## What's for Lunch?

Some sharks are probably not very picky about what they eat. But certain kinds of sharks eat some foods more than others. For example, hammerhead sharks eat mostly stingrays. Smooth dogfish eat mostly crabs and lobsters. Tiger sharks eat mostly sea turtles. Blue sharks eat squids. And whale sharks eat plankton.

Many sharks prey most often on the weakest members of a population. They eat weak, ill, or injured animals because they are the easiest to catch.

**These predators have poor appetites.**
Sharks eat far less than most people imagine. Remember that sharks are cold-blooded. Cold-blooded animals have a much lower metabolism than warm-blooded animals such as mammals. So sharks just don't need enormous amounts of food. A shark probably eats about 1% to 10% of its body weight in a week, and many sharks probably go several weeks between meals!

**Sharks don't eat people... very often.**
Only 32 kinds of sharks have ever been known to attack people. Like other wild animals, most sharks would rather avoid you. Those that have attacked are mostly large sharks that mistook people for food or attacked to protect their territory.

### Shark Storytellers

***OBJECTIVE:*** Given a topic, the student will be able to demonstrate all the steps in the writing process: prewriting, writing, responding, revising, and editing.

***MATERIALS:*** Resource materials on sharks.

***ACTION:*** Each student writes a short story based on "a day in the life of a shark."

As a prewriting activity, discuss shark behavior, senses, conservation, and other topics. Use the resources listed on page 15. Encourage students to use books and videos to get more ideas on what sharks do. Brainstorm a few possible outlines students might use to write a story about sharks. Can students think of more than one outline for telling the same story?

Students write their own short stories about a day in the life of a shark. Once they are finished writing their stories, divide the class into small response groups of two to five students. Students share their work by reading aloud or exchanging papers, and they respond to the work of others.

Next, students revise their stories. In this process they can rethink and reorganize their stories, changing as much as they want.

Explain to students that authors edit their writing before they submit it to a publisher. As student authors, they now have the chance to edit their own stories. Make dictionaries and other reference books available. You may wish to help students develop a checklist for editing their stories.

Make a book out of the stories and/or read them in front of the class.

## Calculating Sharks

***OBJECTIVES:*** (l) Given data about sharks and the amount of food they eat, the student will be able to solve for the unknown in percentage problems.

(2) Given information about a shark's growth, the student will be able to graph coordinates and interpret a linear graph.

(3) Given the conversion factor, the student will be able to convert from metric to English units.

***MATERIALS:*** Calculating Sharks worksheet, pencils, graph paper, calculators (optional).

***ACTION:*** Distribute worksheets to students. Go over the answers together after the students have completed their calculations.

***ANSWER KEY***

1. 650 lb. x .25 = 162.5 Ib.

2.

| | | | | | |
|---|---|---|---|---|---|
| nurse shark | 350 lb. | x .10 | = | 35 Ib. | 15.9 kg |
| sandtiger shark | 2501b. | x .10 | = | 251b. | 11.3kg |
| lemon shark | 300 lb. | x .10 | = | 30 Ib. | 13.6 kg |
| brown shark | 150 lb. | x .10 | = | 15 Ib. | 6.8 kg |

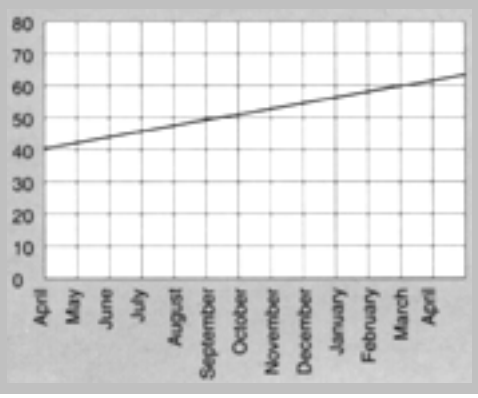
3. 7 lb. bluefish + 2 lb. mackerel + 5 lb. herring = 14 lb. total food fish

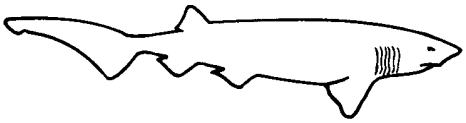
| | |
|---|---|
| bluefish | 7 lb./14 lb. = .50 or 50% |
| mackerel | 21b./141b. = .14 or l4% |
| herring | 5 Ib./14 lb. = .36 or 36% |

4.

