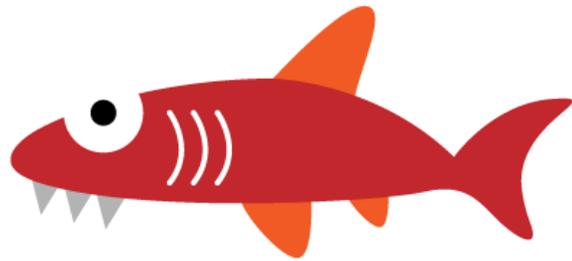


Greater Cleveland Aquarium

SHARKS! 1.0

Teacher Guide



Theme: Shark Adaptations

Grade Band: 3-5

Program Length: 1 hour 30min

Overview

Students come face-to-face with these magnificent creatures and investigate their unique adaptations. In a classroom introduction, students learn how scientists track and study sharks. Students compare and contrast sharks to bony fish and discover what makes sharks thrive as top ocean predators. On the aquarium tour, students observe several shark species and interact with stingrays in the touch pool. By the end of the program, students will understand why sharks and rays should be revered, not feared.

Goal

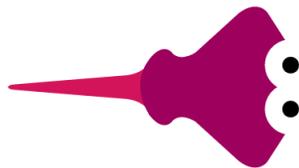
Students develop enthusiasm and a deeper understanding of sharks. Students will appreciate the role sharks play in the aquatic environment and recognize the importance of shark conservation.

Objectives

1. Students describe an ocean food chain and the importance of sharks as predators.
2. Students identify what an adaptation is and how adaptations are necessary for the survival of sharks. Special emphasis is placed on shark teeth, skin, and sense adaptations.
3. Students compare and contrast the anatomy of sharks, rays, and bony fish.
4. Students recognize the importance of shark conservation and identify three threats to sharks.

Standards

Grade	Strand	Topic	Content Statement
3	Life Science	Behavior, Growth and Changes	Individuals of the same kind differ in their traits and sometimes the differences give individuals an advantage in surviving and reproducing.
3	Life Science	Behavior, Growth and Changes	Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.
4	Life Science	Earth's Living History	Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.
4	Life Science	Earth's Living History	Fossils can be compared to one another and to present day organisms according to their similarities and differences.
3 – 4	Inquiry		Observe and ask questions about the natural environment.
3 – 4	Inquiry		Communicate about observations and explanations.
5	Life Science	Interactions within Ecosystems	Organisms perform a variety of roles in an ecosystem.
5	Life Science	Interactions within Ecosystems	All of the processes that take place within organisms require energy.
5	Inquiry		Think critically and logically to connect evidence and explanations.



Vocabulary

Shark	Cartilaginous Fish	Fusiform
Stingray	Bony Fish	Heterocercal
Adaptation	Conservation	Elasmobranch
Predator	Dermal Denticle	Electroreception
Prey	Swim Bladder	Symbiosis

Pre-Activities

Lessons to help prepare your students and enhance your field trip experience:

1. Create an ocean food chain.
 - a. Review the terms producer, herbivore, carnivore, and decomposer. Investigate what kinds of organisms fill each of these roles in an ocean habitat.
 - b. Have students design a food chain with a shark as the top predator. Students can choose any number of shark species; different sharks eat different prey. Example: Phytoplankton – Zooplankton – Sardine – Mackerel – Tuna – Great White Shark.
 - c. For a creative presentation, scroll down to view the “Ocean Food Web Foldable” on this blog: <http://bookishways.blogspot.com/2011/12/unit-resource-portfolio-oceans.html>
2. Fish Anatomy
 - a. Fish have many different kinds of fins. What are they called and what are they used for?
 - i. Department of Natural Resources is a great reference: <http://www.dnr.sc.gov/fish/anatomy.html>
 - ii. Check out the worksheet pages at the end of this teacher guide.
 - b. Pass out pictures of various fish species. Have students identify the parts of the fish they already know. Mouth, eyes, gills, scales, and tail may already be familiar.
 - c. Introduce the terms: lateral line, anterior dorsal fin, posterior dorsal fin, caudal fin, anal fin, pelvic fin, and pectoral fin.
 - i. Have students identify and label these parts on their fish picture.

- d. Different species of fish have different shapes and arrangements of fins. Have students compare and contrast their fish to a partner's.
 - e. Lead a discussion on why different fish have different shapes, sizes, and fins. They live in different habitats, eat different foods, move in different ways, fulfill different niches, etc.
 - f. During the aquarium field trip, we will compare the anatomy of sharks to bony fish.
3. Familiarize the students with the aquarium by viewing the aquarium map and by visiting the Greater Cleveland Aquarium website:
www.greaterclevelandaquarium.com
 4. Preview the animals we have on exhibit on our animal facts website:
<http://m.greaterclevelandaquarium.com>

Post-Activities

Lessons for the classroom to help reinforce concepts from your field trip experience:

1. Interview a shark
 - a. Assign students a research partner and a shark species. An extensive database of shark species can be found at the following website
<http://www.shark.ch/Database/Distribution/index.html>
 - b. Have students generate a list of questions they want to ask the shark. For example: What do you eat? Do you sleep? Where in the world do you live? Do you have any friends? How fast can you swim? Etc.
 - c. Students research the answer to their questions using computers or print resources.
 - d. Have students present their findings in an interesting way. For example: type a news story, perform a skit, film the interview with one student as the shark, write a creative story using the facts, etc.
2. Shark Graphing Activities
 - a. Draw a shark using graph coordinates:
http://mathcrush.com/graph/ws_graph_shark_pv.gif
 - b. There are a number of lessons on the Oearch website including cartography, math, data and graphing. Click on the grades 3-5 tab:
<http://www.oearch.org/#curriculum>. Educational PowerPoints are also provided.

