Grade Level: 6-8
Time Estimate: 3-5 days

SHARK SENSES / INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, and activities to help students learn about shark senses. These include the five basic senses as well as the lateral line and the ampullae of Lorenzini. Students will be able to examine the mechanics and anatomy of each of these senses. Students will also use real OCEARCH data to creatively explore how sharks use their senses.

Part 1. Photoreception
Part 2. Mechanoreception
Part 3. Chemoreception
Part 4. Electroreception
Activity. Sensory Stories

Goals & Objectives

The students will:

- learn basic taxonomy;
- classify sharks taxonomically based on morphology;
- learn external anatomy of sharks;
- learn internal anatomy of sharks.

// STANDARDS

This lesson aligns with the following TEKS:

6th Grade Science: 1A, 1B, 2A, 2E, 3A, 3B, 4A 12A, 12E
7th Grade Science: 1A, 1B, 2A, 2E, 3A, 3B, 4A 11A, 11B, 12A, 12C, 12F
8th Grade Science: 1A, 1B, 2A, 2E, 3A, 3B, 4A

This lesson aligns with the following Next Generation Science Standards:

Framework

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Constructing explanations and designing solutions
6. Obtaining, evaluating, and communicating information

MS. Forces and Interactions – MS-PS1-4

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural of designed systems (MS-PS1-4)

MS. Forces and Interactions – MS-PS2-2, MS-PS2-4

Science and Engineering Practices

Engaging in Argument from Evidence

- Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem (MS-PS2-4)

Connections to Nature of Science-Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2)(MS-PS2-4)

MS. Structure, Function, and Information Processing – MS-LS1-1, MS-LS2-2, MS-LS1-8

Disciplinary Core Ideas

LS1.D: Information Processing

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The

signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

Crosscutting Concepts

Scale, Proportion, and Quantity

- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)
- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. (MS-LS1-2)

MS. Matter and Energy in Organisms and Ecosystems – MS-LS1-1, MS-LS2-2, MS-LS1-8

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations or organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)

Connections to Nature of Science- Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)

Helpful Tips

1) The content in this lesson is based on the conservation work of OCEARCH™ and the Global Shark Tracker™. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker™ is also available as an app for iPhone and Android.
2) This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3) Vocabulary words will be underlined as they first appear in the lesson plan. A complete list of vocabulary words is included as well.
4) Answers to questions and prompts for discussions will appear in *italics*.
5) Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6) Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7) Email all questions about this lesson to info@OCEARCH.org.

Vocabulary

Acoustico-Lateralis – Sensory system which includes both the ears and lateral line; based on mechanoreception.
Ampulle of Lorenzini – Pores located on the head of the shark that are sensitive to electrical stimulation.
Basihyal – A shark's tongue. Thick piece of cartilage located on the floor of the mouth.
Chemoreception-Process in which organisms respond to chemical stimuli.
Bioelectric Field – Electric field generated by a living organism.
Chemoreceptor – Sensory receptor that responds to chemical stimuli.
Cones – Photoreceptors sensitive to different wavelengths of light and are responsible for color vision.
Electroreception – The detection of electric fields or currents.
Gustation – The action of tasting.
Gustatory Cells – Rod shaped cells responsible for sensing taste. These cells are located in pits on the taste buds.
Hair Cells – Sensory receptors that contain a series of hair-like structures.
Hydrodynamic Reception – The ability of an animal to sense water movements.
Lateral Line – Series of specialized pores used in the detection of pressure and vibration. The lateral line is present in all fish.
Mechanoreception – Response to mechanical stimulation, basis of touch, hearing, and balance.
Nares – Olfactory organs of a shark.
Nictitating Membrane – An inner eyelid that can be drawn across the eye to protect it.
Olfaction – The sense of smell.
Otoliths – Stony mass within the inner ear, involved in sensing gravity and movement.
Pheromones – Chemical substance excreted by an animal that triggers a behavioral response of a member of the same species.
Retina – Layer at the back of the eye that is sensitive to light.
Rods – Photoreceptors responsible for vision at low light.
Tapetum Lucidum – Specialized tissue located behind the retina that reflects light back to the retina to increase visibility in low light scenarios.

