Cabrillo Marine Aquarium
Lesson Plan

Grade Level: Fourth Grade, Sixth Grade

Title: Ocean Food Chain Game

Objective: Students will be able to define a food chain and recognize the difference between an herbivore, carnivore and omnivore.

California Science Standards: **4th:** 2b **6th:** 5a, 5b

Time to Complete: 50 Minutes (It is recommended to have at least twelve students for this activity. Plan on 30 minutes of "play" time.)

Materials Provided by CMA Ocean Discovery Kits: ***Worksheet: Observation and Analysis of the Ocean Food Chain,*** Animal Buttons; Pictures of Phytoplankton, Pacific Sardine, Pacific Mackerel, Yellowtail; Preserved Specimens of Pacific Sardine, Pacific Mackerel

Materials Provided by Teacher: Masking tape, sandwich bag (or other container) per student, 4-5 liters of popped popcorn, pencils, stopwatch or clock

Vocabulary: Carnivore, decomposer, food chain, food web, herbivore, omnivore, phytoplankton, plankton, primary consumer, producer, secondary consumer, tertiary consumer, trophic level

Teacher Preparation:

1. Make a "stomach" bag for each student by placing strips of masking tape across each plastic sandwich bag so that the bottom edge of the tape is 4cm from the bottom of the bag. The top of the tape, then, will be 6.5 cm from the bottom of the bag.
2. Make sufficient copies of the "Observation and Analysis" worksheet for the class.
3. You will want to select a large area or other open space that is suitable for a game of tag.

Background Information:

The transfer of food from its source, algae and phytoplankton, to one or more organisms is called a food chain. (To go deeper, the chain actually starts with photosynthesis) This transfer occurs when one organism consumes another. In this game, there are four links to the food chain: phytoplankton, sardine, mackerel, and yellowtail. Popcorn represents the phytoplankton, and students play the parts of sardine (phytoplankton eaters), mackerel (which eat sardine), and yellowtail (which eat mackerel). During each round of the game, the "animals" must get enough to eat and avoid being eaten. In this game, the populations (one kind of organism living in a given area) are so small that the survival of two sardine,

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two mackerel, and one yellowtail (a highly migratory fish that frequently is found in schools so it can find a mate and thus reproduce) represents a "balanced" food chain.

Phytoplankton: Derived from the Greek words "*phyto*" (plant) and "*plankton*" (made to wander or drift), these microscopic plant-like organisms are the base of the marine food web, and they play a key role in removing carbon dioxide from the air. Like land plants, phytoplankton have chlorophyll to capture sunlight, and they use photosynthesis to turn it into chemical energy as they consume carbon dioxide and release oxygen. Phytoplankton (producers) serve as food for fish and other larger organisms.
Sardine (*Sardinops sagax*): Reaching an average length of up to 16 inches, the Pacific sardine (omnivores) are a schooling fish that feed on zooplankton (copepods, arrow worms, and krill) and phytoplankton.
Mackerel (*Scomber japonicas*): The Pacific mackerel reaches a length of 25 inches, and similar to Pacific sardine, they are a schooling fish. Mackerel (carnivores) will feed on small fishes, squids, and large plankton such as krill and copepods.
Yellowtail (*Seriola lalandi*): Yellowtail are a type of jack and can reach a length of 5 feet. Swimming usually in schools, they (carnivores) feed on mackerels, squid and pelagic red crabs.

	Pacific Sardine	Pacific Mackerel	Yellowtail
Length	Up to 16 inches; average 9 inches	Up to 25 inches; average 16 inches	5 feet
Lifespan	16-25 years	11 years	12 years
Age of maturity	2^{nd}-3^{rd} year	Males – age 1 Females – age 2	2 years; all spawn by 3 years
Breeding Season	All year; peaks February-August in Southern California; spawn every 6-8 days during peak season	January – October; peak April to August; spawn 8 or more times per season	Off warmer waters May – October; peaks July and August off central Baja California
Number of eggs produced per spawn	9,000 – 101,000	68,000	458,000-3,900,000 per season

Lesson Outline:
1. Observe the fish specimens, focusing on overall size and mouth size. Have students draw and label mouths on the handout.
2. Define a food chain: the transfer of energy from the primary producers (typically green plants) through a series of organisms that eat and are eaten, assuming that each organism feeds on only one other type of organism.
3. Students record definition on the worksheet.

