MARINE BIOLOGY

Grades 7-8

STUDENT JOURNAL

This journal belongs to:

THE GOOD AND THE BEAUTIFUL

Grades 7-8

Marine Biology

STUDENT JOURNAL

The Good and the Beautiful
CURRICULUM

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Marine Biology* science unit. It contains all the activity and journal pages that are needed to complete the unit. Each student will need a copy of the science journal.

The *Marine Biology* lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student spend enough time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries after they've finished.

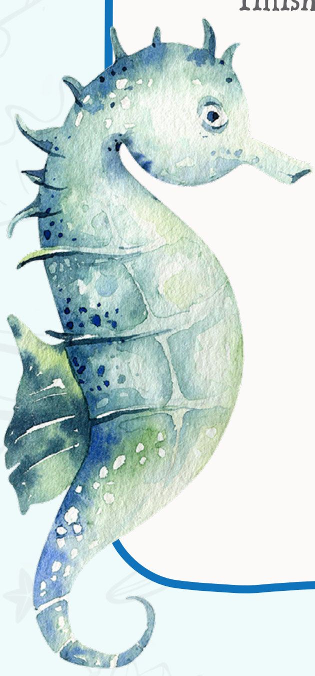


TABLE OF CONTENTS

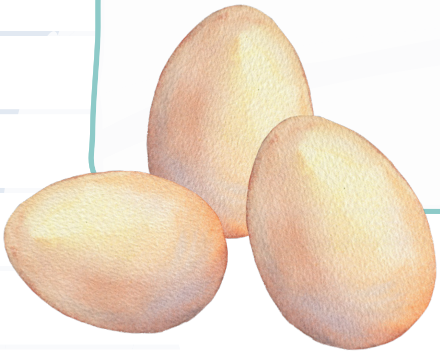
HOW SALT AFFECTS BUOYANCY EXPERIMENT

MY HYPOTHESIS:

Control	Salt	Sugar
I predict the egg in the water will	I predict the egg in the salt water will	I predict the egg in the sugar water will

MY RESULTS:

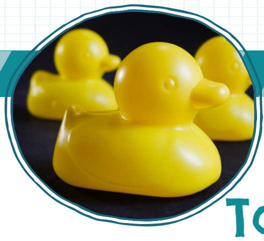
Control	Salt	Sugar
The egg in the water	The egg in the salt water	The egg in the sugar water



EXTENSION

Instructions:

1. Read the article below.
2. Pretend you are a reporter writing about the cargo spill. Write a newspaper headline about it.
3. List 3–5 facts about the spill and what scientists learned from it that you would include in a newspaper article.



What a Colorful Cargo Spill Taught Us About Ocean Currents

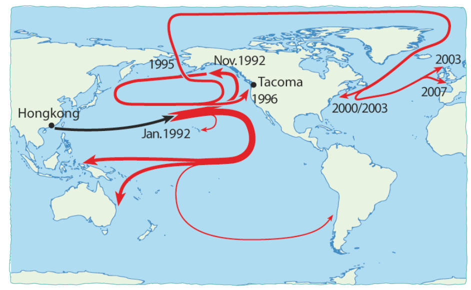
In 1992 a cargo ship in the Pacific Ocean lost a crate carrying 28,800 colorful plastic bath toys—yellow ducks, green frogs, blue turtles, and red beavers. The ship was carrying the toys from Hong Kong, China, to the United States when a storm washed the shipping container overboard. Few people could have guessed what these rubber duckies and other toys traveling the world would teach us about the ocean!

How is it possible that these bath toys traveled the world? Ocean ***currents*** carried them. A current occurs whenever something like water, air, or energy travels in a specific direction—a flow. Regions of the ocean flow in a specific direction. Look again at the “Ocean Currents” page from the lesson and notice the flow of the warm and cold water.

Currents not only affect where spilled cargo goes, but they also affect marine life. Ocean currents move the water, heat, nutrients, and oxygen on which marine organisms depend.