Grade Level: 6-8
Time Estimate: 5-15 mins

SHARK SENSES / PRE-LESSON ASSESSMENT

Use the following true/false, short answer, fill in the blank, and multiple choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, in groups, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False Sharks are believed to have one of the most advanced electrical sensitivities within the animal kingdom.

Answer: *True*

2. A shark's sense of both _____ and _____ rely on chemoreceptors.

Answer: *Smell, Taste*

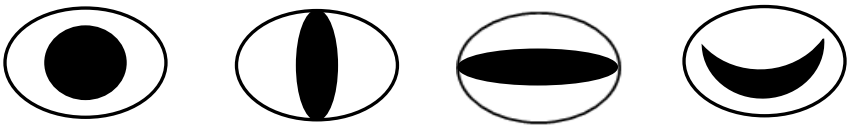
3. Hair cells are located in the_____.
   a. Lateral Line
   b. Ear
   c. Both
   d. Neither

Answer: *c. Both*

4. True or False The function of the Nictitating Membrane is to allow the shark to sleep.

Answer: *False*

5. Which of the following best describes the typical shape of a sharks pupil:



A. B. C. D.

E. All are possible

Answer: E. *All are possible*

Student handout on next page

Name:_____ Date:_____

Shark Senses

Select the correct answer(s) to each of the following questions

1. True or False Sharks are believed to have one of the most advanced electrical sensitivities within the animal kingdom.

2. The shark's sense of both _____ and _____ rely on chemoreceptors.

3. Hair cells are located in the_____.
   a. Lateral Line
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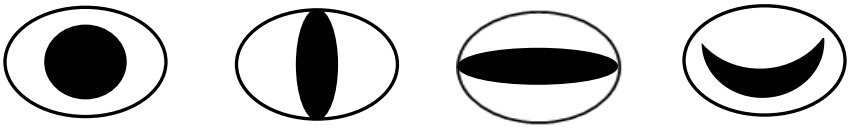


A. B. C. D.

E. All are possible

Pre-Lesson Assessment

Grade Level: 6-8

SHARK SENSES / LESSON PLAN

Introduction

To understand sharks, it is important to take a look at how they perceive and interact with the world around them. It is through their varied sensory systems that they interpret their environment. Sharks have many senses similar to our own, but they also have some additional senses that are different from anything we experience. They can use their senses to look for food, find other sharks, escape from possible danger, or navigate their habitat. Sharks have seven senses! In this lesson we will explore the characteristics of each of the seven senses.

Part 1. Photoreception

Generally, sharks are considered to have exceptional vision. Some species are estimated to have a lens seven times the optical power as a human lens (e.g., lemon sharks). Many species of sharks are able to dilate (make bigger) and contract (make smaller) their pupils to control the amount of light entering the eye just like in human eyes.

However in sharks, there are three different pupil shapes (Figure 1). The first is like ours, a circle. The second is an elongated slit like a cat-eye and can be situated vertically or horizontally. The third shape is a crescent or horseshoe shape. The pupil changes to these shapes during contraction in lighted conditions, and then dilates to large circles in dark conditions.

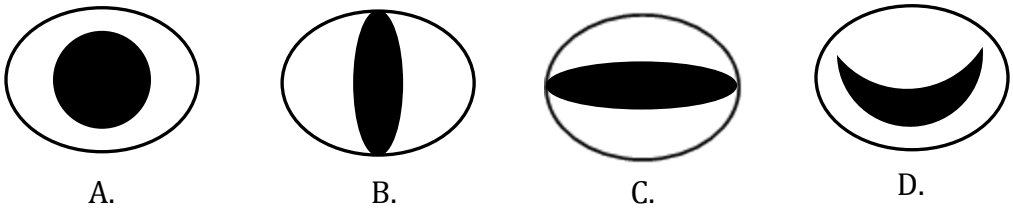


Figure 1. Shark Pupil Shapes A. Circular pupil, B. Slit shaped pupil – vertical, C. Slit shaped pupil – horizontal, D. Crescent shaped pupil – can vary.