4. Inform students the three fish they are observing are part of the same food chain. Based on their observations, have students infer the food chain for these fish. Complete a think-pair-share.
5. Diagram the

   phytoplankton → sardine → mackerel → yellowtail

   food chain on the board, and display it to the group.
6. Define and identify the *producer*, *consumer* as well as *omnivore* and *carnivore.* (There are no herbivores in this activity.)
7. Explain to students that they are going to become sardine, mackerel and yellowtail in a food chain game.
8. Scatter the popped popcorn over the area and explain that popcorn represents the phytoplankton eaten by the sardines.
9. Place students in three groups and attach the animal identification card. (A specific colored sash or bandana for each type of animal can replace the card and be tied around each student's waist or arm). Be sure each student knows which animal s/he is portraying.
10. Each student should also attach one stomach. Explain that when the game starts, the sardine will only try to eat the phytoplankton (popcorn) by placing it in their "stomachs." The mackerel will only try to eat the sardine (by tagging them) while the yellowtail will only try and eat the mackerel (by tagging them). When a mackerel tags a sardine, the mackerel takes the sardine's "stomach" and the sardine leaves the game. When a yellowtail takes a mackerel, it takes the mackerel's "stomach" and the mackerel leaves the game.
    a. Emphasize that sardine can only feed on the phytoplankton, and that the mackerel can only eat the sardines, while the yellowtail can only eat the mackerel. All animals that are eaten must wait on the sidelines.
    b. Mackerel can eat more than one sardine, and yellowtail can eat more than one mackerel.
    c. Announce that the round will last 3 minutes or until all of one kind of organism are eaten.
11. Play the game by recording the starting population numbers on the data board. State the challenge, and start the stopwatch, then yell, "GO!" The first round lasts a short time because all of the sardine or mackerels are quickly eaten.
12. Count survivors. After the first round, record on the data board the number of each kind of animal that obtained enough food to survive. (Record on handout)
    a. A sardine's stomach must be filled to the bottom of the tape (4cm), and a mackerel's stomach must be filled up to the top of the tape (6.5 cm from the bottom of the bag).
    b. Yellowtail need the equivalent of one mackerel with a full stomach to survive.
    c. Animals with less than a full stomach at the end of round "starve to death."
13. Balance the food chain. Explain that at least two sardine, two mackerel, and one yellowtail must survive at the end of the round to have a balanced food chain.

a. Ask students how they can change the game to produce a balanced food chain. Typical suggestions are: change the number of sardine, mackerel, and yellowtail; provide more phytoplankton (popcorn); set up a safety zone for the sardine and mackerel where they are protected from attack; time releases, sardine feed for thirty seconds before mackerel look for food.

14. Play again. Record the students' suggestions and rank them in order of what the group wants to try first. Make the necessary adjustments: adding or removing identification cards/sashes/bandanas, redistribute "stomachs," and return popcorn to the activity area.
    a. Record the starting populations and reset the timer and play a second round.
15. Allow players to keep changing the rules and repeating the game until they end up with a balanced food chain. At the end of each round, record the number of survivors. Encourage students to compare the results after each round to help them figure out how to balance their food chain. (Record on worksheet.)

Lesson Extensions:

- Yellowtail are highly migratory so more are present in a round.
- As seasons (round) change, Pacific sardine tend to move offshore and spread out in smaller, more numerous groups. Reduce the number of sardine in a round.
- Increased nutrients from human activity has caused a harmful phytoplankton bloom (red tide) to appear on shore. This has reduced the amount of oxygen present in the surrounding waters and many fish move out of the area.
- Introduce a new predator to a round: sea lions, birds, sharks, whales and dolphins all feed on all fish. (Be sure this fish is identified, has a "stomach" and knows what it needs to survive.)
- Introduce humans and their fishing techniques (e.g. purse seine).
- Introduce a population explosion due to breeding.
- Introduce pesticides (colored popcorn) to represent food contaminated with pesticides. Identify how many an organism can eat before it can become fatal (i.e. three for sardine, five for mackerel, ten for yellowtail).
- Increase the competition for food. Both mackerel and yellowtail eat sardine.
- Take a field trip to the Cabrillo Marine Aquarium. Contact (310) 548-7562 for more information and booking dates. Information can also be accessed at: http://www.cabrillomarineaquarium.org/education/programs-school-group.asp .

