Lesson Plan

Empty Oceans

Focus
Sustainable Seafood

Focus Questions
How does the human population affect the population of marine species?
What can citizens do to sustain seafood populations?

Learning Objective
Given the information from the Seafood Watch cards, the students will create a poster to:

- explain what contributes to unsustainable fishing practices and habitat damage.
- explain how citizens can help sustain seafood populations

Grade Level
6-8 (Life Science/Earth Science)

Materials
- ☐ Computer with internet access (Note: all information can be pre-downloaded and printed)
- ☐ Monterrey Bay Aquarium Seafood Watch cards: National and Regional
- ☐ Chart paper
- ☐ Markers
- ☐ Sample charts and graphs

Audio Visual Materials
Overhead or PowerPoint presentation of:
- ☐ Sample charts and graphs
- ☐ Fishing methods
- ☐ Issues in the ocean

Teaching Time
2-3 class periods of 45-55 minutes

Seating Arrangement
Flexible

Maximum Number of Students
30

Key Words
Sustainable (seafood)
Bycatch
Habitat
Longlining
Bottom trawling
Trawling/Dredging
Gillnetting
Purse Seining
Threatened species
Endangered species
Over-fishing

Background Information
In the previous lesson, the students learned about food chains, the food web, and the effect of the removal of large amounts of biomass from a species. In this lesson, students will learn how pieces of the ocean food web, fish, are being removed faster than they can be replenished and how they can become informed consumers to promote sustainable seafood.

Around the world, fisheries are threatened with collapse due to unsustainable fishing methods and ecosystem destruction. There are a variety of factors affecting the oceans and its inhabitants around the United States. Bycatch, habitat damage, and over-fishing are the primary causes in recent times of the decline in species in the aquatic environment. Bycatch results from fishing methods, such as longlining and bottom trawling, which use very large nets to sweep through the water. Fishermen target a certain species, but the nets and lines catch any marine life in their path. This is a significant problem for threatened and endangered marine species. Turtles, whales, and dolphins often become entangled in nets and lines that hinder their ability to catch food or prevent them from surfacing to breath

Habitat damage is evident in various ecosystems along the coastal United States. Coastal waters suffer from the constant population growth along the coasts. Bottom trawling drags nets over the seafloor to catch fish, scallops, sea urchins, and crustaceans, but the nets and the rockhopper gear damage coral and places where fish feed and breed.

Between 1950 and 1994, commercial fishermen increased their catch by 400% to keep up with the growing demand for seafood. Since 1989, the oceans have been over-fished (fish are caught faster than they can reproduce). However, new boats are set into the waters every year around the world. Examples of over-fished species include: cod, sharks, bluefin tuna, many types of West Coast rockfish, monkfish, orange roughy, and Chilean seabass.

However, there are actions citizens of all ages can take to help reverse the decline. The Monterey Bay Aquarium has developed regional and national Seafood Watch cards to guide consumers toward seafood choices that are sustainable (balance fishing practices with species reproduction). The cards give information about the best choices for seafood, good alternatives if the best are not available, and seafood to avoid. Best seafood choices include fish that are sustainably harvested using gear that allows for the least harm to the species' population and to the environment. The information on the cards is updated regularly.

PREPARATION

Download the National Seafood Watch card and the corresponding card for your region of the United States at http://www.mbayaq.org/cr/cr_seafoodwatch/download.asp.
(Note: You may also request wallet-size cards by contacting your nearest National Marine Sanctuary.)

Download the "Issues" summaries at http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_issues.asp.

Download the fact sheets or cards about Fishing and Farming Methods at http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_gear.asp#top.

Prepare sample charts and graphs for overhead projector or PowerPoint presentation.

LEARNING PROCEDURE

Introduction:
Separate the students into groups of four. Have them brainstorm what they know about the fish they eat, such as the names of the fish, where and how they were caught, and any other information they know about the fish, such as its abundance in the ocean. After the brainstorming session, have each group record their information on a chart, and bring the class back together to share ideas.

Lesson:
Activity A: Issues and Fishing Methods

1. Separate the class into groups of four for a jigsaw activity. Have each student visit the Monterey Bay Aquarium Seafood Watch website to learn about the issues surrounding seafood and the fishing gear used to catch seafood. Have each student take notes on one Issue. Then, have students each research and take notes on one fishing method. You may want to choose the issue and the fishing method for the students to balance groups. If computer accessibility is a problem, the information can be printed and distributed to the students in hard copy format.

2. When the students are finished taking notes on the issue and fishing method, have all the students with one method or issue (e.g. the Dredgers) group together and share their information.