Some shark species are unable to regulate their pupil size and use a "ragged flap" to filter the amount of light that enters the eye at any given time. And some shark species, like those that thrive in dark water environments, are unable to control light entering the eye at all. Such an adaptation is unnecessary in a habitat where light is absent or nearly absent.

Unlike humans, shark eyes are located on the sides of their heads. Due to the location, sharks have close to a 360 degree field of vision, meaning they can see nearly all the way around themselves. Sharks do however, have two major blind spots: directly in front of it and directly behind it.

A shark's eye is very similar to all other vertebrates. The eye consists of a lens, a retina, an iris, pupil, and a cornea (Figure 2). A shark's eyes contain a natural reflector called a tapetum lucidium. This is a specialized tissue found behind the retina that reflects light back onto the retina and heightens the image. This tissue is what causes nocturnal animals like house cats and raccoons to have a reflective quality to their eyes when seen at night.

Eyes of sharks have duplex retinas, similar to humans. Inside the retina are photoreceptors called rods and cones, which are light sensing cells. Rods are responsible for sensing levels of luminance, or light. Cones, on the other hand, are sensitive to specific wavelengths of light and therefore give the shark the ability to see color. Color vision gives greater definition to the images seen; the more sensitive eyes are to different colors, the more detail the organism is able to perceive. The question of sharks' color vision is still a topic of debate. It is believed that many sharks do not see in color while others see just one or a few colors. Since color vision would allow sharks to see more detail in the world around them, it may be important to shark species that reside in coral reefs or other complex environments where there are more hazards to navigate through on a daily basis.

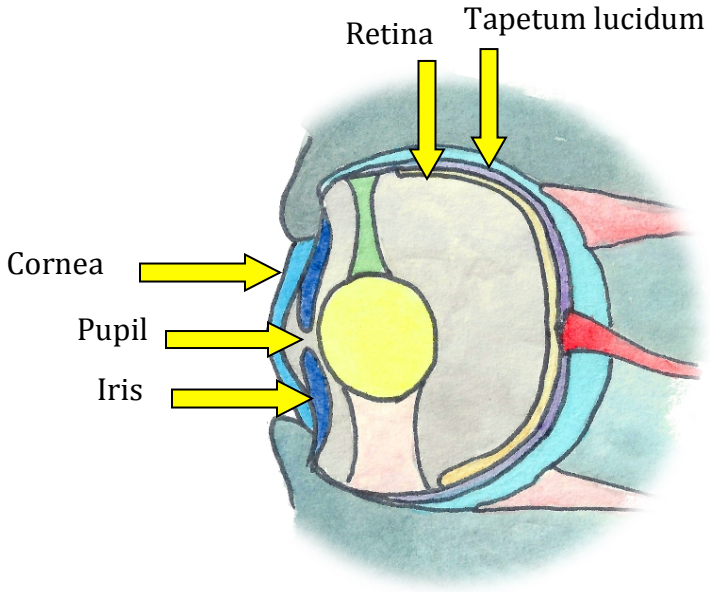


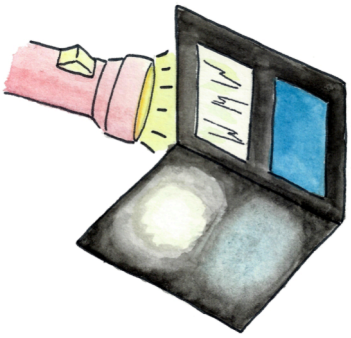
Figure 2. Anatomy of a Shark Eye
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

Sharks have both upper and lower eyelids. However, they are unable to use these eyelids to cover the eye, or blink, like we do. Some species of shark, like the tiger shark, have a third eyelid called a nictitating membrane. This membrane is used to protect the eye during feeding or any other activity that could potentially hurt the eye. Think built-in safety goggles! The great white shark is

one species that lacks this nictitating membrane. Instead, great white sharks roll their eyes back into the eye socket to protect it from scratches and other damage.