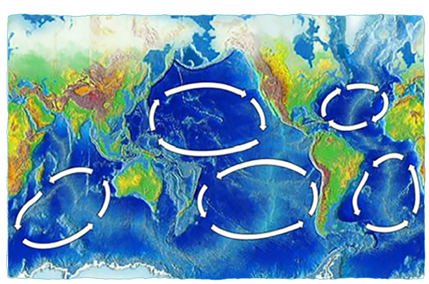
Living things themselves are moved along by ocean currents. Plankton, which are eaten by many animals, are moved by these currents. Many animals that swim freely as adults are unable to move much on their own until adulthood and are pushed by currents until that stage. Other organisms that end up anchored to the seafloor, such as coral and mussels, begin as larvae that drift in the currents.

An oceanographer named Dr. Curtis Ebbesmeyer studied ***flotsam***, the wreckage of a ship or cargo that is floating in the water, to learn more about ocean currents. In 1990, when a load of Nike sneakers and other shoes were knocked off a ship, he enlisted a team of beach-combers to help him track them. When he heard about the colorful bath toy flotsam in 1992, he began tracking where the rubber duckies and other toys washed up, too. Based on this and other data, Dr. Ebbesmeyer created computer models to follow and predict currents. He predicted many of the toys would wash up on the shores of the state of Washington, USA, in 1996. He was correct!



The bath toys traveled the world.

Now, decades later, some of those colorful animal toys are still traveling the ocean. Some have washed up on various shores—Alaska, Hawaii, Australia, Washington, Oregon, and South America. A few have ended up as far away as Eastern Canada and Western Europe. Some toys have even been found frozen in Arctic ice. A couple thousand are stuck in the northern Pacific Ocean, traveling round and round in a circular ocean current known as a ***gyre*** [JIRE]. Scientists knew about this North Pacific Gyre, one of five major ocean gyres, but they did not know how long it took for water to travel in one complete orbit of this gyre. Now, thanks to the little floating toys, they know it takes about three years.