References:

- http://www.anapsid.org/pdf/foodchaingame.pdf
- Love, M. S. *Certainly More than You Want to Know about the Fishes of the Pacific Coast*
- California Department of Fish and Game. Resources Agency. *California's Living Marine Resources: A Status Report*

Cabrillo Marine Aquarium
Lesson Plan

Grade Level: Grades 2 and 4

Title: Meroplankton Match-Up

Objective: Students learn about larval and adult stages of zooplankton in the ocean**.**

California Science Standards: **2nd:** 2a, 2b, 4a **4th:** 2a, 2b, 3b, 3d

Time to Complete: 20 minutes

Materials Provided by CMA Ocean Discovery Kits: ***Worksheet: Meroplankton Match-Up*** (2 versions), ***Photo: Pacific Rock Crab - adult, Photo: Pacific Rock Crab larvae – zoea larvae, Photo: Purple Sea Urchin - adult, Photo: Purple Sea Urchin larvae – pluteus larvae,*** Who am I? Meroplankton Cards, Specimens: Adult Stage in ODK

Materials Provided by Teacher: Copies of worksheet and answer key

Vocabulary: Plankton, zooplankton, phytoplankton, meroplankton, holoplankton, invertebrate

Background Information: Read Aloud & Discuss with Students

In the ocean, many plants and animals spend part or all of their lives floating in the water as plankton. Plankton are at the mercy of the waves, tides, and currents. The study of plankton is termed planktology. The word *plankton* describes organisms in the water column that cannot swim against a current. Plankton size can range from a 100-foot chain of jellies to the smallest microscopic plants and animals in the ocean. The word *plankton* is derived from the Greek word for 'wanderer.'

Plankton live in oceans as well as fresh water. Animal plankton are called zooplankton. Plant-like organisms are called phytoplankton. Phytoplankton are producers, photosynthesizing to make their own food and becoming a food source for zooplankton.

Categorizing plankton, we can also group them based on whether the organism continues to move in the water in the same way its whole life cycle or if it changes body style and on how it moves through the water during its life cycle.

Zooplankton can be divided into two sub-groups. Holoplankton are animal plankton that spend their entire life as plankton. Meroplankton do not stay planktonic their whole life.

Meroplankton are only planktonic for part of their life cycle and at some point become nektonic (able to swim against a current) or benthic (attached/sea floor existence). Examples

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of meroplankton include larvae of sea urchins, sea stars, crustaceans, marine worms, and many fish (nektonic).

There are two types of animals that fall into the group called meroplankton. Invertebrates are examples like sea stars, sea urchins, crabs, sea anemones, sand crabs, sea snails, sea slugs, and clams. Vertebrates include the many types of fish that have a planktonic stage.

Lesson Outline: Meroplankton Match-Up

Many organisms are plankton during their larval stages and grow to be very different-looking organisms as adults. In this activity, students will match pictures of larval and adult animals.

Lesson Procedures:

1. Each group of students is given a worksheet with a set of larval and adult plankton pictures.
2. Students pair the larval and adult pictures and then check their answers to a key given at the end of the activity.

Lesson Wrap-up: Discussion & Questions

1. How do the larval and adult pictures of a single organism compare? Ask students to describe similarities of the larval and adult stage and give details.
2. How did students determine which larval picture went with which adult picture? Ask them to give specific examples.
3. What are the similarities between the larvae and the adult organisms? What are the differences?
4. When the body structure of the organism changes, how might that affect the animal's ability to eat, move, find shelter, and escape predators? Use specific examples such as "how does life change for a fish versus a sea star?" For example, a fish would be a better swimmer, eat larger prey, and be able to follow food sources to different areas because it can now swim against a current in the adult stage. A sea star can attach to rocks or live on the sea floor and (except for the brittle sea stars) will no longer be eating plankton.

Lesson Extensions: Make Your Own Plankton

Plankton are not strong swimmers yet have adaptations for floating, moving, and being able to catch food. Explain that plants use the energy of the sun, and zooplankton eat phytoplankton and other zooplankton. Students can choose whether their plankton make their energy from the sun, or obtain energy by eating other organisms. When asking students to invent their own plankton, they will have to make decisions about how the organism gets energy, about its body structure to aid in survival, and about its life cycle (does it stay plankton its whole life?). They can then make a picture of it and describe how it survives. See link to 'making your own plankton' for additional ideas or materials.