3. This guide from the National Park Service includes great background information on a number of shark species. It also includes lesson plans and worksheets on shark anatomy and adaptations.
<http://www.nps.gov/caloforteachers/upload/Shark%20traveling%20trunk%20curriculum%20guide.pdf>
4. The Enchanted Learning website includes background information on sharks and rays. It also has math, science, geography, poetry, and English activities.
<http://www.enchantedlearning.com/subjects/sharks/classroom/Classroomweblinks.shtml>

Additional Resources

Ocearch

<http://www.ocearch.org/>

Shark Tagging Video

<https://www.youtube.com/watch?v=dkyDDgofNPc>

Florida Museum of Natural History – Department of Ichthyology

<http://www.flmnh.ufl.edu/fish/>

National Geographic

http://news.nationalgeographic.com/news/2005/06/0613_050613_sharkfacts.html

<http://animals.nationalgeographic.com/animals/sharks/>

National Geographic Kids – Great White Shark

<http://kids.nationalgeographic.com/animals/great-white-shark/>

The Shark Research Institute

<http://www.sharks.org/>



Education Department

Greater Cleveland Aquarium

2000 Sycamore Street

Cleveland, Ohio 44113

www.greaterclevelandaquarium.com



OHIO LAKES & RIVERS: Follow the stone path through our forest and check out our bubbling "brook" and our new reptiles and amphibians including salamanders, newts, snakes and turtles.

LAKES & RIVERS OF THE WORLD: Enjoy four individual regions through this gallery: Australia, Asia, South America and Africa. On this journey you meet eastern snake-neck turtles in Australia, archerfish, and one very special giant gourami in Asia, coelacel sturgeons, and an Amazon river turtle in South America, and spurred tortoises from Africa. Play

special attention to these tortoises; they are gentle creatures with playful personalities who encourage you to interact with them by touching their shells.

DISCOVERY ZONE: First, discover facts about water pollution and learn about what you can do to help. We must remember that creating awareness is an incredible challenge; our oceans, lakes and rivers are depending on us. Don't forget to look up at what comes next; the base of one of the Powerhouse's original smokestacks is now home to a moon jellyfish exhibit. Learn about their life stages, from polyps to fully grown jellies, and watch as they "glow" in the dark.

PACIFIC: Here you see fish from the Pacific Sea, Eastern Asia, Indonesia and the northern cold water regions. Of the many, pay close attention to the venomous lionfish, the black and white snowflake eels, the bluefish, sea stars and the giant Pacific octopus.

COASTAL: Check out our 11,000 gallon Touch Pool, seahorse exhibit, and live coral exhibit in our Coastal gallery. At our Touch Pool, learn the official "two-finger touch" technique and interact with our friendly silurgrays.

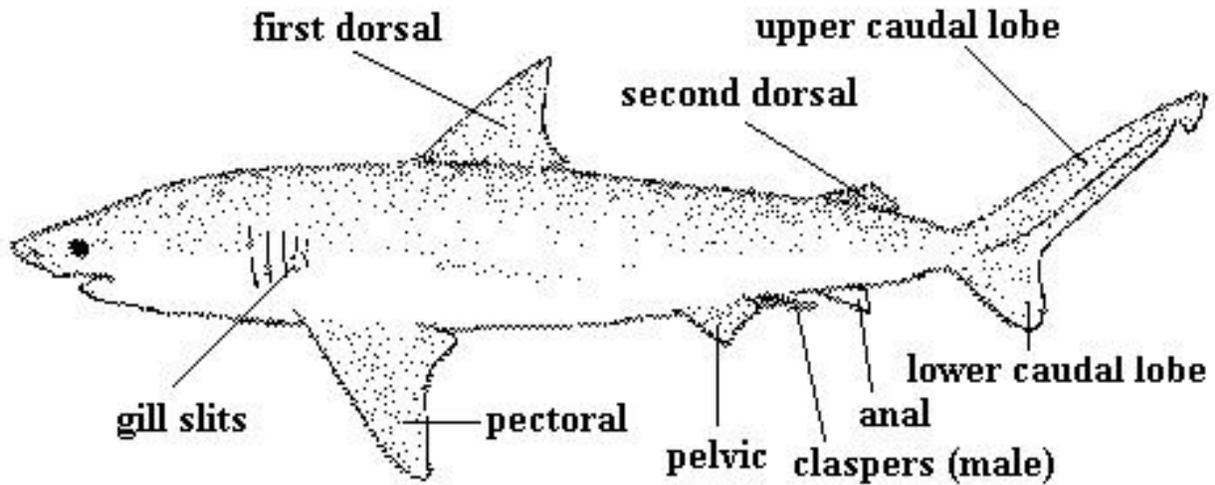
TROPICAL REEF: This corridor features fish from Fiji and Hawaii including the playful rabbitfish, the burrfish and angelfish.