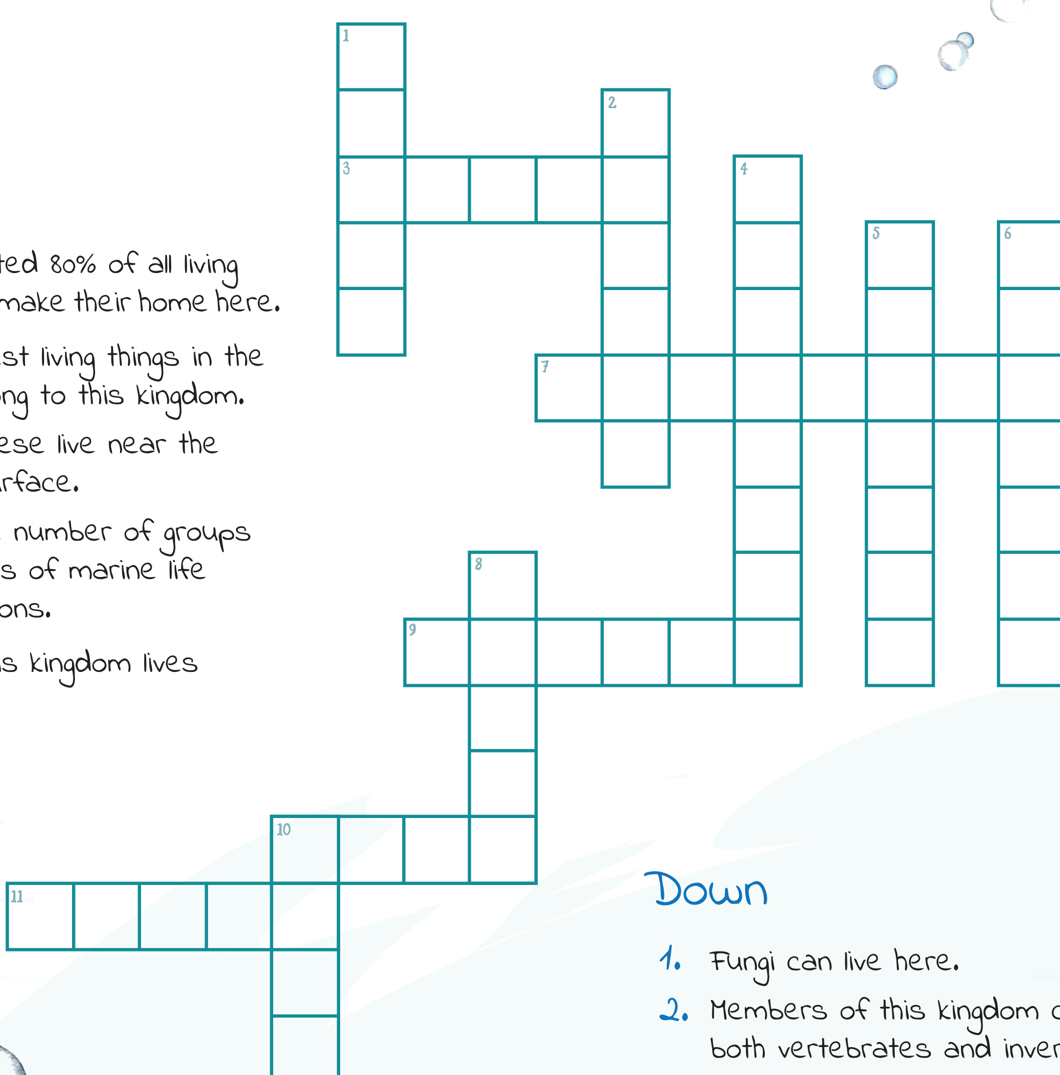


World seawater moves in five main gyres.

Traveling on the Currents

Traveling across the ocean is much easier and faster when you follow the currents rather than going against them. Benjamin Franklin is credited with being the first to chart the path of the Gulf Stream, a strong ocean current from the Gulf of Mexico to the Atlantic Ocean. He used that knowledge to plot new courses to and from the American colonies in the 1700s. These new routes shaved weeks off travel time and reduced the cost of goods going to and from the colonies.

OCEAN LIFE CLASSIFICATION



Across

3. An estimated 80% of all living creatures make their home here.
7. The smallest living things in the ocean belong to this kingdom.
9. Most of these live near the ocean's surface.
10. This is the number of groups or kingdoms of marine life classifications.
11. Most of this kingdom lives on land.

Down

1. Fungi can live here.
2. Members of this kingdom can be both vertebrates and invertebrates.
4. Seaweed are algae that belong to this kingdom.
5. The blue whale is the ________ animal on the planet.
6. When they cover vast areas, they are known as seagrass ________.
8. This is the main food source that almost all marine life depends upon.
10. Bioluminescence can make these appear as if they are glowing.

EXTENSION

Instructions:
1. Read the information and view the charts.
2. Follow the directions and, using the "Shark and Ray Family Dichotomous Key," read the descriptions to see which shark or ray family fits that description. Write its name next to the correct picture. Refer to "Parts of a Shark" as needed.

Getting More Specific with Sharks

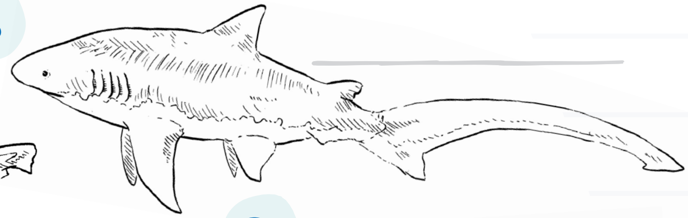
To classify organisms more specifically, scientists group them by certain characteristics, such as physical features or behaviors. A tool called a ***dichotomous*** [die—KAH—ti—mis] ***key*** can help identify an organism using the process of elimination. To use a dichotomous key, look at an organism or a picture of one. In this case, look at one of the lettered pictures on the next page, starting with animal A. (Rays are in the same class as sharks.) Starting with sentence #1A at the top of the key, read the pairs of statements on the "Shark and Ray Family Dichotomous Key." Notice that statements are grouped in twos; the prefix *di-* means "two." Choose the statement that correctly describes animal A. Continue to identify each shark or ray. Always start back at the beginning of the key to identify the next animal and write the correct type of animal on the line next to each shark or ray.