References:

- Summary of Phytoplankton and Zooplankton
  http://www.nhptv.org/natureworks/nwep6d.htm

- Ideas for simple 'making your own plankton' activity
  http://www.gma.org/onlocation/globecactiv.html

Cabrillo Marine Aquarium
Lesson Plan

Grade Level: Fifth Grade

Title: Diatom Art

Objective: Students will: (1) be introduced to the size, shape and color of diatoms; (2) be able to describe the importance of microscopic organisms such as diatoms; and (3) create a pattern inspired by Victorian age art that involved arranging diatoms on a microscope slide.

California Science Standards: **5th:** 2f, 2g

Time to Complete: 90 minutes + time to allow art project to dry

Materials Provided by CMA Ocean Discovery Kits: ***Worksheet: Diatom Art Template, Worksheet: Phytoplankton Coloring Sheet, Graphic: Example of Diatom Art 1-3, Photo: Diatom Art 1-6,*** Prepared Slide with Assorted Diatoms

Materials Provided by Teacher: Images and videos of diatoms from the Internet (optional), art supplies (paper, pencils, crayons, paint or sponge brushes, watercolors, construction paper, cups for water), newspaper**,** scissors, glue

Vocabulary: Diatom, phytoplankton, zooplankton, frustule, producer, photosynthesis, centric, radial, pennate, bilateral symmetry, radial symmetry

Teacher Preparation: If desired, search the Internet for pictures and/or videos of diatoms, and other examples of diatom art. Make enough copies of the ***Worksheet: Diatom Art Template*** for each student and some extras to have handy.

Background Information:
Diatoms: Diatoms are a group of phytoplankton that have cell walls made up of glass-like, silica shells. This glass-like shell is called a frustule and has two halves (or "valves") similar to a petri-dish or Tupperware container where one side fits into the other. Diatoms are primary producers that use the energy from the sun to do photosynthesis, making them an important part of the marine food chain. In the marine environment, diatoms are often eaten/consumed by zooplankton. Diatoms also produce oxygen as a by-product of photosynthesis so humans and other organisms on our planet that respire benefit from diatoms as well. Diatoms are found in two basic shapes, centric (round or radial) and pennate (thin ellipse). Diatoms can be solitary or form chains.

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Diatom Art: During the Victorian age (mid to late 1800s), microscopes were improving and becoming more commonplace. People were fascinated with what everyday objects looked like under a microscope because things looked so different than what people could only see with the naked eye. Some households even had a cabinet of curiosities with prepared slides of items such as bones, insects, feathers, cloth, fossils, and even diatoms. To create diatom art, microscopists would move diatoms around under the microscope with a single human hair mounted on a wooden shaft to create elaborate designs and patterns.

Lesson Outline:
Students will be introduced to artwork from the Victorian age which involved arranging diatoms on a microscope slide to create microscopic intricate patterns. To further illustrate the diversity of colors, shapes and sizes of diatoms, teachers can show videos and/or more pictures. Students will use diatom inspired shapes and colors to create their own diatom art patterns on paper.

Lesson Procedures:

1. Project or pass around photos of Victorian diatom art without revealing from what the patterns have been created.
2. Have students guess how the artists created the art, what materials the artists might have used, and during what time period the art might have been created.
3. After allowing enough time for students to make their guesses, share with them how these images were created and what they were created with.
4. Using videos and/or pictures found on the CD in the Plankton and Algae Kit or the Internet, or the prepared slide of diatoms, introduce students to the amazing diversity of diatoms that exist in a microscopic world in our ocean water. Discuss the structure, function, and importance of diatoms.
5. Have students create their own geometric, bilaterally or radially symmetrical patterns using shapes and colors inspired by diatoms.
6. Using the ***Worksheet: Diatom Art Template*** provided, have students first draw/sketch a single concentric diatom shape in the center.
7. Next, select only one slice of the template and working from the center towards the outer part of the triangle, draw different diatoms to fill up most of the space.
8. Now have students draw the same diatoms from the first slice into all of the remaining parts of the circle.
9. After the design is sketched, students can darken the outlines with pencil.
10. Color the diatoms using crayons. You can encourage your students to use reds, greens, yellows, golds, and browns to imitate the colors naturally found in actual diatoms.
11. Now have students put their sketched designs on a stack of newspapers to paint the background of their designs with watercolors. Be sure to tell your students not to move the paper around when it is wet because the paper may tear easily. Gently blot (not rub!) with paper towels if necessary. Students can paint in a

radial fashion, starting with the middle of the circle and using different colors as they move to the outer, larger concentric circles.

