



TEACHING GUIDE: LET'S INVESTIGATE SHARKS GRADES 1 & 2

This guide is for use with the *Let's Investigate Sharks PowerPoint*. It provides key points to discuss for each slide as well as vocabulary words (highlighted in RED) that can be incorporated. It is not necessary to discuss each and every one of the key points. Select the points you wish to discuss or the ones that best coincide with your current curriculum.

The PowerPoint is broken down in sections (bold, underlined and lettered). The sections can be used as standalone curriculum or used as an entire presentation. You may find it beneficial to break the presentation of the material up into smaller sections.

SQ: Indicates a question you can ask students to engage them in a discussion (Student Question)

(*) Indicates a recommended activity to be used in that section or with a particular slide.

SLIDES

Intro:

1. SHARKS4KIDS Logo
2. Let's Investigate Sharks

A. WHAT IS A SHARK

3. What is a Shark? (Caribbean reef shark)

SQ: What is a **SHARK**?

-Let students give several guesses

- Sharks are cartilaginous **FISH**

SQ: Have you ever heard any bad things about sharks?

SQ: Do you think they are true?

-Sharks are not monsters and they do not eat people. Yes, accidents happen and people get hurt, but most times it is because the shark has mistaken the person as an animal they eat, like a seal, sea lion, or fish.

* Ask the students to come up with words they associate with sharks. Make a list on a large piece of paper, so you can save. Do this again after the presentation and see if the words change.

4. Fish Collage

Sharks are fish.

SQ: Do you have a pet fish?

5. ”Whoa! Sharks are Fish Too! “

-Yes, sharks are fish, but they are different than some of the other fish that might come to mind.

SQ: How are sharks different from other fish?

6. Bones vs. Cartilage

-Sharks do not have bones. Get the students to touch their wrist bones.

-A shark’s skeleton is made entirely of **CARTILAGE**. Have students touch their nose and wriggle it a bit.

- Cartilage is lighter (less dense) than bone and is also more flexible. Both of these attributes make it easier for sharks to maintain buoyancy (keep them from sinking to the bottom)

7. Skin vs. Scales

- Sharks do not have flat **SCALES** like other fish

- Sharks have placoid scales, which are also known as dermal denticles (more about skin later in the presentation).

-The dermal denticles are razor sharp tooth-like scales that reduce drag (hydrodynamic) and allow the sharks to swim faster.

B. WHY ARE SHARKS SO IMPORTANT

8. Why are Sharks so Important?

SQ: Do you think sharks are important?

SQ: In what ways are sharks important for the oceans? For humans?

9. Food Pyramid

- In a balanced **ECOSYSTEM**, the food pyramid shows the quantity of **ORGANISMS** on each level (number of animals) of the food chain. There are more **PRODUCERS** (base) than there are **CONSUMERS** (upper levels). This is necessary to keep the whole system in balance.

-Many shark species are at the top of the **FOOD CHAIN (FOOD PYRAMID)** in almost every part of the world's **OCEANS**.

- Sharks are not always **APEX PREDATORS**, but no matter where in the food chain they exist, they play a critical and necessary role in its balance. They help maintain healthy and sustainable populations of the animals they consume. They also eat injured, sick, dying or dead animals, which keeps the oceans clean and keeps disease from spreading. It is important for each level of the food chain to be in balance in order for the whole ecosystem to be healthy.

-Sharks are **CARNIVORES** meaning they eat other animals.

- Sharks eat (**PREY**) fish, turtles, marine mammals, birds, sea snakes and even other sharks.

10. Biodiversity

-**BIODIVERSITY** is critical for healthy oceans. Scientists have found a decline in ocean biodiversity and this has consequences on the stability of functioning ecosystems. This system is delicately balanced and when a component or multiple components are affected, the entire system and its interconnected parts feel the impact

-Sharks are not always apex predators, but no matter where in the food chain they exist, they play a critical and necessary role in its balance. They help maintain healthy and sustainable populations of the animals they consume. They also eat injured, sick, dying or dead animals, which keeps the oceans clean and keeps disease from spreading.