Shark and Ray Family Dichotomous Key

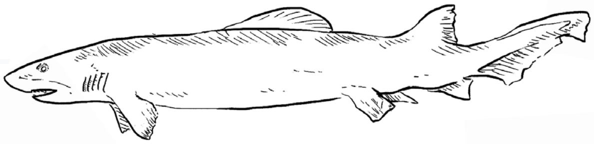
1A	The body is the shape of a kite.	*Go to #12*
B	The body is not the shape of a kite.	*Go to #2*
2A	There is no pelvic fin, and the nose looks like a saw.	*Sawfish*
B	There is a pelvic fin.	*Go to #3*
3A	There are six gill slits.	*Cow Shark*
B	There are five gill slits.	*Go to #4*
4A	There is only one dorsal fin.	*Cat Shark*
B	There are two dorsal fins.	*Go to #5*
5A	The mouth is at the front of the face like a human's, giving it a small nose.	*Whale Shark*
B	The mouth is on the underside of the head.	*Go to #6*
6A	The head goes out on the sides, and eyes are on the extensions.	*Hammerhead Shark*
B	The head does not go out on the sides.	*Go to #7*
7A	The top half of the caudal fin is the same size and shape as the bottom half.	*Mako Shark*
B	The top half of the caudal fin is different in shape and size from the bottom half.	*Go to #8*
8A	The first dorsal fin is very long, almost half as long as the body.	*False Cat Shark*
B	The first dorsal fin is regular length.	*Go to #9*
9A	The caudal fin is very long, almost as long as the body.	*Thresher Shark*
B	The caudal fin is regular length.	*Go to #10*
10A	There is a long point (like a needle) on the end of the nose.	*Goblin Shark*
B	The nose does not have a long point.	*Go to #11*
11A	There is no anal fin.	*Dogfish Shark*
B	There is an anal fin.	*Requiem Shark*
12A	There is a small dorsal fin near the end of the tail.	*Skate*
B	There is not a small dorsal fin near the end of the tail.	*Go to #13*
13A	The front of the animal has two points that look like horns.	*Manta Ray*
B	The are no points that look like horns.	*Stingray*