Activity. How does a tapetum lucidium work? (Optional; 5 – 10 minutes)

This activity provides a great opportunity to show the students how the tapetum lucidium reflects light. First, prepare a folded piece of black construction paper. On the top half, place a square of foil and on the bottom half place a square of blue construction paper. The blue square of paper represents vision without a tapetum lucidium and the square of foil represents vision with a tapetum lucidium. After darkening the lights, use a flashlight to shine light at an angle on the foil so that light reflects onto the second half of the folded black construction paper (Figure 3). Next, shine the light on the blue square of paper in the same manner. Discuss with the class which square, the foil or the blue paper, reflected the most light? Which tissue, reflective or non-reflective, would they rather have inside their eyes if they lived in a dark environment?



When sharks focus their eyes, they use a process similar to that of a camera focusing. Light enters the eye through the cornea and lens. The lens is located behind the pupil and focuses light onto the retina. The lens adjusts the focal length depending on the object's distance in order to obtain a clear image on the retina. The eye will then produce an inverted image on the retina. If an object is far away, ciliary muscles relax and the focal length increases. However, if an object is near the shark, the ciliary muscles become tensed, which changes the shape of the lens. This shortens the focal length.

Teacher Demonstration (Optional; 5 – 10 minutes)

Have the students use hand held magnifying glasses to focus on a nearby object. Next, have them move the magnifying glass closer to, then further away from their eyes. Discuss how the focus of the object changed when the magnifying glass was

Sharks, just like humans, rely on vision to see but rely on *contrast* for object detection. Think about it like this: it is easy to see a shape cut out of computer paper when you hold it up, but that same shape is almost impossible to see if you lay that shape onto another piece of paper that is the same color! Most shark attacks are caused by mistaken identity. Without the ability to see contrast clearly sharks very occasionally mistake humans, as well as other items, for food. For example, examine the picture below comparing a person on a surf board, a sea turtle, and a sea lion (Figure 4). Do they look similar?

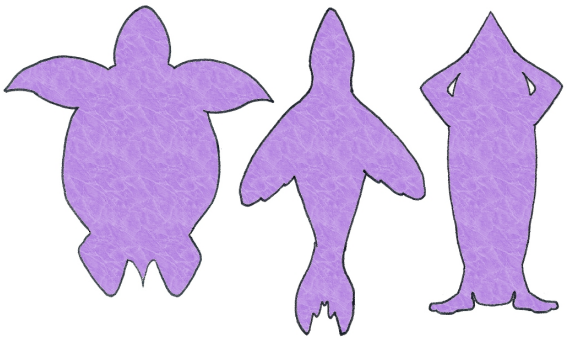


Figure 4. Comparison of silhouettes of a human surfer, sea turtle and sea lion.
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

This usually leads to very surprised sharks that swim away with sore noses, discovering that whatever they bumped into was not in fact a tasty seal. Can you imagine ordering hamburger, and as soon as you take your first bite, you find out that it was a piece of metal? If a person tried that, they would soon end up making their orthodontist very happy. However this is much rarer than the media leads us to believe.

Quick Facts – Shark Attacks

Every year, ten times the number of people are involved in bite attacks with *other humans* in New York city alone than the total number of shark bites worldwide! Between the United States and Canada there are about 40 deaths per year from pigs, while there is an average of only ten deaths per year worldwide from sharks. While pigs in the New York area will never look the same to you, as long as you look like a human to a shark, odds are that both you and the shark will happily swim on your way. We encourage you to look up statistics for yourself because *seeing* is believing.

Part 2. Mechanoreception

The acoustic-lateralis system is a series of organs in sharks that work together to provide both hearing (with the ear) and hydrodynamic reception (with the lateral line). These two senses are based on mechanoreception - a response to mechanical stimuli (i.e., physical sensation). From one form or another, this sense is all about sensing pressure using specialized hair cells. Hair cells are sensory receptors that contain a series of, you guessed it, hair-like structures. These hair cells are used to sense physical pressure through touch or vibrations. However, it is difficult to determine which vibrations are picked up by the lateral line and which are picked up by the inner ear.

