

Oceans for Life Lesson Plan

Saved by a Shark

OVERVIEW

This lesson will depict the effect that sharks have in the Caribbean coral reef system and will show students how over-fishing of sharks has a ripple effect on the marine ecosystem. Students will learn about the balance in the reef ecosystem among sharks and other carnivorous fish, their prey, and algae. Students will see that predatory behavior is not inherently negative and that predators are an important part of a balanced ecosystem.

This lesson is one in a series exploring the history, biology, and ecology of the [National Marine Sanctuaries](#). It was developed for National Geographic's [Oceans for Life](#) program, in collaboration with and with support from the [National Oceanic and Atmospheric Administration](#).

FOCUS

Over-fishing of sharks

FOCUS QUESTIONS

- What effect would the removal of sharks have on coral?
- What effect would the removal of secondary consumers have on the coral? On sharks?
- What effect would the destruction of most of the coral reef have on the rest of the food chain?
- How does over-fishing of sharks have a ripple effect on the marine ecosystem?

LEARNING OBJECTIVES

Students will:

- define predator;
- describe the marine reef ecosystem; and
- demonstrate understanding of how a disruption to the food chain can have a ripple effect through an ecosystem.

GRADE LEVEL

6-8

MATERIALS

- Computer with internet access (Note: all information can be pre-downloaded and printed)
- Spoons (one for each student)
- [Food Chain Game cards](#) (PDF, [Adobe Reader](#) required)

AUDIO VISUAL MATERIALS

- [Saved by a Shark Video](#)

TEACHING TIME

Two to three hours

SEATING ARRANGEMENT

Whole-class instruction and small group activities

MAXIMUM NUMBER OF STUDENTS

No limit

KEY WORDS

Predator, Prey, Ecosystem, Reef, Food Chain

PREPARATION

- Download and prepare video clips
- Organize game cards
- Chart paper



LEARNING PROCEDURE

Opening:

Show students photographs of several sharks found in [Flower Garden Banks National Marine Sanctuary](#):

[Whale shark](#)

[Nurse shark](#)

[Caribbean reef shark](#)

[Dusky shark](#)

[Great hammerhead](#)

Ask students the following focus questions and write their responses on chart paper:

- Which adjectives describe the pictures?
- What do you know about sharks, what they eat, and how they hunt?

Tell them that sharks are predators, and have students generate a definition for the word *predator*. Ask students to make a "value judgment" on predators—are they good or bad? Have them share the reasons for their opinions.

Development:

Tell students that all of the sharks in the photos are inhabitants and visitors of [Flower Garden Banks National Marine Sanctuary](#) (Flower Garden Banks). You may want to explain to students that marine sanctuaries are protected areas of the ocean, much like national parks on land. Tell students they will be creating diagrams depicting the ecosystem in the Flower Garden Banks. In small groups, they should explore the following Web sites, taking notes on the various inhabitants of the ecosystem for their diagrams. Diagrams should depict each of the components of the ecosystem (reef, algae, fish, sharks, etc.) and should indicate the general level of each inhabitant in the food chain. (Teacher note: students should have a basic understanding of the food chain. If

necessary, provide a review of this material.)

Web sites:

[Flower Garden Banks](#)

[The Living Sanctuary](#)

[Flower Garden Banks Profile](#)

[National Marine Sanctuaries—Encyclopedia of the Sanctuaries](#)

Bring the class back together to discuss the Web research. Using student input, draw a simple diagram of the Flower Garden Banks food chain on the board or on chart paper. Ask students:

- Which animals are predators and which are prey?
- Are some both?
- Are any only predators or only prey?
- What is the basis for the entire food chain at Flower Garden Banks (algae)?
- How is the algae dependent upon the coral, and vice versa?

Explain to students that the Flower Garden Banks is home to a variety of sharks, barracuda, and parrotfish. Ask students to describe how each of those animals fit into the food chain in that ecosystem. Ask them which animals they eat and the effect that eating, or not eating, those animals has on the ecosystem as a whole.

Show students the [video clip](#) of various animals from Flower Garden Banks feeding on their prey, including organisms feeding on algae. Point out the fact that some animals are predators but never prey, and some are only prey.

