

Full List of Submitted Questions: Harmful Algal Blooms and California Fisheries

California Ocean Science Trust, July 2016

In response to the 2015-2016 harmful algal bloom (HAB) and subsequent California Dungeness crab and rock crab fishery closures due to elevated levels of domoic acid, the California Ocean Protection Council (OPC) and the Interagency Marine HAB Task Force (HAB Task Force) asked California Ocean Science Trust to lead the development of a frequently asked questions (FAQ) document, as well as convene an OPC Science Advisory Team (OPC-SAT) working group to:

- Explore the science supporting California's existing HAB and biotoxin monitoring in the marine environment along the coast of California; and
- Provide scientific guidance on how to add capacity and support state needs, as described below.

This work will be informed by questions submitted by variety of sources including the HAB Task Force, the Dungeness Crab Task Force, Senator Mike McGuire's office, Commercial Fishermen of Santa Barbara, and others with regards to harmful algal blooms (HABs) and California fisheries. This document contains the full list of questions submitted thus far.

Ocean Science Trust, working closely with the OPC-SAT working group, will work to determine which questions are feasible to address in the FAQ, and which are appropriate for the working group to address (in both the short and longer-term). The FAQ will prioritize addressing questions that do not require additional research. Visit [here](#)¹ for the list of questions to be addressed in the FAQ.

Additional information and resources are available on the Ocean Science Trust [webpage](#)².

¹ <http://www.oceansciencetrust.org/wp-content/uploads/2016/07/HABs-and-Fisheries-FAQ-List-2016-.pdf>

² <http://www.oceansciencetrust.org/project/harmful-algal-blooms-and-california-fisheries/>

Full List of Submitted Questions

- How are harmful algal blooms and associated biotoxins being monitored along the west coast?
- What harmful algal species and associated toxins are being routinely monitored by the State and how?
- Where can HAB monitoring and active bloom information be found?
- Are HAB events increasing in frequency? Are there links between climate change and HAB events?
- Can we predict future HAB events and impacts to fisheries?
- How are government agencies responding to the 2015/16 shellfishery closures in California (e.g., Dungeness and rock crab, razor clam)?
- What is the history of domoic acid toxicity in seafood in the U.S.?
- What are the current (2016) domoic acid action levels for seafood in California? Clarify if the cutoff is 30 or 31 PPM.
- What is the scientific rationale behind the action levels for domoic acid toxicity in seafood?
- What are the current (2015/16 season) criteria for opening and closing the Dungeness crab fishery based on action levels?
- Where can information be found on the current domoic acid sampling protocol? Cite a protocol or methods paper, if available.
- Where are the domoic acid biotoxin monitoring sites in California?
 - How were the sites selected?
 - How frequently are sites sampled? What determines how frequently sampling occurs?
 - How is spacing of sites considered?
 - How are samples collected within a site (distance, including buffer zones)? Does sampling control for potential differences in domoic acid levels between male and female Dungeness crabs?
- What toxin sampling protocol do other west coast states adhere to for Dungeness crab, and what is the rationale?
- How is domoic acid detected in seafood samples? How are the samples processed during testing? (i.e., are whole crabs homogenized in seawater or freshwater? Are viscera tested separately from crab tissue?)
- How long does it take to process samples once they have been received by CDPH?
- What are the long-term effects of low levels of domoic acid exposure?
- What agency leads California's seafood biotoxin monitoring and sampling programs, and how are these programs funded?
- What are the roles of the various California agencies involved in HAB response, monitoring, and fisheries management?
- How do HAB and fishery management measures in California, specifically for domoic acid and Dungeness crab, link to what is being done in Oregon and Washington?
- What are the roles of the various California agencies involved in HAB response, monitoring, and fisheries management?
- How do HAB and fishery management measures in California, specifically for domoic acid and Dungeness crab, link to what is being done in Oregon and Washington?

- How does Dungeness crab management differ between the recreational and commercial sector, and what is the rationale for this difference?
- What do differences in management between the commercial and recreational sectors mean for opening and closing of each sector? (e.g., why did the commercial sector have to wait while the sport sector was opened?)
- When will testing for the 2016-17 season commence?
- Why was a two-test system required most of the time and a one test system at other times? Describe CDFW's rationale for opening the District 10 line without the two consecutive clean tests required elsewhere.
- What's next for California? How can interested individuals get involved?
- There appears to be a double standard in testing: to initially open a season, all crabs of a 6 crab sample must pass but if a season is already in progress 3 of 6 crabs can fail without a closure being ordered. Is there a scientific basis for this?
- What is the scientific and statistical basis /analysis for the protocols? Are they rigorous and sound?
- Is the overall domoic acid testing protocol/methodology scientifically appropriate?
- Is testing the viscera an appropriate proxy for understanding the domoic acid levels in the meat?
- Can research be performed to show how much domoic acid is in the meat by looking at the viscera?
- What is the level of domoic acid in the viscera when the meat also starts to test threshold levels?
- If the public does consume the viscera, is 30ppm an appropriate threshold to keep people from getting ill?
- Can the threshold be based on an average? Could the average of the sample be below a threshold, however the highest crab cannot exceed a certain level (e.g. 100ppm)?
- Why is 30ppm sometimes over the limit (Trinidad South 2/20/2016) and other times under the limit (Fort Bragg Ten Mile 4/17/2016)?
- Do males versus females respond differently to domoic acid?
- Should all the sampled crabs be legal sized males since those are the ones that will be in the market?
- Support for more research on sublegal versus legal crabs (e.g. Do crabs of different sizes process domoic acid differently?)
- Should there be different sampling for females to consider the sport fishery?
- Is a sample size of six crabs sufficient to understand the domoic acid content of the stock? Would a larger, more representative sample size more appropriate?
- What is an appropriate buffer between a closed and open area for sampling?
- What is the ideal distance between sample sites?
- Once a site or area tests "clean," should it continue to be retested until adjacent sites/areas are also "clean"?
- Once a site or area tests "clean," should it be resampled after a designated period of time to ensure crabs have stayed clean?
- The algal bloom responsible for DA dissipated from the surface months ago, but very high levels of DA persisted in crabs; what explains this?
- Is there evidence that the CA event in crabs could be a multi-year phenomenon?
- Should sediment samples and water samples be taken from depths where the crab samples are being caught (i.e., from the bottom)?
- What are the sentinel species for DA?