Hearing

A shark's ears are tiny openings located behind the eyes. Sharks are low-frequency sensitive. Sharks can hear sound frequencies from 10 Hz to 800 Hz (lower numbers are lower pitched sounds); whereas humans can typically hear frequencies from 25 Hz to 16,000 Hz. A shark's hearing is perfectly adapted to its environment. Sound travels farther and faster in water (sound moves about 1500 meters per second in water versus 340 meters per second in air). In addition, lower pitched sound travels farther in water than higher pitched sounds.

Balance and Coordination Activity (Optional; 5 minutes)

Have the students stand up and slowly tilt your torso to the side being careful not to fall over. How did you manage it? Most people will find that without thinking they change the position of a leg or arm or find that they have tightened the muscles on the opposite side of their body in order to compensate for their shifting center of gravity. We are able to do this because our ears, much like those of the shark, can sense the change in balance and coordinate with our nerves

A shark's ears are used for much more than just detecting sound, they also give the shark a sense of balance and self awareness. The ears of a shark are entirely internal and are connected to the outside by a small tube. A tiny hole, or ear opening can be seen behind the eye. The inner ear is composed of three semicircular canals and otolith organs (utriculus, sacculus, and lagena) (Figure 5).

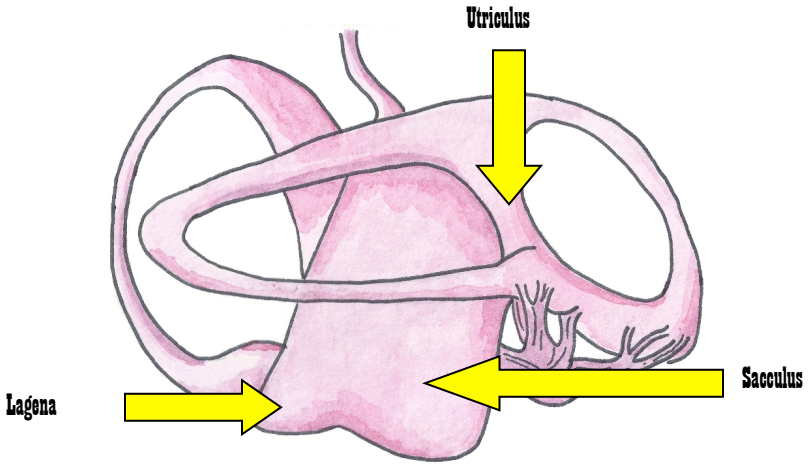


Figure 5. A Shark's Inner Ear
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

The utriculus, sacculus, and lagena are responsible for the shark's hearing and balance. The canals are fluid-filled with sensory hair cells used for sound detection. The canals are arranged in different orientations (two vertical, one horizontal) and each responds to shifts in orientation.

The otolith organs also contain sensory hair cells. Overlaying the hair cells is the otolithic membrane, a fibrous structure in which otoliths are embedded (calcium carbonate crystals). Otoliths make otolithic membranes much heavier than the structures and surrounding fluids. If a shark's head tilts, gravity will cause the membrane to shift resulting in displacement of the hair cells. These changes send signals to a shark's brain allowing the shark to sense its orientation in the water (right side up, upside down, head up, head down, sideways).

Imagine a rock tied to the end of a string, you can move the string all different ways, but gravity will always pull the rock downward. This inner ear communication is very important for sharks that live in the open ocean where there are few visual

cues to let the shark know which direction they are swimming. In addition, the movement of the fluid within the ear and otoliths can also tell the shark at what speed it is swimming. This is something that would be otherwise very difficult to determine without visual reference.

Teacher Demonstration (Optional; 5 minutes)

Having trouble picturing how an otolith always points down? Tie a small weight to the end of a string and hold onto the other end. Slowly move your hand in any way that you like. No matter what you do, the weight will always pull the string down.

Touch

Although sharks are unable to touch objects the way humans do, they occasionally use their snout and mouth to explore unrecognizable objects. An investigative bite can be considered a form of touch and is often referred to as "actual contact". In addition to an actual contact with an object, sharks have a second type of touch, referred to as "distant touch." In connection with the acoustic system, sharks have hydrodynamic sensation that allows them to feel vibrations through the water in their environment.

