Harmful Algal Blooms Workshop

March 22-23, 2018 - Sacramento, California

Summary of Key Themes, Discussion Highlights & Next Steps

Overview

California Ocean Protection Council (OPC) and California Ocean Science Trust (OST) co-hosted a workshop on March 22-23, 2018, in Sacramento, California, in partnership with California's Interagency Harmful Algal Bloom Task Force (Task Force). The workshop was convened in order to build upon previous work on HABs and continue implementation of OPC Science Advisory Team Working Group recommendations. The workshop agenda and discussion focused on how the scientific understanding of harmful algal blooms (HABs) can inform domoic acid monitoring for seafood safety in California. Lessons learned from Oregon, Washington, and the federal government were shared to strengthen the discussion.

California's Task Force was established by OPC in early 2016 in response to the 2015-2016 domoic acid event on the West Coast. The Task Force consists of representatives from the California Department of Fish and Wildlife (CDFW), the California Fish and Game Commission (FGC), the California Department of Public Health (CDPH), the California Office of Environmental Health Hazard Assessment (OEHHA), and OPC. In addition to convening and coordinating with the Task Force, OPC funded its nonprofit partner, OST, to convene a Working Group of OPC's Science Advisory Team (OPC-SAT) to advance two important resources regarding HABs and California fisheries in 2016. In August 2016, the Working Group, OST and other partners, developed a Frequently Asked Questions (FAQ) document. The FAQ addressed questions on (1) HABs and seafood toxin monitoring efforts in California; (2) domoic acid and California fisheries; (3) human health and seafood safety concerns; and (4) California's fishery and seafood toxin management. In October 2016, a short-term scientific guidance document was finalized which frames scientific opportunities on harmful algal blooms and California fisheries.

This March 2018 workshop began implementation of two recommendations from the scientific guidance document, and advanced discussions focused on monitoring domoic acid for seafood safety, including:

- Discussing how California and other states are approaching and conducting monitoring for HABs, specifically domoic acid, and how different entities engage in monitoring efforts
- Mapping current sampling locations that reflect HAB species and how to leverage efforts and/or fill gaps in monitoring to maximize the efficiency of the state's domoic acid monitoring
- Learning the current scientific understanding of HAB toxins and how they move through the environment and the food web, and understanding how the scientific community is monitoring for and predicting the movement of HABs
- Identifying potential collaborative partnerships for informing or enhancing the state's domoic acid monitoring for seafood safety
- Outlining next steps for advancing a robust, cost-effective, and flexible monitoring program

Workshop Goals

- Begin implementation of OPC-Science Advisory Team Working Group recommendations, particularly:
    - *Recommendation 1: Continue to build out a robust, cost-effective, and flexible monitoring program that can be responsive to future HAB events, and that considers impacted communities.*
    - *Recommendation 5: Improve understanding of how biotoxins move through food webs.*
- Identify ways to streamline the sampling and analysis process for domoic acid
- Identify how our scientific understanding of HABs can better inform or enhance California's monitoring for HAB species, focused on domoic acid
- Create a roadmap for actionable next steps that will contribute to better informing or enhancing the state's monitoring for HAB species, focused on domoic acid

Forty participants engaged in the March 2018 workshop, including California, Oregon, Washington state and federal agency staff, fishermen, academic scientists, environmental organization representatives, and other partners. Venue spaced was limited so invited participants represented a variety of groups engaged in or interested in HABs monitoring for seafood safety, as well as those who serve as "key communicators" and disseminate information to their respective entities.

This document provides an overview of the key themes, discussion highlights, key questions, and identified next steps that emerged from the workshop. This summary is intended to capture high-level details and key themes, rather than provide a transcript of the discussion.

Key Themes & Discussion Highlights

California, Oregon, and Washington have similarities and differences in how each state monitors and addresses HAB events.