11. 100 Million

- Approximately 100 million sharks are killed each year. This is a VERY large number and the point of the slide is to get their attention and to think about just how LARGE this number is.

12. Human Impact: Sharks are in DEEP Trouble

- Sharks are primarily fished for their meat and fins, but also for their cartilage, liver and skin.
- -Shark fins are used to make shark fin soup. A bowl of this soup can cost \$100.00 or more.
- Shark finning is the cruel practice of removing the fins of a live shark.
- Sharks are also caught as **BYCATCH** by other fisheries.
- WATER POLLUTION** and habitat destruction have a negative impact on the oceans and sharks.
- The **LIFE CYCLE** of sharks is very different from other fish. They are slow growing and do not lay thousands of eggs.
- Some sharks will carry their babies for 12 months and only give birth to 2-15 pups.
- Baby sharks are called “pups.”
- Shark **POPULATIONS** are declining because they cannot reproduce fast enough to recover from the millions being killed each year.
- Shark **BIOLOGISTS** believe many sharks are at risk of **EXTINCTION** due to overfishing, habitat loss, finning and being caught as bycatch.

* There is a printable poster of this slide

C. WHERE DO WE FIND SHARKS

13. Where do we Find Sharks?

SQ: Do you think there are sharks in the ocean near us? (If near an ocean)

SQ: Has anyone ever seen a shark either in the ocean or maybe in an aquarium?

* As a class, you can research what shark species can be found in your area.

14. Map of the World

-Sharks are found in every ocean around the world.

15. Habitat & Ecosystems

-Sharks can be found in lots of different ecosystems and **HABITATS** including the open ocean, seagrass beds, **CORAL REEFS** and **MANGROVE FORESTS**.

-They can be found in cold water, warm water and even in fresh water rivers.

- Bull sharks can actually swim in brackish (fresh and salt water mix) and freshwater. They have been found thousands of miles up rivers around the world, some are far north up the Mississippi river as Illinois.

- Different sharks can survive in different habitat because of adaptations like camouflage and tail shape or because of different behaviors.

D. HOW MANY AND DIVERSITY

16. How Many Sharks?

SQ: How many different types of sharks do you think there are?

SQ: Can you name five different sharks? How about ten?

- There are over 500 different types of sharks that we know about. They range in size from 6 inches to 50 feet in length. They are all sharks, but they are incredibly diverse. They share common traits which classify them all as sharks, but they also have many differences. Differences include coloration, size, eye shape, fin shape and size, tooth shape and size and adaptations for hunting and survival.

17. Behaviors

-Different species have different behaviors that help them survive, which can include how they get food, hiding and being social.

- Some sharks are awesome ambush predators, using camouflage to hide and then attacking when prey is nearby (Angel sharks).

-Sharks have different personalities just like we do. Some sharks are bold, while others are shy. (Lemon sharks)

- Some sharks are social and hunt together, while others are very solitary. (dogfish vs. great white sharks)
- Juvenile lemon sharks have best buddies they hang out with.

E. SHARK PARTS

18. Shark Parts- Just What Have They Got

SQ: Do you think sharks have parts like us?

SQ: Do certain body parts help sharks survive in specific habitats?

19. Let's Dive in and Take a Closer Look

Sharks and other animals have body parts that help them seek, find and take in food when they are hungry. Different sharks have different **ADAPTATIONS** which also help them survive. These can include camouflage or the size and shape of their fins and teeth.

20. Teeth

-Humans have one row of teeth on the top and one row on the bottom (52 teeth total over our lives, 20 baby teeth that we lose, and 32 adult teeth).

-Sharks have several rows of teeth and they are constantly falling out. Most sharks have about 5 rows of teeth.

-Sharks will have thousands of teeth over their lifetime!

- Sharks usually lose at least 1 tooth per week. Imagine losing a tooth every time you ate an apple.

21. Teeth and Jaw Shape

-Different sharks have different shaped teeth depending on what they eat.

