

## LESSON: Coral Reef Web

**Summary:** Students design a “web,” or visual diagram, to show the interdependence of plants, animals, and microorganisms in the coral reefs of the world. The diagram also includes common stressors placed on that environment, and how the health of that ecosystem can affect the health of people.

**EHP Article(s):** “The State of the Oceans, Part 2: Delving Deeper into the Sea’s Bounty,” *EHP Student Edition*, January 2005: A472–A481.  
<http://ehp.niehs.nih.gov/members/2004/112-8/focus.html>

“Risky Shellfish? Assessing Hazards of Clam Consumption” *EHP Student Edition*, January 2005: A491.  
<http://ehp.niehs.nih.gov/docs/2004/112-8/ss.html#risk>

**Objectives:** By the end of this lesson students should be able to:

1. Demonstrate understanding of interdependence of plants, animals, and microorganisms in the coral reefs of the world and use appropriate vocabulary.
2. Describe how the health of this ecosystem can affect people.

**Class Time:** 1–2 hours

**Grade Level:** 9–12

**Subjects Addressed:** Life Science, Biology, Ecology, Environmental Science

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### ► Prepping the Lesson (15–20 minutes)

#### INSTRUCTIONS:

1. Obtain a class set of *EHP Student Edition*, January 2005, or download articles at <http://www.ehponline.org/science-ed> and make copies.
2. Make copies of the student instructions.
3. If you will be using class time to make the web diagrams, assemble blank paper/poster paper and a variety of colored markers.

#### MATERIALS (per student):

- 1 copy of *EHP Student Edition*, January 2005, or 1 copy of each of the articles “The State of the Oceans, Part 2: Delving Deeper into the Sea’s Bounty” and “Risky Shellfish? Assessing Hazards of Clam Consumption”
- 1 copy of the student instructions
- 1–2 pieces of blank paper/poster paper
- Colored markers

#### VOCABULARY:

Carnivore  
Food chain/food web  
Herbivore  
Invertebrate  
Omnivore  
Stressor



**BACKGROUND INFORMATION:**

The article titled “The State of the Oceans, Part 2: Delving Deeper into the Sea’s Bounty” is fairly comprehensive and provides most of the information students need to complete the assignment. The article “Risky Shellfish? Assessing Hazards of Clam Consumption” provides some additional important information, especially related to human health risks. A few minor detail gaps can be filled by going to the websites listed in the Resources section of this lesson. Additional information provided by these websites has been included in the Assessing the Lesson section for your reference.

**RESOURCES:**

*Environmental Health Perspectives*, Environews by Topic, <http://ehp.niehs.nih.gov/topic>. Choose Environmental Medicine, Marine and Coastal Science, Natural Resources, Sustainable Development/Conservation, Toxic Algae

Environmental Protection Agency (EPA)—Habitat Protection: About Coral Reefs, <http://www.epa.gov/owow/oceans/coral/about.html>

National Oceanic and Atmospheric Administration’s (NOAA) Coral Reef Information System, <http://www.coris.noaa.gov/>

Nassau Groupers: Morphology and Life History, <http://www.greenreefbelize.com/reefbriefs/briefs73.html>

Sea and Sky Presents Reef Life, <http://www.seasky.org/reeflife/sea2.html>

Sea Turtles, [http://www.aquariumofniagara.org/aquarium/sea\\_turtle.htm](http://www.aquariumofniagara.org/aquarium/sea_turtle.htm)

Sea World: Reef Ecosystem, <http://www.seaworld.org/animal-info/info-books/coral/reef-ecosystem.htm>

Species Snapper, Yellowtail, <http://fwie.fw.vt.edu/WWW/macsis/lists/M010183.htm>

Teacher’s Notes/Lesson Plan on Coral Reefs, [http://www.msc.ucla.edu/sswims/links\\_files/FrankLessonPlan.pdf](http://www.msc.ucla.edu/sswims/links_files/FrankLessonPlan.pdf)

For evolution extensions, <http://www.pbs.org/wgbh/evolution/survival/coral/partners.html>

**► Implementing the Lesson****INSTRUCTIONS:**

1. Hand out copies of *EHP Student Edition*, January 2005, and refer your students to the articles “The State of the Oceans, Part 2: Delving Deeper into the Sea’s Bounty” and “Risky Shellfish? Assessing Hazards of Clam Consumption,” or hand out article copies.
2. Hand out the student instructions.
3. Review the instructions with the students, calling their attention to the type of information from the articles to which they should pay particular attention.
4. Have the students read the articles and highlight and/or take notes as needed.
5. You may want to provide some time in class for the students to begin formulating ideas for a web or diagram design or even have a rough draft by the end of the period, so that they can ask questions and receive guidance.
6. If students will make the diagrams in class, hand out markers and large pieces of blank paper. You may also assign as homework.

