, as this is the type of detection technology complements our hand-portable sample preparation system.

We have a number of ongoing field studies in CA and WY that provide opportunities to deploy the Freedom4 for detecting the *Microcystis* toxin encoding genes, pathogens, and targeted eDNA assays. These combined efforts would further your proposed field-based ground truth work to advance the tools as well as the predictive capabilities needed by resource managers and other stakeholders as highlighted in your proposal.

This is an exciting opportunity and we look forward to collaborating with you. Good luck on the proposal!

Sincerely,

A handwritten signature in black ink, appearing to read 'Chris Scholin'.

Chris Scholin, President/CEO  
Monterey Bay Aquarium Research Institute  
7700 Sandholdt Rd.  
Moss Landing, CA 95039

e-mail: [scholin@mbari.org](mailto:scholin@mbari.org)  
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phone: 831-775-1779

August 1, 2018

Dr. Holly Bowers  
Moss Landing Marine Laboratories  
7544 Sandholdt Road  
Moss Landing, CA 95039

Dear Holly,

We are writing in support of your proposal: "Advancing portable detection capabilities of Harmful Algal Bloom species in California waters".

The portable harmful algal bloom (HAB) detection device is of significant interest to the Monterey Bay Aquarium (MBA), as it could be used to inform operational settings of the MBA seawater system in response to a HAB event. The exhibits and galleries at MBA are entirely reliant upon the continuous supply of seawater from Monterey Bay. Some systems receive only filtered seawater, while others, primarily those containing filter feeding organisms, receive raw, unfiltered seawater. The presence of toxic HAB cells in raw seawater could result in the accumulation of toxins in these filter feeding communities. These toxins can be transferred to higher trophic level organisms which consume filtered feeders, potentially causing them harm. Should MBA personnel become aware of a HAB event in Monterey Bay, the typical response is to discontinue the distribution of raw seawater, and to provide only filtered seawater to all systems.


Currently, weekly HAB reports from the Monterey Wharf are used to inform these operations. However, the coarse sampling interval at Monterey Wharf limits our ability to respond quickly to HAB events. Having the ability to quickly mobilize your device at the wharf and/or Aquarium would greatly reduce lag time in making management decisions.

During the project period, we will maintain close two-way communication regarding impending HAB threats and will request testing of the MBA intake system during those periods. We are excited to be part of this 'proof-of-concept' testing of a handheld genetic detection device in an Aquarium setting: near real-time detection of harmful algal cells translates into near-real-time decision making in order to protect our precious living collection.

We look forward to developing this collaboration with you!

Sincerely,

  
Kasie Regnier  
Director of Applied Research  
Applied Research Department

  
Brian Maurer  
Water Systems Manager  
Applied Research Department

July 15, 2018

Dr. Holly Bowers  
Moss Landing Marine Labs  
7544 Sandholdt Rd  
Moss Landing, CA 95039

Dear Dr. Bowers,

I am pleased to support your proposal to USC Sea Grant/Ocean Protection Council titled “Advancing portable detection capabilities of Harmful Algal Bloom species in California waters.”

As you are aware, SCCOOS is one of 11 regional associations that contributes essential ocean observing data to the national U.S. Integrated Ocean Observing System (IOOS<sup>®</sup>). Our mission is to provide coastal and ocean observations and products to a diverse stakeholder community. To that end, we maintain a database for Cal-HABMAP (the California Harmful Algal Bloom Monitoring and Alert Program), a program that was started in 2008 by a group of concerned academics, stakeholders, and managers in the State of California who recognized the need for a coordinated HAB monitoring system. Through an email listserv, Cal-HABMAP provides weekly updates on current HAB events and facilitates information exchange among researchers, managers, and the public. SCCOOS manages the data visualization and long-term data archive to ensure that quality controlled data are fully accessible to users. SCCOOS recently initiated an additional HAB information product in the form of a bi-monthly CA HAB Bulletin that integrates HAB model predictions from the California Harmful Algae Risk Mapping (C-HARM) system with HAB and animal stranding observations (Marine Mammal Center) to synthesize all available near real-time information into a quick outlook for the public and resource managers. Currently, we are iterating on the conceptual design for the Bulletin using feedback from the HAB community and public health/fisheries managers. The product is a collaborative effort with CeNCOOS, our sister RA in central and northern California.

As we look to the future of expanding these products for disseminating HAB information, we embrace data generated by cutting edge technology like the handheld qPCR device your group recently acquired. Mobile platforms such as these that can generate near real-time data are key in our efforts to provide timely information in order to support critical management decisions. The ground-truthing fieldwork outlined in your proposal will serve as a pilot project for proof-of-concept integration of qPCR data into Cal-HABMAP and the CA HAB Bulletin.

This is an exciting opportunity to rapidly advance HAB monitoring and event reporting efforts in California. Good luck on the proposal, and we look forward to collaborating with you on this project.

Sincerely,



Dr. Clarissa Anderson  
Executive Director - SCCOOS





Central & Northern California  
Ocean Observing System

Dr. Henry Ruhl  
CeNCOOS Director  
Monterey Bay Aquarium Research Institute  
7700 Sandholdt Rd  
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July 23, 2018

Dr. Holly Bowers  
Moss Landing Marine Laboratories  
7544 Sandholdt Road  
Moss Landing, CA 95039

Dear Holly,

I am writing to voice support for your proposal titled "Advancing portable detection capabilities of Harmful Algal Bloom species in California waters".

One goal of CeNCOOS, as outlined in our 2014-2019 Strategic Plan, is to maintain HAB monitoring as a core directive. This effort ensures that ongoing, uninterrupted long-term data sets can be utilized by a broad audience of stakeholders. To that end, we have provided continued support for co-PI Smith's and Dr. R. Kudela's (UCSC) weekly monitoring programs at Monterey and Santa Cruz Wharf sites, respectively. The added value of your proposed shore-based qPCR detection technology will be advantageous for 1) expanding temporal and spatial sampling, 2) increasing resolution for difficult species, and 3) responding to rapid response situations.

We expect that this project will enable the future integration of qPCR results into current HAB datasets hosted by CeNCOOS as an added variable towards better understanding population dynamics and their relation to environmental variables (<https://www.cencoos.org/data/parameters/blooms>). These datasets are crucial resources for working towards prediction (now- and forecast models), management and mitigation of HAB events. For example, near real-time species detection will be useful for The generation of HABMAP bulletins (<http://sccoos.org/california-hab-bulletin/>) and the California Department of Public Health in creating public health notices and recreational harvest warnings. In order to increase awareness of the technology and its capabilities among our network of partners, we anticipate having you provide a demonstration-type presentation at one or more CeNCOOS meetings.

CeNCOOS looks forward to continuing our collaboration with MLML through expanded HAB datasets using this exciting new technology.

Best wishes,

Henry Ruhl  
CeNCOOS Director