Ask students if they think it would be a good idea to remove sharks from the Flower Garden Banks ecosystem. Why or why not? Ask them to consider the effects of the removal of sharks



on the rest of the food chain. What would happen to the rest of the ecosystem's inhabitants?

Tell students that they'll now be playing a game that simulates such changes in the ecosystem.

Write the following Food Chains on the board:

- Food Chain 1: Tiger Shark—Grouper—Parrotfish—Cyanobacteria
- Food Chain 2: Reef Shark—Barracuda—Sponges—Seaweed
- Food Chain 3: Hammerhead Shark—Sting Rays—Sea Urchins—Coral
- Food Chain 4: Dusky Shark—Angelfish—Butterflyfish—Zooxanthellae

Divide students into groups of five. Distribute a set of [Food Chain Game cards](#) (PDF, [Adobe Reader](#) required) and four spoons to each group. The spoons should be lined up in the middle of the table, within equal distance of each student. Groups then select one student as the dealer who deals four cards to each student. The goal of the game is to end up with a balanced ecosystem (one of the Food Chain groups.) The dealer draws one card from the pile and either keeps it or passes it on. If the dealer keeps the card, he or she must discard one from their hand. Whatever card the dealer is discarding gets passed to the person on their right, who either keeps that card or passes it on, and so on. When someone has a balanced ecosystem they take one of the four spoons from the center, at which point everyone else must grab for the remaining spoons. The person who doesn't get a spoon gets a point and the game ends when someone gets five points. The person with the fewest points wins.

After students have completed the game, ask them to describe the effects of removing the

following components from the food chain:

- coral
- algae
- mid-sized fish
- sharks

Help students understand the interconnectedness of the members of the ecosystem, and the ripple effect that occurs when one part of the food chain is removed or significantly decreased.

Ask students:

- What effect would the removal of sharks have on the coral? Why?
- What effect would the removal of secondary consumers have on the coral? On sharks?
- What effect would the destruction of most of the coral reef have on the rest of the food chain? Can you predict the order in which species would begin to feel the effects? How long do you think it would take before the sharks' food source ran out?

Have students revisit their earlier thoughts on predators. Ask them if their opinions have changed at all, and why. Do they consider predators to be a help, or hindrance to the Flower Garden Banks specifically? Why?

Closing:

Ask students to reflect upon the value of Flower Garden Banks and why they think it should be preserved. Considering what they have learned about ecosystem balance and the food chain, what types of preservation activities do they think would be appropriate? Is there one area or inhabitant of the sanctuary they think is most important? Why? Ask them to predict what might happen to the area without preservation efforts.



SUGGESTED STUDENT ASSESSMENT

Stage a mock debate in which students take the sides of shark protection or shark fishing. As teams of students debate, have other students assess the teams' understanding of the primary concepts by completing the [Online Assessment Rubric](#). Alternatively, teachers may choose to use this assessment rubric themselves.

EXTENDING THE LESSON

- Students can design a 1-day eco-tour of the Flower Garden Banks National Marine Sanctuary to inform people about the treasures and trials of this special area. Have students create a brochure highlighting their tour.

RELATED LINKS

[Ecopath with Ecoism](#)
[Flower Garden Banks National Marine Sanctuary](#)
[Ichthyology at the Florida Museum of Natural History](#)
[NOAA Encyclopedia of the Sanctuaries](#)
[NOAA National Marine Sanctuaries](#)
[NOAA National Marine Sanctuaries—Flower Garden Banks Photo Galleries](#)
[National Geographic News: Are People Eating Sharks Out of Existence?](#)
[National Geographic: Animals—Fish](#)
[National Geographic: Crittercam](#)
[National Geographic: EdNet—Oceans for Life](#)
[National Geographic: Flower Garden Banks](#)

CONNECTIONS TO OTHER SUBJECTS

Geography, ecology, biology

NATIONAL SCIENCE EDUCATION STANDARDS

- Life science: Structure and Function in Living Systems
- Life science: Populations and Ecosystems

NATIONAL GEOGRAPHY STANDARDS

- Standard 7: “The physical processes that shape the patterns of Earth’s surface”

[Ocean Literacy: Essential Principles and Fundamental Concepts](#) (PDF, [Adobe Reader](#) required)

- Principle 5: The ocean supports a great diversity of life and ecosystems
- Principle 6: The ocean and humans are inextricably linked

FOR MORE INFORMATION

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