Parts of a Shark

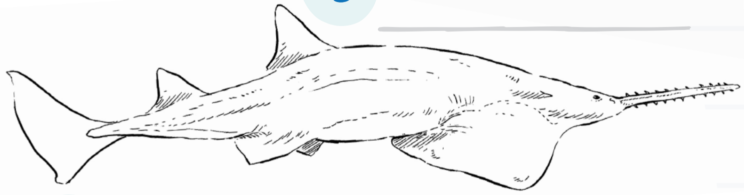
B



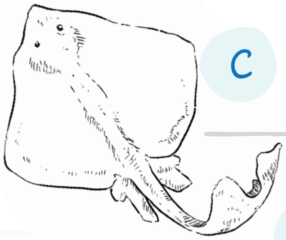
A



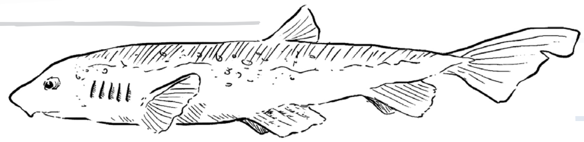
D



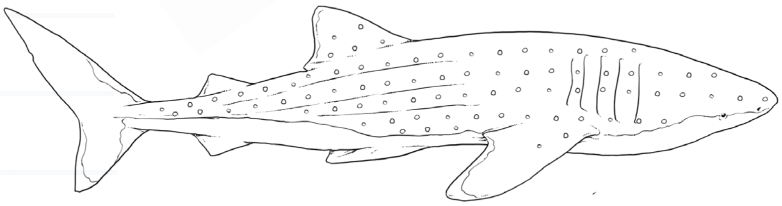
C



F

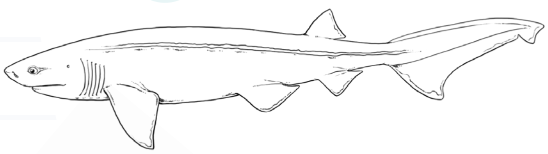


E

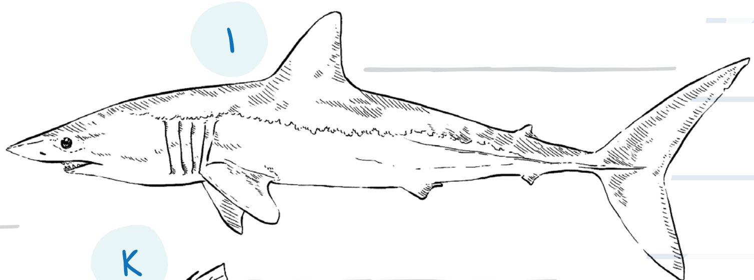


G

H

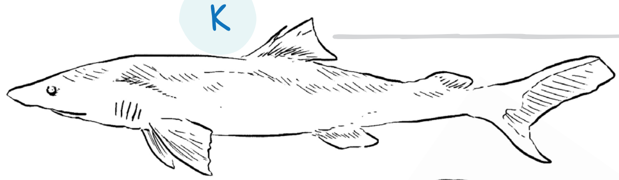


I

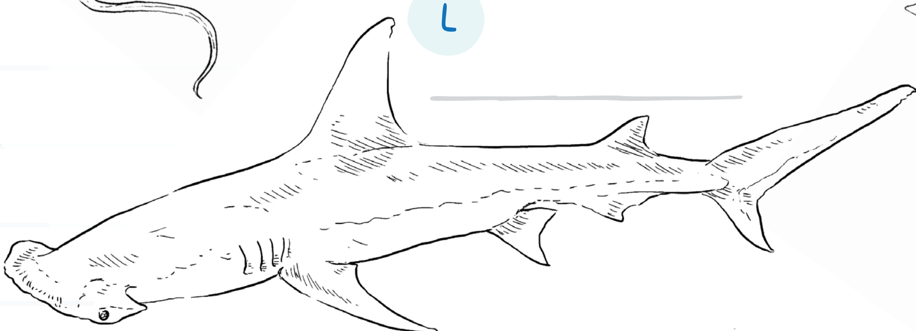


J

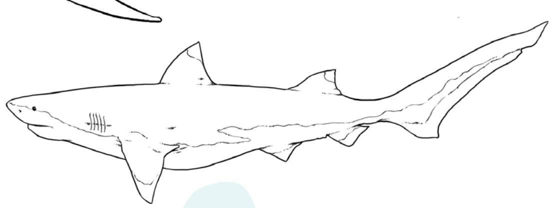
K



L



M



N

My Marine Invertebrates Booklet

Cnidarians

CORALS, JELLYFISH, AND ANEMONES

Cnidarian Facts

Jellyfish

Anemones

Echinoderms

STARFISH, SAND DOLLARS, SEA CUCUMBERS, AND SEA URCHINS

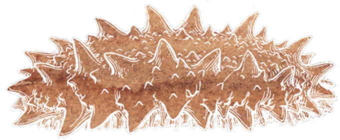
Echinoderm Facts

Feeding Echinoderms

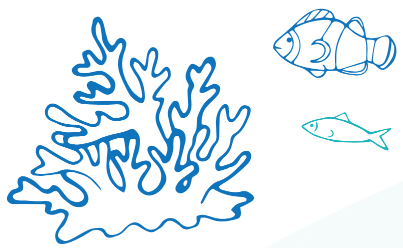
Sea Urchin

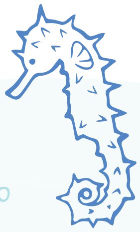
Starfish

Sea Cucumber

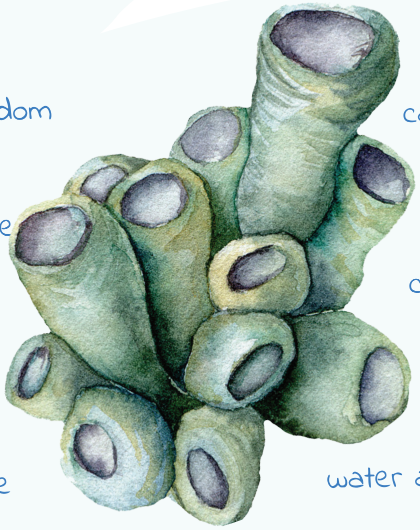


Sand Dollar





Sponges



belong to the ______________ kingdom

need only ____ cell to survive

are like a ______________ system

need ______________ to survive

can be used for ______________

can live at ______________ depth

water and food flow through ______________

EXTENSION

Instructions:

1. Read the article.
2. Fill in the infographic on the next page.

Case Study of the Colossal Squid

Throughout history, there have been fantastical legends about giant octopuses or other sea creatures that attack ships. While we do not know of any species of octopus large enough to attack a ship, there are some very large species of squid.

The largest squid, in terms of mass, is the colossal squid *Mesonychoteuthis* [MEE–zaw–nih–koe–TOO–ih–this] *hamiltoni*, for the Greek words *meso,* meaning "middle"; *onycho,* meaning "claw"; and *teuthis,* meaning "squid." The beak of a colossal squid, made of the hard material chitin, is shown here. It looks like a parrot's beak.

Smithsonian Institution

We did not even know of the existence of the colossal squid until 1925, when some unknown arms were found in the stomach of a sperm whale. Since then, we have learned what we know of the colossal squid through just a few specimens. Current estimates suggest an adult colossal squid may reach a maximum size of 12–14 m (39–46 ft) and weigh 750 kg (1,650 lb). If these are accurate, the colossal squid is the largest known invertebrate on the planet!