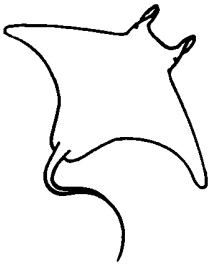
| | |
|---|---|
| shrimp | 8 lb./129 lb. = .062 or 6.2% |
| clams | 8 lb./129 lb. = .062 or 6.2% |
| brine shrimp | 42 lb. /129 lb. = .326 or 32.6% |
| whitebait | 12 lb./129 lb. = .093 or 9.3% |
| mackerel | 8 lb./129 lb. = .062 or 6.2% |
| squid | 16 Ib./129 lb. = .124 or 12.4% |
| lettuce | 35 Ib./129 lb. = .271 or 27.1% |

5 a. about 48kg
b. about 61 kg
c. about 134.5 lb.





## Calculating Sharks



1. A shark's liver is extremely large. It makes up as much as 25% of the shark's total body weight. If a bull shark (Carcharhinus leucas) weighs 650 pounds, what is the maximum weight its liver might be?

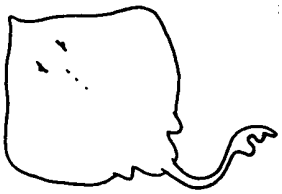
2. The sharks of Sea World eat approximately 10% of their body weight in food ) per week. Sea World Aquarists weigh the food fish before they feed it to the sharks. They record the amount and total weight of food fish each shark eats during a feeding.

   Here are estimated weights of some Sea World sharks. Calculate how many pounds of fish each of the following sharks eats in one week. There are 2.2046 pounds in one kilogram. How many kilograms of fish does each shark eat in one week?

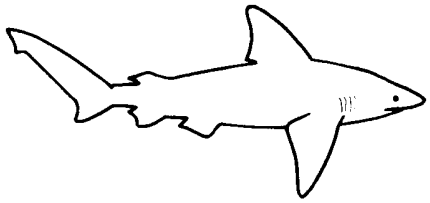
| **shark** | **weight** | **weekly food amount** | |
|---|---|---|---|
| | | **in pounds** | **in kilograms** |
| nurse shark | 350 lb. | | |
| c<br>sandtiger shark | 250 lb. | | |
| lemon shark | 300 lb. | | |
| brown shark | 150 lb. | | |

3. A shark eats 7 pounds of bluefish, 2 pounds of mackerel, and 5 pounds of herring in one week.

   a. What percent of the weekly total is each type of fish?

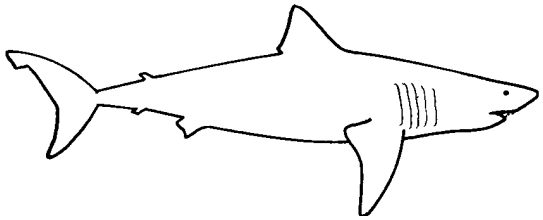


   b. Estimate how much this shark weighs, based on how much it eats.



4. As a group, 2,000 fish in the Coral Reef Aquarium at Sea World eat the following amounts of food per week:

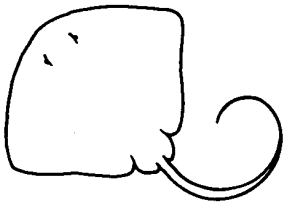
   8 lb. shrimp
   8 lb. clams
   42 lb. brine shrimp
   12 lb. whitebait
   8 lb. mackerel
   16 lb. squid
   35 lb. lettuce



   What percent (by weight) of the weekly total is each food type?

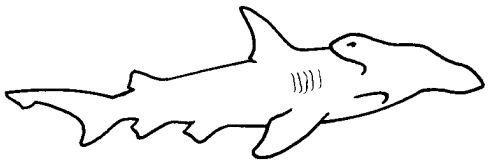
5. As sharks grow, their weight increases in proportion to the amount of food they eat. A brown shark weighs 40 kilograms in April and 55 kilograms in January. Graph these two measurements on graph paper. Plot weight on the vertical axis and months on the horizontal axis. Then use your graph to answer the questions below.

   a. Estimate the brown shark's weight in September.



   b. If the brown shark's weight increases at the same rate, what will its weight be next April (in kg)?

   c. There are 2.2046 lb. in one kilogram. What will the brown shark's weight be next April in pounds?