- Oregon is doing studies now, on what is the mortality rate when harvesting on soft crab. Can we use their studies or do we need more of our own in CA?
- Are we killing a high percentage of the crab that we would harvest in November by fishing May- June- July?
- There are concerns about the impacts to the resource if the industry fishes on soft crabs. Should crab quality testing also be required to open the fishery?
- Does handling mortality from fishing soft crabs harm the resource?
- Can we incorporate DA test with crab quality (recovery) test? That way we have more crab to choose from for the sample set.
- What should/could a proactive monitoring program look like? Research needs and costs should be identified.
- Why are toxins concentrating in some areas?
- What is the mechanism for HABS forming, moving through the environment, and moving through the food chain?
- How do toxins move through the food chain? We need to better understand the movement of the toxin.
- What is the practicality of depurating the contaminated product, at least for crab and lobster? This is an accepted practice for bivalve shellfish contaminated by bacterial pathogens, placing them in flow-through tanks containing treated seawater. We want to learn more about the cleansing rates in crab and lobster when their diet doesn't contain domoic acid. Toxin residence time in the organism/fish.
- How long will the toxin, domoic acid, be around? What is the residence time in the environment and in the organism?
- Should sediment samples and water samples be taken from depths where the crab samples are being caught (i.e., from the bottom)?
- Should we monitor different habitats – from the sandy beach to the offshore environment?
- Scientific tool usage/development guidance
 - Offshore monitoring tools
 - Downscaled regional models
- Should observers be on boats to help ensure credibility to testing results?
- There is interest by the fleet in working with CDFW, CDPH, and scientists to discuss how to streamline sampling and minimize impacts to the fleet if this scenario were to occur again. How could this process work?
- Why is the process for closing the fishery different than the process for opening the fishery? For example, there can be up to four contaminated crabs before the fishery is closed, but there cannot be any contaminated crabs in a sample to open the fishery. Why is the industry allowed to fish on elevated crabs, but once the fishery is closed, not able to open the fishery if even one crab is elevated?
- Should we ask the FDA to review this standard? (30 ppm)
- Is 30 ppm the correct number for an action level? Should we ask the FDA to review this standard? Do we need research projects to determine if the 30ppm number is the accurate and appropriate number? Is CDPH, the department or any other entity engaged in research efforts to confirm the threshold's adequacy?
- Will we see a written document describing California's future domoic acid testing protocol, domoic acid fishery closure and reopening protocol, and communication measures before next season begins?

- During this entire process, the DPH lab has been criticized for not getting the results out on a timely basis. It was not uncommon to wait 10-12 days or longer to get Dungeness crab results. Quite often, however, numerous rock crab results were released during these lengthy wait periods. Given the significantly greater economic impact of the Dungeness crab fishery and the much shorter season, should the lab give priority to Dungeness crab samples?
- Was laboratory workload a limiting factor during testing? Do we need to talk about sample turn-around time at the lab? If so, are other certified labs available for DA testing?
- In order to reduce overloading the lab, could testing for the three north coast ports (Crescent City, Trinidad and Eureka) be consolidated or rotated among ports until DA averages reached a certain level, e.g., 45 ppm? Thereafter, testing would be conducted on a port by port basis.
- Since only the meat of the crab is consumed, is 30ppm an appropriate threshold?
- Could the Director of CDFW authorize a 10 day fair start within a management area if that management area had multiple openers?
- What is the best way to address non-DA issues: crab quality throughout season, district/statewide opener, etc.
- What opportunity is there to fish under advisories for viscera or requiring removal of viscera prior to cooking/consumption?
- Is there a way to find funding to pay the fishermen for doing the job of collecting samples? Our assoc. paid for the fuel this year for fishermen to get the samples in our harbor, a fishermen should get paid to do the job along with his crew.
- There also was some talk about having the Commercial Fleet regulated and managing the fisheries at a State level. Then the Sport Fleet is managed by the Fish And Game Commission. Then the Health Dept. is managing for DA at the county level. This is very hard for the public to sort out. The consumer will ask, the crab are clean here, the sport are fishing over there, and the commercial are waiting to go fishing, Why? Some work is needed on educating the public, also protocols to reopen fisheries.
- Is evisceration an acceptable and practical strategy when toxin levels are below the threshold in flesh (e.g., crab, lobster, finfish)?