

LESSON 2 Sharks-Top Predators of the Open Ocean

Lesson at a Glance

Sharks live in both inshore and offshore or open ocean waters. They are found in all the oceans of the world. Sharks are feared and often misunderstood. In this lesson, students investigate and research common Hawaiian inshore and open ocean sharks. They investigate shark size, where they hunt for food, and what they eat; in doing so, students are able to describe where sharks fit in the marine food chain as well as how energy flows through that ecosystem.

Lesson Duration

Two 45-minute periods

Essential Question(s)

Where do sharks live?

What is the role of sharks in the marine food chain?

How does energy flow in a marine ecosystem?

Related HCPSIII Benchmark(s):

Science SC.5.3.1
Describe the flow of energy among producers, consumers, and decomposers.

Key Concepts

- Sharks live in all the oceans of the world and can be found in both inshore and open ocean waters.
- Sharks are consumers found at the top of the energy pyramid.
- A food web depicts how most organisms are a part of more than one food chain and presents a more complete picture of the flow of energy in an ecosystem.

Instructional Objectives

- I can describe where different types of sharks live and the types of food they consume.
- I can describe how sharks are part of the food chain and their role in the flow of energy within a marine ecosystem.

Assessment Tools

Benchmark Rubric:

Topic		Cycles of Matter and Energy	
Benchmark SC.5.3.1		Describe the cycle of energy among producers, consumers, and decomposers	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give detailed examples of the cycle of energy among producers, consumers, and decomposers	Describe the cycle of energy among producers, consumers, and decomposers	Describe a part of the energy cycle with an example (e.g., describe one or two parts of a food chain)	Recognize an example of part of an energy cycle



Assessment/Evidence Pieces

Lesson
• Student Worksheets <i>Shark Questions</i>

Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> Method to project PowerPoint Chart paper 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Internet access 	<ul style="list-style-type: none"> Worksheet: <i>Sharks</i> Worksheet: <i>Shark Questions</i>

Instructional Resources

Student Worksheet: *Sharks*

Student Worksheet: *Shark Questions*

PowerPoint Presentation: *Feed the Shark*

PowerPoint Presentation: *Great White Shark Migration (optional)*

Student Vocabulary Words

crustaceans: a large group of arthropods, comprising almost 52,000 described species includes bottom-dwelling crabs and lobsters as well as mid-water column shrimp.

cephalopods: biological classification meaning “head-foot.” Includes octopus, squid and chambered nautilus.

bony fishes: fish that have jaws, skeletons made of bones; most have scales and swim bladders

cartilaginous fishes: fish, such as sharks and rays, which have skeletons made of cartilage and not bone.

cetaceans: biological names to mean “whale,” its original meaning, “large sea animal.” Includes whales (baleen and toothed-sperm whales, dolphins, and orcas), porpoises, dolphins.

inshore: shallow water around a land mass that includes ecosystems, such as coral reefs, estuaries, bays, etc.

Less than 100 meters (328 ft.) off the coast; in Hawai‘i, sometimes called near shore or coastal waters.

open ocean: deep ocean waters beyond the inshore zone. Usually more than 300 meters (984 ft.) off the coast.

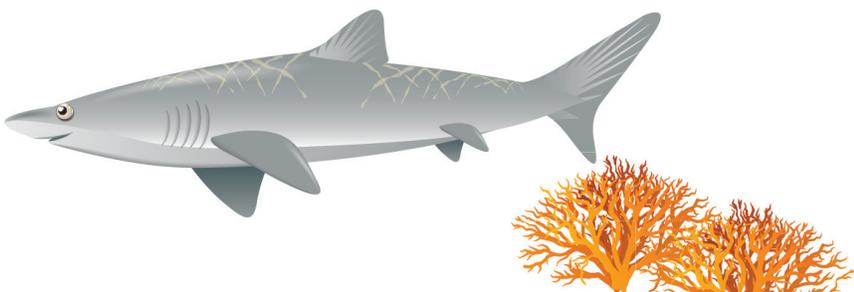
Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Review and make copies of the Student Worksheets *Sharks* and *Shark Questions*, one per student.
- Arrange for the class to go to the computer lab or library to do research on sharks.
- Optional: An 8 1/2 x 11 PDF version of a poster of Hawai‘i sharks is available at <http://www6.hawaii.gov/dlnr/dar/index.html>
Click on the Education button located on the left of the page.
- Prepare a piece of chart paper with the new vocabulary words and definitions for this lesson.