## Print a Fish (You Can Gyotaku, Too!)

Students love making their own fish prints!

***OBJECTIVE:*** Given a fish and printing materials, the student will be able to identify fish body parts and create an impression of a fish.

***MATERIALS:*** one or more fresh or freshly thawed fish

nontoxic, thick, water-based ink

small and medium brushes

modeling clay or Play-Doh

newspaper prewashed fabric (a light muslin or other cotton works well), newsprint, or rice paper

***ACTION:*** Sometime in the early 1800s fish printing, or gyotaku, originated in Japan or China. Fisherman in Japan use fish printing to keep a record of their catches.

Fish printing has been practiced as an art in the U.S. for about 35 years. You can use these same directions to make prints of shells, plants, or other objects.

Follow these directions to make your fish print. You can use a fish forup to ten good prints. Re-ink each time.

1. Wash the fish carefully but thoroughly with soap and water to remove the mucus. Dry the fish. Clip any sharp spines with pliers.
2. Place the fish on several layers of newspaper. Plug the anus of the fish (the opening just in front of the anal fin) with a small piece of paper.
3. Adjust your fish so that it lays the way you want it to look in your fish print. Identify the fins and spread them out into a lifelike position. Support the fins with clay or Play-Doh to hold them in place.
4. Leaving the eye blank, apply a thin coat of ink onto the fish. Brush from head to tail. After your fish is covered with ink, brush from tail to head.
5. Place your printing surface (paper or fabric) carefully over your fish. With your fingers, press it firmly over the inked fish. Try not to wrinkle the paper or move it around too much once you have set it in place.
6. Carefully remove your printed fabric or paper. Print your fish a second time right away (without re-inking) for a better print.
7. Paint in the eye with a small brush or marker.

## Sharks in Danger

Over the years, people have used sharks for food, medicines, vitamins, weapons, and jewelry — even sandpaper. But today some species are on the very brink of extinction. What happened?

For one thing, shark meat became a popular food. And thousands of sharks are caught by accident, snagged in nets set out to catch other types of fish.

**Sharks can't bounce back.**
Sharks grow very slowly compared to other fishes. A female produces at most only a few hundred pups in her lifetime, compared with millions of offspring produced by other fishes. Overfished shark populations may take years to recover.

**Go fish — wisely.**
A wise management plan for sharks includes setting catch limits and closed seasons for both commercial and recreational anglers. And wasteful practices such as shark finning — removing only the fins and tossing back the rest of the shark — could be prohibited.

**What can we do to help?**
Conservation begins with learning. Research into shark reproduction helps us understand shark population dynamics. And when we understand shark populations, we can better plan for the future of sharks.

Keeping the ocean clean and adhering to fishing regulations are more ways we can help. (Hint for teachers: visit your local bait and tackle shop or contact your state's Fish and Game Department for information on fishing regulations in your state.)

## Robo Shark

***OBJECTIVES:*** The student will brainstorm and create a fictional species of shark that might be found in the oceans of the future, describe the futuristic habitat in which the shark lives, and point out several adaptations it has that help it survive in this habitat.

***MATERIALS:*** paper, glue, scissors, plastic bottles, cans, scraps of wood, other nonfood "garbage" items.

***ACTION:*** Lead your students in a discussion about environmental problems in the oceans. Animal species that cannot adapt to environmental changes go extinct. Other animal species do adapt to environmental changes. Whatkind of adaptations might they develop?

Invite students to use their imaginations to create their own futuristic shark out of scrap materials, working alone or in groups. Have each student or work group write a brief description of their shark's habitat, adaptations, prey, etc. Allow each student (or group) a chance to share their creation with the class.

***DEEPER DEPTHS:*** Use only recyclable materials to create the "Robo Sharks." Then, have your students take their creations to a recycling center and recycle them.

## Some More Good Reading

Bunting, Anne Eve. The Sea World Book of Sharks. San Diego: Sea World Press, 1979.

Castro, Jose I. The Sharks of North American Waters. College Station: Texas A&M University Press, 1983.