Present in all species of fish, the lateral line is a series of specialized pores. The lateral line is considered a sixth sense in sharks. The lateral line is spread over the tail, trunk, and head of the shark (Figure 6). The lateral line consists of hundreds of mechanoreceptors called neuromasts. Neuromasts are the smallest functional unit of the lateral line and consists of hair cell epithelium that connects these hair cells with the surrounding water. A longer hair-like fragment of these cells extends into a jelly–like dome which is exposed to the external environment. Any vibrations in the water will cause the gelatinous substance to move bending the longer 'hair' of the hair sensory cell which triggers a message to the brain.

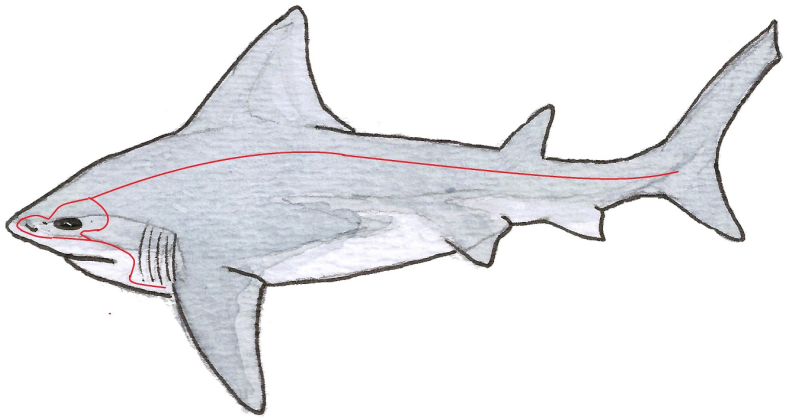


Figure 6. The Lateral Line of a Shark – The red line shows where the specialized sensory pores are located on a shark's body.
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

Part 3. Chemoreception

Chemoreception processes chemical stimuli (e.g., odors). These chemical stimuli provide information about the shark's environment, including location of prey, detection of predators, and detection of potential mates. The fundamental part of these senses is the chemoreceptor, a sensory receptor that translates chemical signals into something that the shark can react to. Dissolved molecules from the surrounding water bind to these chemoreceptor cells which send messages to the shark's brain. Sharks are sensitive to very low levels of chemical stimuli in water. As a matter of fact, sharks have been known to sense as much as one odorous molecule in 1,015 molecules of water.

Smell

Nares (like human nostrils) of sharks are located at the anterior region of the snout (Figure 7).

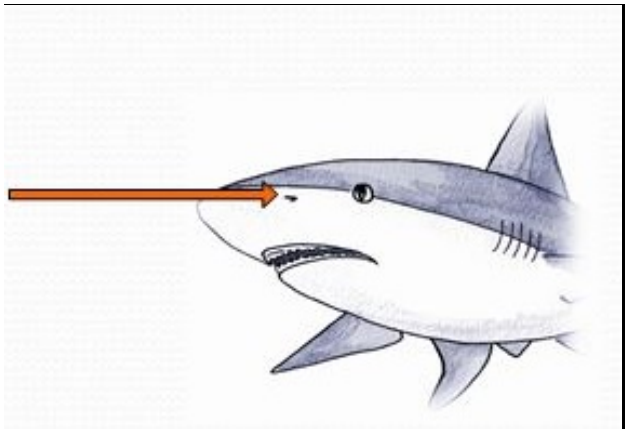


Figure 7. Shark Nares
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

Smell, or olfaction, is a sense that receives a lot of attention when it comes to sharks. Sharks have a great sense of smell. A shark's nares is divided by an external nasal flap. This flap produces an internal nostril and an external nostril. Water flows into the internal nostril, flows around a nasal valve, passes over olfactory lamellae, and flows out of the external nostril. Olfactory lamellae are a series of folds inside the olfactory cavity which increases surface area for dissolved odors to register. Dissolved odors bind to receptor cells in the lamellae and send a signal to the brain.