- Oregon (OR) and Washington (WA) use sentinel species to trigger testing in crab.
    - Domoic acid concentrations in Razor clams seem to be tightly linked to domoic acid concentrations in crab in WA.
    - OR and WA test crab during the season if there are high levels observed in bivalves.
- Oregon is working on establishing a shellfish task force and aiming to integrate shellfish monitoring.
- California is working towards greater integration of relevant information from the scientific community in order to leverage resources and maximize effectiveness of monitoring programs.
- California relies heavily on partnerships and volunteers for sampling, and frequency of sample collection is variable based on various factors such as weather, seasonal closures for certain fisheries, and volunteer participation.
- Oregon has evisceration orders for Dungeness crab when viscera levels of domoic acid are above the threshold levels. OR has allowed the commercial fishery to remain open, with an

evisceration order in place, and has closed the recreational fishery when domoic acid levels were above the federal threshold.

- California has explored commercial crab fishery evisceration orders and may consider them as an option in the future if interest arises and if this pathway is beneficial to all entities. In California, when domoic acid levels have been above the action level in viscera in crabs and lobster, the commercial fishery has been closed or the opening delayed. For recreational fisheries, the opening may have been delayed or remained open with an advisory to not eat the viscera.
- Washington has focused on phytoplankton collection in locations tied to shellfish monitoring.

Action step: *Increase communication between the states to learn from one another, share information, and better align protocol where appropriate in terms of monitoring, and collecting and processing seafood samples.*

There is a distinction between monitoring for indicators of current and future HAB events and sampling species for domoic acid in order to determine safety for consumption; both are important. Other data streams and models have the potential to inform or be incorporated into the state's monitoring for HAB indicators.

- California state monitoring for HAB events includes phytoplankton sampling that triggers sampling of bivalve shellfish and possibly other species like crustaceans and fish.
- In California, species are collected for domoic acid sampling through close collaboration with harvesters. There is some variation in how this is done in other states as well, sometimes including observers or more formalized partnerships.
- CDPH would like to receive crab and lobster seafood samples from all goal sites and potentially in advance of and outside the season as well (outside the season could also help inform the academic communities prediction of HAB events and how they move through the environment and food chain).
- The group discussed augmenting the state's monitoring for HAB events with work from academia and other organizations such as UCSB, SCOOS, CENCOOS, etc.
- NOAA ship cruises, CalCOFI data, and data that could be collected at current locations measuring for ocean acidification and hypoxia parameters were mentioned as potential additional data streams to inform the state's monitoring and sampling processes.
- A scientific working group or panel could help inform sampling locations, frequency, and durations for collection of seafood samples for testing of domoic acid.

Action step: *Convene a group of key partners to advance conversations about how various data streams may help enhance the state's monitoring and sampling processes, as well as to discuss the potential for integrating or aligning various data streams and modeling efforts into the state's monitoring and sampling processes.*

Monitoring and research have contributed to enhanced knowledge of where potential domoic acid 'hotspots' may be, and the scientific community is continuing to learn more about when and where these hotspots occur. Continued information exchange between the scientific community, agencies, harvesters and other partners regarding when and where these hotspots occur may be beneficial.

- Considering integration of current predictive modeling efforts was highlighted as an important piece of developing a more efficient and effective monitoring program. Agency staff suggested that using model results that indicate where a harmful algal bloom will likely occur could help target capacity and resources to certain locations for enhanced sampling.
- Information about where potential domoic acid 'hotspots' are located, meaning where blooms and/or where observed threshold domoic acid levels in a species have occurred and are likely to occur, could also help target enhanced monitoring and sampling efforts.

Action step: *Create a map of sampling locations overlaid on likely HAB 'hotspots' as a potential starting place for enhanced monitoring and sampling. A collaborative working group or synthesis publication may need to be advanced in order to succinctly map potential 'hotspot' locations.*

Scientific understanding has continued to evolve since the OPC-SAT scientific guidance on HABs document was released. Scientific advances have been made with respect to hotspots and predictive models; however, many scientific questions remain, particularly with regard to HAB physiology, the mechanisms by which HABs move through the food chain, and further refining and enhancing predictive models.

