

College Guild
PO Box 6448 Brunswick, Maine 04011

Marine Biology

Unit 3 of 5

Sharks

Before reading further in this Unit, try this method for organizing new information. Often used for high school and college courses, this is a helpful way to create a map of knowledge you already have, questions you have about a topic, and the information you take away after a Unit. If you don't have enough room on this page, you can write on a separate sheet of paper too.

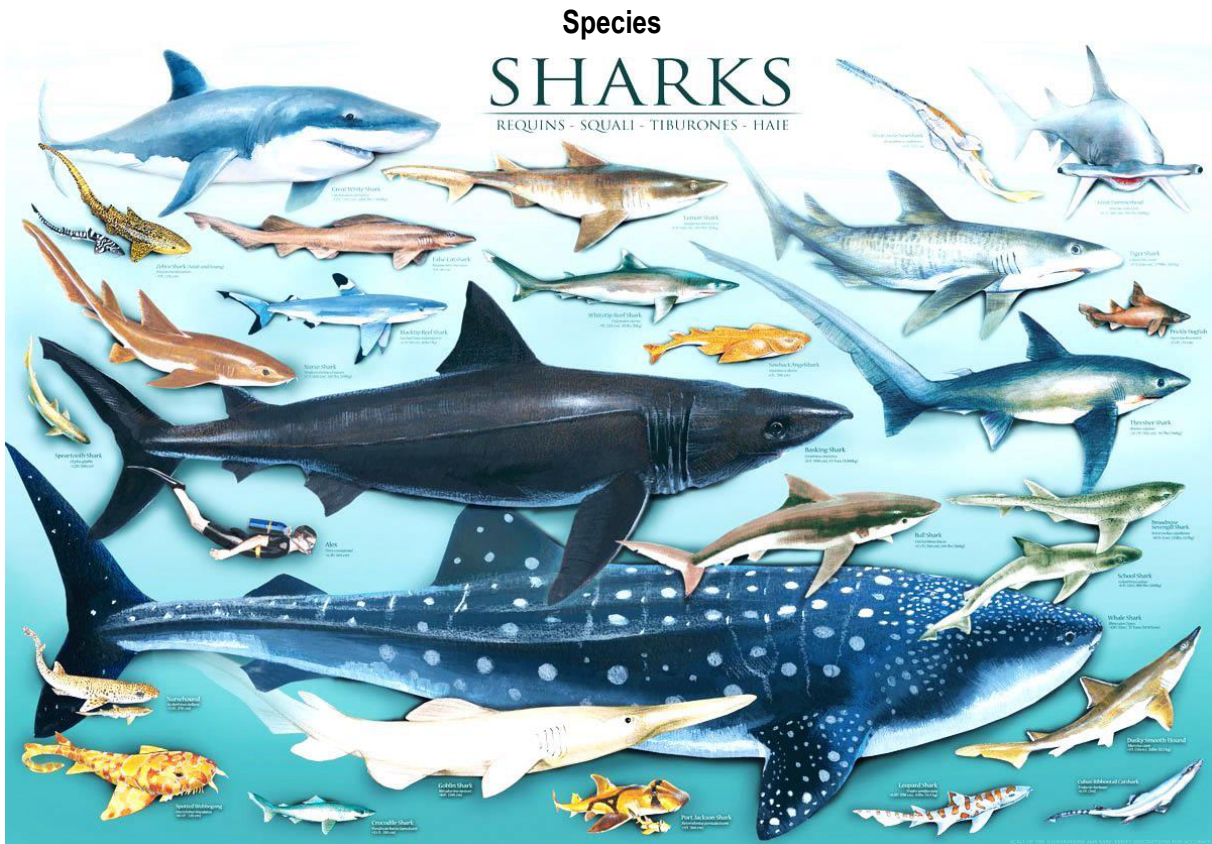
- 1. In the first column of the table, write at least five things you already known about sharks.**
- 2. In the second column, write at least five things you would like to learn about sharks.**

Leave the third column blank for now; we'll return to this at the end of the Unit.

SHARKS		
KNOW	WANT to know	LEARNED

Introduction

Sharks are a family of large, often predatory fish that have been lurking in marine depths since before the dinosaurs roamed earth. They occupy the top rungs of the food chain in their habitats and as such, they play an important role in maintaining the populations of creatures below them and sustaining a balanced ecosystem. There are around 465 species of sharks, all of which have skeletons composed of cartilage -- flexible tissue that is lighter than bone. They breathe through two sets of seven gill slits, located on each side of their bodies. Finally, all sharks have numerous rows of teeth; these sharp, pointy bones grow back quickly if lost. This Unit, we'll explore types of sharks, their role in the food web, attacks on humans, and threats to their continued survival.