In great white sharks, 14% of the total brain mass is devoted to the olfactory system. This shows that smell is extremely important to their understanding of the world around them. However, it's not all about finding the next tasty fish.

Sharks also have a well developed system that produces pheromones (shark-to-shark chemical signals). This well-developed pheromone system may help these sharks find each other across miles of wide-open ocean. This is a system that we see in common with many other animals around the world!

Animals naturally produce chemical signals to avoid predators. For example, when a single minnow is attacked in a school of minnows that individual releases a specific chemical that warns others in its school of the danger and they can swim away!

Since sharks have such an excellent sense of smell and naturally use chemical signals to communicate, researchers have been developing shark repellents that use chemical signals. Scientists say that these repellents carry a chemical messenger that triggers a flight reaction in the sharks. They hope to one day use these repellents near popular beaches to deter the sharks from coming too close to swimmers.

Taste

Taste, or gustation, is also based on chemosensory reception. A shark's tongue is known as a basihyal, a small thick piece of cartilage located on the floor of the mouth. It is useless to most sharks except carpet sharks and the cookiecutter shark. Carpet sharks have a large basihyal which helps create suction (Figure 8). The cookiecutter shark uses its basihyal to tear off pieces of their prey – large marine animals.

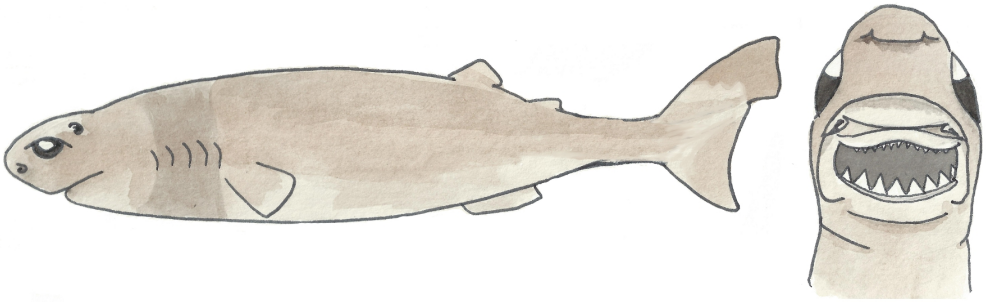


Figure 8. Cookiecutter Shark
Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

Chemoreceptors that detect taste are called gustatory receptor cells. Dissolved chemicals from anything that the shark gets inside of its mouth bind to the gustatory cells located in the mouth and throat. The gustatory cells then send a signal to the brain for the shark to process. At this point, the shark decides to accept or reject the object within its mouth as food. This "bite and release" behavior is seen in many sharks including the great white.

In cases of mistaken identity, sharks may reject the item after the first initial bite. After taking a bite the shark realizes that the object they have tasted is not the "high fat mammal" it was expecting. From the shark's perspective, the work needed to digest the object is not worth the energy that would be gained. However, many non-food items have been found in the stomachs of sharks because they resemble the shark's typical foods. For example, a shiny license plate or soda can may resemble a fish, or a piece of rubber tire might resemble a sea turtle. Without a true sense of touch, tasting and investigating with their mouth is the best way to discover what an object is, or at least to find out if it could be eaten.

Part 4. Electroreception

Sharks possess all five senses that humans possess (sight, hearing, touch, smell, and taste). Sharks have an additional sense called electroreception. In sharks, neuromasts (which you've seen before in the lateral line) have been modified to become electroreceptors called Ampulle of Lorenzini. This is considered a shark's seventh sense.

These are advanced lateral line pores that contain specialized hair cells at the base of a gelatinous filled pore. These pores are located only along the head and snout of the shark. Rather than sensing a change in water movement, these cells respond to fluctuations in electrical stimuli. Sharks are able to sense up to 10 millionths of a volt and have around five million times the sensitivity of humans. To put that in perspective, a typical power outlet in the United States produces 110 volts of electricity.

Sharks are believed to have one of the most advanced electrical sensitivities within the animal kingdom. Sharks use this amazing skill to locate prey hidden in the sand. Due to the activity of their nerves and muscles, a shark's prey gives off a weak bioelectric field. Sharks can sense the difference between the bioelectric fields of their prey and the background.