- Scientific understanding of how domoic acid moves through the food chain is still not well understood and some of the data collected in the past couple of years contradicts previous hypotheses.
- A better understanding of both the mechanisms and timing of how domoic acid moves through the food chain will aid in predictive modeling as well as alerting managers and industry to when domoic acid will impact various seafood species. Sediment is one hypothesis for how domoic acid may be moving into species. However, monitoring and research in the benthic community is needed in order to either confirm, refute, or refine this hypothesis.
- How quickly domoic acid clears from the tissue of different organisms is not well understood, but continues to be a pressing question from managers and fishermen that could help inform management decisions and better allow fishermen to plan their seasons.
- There are unaddressed scientific questions regarding why some *Pseudo-nitzschia* blooms produce domoic acid and why some *Pseudo-nitzschia* blooms do not produce domoic acid (e.g. why are some blooms toxic and some blooms not toxic). Much of our understanding about the physiology and ecology of these organisms comes from studies of similar, but different diatoms in other regions of the world.
- While understanding of the physical ocean conditions that are linked to these blooms is growing and improving, there are gaps in understanding the physiology of *Pseudo-nitzschia* and how and why it produces toxins.

- Integration of predictive models based on environmental factors with physiological data to better predict where 'hotspots of domoic acid' occur, not just hotspots of where blooms occur is needed.
- Currently, more is known about nearshore blooms and toxins, and less is known about offshore and subsurface blooms. More information about these blooms could provide early warning about when a bloom may be moving nearshore. Research has shown that sea mammals, who forage and swim offshore, appear with toxic poisoning onshore a few weeks before signs of a bloom are documented nearshore.
- Participants indicated the need for continued and additional funding to support further enhancing the scientific understanding and impacts of HABs.

Action step: *Given recent scientific advancements, there is a need to prioritize science questions based on most pressing state management needs and to support continued advancements within the marine HABs field.*

Workshop participants all expressed the desire for transparent and predictable processes and communications. Lessons learned from California and other states can inform an effective communications approach.

- Enhanced communication between fishermen, scientists, agency staff, legislative representatives, funders, and other partners was discussed and identified as a continued priority.
- Other states have used mechanisms such as a text alert system from the state to fishermen, a private data portal from academia to managers to see the most up-to-date scientific data, and newsletters to enhance communication between groups. California can consider enhancing, participating or implementing these or similar communications approaches.
- Establishing multiple communications channels will help disseminate information as well as bolster confidence in the process and action steps, as well as trust among partners and stakeholders.
- Communication with the public was also identified as important component of sharing information.

Action step: *Workshop participants began mapping out a skeletal flow chart of a process for HAB and biotoxin related baseline monitoring, event response and sampling, and information dissemination. This flow chart would need to be completed in order to be useful.*

Workshop participants recommend partnerships as a valuable tool to provide enhanced awareness of the issue and the science, improved efficiency, leveraging of resources, and increased trust.

- Current partnerships (e.g. Dungeness Crab Task Force) may help open lines of communication for future partnerships.

- Enhanced communication was acknowledged continuously throughout the discussion as one of the key benefits of collaborative partnerships to share information, address concerns, and increase trust. Examples from other states were also discussed.
- Partnerships can be used to leverage funding and maximize impact.
- There may be value to considering lessons learned from existing partnerships to identify what might be most effective for enhanced HABs monitoring communications, such as the PCFFA magazine, outreach materials developed by NOAA, e-newsletters and updates and other non-traditional communication mechanisms such as text alert systems and private data portals.
- Participants indicated that this workshop provided connections to other colleagues and peers along the West Coast and in California to inform potential future partnership and communication opportunities.

Action step: *Consider communications options explored during workshop and develop an approach to enhance communications for upcoming fishing seasons.*
Action step: *Consider how existing or new partnerships can support enhanced awareness, enhanced efficiency of sampling and monitoring approaches, leveraging of resources, and increased trust.*

Contact

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