In February 2007 a New Zealand fishing crew in Antarctic waters hauled in their gear and found a nearly dead colossal squid munching on a fish they had caught. The crew tried to free the squid by making it let go of the fish, but it would not. They tried freeing the fish from the line, but they could not. They set about collecting the squid for transport back to New Zealand. It took the crew two hours to get the 495-kg (1,091-lb), 4.5-m (15-ft) cephalopod aboard!

Colossal squid are rarely found and live in deep ocean waters. They are aggressive hunters with the largest beaks of any squid, which they use to tear through prey. If that is not dangerous enough, they also have 25 rotating hooks split among two rows on the ends of each of their tentacles. We know very little about their diet, except that they like to eat large Patagonian toothfish, which is what that squid was clamped onto when the New Zealand fishing crew found it.

From what we can tell by examining the stomach contents of ocean creatures, the largest predators of colossal squid are sperm whales, the largest toothed predators on Earth.

So, whatever happened to the colossal squid caught by the fishing crew? It was transported back to New Zealand, frozen in a large cube of seawater, and handed over to the Museum of New Zealand Te Papa Tongarewa. It was carefully thawed over several days in a bath of icy seawater, partially dissected, and preserved for display. When workers dissected the squid, they found the largest eyes of any creature known: 27 cm (11 in) wide, and that was in its thawed, collapsed state! When the squid was alive, the eye was probably up to 40 cm (16 in) across, which is about the diameter of a large dinner platter.

The colossal squid is extremely rare but has been found occasionally. Who knows? Maybe the legends are true!

SHARK'S SENSE OF SMELL EXPERIMENT

MY HYPOTHESIS:

In which cup will I notice the smell first?

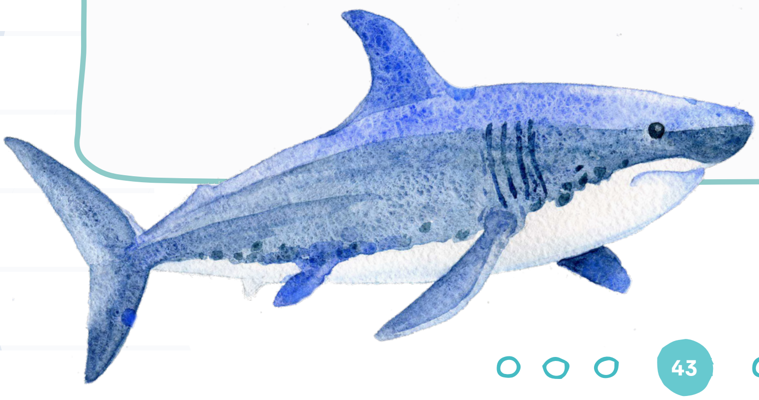
MY RESULTS:

In which cup did I notice the smell first?