It is thought that sharks can also use this sense for navigation by detecting variations in the electric fields formed by the Earth's natural magnetic field. There is a large amount of research on the migration patterns of sharks and how they navigate those patterns. OCEARCH contributes to this research by providing near-real time data for the location of specific sharks over long periods of time. This data can help researchers investigate where sharks go, when they travel, and if they return to particular locations.

If you visit the Global Shark Tracker ™ you may notice that the sharks appear to know exactly where they are going! They are likely following the Earth's magnetic field, much like people use maps or a GPS.

Electroreception Activity (Optional; 30 minutes)

Materials:

Each group will need:

Square of thin cardboard

Pencil

Paper

Handful of paper clips

Tape or Glue

A magnet

Instructions:

Divide the students into small groups. Have each group trace a single trail on one side of the cardboard. Then have them glue paperclips along the trail (Figure 9). Cover the trail with a sheet of paper that they have written their team name on. Flip the cardboard over so that the paperclip side is facing down. Next have the groups trade the cardboard pieces. Each group should cover the board (paperclip side down) with a sheet of paper and use their magnet to locate and follow the trail, tracing it with their pencil. Compare your new map with the original route!

Shark Senses

ACTIVITY – Sensory Stories

Introduction

In this activity, students will write their own story. The story will be created using a combination of creative writing techniques, OCEARAH shark data, and the students' own research. These elements will be brought together to explain the movements of the chosen shark based on what the shark might be sensing and the mechanics of that shark's sensory systems.

Materials

- Computer with internet access
- Paper and writing utensil
- Handout provided

Instructions

Direct each student to the OCEARCH website, www.ocearch.org, and have them click on the shark tracker to locate the shark profiles. Each student should choose a shark and write down any information available. The students should then examine the general path the shark has traveled over the last few weeks. Record this information as well.

Next, have the students use the internet, books, or other resources to research what environmental factors are present near the shark's location. Factors could include migrating fish, warm or cold water, whale birthing locations and season, mating season for the sharks, high human activity, and many others!

The students should use this information to write a story about the shark's movements. For example, if the shark has been moving south for several weeks and suddenly turns to head northwest, and you know that whales are currently giving birth just northwest of the shark's location, is the shark's change of direction due to a new food source? Did the shark smell the food or use one of its multiple other senses to detect its prey?

Encourage the students to use their imagination to explore why the shark might be moving in the direction that it is. As they do this, also have them describe what is happening within the shark's senses. With the previous example the student would need to explain how a scent is transferred from the shark's environment to a signal in the shark's brain. The students should create reasoning for at least three of a shark's movements and fully describe two or three of the shark's sensory processes.

In doing this the students will be taking part in what the OCEARCH researchers do on a daily basis – trying to discover why sharks do the things they do!

Student handout provided below

Activity. Sensory Stories

Name: _____

Date: _____

Instructions

This is your chance to write your own shark story! Go to the Global Shark Tracker ™ at ocearch.org and choose your shark. Next you are going to record information about your shark in the table below. For this assignment, you will have to do some research about where your shark has been or is going. Factors could include migrating fish, warm or cold water, whale breeding sites, mating season for the sharks, or high human activity. Include information of the shark's senses in your story. Are they at a popular feeding ground? If so, what senses are they using? Are they migrating in open water? If so, what senses are they using?

Table 1. Shark Information

Name	
Species	
Gender	
Stage of Life	
Length	
Weight	
Tag Date	
Tag Location	
Total Travel	

Here are some questions you may want to answer about your shark.

1. Does your shark spend a lot of time along the coastline? Why?
2. What prey does your shark species feed on?
3. Is your shark spending a lot of time in the open ocean? Why?
4. What season is it? Is it whale migrating season? Are pinniped (e.g., seals and sea lions) young beginning to enter the waters on their own?
5. Where do you think your shark is going? Researchers are usually able to make predictions about their shark's migratory routes. Why do you think they are going to each area (e.g., coastal or open ocean)?