12. After the artwork is dry, you may want to cut the circles out and mount onto construction paper.

Lesson Extensions:

1. For younger students, teachers can have different diatom-inspired shapes pre-cut from construction paper or pre-drawn patterns, which students can choose from to arrange in their own radial pattern on a second sheet of construction paper.
2. For older students familiar with using photo editing software, like PowerPoint or Photoshop, artwork can be done on a computer.
3. Examine samples of concentrated ocean water under a microscope to look for diatoms.
4. Look at diatomaceous earth under a microscope.
5. Include the ***Worksheet: Phytoplankton Coloring Sheet***

References:

- Diatoms are Delightful
  http://glaquarium.org/wp-content/uploads/2012/08/Delightful-Diatoms.pdf
- Tree-of-Life Web Project
  http://tolweb.org/Diatoms/21810
- Monterey Bay Aquarium Research Institute Diatoms Quick Facts
  http://www.mbari.org/staff/conn/botany/phytoplankton/phytoplankton_diatoms.htm
- Plankton Chronicles, Diatoms – Life in Glass Houses (video)
  http://www.planktonchronicles.org/en/episode/new-diatoms-life-in-glass-houses
- A Cabinet of Curiosities – A Selection of Antique Microscope Slides from the Victorian Era
  http://www.victorianmicroscopeslides.com/slides.htm

Cabrillo Marine Aquarium
Lesson Plan

Grade Level: Seventh Grade

Title: Crazy Currents

Objective: Students will practice tracking pollution/marine debris by following oceanic currents.

California Science Standards: 7th: 7a, 7b

Time to Complete: 30 minutes

Materials Provided by CMA Ocean Discovery Kits: ***Reading Handout: The Great Pacific Garbage Patch, Worksheet: Oceanic Surface Currents Map, Worksheet: Pacific Ocean Surface Currents Map, Graphic: Oceanic Surface Currents Map, Graphic: Pacific Ocean Surface Currents Map,*** Examples of Marine Debris

Materials Provided by Teacher: Copies of oceanic surface currents maps. Teacher can add more examples of trash from around the classroom that could become marine debris.

Vocabulary: Current, point source pollution, non-point source pollution, marine debris

Background Information: Destructive or not, marine debris has provided human kind with priceless information regarding oceanic currents. We have followed glass bottles, rubber duckies, even Nike shoes to discover the more complex movements of our waters.

Lesson Procedures:

1. As a class, read aloud the ***Reading Handout: The Great Pacific Garbage Patch***
2. Inform students that we will be using our knowledge of the ocean's currents to track pollution.
3. Divide class into small groups.
4. Give each student or group a copy of a map that shows the oceanic surface currents and an item that will represent the marine debris they will track.
5. Teacher or group can provide a country of origin for their debris and a destination.
6. Using the map, groups must plot a route the debris may take (many possibilities).
7. To make the lesson more interesting/challenging:
    - Use the version of the map with no currents named and have students follow directions from origin to destination (e.g., origin: Peru, south equatorial current, east Australian current…)

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- Group chooses origin, # of currents entered, destination, and clues regarding where the debris has been (plastic bag with lei inside must have passed by Hawaii at some point).

Lesson Wrap-Up:

1. Have students present their marine debris, the country or origin, and which currents the marine debris followed.
2. The items you used for your lesson were most likely examples of point source pollution. Discuss the difference between point source pollution and non-point source pollution.

Lesson Extensions:

- What products and/or countries contribute most to marine debris? Is this an accurate representation/assessment? Why and why not?
- Have students research some of the major environmental impacts of their particular type of marine debris.
- Use the online computer model simulation program called Ocean Surface Current Simulator (or OSCURS) to compare students' predictions with a computer model's prediction. You can find instructions for OSCURS in Lesson 2: Geographical Distribution of the High School portion of your binder.
- Have students look-up natural disasters (i.e. Hurricane Katrina, Japanese tsunami, BP oil spill, etc.) and link the impacts to the marine environment and the associated marine debris.

References:

- Moody, S. *Washed Up: The Curious Journeys of Flotsam and Jetsam*
- http://education.nationalgeographic.com/education/encyclopedia/great-pacific-garbage-patch/?ar_a=1
- http://science.howstuffworks.com/environmental/earth/oceanography/great-pacific-garbage-patch.htm
- http://www.algalita.org/education/school-assemblies.html

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).

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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