**NOTES & HELPFUL HINTS:**

- You may consider implementing this lesson during or after a unit on ecosystems, oceans, environmental health, or environmental science.
- Depending on your class dynamics and classroom management techniques, students can read the article independently, as a group, or aloud to the whole class. Working as a whole group may be especially good for reviewing the article “Risky Shellfish? Assessing Hazards of Clam Consumption” in order to help the students pick out the key points and not get lost in the details.
- If your class needs additional focus or guidance, instruct them to read the first four paragraphs of the article “Risky Shellfish? Assessing Hazards of Clam Consumption.” For the article “The State of the Oceans, Part 2: Delving Deeper into the Sea’s Bounty, students can focus on the following sections: Introduction, Coral Reefs: A Critical Ecosystem, Marine Pharmaceuticals, and Preparing for the Future.
- You can meet the National Science Teaching Standards A (*Work together as colleagues within and across disciplines and grade levels*) and D (*Design and manage learning environments that provide students with the time, space and resources needed for learning science*) by working with a Social Studies teacher to do research on the economic impacts of coral reef damage including economic impacts from adverse health effects. The World Health Organization may be a good resource for this.



## ▶ Aligning with Standards

### SKILLS USED OR DEVELOPED:

Reading comprehension; organizing information; oral communication

### SPECIFIC CONTENT ADDRESSED:

Ecosystems, cooperation and competition, environmental health

### NATIONAL SCIENCE EDUCATION CONTENT STANDARDS MET:

Life Science

- interdependence of organisms
- matter, energy, and organization in living systems
- behavior of organisms

Science in Personal and Social Perspectives

- personal and community health
- population growth
- natural resources
- environmental quality
- natural and human induced hazards
- science and technology in local, national, and global challenges

### TEACHING STANDARDS:

A & D (See Implementing the Lesson: Notes & Helpful Tips).

## ▶ Assessing the Lesson

There will likely be a variety of design ideas developed by the students. Below is a list of elements that, if included, would constitute a thorough diagram. The information in parenthesis and italics provides suggestions and additional resources that can be found at the websites provided in the Resources section of this lesson.

- Carnivores—Groupers, snappers, sharks (*Students should define "carnivore."*)  
*Groupers—Adult groupers eat parrotfish, wrasses, damselfish, squirrelfish, snapper and grunts. Young groupers mostly eat crustaceans like crab, stomatopod, hermit crab, panulirid lobster, and shrimp. Young groupers live near "coral clumps covered with macroalgae and over seagrass beds."*  
*Snappers—Adult snappers eat crabs, shrimp, fish.*  
*Sharks—Sharks eat fish, crustaceans, mollusks, marine mammals, and other sharks.*
- Large Omnivores—(*The article does not specifically list examples of large omnivores, this could be additional research for the students depending on the project. Students should define "omnivore."*)  
*Sea turtles are omnivores with a diet of squid, fish, crustaceans, algae, and floating seaweed.*
- Herbivores—Parrotfish (*An important role is to control algae growth. Students should define "herbivore."*)  
*Other herbivores include sea urchins, butterfly fish, and some adult turtles.*
- Smaller Fish—(*This is another area where students can do some additional research to give specific examples since none are provided in the article.*)
- Invertebrates—sea urchins (help control algae), sponges (filter water) (*Students should define "invertebrate."*)
- Algae are a starting point of the food web so they are an important food source. If algae grow uncontrolled they prevent coral larvae from settling, growing and then calcifying (i.e. prevent growth of the reef).
- Stressors include domestic and industrial waste, local and world-wide seafood trade, and aquarium trade. (*Students should define "stressor."*)
- Loss of reefs means loss of food/health (loss of important protein source, exposures to toxicants including metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls [PCBs], and chlorinated pesticides), loss of potential pharmaceuticals (~1000 species per square meter of reef, constituting thousands of chemicals), loss of jobs (\$375 billion per year in goods and services).



**Step 1:** Read the two articles below from the *EHP Student Edition*, January 2005.

"The State of the Oceans, part 2: Delving Deeper into the Sea's Bounty,"  
*EHP Student Edition*, January 2005: A472–A481.  
<http://ehp.niehs.nih.gov/members/2004/112-8/focus.html>

"Risky Shellfish? Assessing Hazards of Clam Consumption," *EHP Student Edition*,  
January 2005: A491.  
<http://ehp.niehs.nih.gov/docs/2004/112-8/ss.html#risk>

**Step 2:** Design a "web," or visual diagram, to show the interdependence of plants, animals, and microorganisms in the coral reefs of the world. The diagram should also include common stressors placed on that environment and how the health of that ecosystem can affect the health of people.

In your web, use different colors, symbols, or other indicators to show:

- a. Food interdependence
- b. Habitat dependence
- c. Stressors
- d. How ecosystem loss (including contamination) affects people's health and the economy

Define: carnivore, food chain/food web, herbivore, invertebrate, omnivore, and stressors

**NOTE:** Some specific details, like species names and definitions, are not included in the article. Find out from your teacher if you should do additional research to develop a more detailed diagram.