SHARK SEATUBE: Home to four species of sharks and an amazing variety of aquatic life, this gallery is surely impressive. Elegance and splendor co-exist in the exhibit with sand tiger sharks reaching up to 8' long. Let our SeaTube fascinate you as you walk through this wonderful subaquatic world, allowing extraordinary viewing access to sharks, moray eels, groupers and more.

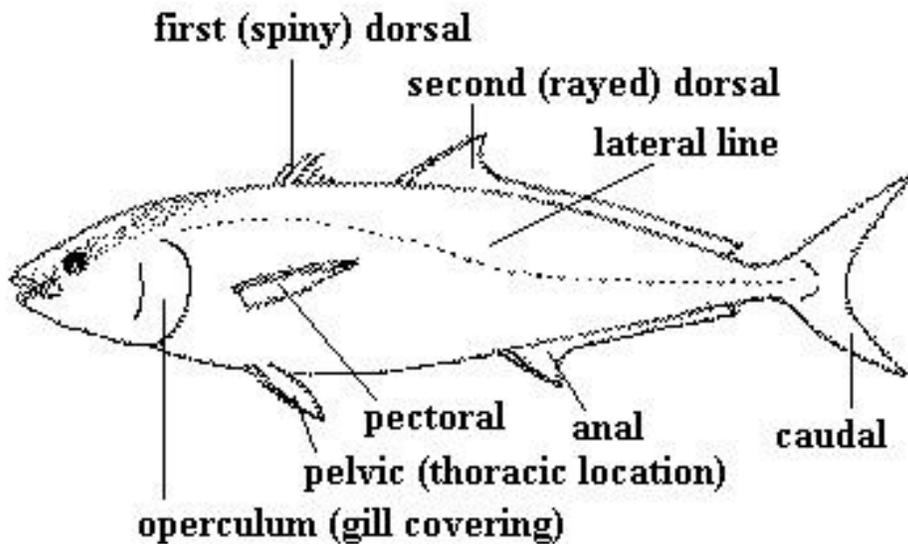
EXPLORATION STATION: The Exploration Station is designed as a research vessel and is located on the second floor of the Powerhouse, next to the Cafe. This exhibit features hands-on interactive fun especially for our younger guests. Stop by to meet our most electrifying resident, the electric eel, presented by FirstEnergy.



**Typical Cartilaginous Fish
Order Carcharhiniformes**



**Typical Bony Fish
Order Perciformes**



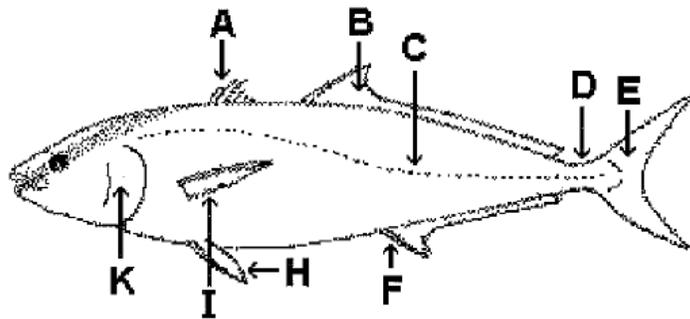
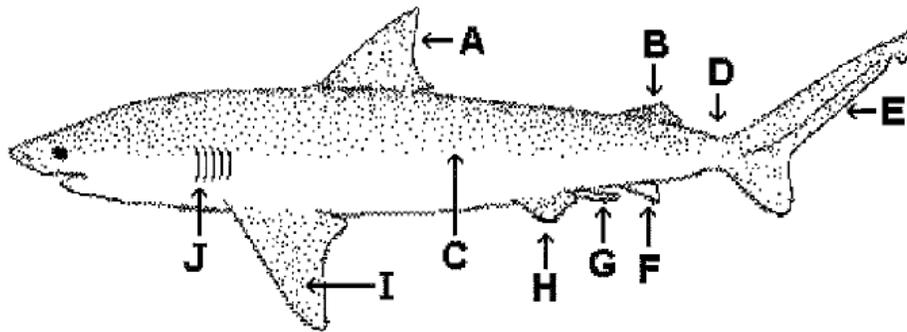
Chondrichthyes - (Bull Shark)
(Cartilaginous Fish)

Name: _____

Date: _____ Block: _____

-vs-

Osteichthyes - (Amberjack)
(Bony Fish)



- | | | | |
|----|-------|----|-------|
| A- | _____ | G- | _____ |
| B- | _____ | H- | _____ |
| C- | _____ | I- | _____ |
| D- | _____ | J- | _____ |
| E- | _____ | K- | _____ |
| F- | _____ | | |