CALIFORNIA OCEAN SCIENCE TRUST

Ask an Expert:
Harmful Algal Blooms Along the California Coast

What are harmful algal blooms (HABs)?

Harmful algal blooms occur when specific types of algae overgrow and produce toxins. Blooms can occur naturally, but under the certain conditions lead to toxins that can harm marine wildlife and can potentially impact human health.

Two main HAB groups in California:

Diatom*: Pseudo-nitzschia* species

Produces *domoic acid* (neurotoxin) that can accumulate up the food chain, causing amnesiac shellfish poisoning in humans and death or illness in wildlife

Dinoflagellate*: Alexandrium catenella*

Produces *saxitoxin* (neurotoxin) that can cause paralytic shellfish poisoning and human illness

What causes HABs?

Blooms of toxin-releasing algae arise from a complex mix of factors - no single factor is a straightforward predictor of all blooms across regions or of different species. Scientists consider the following factors that can be at play during bloom events to think about when we are likely to experience one[1]:

- natural cycles of wind-driven upwelling of nutrient-rich deep ocean waters
- changing climate & oceanographic conditions
- changes in precipitation increasing nutrients into coastal ecosystems
- runoff from land (e.g., fertilizer, human or animal waste)

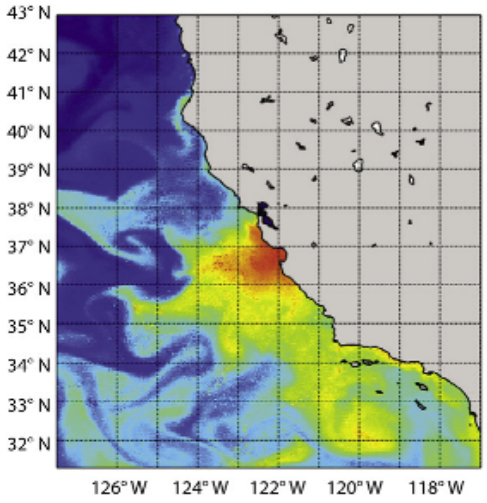

Figure 1: Forecasting domoic acid events from C-HARM run by NOAA CoastWatch. This example predicts the probability (red is high) of domoic acid for March 26, 2016 for the central & north coast of California (from Los Angeles to Oregon)[2]

HAB impacts on wildlife & human health

Marine mammals like sea lions and dolphins can become sick, stranded on beaches, and die if they eat food contaminated by the toxins in harmful algal blooms.[3,4] In the last several years, there has been a high number of marine mammal strandings in Southern California, making news headlines. Domoic acid is linked to behavior changes in wildlife, which has resulted in sea lion attacks on swimmers and surfers. Birds, such as pelicans, have also been poisoned by domoic acid and chicks have starved.[5] Additionally, the neurotoxins produced by algae can accumulate in seafood, posing a danger to human health from seafood consumption. In collaboration with the Department of Public Health and Department of Fish and Wildlife, the State of California Office of Environmental Health Hazard Assessment assesses and tracks HAB impacts on health and well-being of humans, fish and invertebrates, and wildlife.

Monitoring and forecasting HABs in California

There are several efforts California-wide to monitor and respond to HABs (Fig. 3). See boxes below for links to major algae monitoring efforts as well as mammal or bird strandings and rehabilitation centers. Many of these efforts focus on collecting data on the top 9 HAB species in California, and several make use of technology innovations such as Imaging FlowCytobots (automated, submersible microscopes that send real time data of sampled algae; Fig. 2).

Monitoring Efforts

- California HABMAP statewide HAB network and forecasting system
- SCCOOS California Domoic Acid Event Tracker Tool
- California-Harmful Algae Risk Mapping (C-HARM)
- California HAB Bulletin
- CDPH and CalEPA OEHHA: Domoic acid tracking, Marine Biotoxin Monitoring Program, marine HAB-related illness tracking program
- State of California Water Quality Monitoring Council - HAB Report Map

Mammal & Bird Rehabilitation Efforts

- SCCOOS Southern California Stranding Event Tracker tool
- NOAA West Coast Marine Mammal Stranding Network
- San Pedro: Marine Mammal Care Center
- Sausalito: The Marine Mammal Center
- Laguna Beach: Pacific Marine Mammal Center
- Los Angeles & San Francisco Bay: International Bird Rescue

Figure 2: Imaging FlowCytobots
Photo Credit: SCCOOS

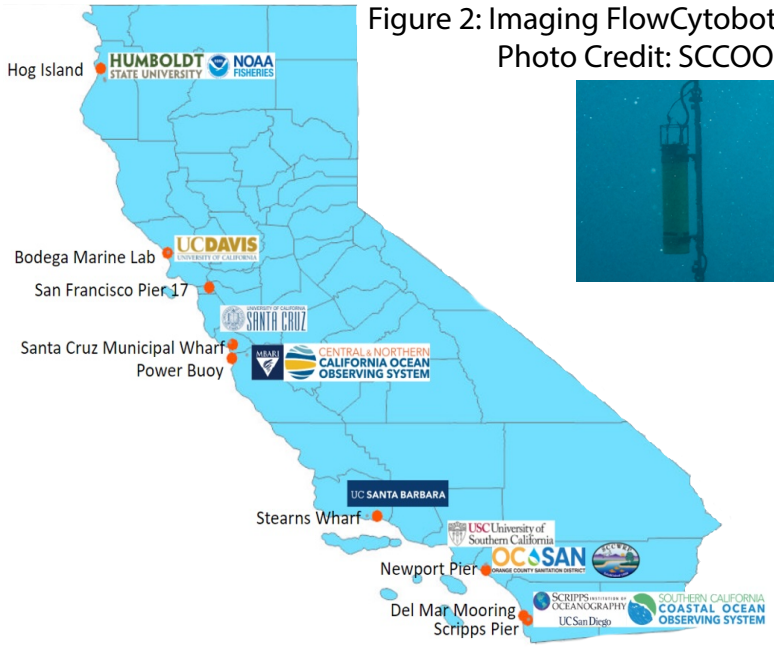

Figure 3: Statewide network of Imaging Flow Cytobots. Most of these stations are also involved in the HABMAP network including the Santa Monica Pier station not listed. Photo Credit: SCCOOS

HABs have increased in California and world-wide, making it essential to better understand, predict, and respond to HAB events. Monitoring efforts are key for tracking, learning from, and advancing our predictive ability and modeling.

References: [1]Sandoval-Belmar et al. 2023 doi.org/10.1016/j.hal.2023.102435 , [2]Kudela et al. 2015 doi.org/10.1016/B978-0-12-802022-7.00005-5; [3]NOAA. March 2025 Feature Story Link; [4]Smith et al. 2023 doi.org/10.3389/fmars.2023.1278293, [5]Gibble et al. 2021 doi.org/10.1016/j.hal.2021.101981