Chovan, Judith L. and Sara E. Crump. Sharks, Fact and Fantasy. Los Angeles: Natural History Museum of Los Angeles County, Education Division, 1990.

Compagno, Leonard J.V. FAO Species Catalogue, Vol. 4, An Annotated and Illustrated Catalogue of Shark Species Known to Date. Rome: FAO, 1984.

Ellis, Richard and John E. McCosker. Great White Shark. New York: Harper Collins, 1991.

Fergusen, Ava and Gregor Cailliet. Sharks and Rays of the Pacific Coast. Monterey, California: Monterey Bay Aquarium, 1990.

Gruber, Samuel H., ed. Discovering Sharks. Highlands, New Jersey: American Littoral Society, 1991.

Klimley, A. Peter. "An Inquiry Into the Causes of Shark Attacks." Sea Frontiers 20(2), March-April 1974, pp. 67-76.

MacLeish, William H., ed. Oceanus 24(2). Winter 1981/82.

Montgomery, Sy. "New Terror of the Deep." International Wildlife 22(4) July-August 1992, pp. 38-47.

Moss, Sanford A. Sharks, an Introduction for the Amateur Naturalist. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1984.

Sea World Education Department. Sharks and Their Relatives. San Diego: Sea World Education Department Publications, 1991 (available for $3.50 through any Sea World park).

Springer, Victor G. and Joy P. Gold. Sharks in Question. The Smithsonian Answer Book. Washington, D.C.: Smithsonian Institute Press, 1989.

Stevens, John, ed. Sharks. New York: Facts On File Publications, Inc., 1987.

## Books For Young Readers

Arnold, Caroline. Watch Out For Sharks! New York: Clarion Books, 1991.

Behrens, June. Sharks. Chicago: Children's Press, 1990.

Cerullo, Mary M. Sharks. Challengers of the Deep. New York: Cobblehill, 1993.

Gibbons, Gail. Sharks. New York: Holiday House, 1992.

Gustafson, Sarah. The Shark Dictionary. New York: Checkerboard Press, 1990.

Maestro, Betsy. A Sea Full of Sharks. New York: Scholastic, Inc., 1990.

McBarnet, Gil. The Shark Who Learned a Lesson. Puunene, Hawaii: Ruwanga Trading, 1990.

Rabin, Staton. Monster Myths. The Truth About Water Monsters. New York: Franklin Watts, 1992.

Spinelli, Eileen. Sharks. Illinois: Children's Nature Library Publications Intemational, 1991.

Steele, Philip. Sharks and Other Ocean Creatures of the Deep. New York: Darling Kindersley, 1991.

Wexo, John Bonnet. Zoobooks 2: Sharks. San Diego: Wildlife Education, Ltd., 1986.

## Shark! Pre/Post Assessment

Use this assessment to discover how much your students already know about sharks before you begin this unit, and later as a conclusion to your study.

- Describe two different kinds of sharks. How are they different? How are they the same?
- What's the difference between sharks and bony fishes?
- How can you tell different kinds of sharks apart?
- How do sharks find their prey?
- What do sharks eat? Do they eat people?
- Describe "a day in the life of a shark."
- Why are some shark populations in danger?
- How can people help conserve sharks?

**COVERS**

***Front:*** mako sharks (Isurus oxyrhinchus)

***Back (clockwise from upper left):*** sandtiger shark (Eugomphodus taurus), horn shark (Heterodontus francisci), sandtiger shark (Eugomphodus taurus), brown shark (Carcharhinus plumbeus)

### Want more information?

The Sea World Education Department has information booklets and curriculum materials available on a variety of marine animals and topics. Call or write to request an EDUCATION MATERIALS ORDER FORM.

**Sea World of California**
(619) 226-3834
1720 South Shores Road
San Diego, CA 92109-7995

**Sea World of Florida**
(407) 363-2380
7007 Sea World Drive
Orlando, FL 32821-8097

**Sea World of Ohio**
(216) 562-8101
1100 Sea World Drive
Aurora, OH 44202-8706

**Sea World of Texas**
(210) 523-3606
10500 Sea World Drive
San Antonio, TX 78251-3001

Sea World.

Busch Entertainment Corporation