



Cabrillo Marine Aquarium Lesson Plan

Grade Level: Sixth Grade

Title: Beware! Harmful Algal Blooms

Objective: Students will learn about the negative impacts of urban runoff to the marine environment and research different species of phytoplankton that may lead to harmful algal blooms.

California Science Standards: 6th: 2b, 5a, 5b, 5c, 5e, 7d

Time to Complete: 30 minutes for instruction plus project time for students

Materials Provided by CMA Ocean Discovery Kits: *Graphic: Zooplankton ID Guide, Graphic: Phytoplankton ID Guide*, Giant Microbes: Red Tide (*Alexandrium* spp.) and Sea Sparkle (*Noctiluca* spp.), photos and videos of some HABs on CD

Materials Provided by Teacher: Paper for designing Wanted Posters, computers for students to complete research

Vocabulary: Biomagnification, bioaccumulation, eutrophication, harmful algal bloom, runoff, toxin, weathering

Background Information:

As water moves through our watersheds in Los Angeles from mountains, through city streets, and ultimately to the ocean, the runoff can pick up pollutants that come in different forms. The more obvious and visible types of pollutants are things like plastic bags, cigarettes, and polystyrene (Styrofoam). There is also a whole host of other pollutants that cannot be as easily detected with the naked eye. In this lesson, we will focus on nutrient pollution and the harmful effects of having too much of a good thing in our oceans.

Nutrients naturally run off from land to sea and this process is beneficial to life in our oceans. Weathering of soil and rocks in a watershed can be an important source of these essential nutrients to coastal ecosystems. Unfortunately, the amount of nutrients entering our oceans increases due to human activity. Human-related nutrient pollution can come from water treatment plants, soaps, fertilizers, agriculture, and livestock farming. An increase in nutrient pollution can result in excessive growth of algae. This rapid growth of algae is called a harmful algal bloom (HAB).

HABs can block the amount of sunlight penetrating the water making it inhospitable for other organisms such as seagrass and kelp to thrive. As the algal bloom dies off and decays, oxygen can be used up leading to extremely low levels of dissolved oxygen in the surrounding environment killing organisms such as fish and invertebrates. Some algal blooms can also pose a different kind of threat. There are a handful of species of microscopic algae that are able to produce toxins. These toxins can make their way up the food chain through biomagnification and bioaccumulation and be detrimental to top predators and even humans.

Here is a list of some of the organisms that can cause harmful algal blooms and (if applicable) toxins associated with them in parenthesis: *Alexandrium* spp. (saxitoxins), *Dinophysis* spp. (dinophysis toxin, okadaic acid), *Pseudo-nitzschia* spp. (domoic acid), *Akashiwo sanguinea*, *Cochlodinium* spp., *Lingulodinium polyedrum* (yessotoxin), *Noctiluca* spp., *Phaeocystis* spp., *Prorocentrum* spp.

Lesson Procedures:

1. Discuss impacts of nutrient pollution with students, highlighting HABs.
2. Use *Graphic: Phytoplankton Identification*, Giant Microbes: Red Tide (*Alexandrium* spp.) and Sea Sparkle (*Noctiluca* spp.), photos and videos from CD, and photos and videos found online to show students what HABs look like.
3. Break students into groups to research a species of microscopic alga that can lead to a HAB.
4. Have students create a "Wanted Poster" to warn the community of potential culprits of HABs. The Wanted Poster can include the following information: the species name, an illustration of the microscopic alga, written physical description, harmful effects on the environment. If the alga can produce toxins, have students include information on the harmful effects of the toxin.
5. Have students present their Wanted Posters to the class.

Lesson Extensions:

1. You can also give students a choice of creating a nightly news segment warning the community of their species of microscopic alga, or a "live" news broadcast at the scene of a HAB.
2. Tow for plankton and look for potential HAB related organisms.

References:

- Nutrient Pollution:
<http://oceanservice.noaa.gov/facts/nutpollution.html>
- Harmful Algal Blooms:
<http://oceanservice.noaa.gov/hazards/hab/>
http://oceanservice.noaa.gov/websites/retiredsites/sotc_pdf/hab.pdf