

# Monterey Bay National Marine Sanctuary

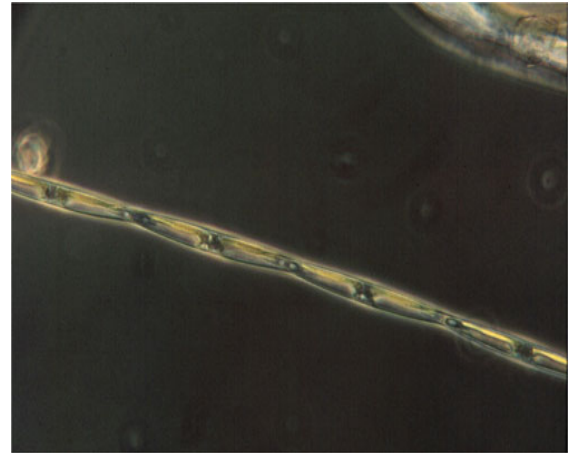
## Human Health - Harmful Algal Blooms

### Management Issue

Harmful Algal Blooms (HABs) are a naturally occurring event on the west coast. In the last 30 years they have increased in both frequency and intensity. Impacts include threats to marine wildlife, economic losses to fisheries and tourist industries, and human health. There is also a potential for long-term shifts in the function of the coastal ecosystems, from diatom-dominated upwelling to more pronounced fall blooms of dinoflagellates, which could alter the diatom-krill-fish trophic structure.

### Description

Recent evidence suggests that HABs are escalating in both frequency and duration. While one culprit is most likely anthropogenic influences, it may also be that events are better documented due to more rigorous and abundant survey methods, or that natural cycles in HAB dynamics are simply on the upswing. Recent HABs are also exhibiting new strains of algae not recognized on the west coast until the early 1990s, such as *Pseudo-nitzschia australis*, a diatom that produces the toxin domoic acid, or the dinoflagellate *Cochlodinium*, which became an issue in 2004, and is a known fish-killer rampant in the western Pacific. By studying the population structure of these potentially toxic species, we hope to gain a better understanding of the mechanisms that control the distribution and toxicity of HABs.



*Picture of the algae Pseudo-nitzschia australis, a strain of algae that was previously unknown on the west coast that harbors the toxin domoic acid. Photo Credit: Sanctuary Integrated Monitoring Network (SIMoN).*

### Questions and Information Needs

- 1) What are reliable indicator species for the presence of HAB toxins (*Emerita* sp., *Mytilus* sp.)?
- 2) How do HABs affect local species populations?
- 3) What are the recovery rates for shellfish and other market organisms (e.g., rockfish, flatfish, bait fish), purging themselves of toxins, after a HAB event has ended?
- 4) What are the natural and anthropogenic factors influencing the HABs?
- 5) What are the other, non-filter feeding pathways that HABs impact the ecosystem, such as through contamination of flatfish or bait fish?
- 6) What are the effects of prolonged low-level exposure in marine organisms such as the California Sea Lion and Southern Otter?
- 7) What role do agricultural versus urban nutrients play in the development of HAB events?

### Scientific Approach and Actions

- Develop a long-term monitoring program that determines causes and effects of HABs including: water quality analysis of effluent, indicator species, and strains of algae
- Identify habitats where recurring HABs appear
- Evaluate temporal and spatial scales of HAB presence, and in particular the relationship to contamination of recreational and commercial fisheries and impacts on marine populations
- Utilize integrated watershed water quality data to assess the impact of the watershed on non-point effluent that might cause HABs

*Current as of 11/28/2012*

*For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>*

## Potential Key Partners and Information Sources

University of California at Santa Cruz, Monterey Bay Aquarium Research Institute, Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Department of Public Health

## Management Support Products

- Maps of habitat distribution and HAB threat levels posed by proximity to fishing grounds and tourist areas
- Determine placement of reoccurring HAB water bodies
- Integrated map of the population structure of fishes and invertebrates to determine distribution and toxicity of HABs
- Characterization of the relationship between biological communities, oceanographic conditions, and anthropogenic influences that may cause HABs

## Planned Use of Products and Actions

- Enhance existing notification systems to increase public awareness of HAB events and potential consequences
- Work with local jurisdictions to reduce private and public sources of effluent that might contribute to HABs
- Develop criteria for selecting and prioritizing habitats vulnerable to HABs
- Increase understanding of the mechanisms that control the distribution and toxicity of HABs
- Develop and implement prevention program for known introduction pathways of effluents that cause HABs
- Assess ecological and economic impacts of HABs in the Sanctuary

## Program References

### MBNMS Management Plan

- Beach Closures and Microbial Contamination Action Plan, Strategy BC-2, BC-3
- Water Quality Protection Program Implementation Action Plan, Strategy WQPP-9, WQPP-10, WQPP-17

### MBNMS Condition Report

- Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality? (Offshore Environment - Question 1)
- What is the eutrophic condition of sanctuary waters and how is it changing? (Offshore and Nearshore Environment – Question 2)
- Do sanctuary waters pose risks to human health? (Offshore and Nearshore Environment – Question 3)
- What are the levels of human activities that may influence water quality and how are they changing? (Offshore and Nearshore Environment – Question 4)
- What is the condition or health of key species and how is it changing? (Offshore and Nearshore Environment -Question 13)

### ONMS Performance Measures

- Number of sites in which water quality, based on long-term monitoring data, is being maintained or improved
- Number of sites in which select living marine resources (LMRs), based on long-term monitoring data, are being maintained or improved
- By 2017, all sanctuaries will have monitoring programs with an observing system component that adequately track the status and trends of sanctuary resource conditions

*Current as of 11/28/2012*

*For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>*