* This image illustrates a sampling of the diverse shark species known to inhabit the ocean*

The great white shark is the largest species of predatory fish (though not the largest species of shark), reaching lengths of up to twenty feet. Their upper bodies are slate gray which allows them to blend in to the dark water, though their underbellies are a pearly white to match the light sand below. With the keen ability to detect the scent of blood from up to three miles away and 300 serrated (jagged-edge) teeth, their main prey includes sea lions, seals, small cetacea, sea turtles, and already dead carcasses.

The largest species of shark (and fish!) is the massive whale shark, which grows to more than sixty feet in length and may live for over fifty years. This growth occurs slowly compared to other species: due to this, it cannot produce young until it has reached a length of twenty-seven feet.

Despite their size, whale sharks feed mainly on plankton and small fish. As they glide through the water they leave their mouths open; this, in turn, acts as a suction and filtration system. They are native to warm ocean waters and may be migratory. Unlike most fish, they give birth to live young: they may produce up to 300 at a time!

The hammerhead shark uses its long, horizontally-set head to carefully scan the ocean water for prey. Because its eyes are located so far apart, it has a much wider range of vision than other sharks. It also uses its head to attack prey like stingrays, which it pummels and then presses firmly to the sand below, crushing it. They mainly occupy temperate water, but will migrate towards cooler environments in the summer months. There are several sub-species of hammerhead, including the squat, scalloped, smooth, small-eye, and great hammerheads.

Saw sharks are immediately recognizable by their long, sword-shaped snouts. This species uses long whisker-like appendages that grow from the snout to sense prey (mainly fish, crustaceans, and squid) and then plunges the serrated "saw" into the creature's body, paralyzing it. There are 9 sub-species of saw shark, the largest of which may grow up to five feet in length. They may lay numerous eggs at a time rearing up to seventeen pups per litter.

3. Each of the four featured shark species is illustrated in the chart above. Using the information above, try to locate each species: write where each is found on the poster (e.g.: nurse shark -- bottom left, third from the edge). write at least one sentence describing the strategies you used to find each species.

4. Draw a sketch of what you imagine the inside of a shark's jaw might look like based on the information in this Unit. It can be the jaw of a specific species or of a general shark.

5. Choose a shark from the illustration that wasn't featured in the text. Write at least four sentences describing the shark's behavior, diet, preferred location, and other interesting characteristics. Of course, you'll have to make this information up, but try to be realistic!

6. Sharks are often thought of as vicious, frightening creatures. Which of these four species do you find the most frightening and why? Which do you find the least frightening?

Attack

When sharks attack, incidents are often heavily reported in the newspapers, magazines, and on television, making such events seem far more prevalent than they actually are. Here are some eye-opening statistics regarding the number of actual occurrences:

- * One is 58,730 times more likely to die of the flu than of a shark attack
- * One is 3,307 times more likely to be injured by a toilet than by a shark
- * In the United States, one is twice as likely to be fatally struck by lightning than to be fatally attacked by a shark
- * New Smyrna Beach in Florida has the highest density of shark attacks in the world: one estimation supposes that every swimmer has been within ten feet of a shark
- * 2 million sharks are killed by humans for every one human killed by a shark
- * 93% of shark attack since 1580 have been on males
- * One average, there are 16 shark attacks each year in the U.S.; there is an average of only one fatality every other year

While shark attack are actually quite rare, they are still extremely frightening when they do happen. The following is a brief summary of the attack on a young surfer: her story became the basis for the movie *Soul Surfer*.

Thirteen-year-old Bethany Hamilton was Hawaii's top female surfer in her age group and one of the best in the United States when she made headlines in 2003 after being attacked by a 14-foot tiger shark. She had gone surfing on the morning of Halloween with her best friend Alana, her brother Byron and Alana's father Holt. Bethany was lying sideways on her board with her left arm dangling in the water when the shark came up from below and bit her arm off just below the shoulder. Her surfing partners acted quickly, applying a tourniquet to her arm with a surf leash and paddling her to shore on her board. Bethany passed out on the beach while waiting for an ambulance.

Despite losing 60 percent of her blood, she survived several surgeries and avoided infection. Remarkably, Bethany was in the water less than a month later, catching waves on Thanksgiving Day. Her balance was slightly off, but she quickly adjusted and showed the same aggressive style she was known for before her accident. Although it's more difficult for her to paddle out, she refused any special treatment in her return to competition surfing and won her first national title in 2005 at the National Scholastic Surfing Association National Championships.

Sharks are generally said to attack because they confuse humans for other similar-sized prey like dolphins, seals, and large fish. They are known to take an initial "taste" of the unfamiliar prey and then swim away when they find the taste unrecognizable or unappealing. While the movie *Jaws* paints the portrait of a bloodthirsty killer, it seems that most sharks are just trying to go about their normal feeding habits.

7. Based on the information about shark attack, has your conception of sharks changed at all? How so?

8. One might think of sharks as ferocious killers or misunderstood victims of a media craze. Name some other examples of people or animals who are thought of or portrayed in a negative light but may actually have another side. Explain how each example fits these criteria.