I. Common Sharks in Hawai‘i

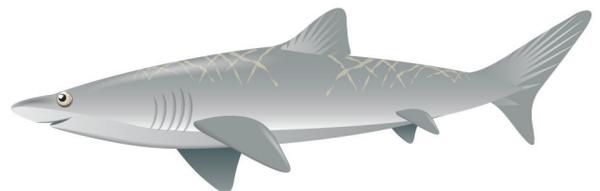
- Have students brainstorm answers individually in response to the question: *What words come to mind when you think of sharks?* Ask students to write their answers on a piece of paper. Then, have students share their answers with the whole class. Keep a master list of words on the board. After creating the list, tell students that they are going to study sharks in more detail and investigate where sharks live and how they are part of the food chain.
- Before beginning shark research, take a moment to go over the new vocabulary for this lesson. Post the piece of chart paper prepared prior to the lesson. Go over each word and its definition. Ask students to pay close attention to how these new vocabulary words relate to their shark research.
- Distribute Student Worksheet: *Sharks* to students, and divide them into eight groups for their shark research. Assign each group 2 species of shark to research. Point out that the worksheet lists the prey (what the shark eats), and their job is to find out where the shark lives (inshore or open ocean), determine whether the shark is a predator or scavenger, and find at least one interesting fact about the shark.
- When students are done researching sharks, ask each group to share the habitat, place in the food chain (predator or scavenger), and interesting facts with the class, and let other students record these interesting facts in their worksheet.
- Now that they have completed and shared their research, have students individually complete the Student Worksheet *Shark Questions*.



- F. Review Student Worksheet *Shark Questions* with the class. Emphasize the following facts:
- 1) Sharks can be found in different habitats (Suggestion: Show short PowerPoint *Great White Shark Migration*).
 - 2) Sharks consume from many parts of the food chain (Ask students to give examples).
 - 3) Of 400 species of sharks known worldwide, only a few are aggressive and known to attack humans.
 - 4) Sharks possess the ability to sense electrical currents through special sensory organs in their snouts. They use this extra sense to help them find hidden prey within short ranges.
 - 5) Sharks don't have scales like most fishes; instead, they have tooth-shaped denticles that help reduce friction from the water when the shark swims.
 - 6) Sharks have cartilaginous skeletons.
 - 7) One of the largest inshore sharks is the tiger shark (average of 4.26 meters or 14 feet)
 - 8) The largest shark is the whale shark, which can be as long as 40 feet. They are filter feeders.
- G. Ask the students to tell you what a food chain is (NOTE: This should be a review since this concept was covered in fourth grade science.). Write the word food chain on the board. Review its definition, ensuring that the discussion includes concepts of producers, consumers and decomposers. Explain that they are going to learn more about the ecosystem that sharks live in as well as a shark's role in the food chains within that ecosystem. Show students the PowerPoint *Feed the Shark*.
- H. After the PowerPoint, ask the students to assist you in creating a basic sample food chain. As the students assist with the creation of this food chain, make sure that they are able to determine which organisms are producers, consumer sand decomposers. Facilitate a review of the energy pyramid and how energy flows within it. Use the organisms in the food chain already created up on the board to facilitate this review.
- I. In order to reinforce the transfer of energy among sharks and the other organisms in their marine food chain, have students create a food chain/food web and energy pyramid for the shark their group did research on. Allow students access to reference materials and the Internet to further research organisms that are a part of their shark's food chain and energy pyramid.
- J. Have volunteers share their food chain and energy pyramid with the class. Give a prize for the longest food chain or web (or the one with the most organisms involved).

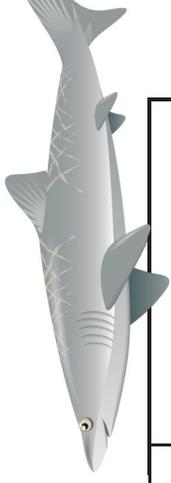
Extended Activities

1. Ask students to research energy saving adaptations of sharks (and rays). For example, using cartilage rather than bone makes for a lighter body than bony fish. Students can learn about the differences between cartilaginous fish and bony fish.
2. Ask students to observe live sharks from safe locations. They can look at shark behavior at the shark tank web cam at Waikiki Aquarium at www.waquarium.org/cameras.html.
3. Ask students to investigate the Hawaiian cultural relationship with sharks, DLNR Aquatic Resources, at <http://www.hawaiiisharks.com/inshore.html>.
4. Have students make a poster showing the sizes of sharks to scale (e.g., 1 in. equals 1 foot length of shark), or a real-length outline of a shark in chalk on school pavement, or with masking tape on a wall.