What part am I able to smell? (Hint: Use the chart in your course book.)

FACTS:

What facts have you learned about a shark's sense of smell?



Lesson 10 | Grades 7-8

EXTENSION

Instructions:

1. Read the information from the interview with Dr. David Shiffman.
2. In your science journal, write 2–3 questions that you would ask him about sharks or marine conservation if you could.
3. Copy the definitions into your science journal.

An Interview with a Shark Conservation Biologist

Dr. David Shiffman grew up reading every book about sharks that he could get his hands on. He loved sitting by the shark tank at the Pittsburgh Zoo, and, as soon as he was old enough, he learned to scuba dive and became a certified diver. For five years he attended a marine biology summer camp in the Florida Keys. Dr. Shiffman earned degrees in biology, marine biology, and ecosystem science and policy. He is interested in how humans conserve and manage chondrichthyan fishes (sharks and rays).

What first made you interested in marine biology? I've been interested in marine biology as long as my family can remember, even though we grew up far from the ocean. I've always known this is what I want to do with my life—but it's OK if you don't know what you want to be when you grow up yet!

Why does your work focus on sharks rather than another marine organism? I've loved sharks as long as my family can remember, and when I learned in later science classes that they are ecologically important and threatened with ***extinction***, that seemed like a worthy pursuit for my professional studies.

Why are sharks important to marine ecosystems? Predators are always important to healthy functioning ecosystems—they keep the food chain in balance by keeping prey populations under control. The same thing is true in the ocean; when we lose sharks, it can send ripple effects through the whole ecosystem—and the ocean is an ecosystem that billions of humans depend on for food.

What does conservation mean when it comes to sharks? Humans are killing too many sharks, mostly via unsustainable overfishing, either for their fins or for their meat, either intentionally targeting them or accidentally catching them as ***bycatch***. The goal of shark conservation is to reduce the number of sharks killed so that populations remain healthy. This does not mean no shark fishing ever; it means no unsustainable shark fishing.

What do you wish every 7th and 8th grader knew about shark conservation? Sharks are not a threat to humans. We're better off with healthy shark populations off our coasts than we are without them, and many species are in trouble. Fortunately, we can help save them!

What advice do you have for a junior high student interested in marine biology? Read everything you can. Take all the science and math and writing classes you can. Don't ask, "When will I need to know this?" Because if you want to be a scientist, you need to know this.

What can young people do to protect marine life? The single biggest thing that most people can do to help the ocean is to stop eating unsustainable seafood—you can eat ***sustainable*** seafood using guides like Seafood Watch. You can also reduce your ***carbon footprint***, use less plastic, and things like that. But overfishing is the greatest threat to marine ***biodiversity***.

Note: The Monterey Bay Aquarium Seafood Watch program at seafoodwatch.org makes recommendations about seafood caught or farmed in ways that are less harmful for the environment. Ask for permission before going online.

Definitions

Extinction: the dying out of a species

Bycatch: species not purposely caught when fishing

Sustainable: using natural resources in a way that could continue for a long time

Carbon footprint: the amount of carbon dioxide released into the atmosphere because of a person's energy use

Biodiversity: the variety of living things in a given place

HOW DO OCEAN ANIMALS STAY WARM EXPERIMENT

MY HYPOTHESIS:

Control	With Protection
How long can I leave my hand in the icy water without protection?	How long can I leave my hand in icy water with blubber protection?

MY RESULTS:

Control	With Protection
How long was I able to leave my hand in the icy water without protection?	How long was I able to leave my hand in icy water with blubber protection?

List two other benefits of blubber.