9. What is the difference between a "survivor" and a "hero"? Which would you call Bethany Hamilton and why?

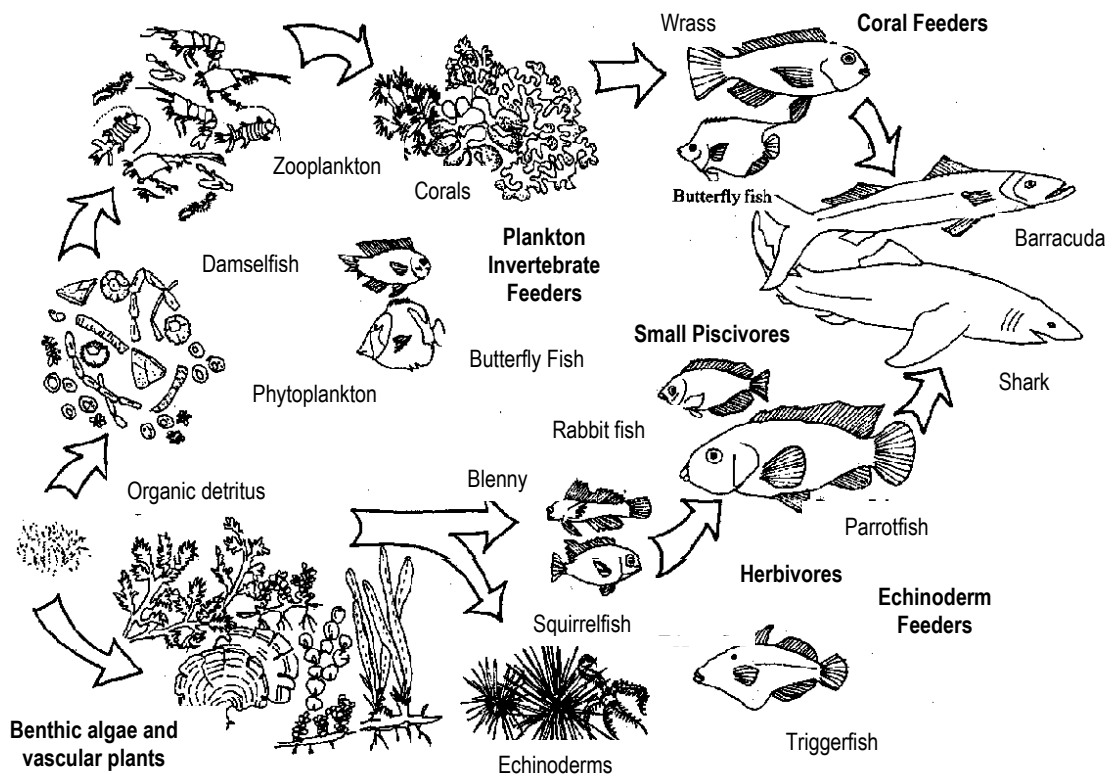
10. Write a short story in which a shark is the protagonist (hero).

Importance

Ultimately, sharks are an extremely critical family of fish. Their primary role is that of an apex predator: a creature that preys on numerous species but that is hunted by few (namely humans). While this obviously entails killing animals of lesser positions in the food web, it is necessary for a thriving marine environment, flourishing populations of oceanic animals and plants, and even a strong economy. Here's why:

- * Sharks remove the weak and sick members of a species (mainly because they're easier prey). As surviving members of the species in question produce young, each subsequent generation becomes slightly stronger and more resilient because the weak and diseased traits are not passed on.
- * Sharks control the populations of lesser species through their hunting routines. If sharks decrease in number, these other species increase in number. This produces either a lack of food (because more members of a species are competing for the same resources) or an overgrowth of harmful marine plants like algae.
- * This type of imbalance currently threatens types of mollusks and crustaceans. A study in North Carolina showed that a decrease in the local shark population was leading to economic hardship in the seafood restaurant industry: without key ingredients, it's impossible to produce popular dishes.

Below is an example of a marine food web -- an illustration of how multiple food chains (the simple prey-predator flow charts you saw in Unit 1 of this course) relate to one another.



11. If one simple food chain from this food web chart looks like this [Sharks <-- parrot fish <-- squirrelfish <-- algae <-- detritus], find and write out at least one more. What do you think would happen if sharks were removed from this system.

12. Humans are virtually the only threat to sharks. In what ways might they be diminishing the shark population?

13. Imagine you've been hired to educate young children about the importance of sharks. Which means of education (such as books, magazines, film, guest lectures, games, etc.) would you use and why? What type of information would you want to include? What is the most important lesson you hope the children would learn?

14. Looking back at the KWL chart from the beginning of this Unit, fill in the last column with five new pieces of information you've learned about sharks. Be sure to use your own words rather than simply copying from the text.

15. After completing this Unit, what are five more things you would like to learn about sharks? (This is the KWL organizer coming full circle; there's always more to learn and explore!).

Remember: First names only & please let us know if your address changes

Appendix Marine Biology: Unit 3 of 5

Citations

Bibliography

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