3. Have students gather back with their original groups of four and share all the information on the fishing methods. Discuss the information using the questions below as a guide. Emphasize that as the demand for seafood has grown and fishing technology has improved, fishermen have become better at catching fish. The United States regulates fishing to try to help fish stocks recover, but many other countries do not.

- What surprised you the most in your research?
- Which fishing method is the least harmful to the environment? To the non-targeted species (bycatch)? Why?
- Which fishing method is the most harmful to the fish? To the bycatch? Why?
- Why are fishermen using the harmful methods if they cause damage?
- How do these fishing actions affect the sustainability of the resource?

Activity B: Fish in Your Area

1. Divide the students into small groups (2-4 each). Have students develop a research project to answer the following questions:

- Where are fish sold in your community? (i.e. list all the local supermarkets, fish markets, local restaurants)
- What are the top five types of fish sold at each place?
- Where does the fish come from?
- How is it caught?
- What is the price of each fish at each location?
- What is the most popular fish species?

- What is the frequency of different fish species in the markets?
- Which of these species are facing overfishing pressures? This information can be found on the Monterey Aquarium Seafood Watch site.

2. Have students represent this data in graphs and charts to present to the class. Each presentation should interpret the data and explain the implications of the amount and type of fish consumed in the community on the sustainability of the species.

3. Have students write letters to an area business establishment presenting what they have learned and actions they would like to see the business take to help promote sustainability.

THE BRIDGE CONNECTION

www.vims.edu/bridge/--Click on "Ocean Science Topics" in the navigation menu to the left, then navigate to (1) "Human activities," then "Environmental Issues," then "Sustainability" or "Conservation"; (2) "Human activities," then "Seafood" or "Fisheries"; (3) "Biology," then "Vertebrates," then "Fishes"; and (4) "Biology," then to "General Marine Life."

THE "ME" CONNECTION

Have students write a letter to the National Marine Sanctuary Foundation, a Seafood Watch partner, outlining what they learned about sustainable seafood and the actions they will take to help over-fished populations of fish recover:

National Marine Sanctuary Foundation
8601 Georgia Avenue
Suite 501
Silver Spring, MD 20910

CONNECTIONS TO OTHER SUBJECTS

English/Language Arts; Social Studies; Geography

EVALUATION

1. Formative Evaluation: Evaluate the group work in progress, the related presentation, and the research project.
2. Summative Evaluation: There are seven species of fish that appear on all the regional and the national Seafood Watch cards (Chilean Seabass/Toothfish; Orange Roughy; Salmon – farmed, including Atlantic; Sharks; Shrimp – imported, farmed, or trawl-caught; Swordfish; and Bluefin Tuna). Have each student pick a species to research (not one identified in the group project). They should answer the following questions on a poster or in a PowerPoint presentation. A graphic representation of the fish should be included.

- What type of fish did you research?
- Where does it live?
- Who fishes it and how?
- Where are most of the consumers of the fish live?
- Why is it not a sustainable resource?
- How can people help increase the population of the fish? (Should have the Seafood Watch website on the poster.)

EXTENSIONS

Visit http://www.oar.noaa.gov/k12/html/fisheries2.html – Students can visit this site and complete the activities on fisheries management.

Resources

http://www.mbayaq.org/cr/seafoodwatch.asp --The Monterey Bay Aquarium Seafood Watch homepage with links to the Educators page, the Seafood Watch cards, the information about why choices matter, and the actions people can take to change seafood buying practices of friends, family, and businesses.

http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_gear.asp -- This Monterey Bay Aquarium website explains each type of fishing gear and fish farming method.

http://www.oar.noaa.gov/k12/html/fisheries2.html – The National Marine Fisheries Service web site with information on the amount of fish caught by weight on all coasts and the dollar amounts associated with the catch. Students can input query criteria for their species to find monthly and yearly landings.

http://sanctuaries.noaa.gov/ --Website of the National Marine Sanctuary Program

http://sanctuaries.noaa.gov/education/ - National Marine Sanctuary Education Program website with sections specifically designed for students and for teachers.

National Science Education Standards

Content Standard C: Life Science
- Structure and Function of Living Systems
- Regulation and Behavior
- Populations and Ecosystems

Content Standard F: Science in Personal and Social Perspectives
- Populations, Resources, and Environments
- Natural Hazards
- Risks and Benefits

National Geography Standards

Essential Element 4: Human Systems
- Oceans as providers of goods and service

Essential Element 5: Environment and Society
- Human influences on the oceans
- Ocean influences on humans
- Ocean resources

For More Information

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Acknowledgement

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