LESSON 2

Name: _____ Date: _____



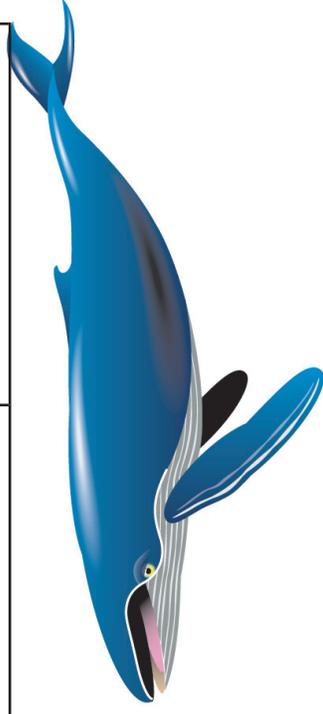
SHARKS



SHARKS	HABITAT	PREY	PREDATOR AND/OR SCAVENGER (P) or (S)	INTERESTING FACTS
Blacktip reef shark <i>Carcharhinus melanopterus</i> (length 5–6 feet)		Small reef fishes & invertebrates		
Blacktip shark <i>Carcharhinus limbatus</i> (up to 8 feet)		Cephalopods, bony fishes, occasionally crustaceans		
Scalloped Hammerhead shark <i>Sphyrna lewini</i> (7–14 feet)		Reef fishes, smaller sharks & rays, Cephalopods, crustaceans		
Whitetip reef shark <i>Triaenodon obesus</i> (5–7 feet)		Reef fish, octopus, crustaceans		
Sandbar shark <i>Carcharhinus plumbeus</i> (6–8 feet)		Small reef fishes, crustaceans, mollusks		

SHARKS	HABITAT	PREY	PREDATOR AND/OR SCAVENGER (P) or (S)	INTERESTING FACTS
Grey Reef Shark <i>Carcharhinus amblyrhynchos</i> (6–8 feet)		Bony fishes, cephalopods and crustaceans		
Tiger shark <i>Galeocerdo cuvier</i> (14–18 feet)		Wide variety of marine animals, carrion		
Galapagos <i>Carcharhinus galapagensis</i> (10–12 feet)		Bottom fishes, smaller sharks, cephalopods		
Oceanic whitetip shark <i>Carcharhinus longimanus</i> (10–13 feet)		Pelagic fishes, bites flesh from larger fishes and small sharks, cetaceans		
Thresher shark <i>Alopias pelagicus</i> (Up to 11 feet)		Squid, bony fishes		
Silky shark <i>Carcharhinus falciformis</i> (Up to 10 feet)		Mackerels and tunas		

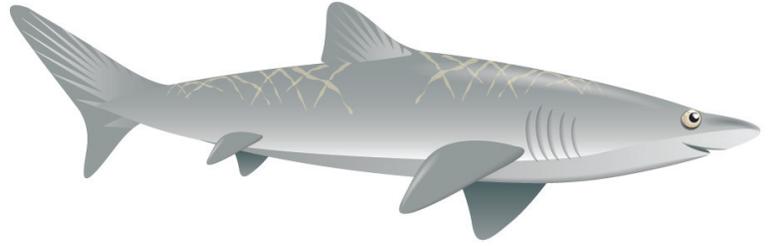
SHARKS	HABITAT	PREY	PREDATOR AND/OR SCAVENGER (P) or (S)	INTERESTING FACTS
Whale shark <i>Rhincodon typus</i> (Up to 50 feet)		Small fishes, crustaceans, squid		
Blue shark <i>Prionace glauca</i> (Average 13, up to 20 feet)		Cephalopods, crustaceans, small bony fish and sharks		
Shortfin Mako shark <i>Isurus oxyrinchus</i> (Up to 14 feet)		Tunas, mackerels, sharks		
White shark <i>Carcharodon carcharias</i> (Up to 21 feet or more) (rare in Hawaiian waters)		Dolphins, whales, seals, sharks, rays, bony fishes, carrion		
Cookie cutter shark <i>Isistius brasiliensis</i> (Up to 20 inches)		Squid, small fishes, crustaceans, bits of flesh from larger fishes and cetaceans		



LESSON 2

Name: _____ Date: _____

Shark Questions



Habitat

1. Where do sharks live?

Predation

2. Do inshore sharks and open ocean sharks prey on the same organisms?

Role

3. How are sharks a part of the food chain?

Survival

4. Take one of the interesting facts about sharks in the previous worksheet and explain how this fact helps sharks survive.