22. Gills

- Sharks have 5 to 7 gills slits on each side of their body

- Even though they live in the ocean they still need oxygen to live

-Sharks use their **GILLS** to pull oxygen from the water

- Water enters the shark's mouth and is expelled through the gill slits. This is the part of the gills we can see.

-Most sharks have to swim to stay alive, but others can rest on the bottom and pump water over their gills in order to get oxygen.

23. Lounging :

- Lemon sharks (top) and nurse sharks can lie on the bottom and pump water over their gills in order to breathe. This is called buccal pumping.

24 . Fins

-Sharks have 8 or 9 fins (some have a single dorsal fin)

-They use their fins to swim as well as stay upright while moving through the water.

25. Fin shape & function

- The shape of shark fins varies depending on what habitat they spend most of their time in. Example: A nurse shark has a flat caudal (tail fin) because it spends most of its time on the bottom.

- Some sharks like the Thresher shark can use their caudal (tail) fin to slap and stun their prey before eating them.

- The epaulette shark has an increased range of motion in its pelvic and pectoral fins allowing it to walk over the ocean floor or through tide pools.

26. Eyes

- Shark eyes are similar to our eyes in how they work.

- Shark eyes vary in size and shape depending on the habitat and depth they spend most of their time in.

-Sharks have eyelids, but they do not close all the way

-Some sharks have nictitating membranes, which protect their eyes when they are going after prey.

-Sharks without nictitating membranes can roll their eyes back in order to protect them.

SQ: Do any of these eyes looks like other animals' eyes?

27. Nictitating Membrane

-A nictitating membrane is a thin membrane similar to our eyelids.

-The membrane protects the eye when a shark is going after prey, they cannot see through this when it is closed, and must use other senses.

- Seals and sea lions have claws and fish have sharp spines, all of which could do damage to the eye of a shark during a predation event.

* There is a printable poster of this slide

28. Noses

-Sharks have 2 nares (nostrils) on the underside of their snout.

- Each nare has 2 openings: 1 for water to enter and 1 for water to exit.

- Sharks do not use their noses to breathe. They are only used for smelling.

29. Skin

- Shark skin is made up of tiny razor like scales called dermal denticles. (See next slide)

- Shark skin is very smooth in one direction (head to tail), but feels like a cat's tongue or sandpaper when you rub it the other way (tail to head).

30. DERMAL DENTICLES

- These V shaped scales make the sharks hydrodynamic, meaning they can move with less resistance through the water allowing them to swim faster, and use less energy.

-Olympic swimsuit designers, and boat builders have modeled material after the skin of sharks.

SQ: Why would it be important for sharks to be able to swim fast and smoothly through the water?

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31. Parents and Pups (2 slides)

Baby sharks are called pups

- Sharks give birth 3 main ways

- Lay egg cases (horn shark hatching out)

- Live babies with no umbilical cord (nurse sharks)

- Live babies with an umbilical cord (lemon sharks)

32. Do You Look Like Mom or Dad?

- Baby sharks can look like perfect miniature copies of their parents OR look very different. (Lemon shark vs Zebra shark)

- No matter how a shark is born, there is no parental care.

33. Let's Make Sense of Shark Senses: (5 slides)

-Sharks have all five of the same senses we do, but they actually have a very special 6th sense that helps them detect prey. This slide shows how strong each sense is (how far it can reach).

34. Sight

-Sharks can see in dark or murky water.

35. Hearing

- Sharks have ears, but they are located entirely on the inside of the body. Sound travels faster and farther through water, so often times sharks are able to hear their prey long before they can see it.

36. Smell

-Sharks have an incredible sense of smell.

-Imagine being able to smell a chocolate chip cookie in an area the size of a football field.

-Some sharks can detect a single drop of fish blood within a million drops of seawater or from a quarter of a mile away. A standard track is $\frac{1}{4}$ mile (1320 feet) in length and $\frac{1}{4}$ mile is almost 4 football fields (360 feet) in length.

SQ: Do you think sharks are attracted to human blood?

* If you have a space large enough on school property you can measure out $\frac{1}{4}$ of a mile. Place a marker or half the class at one point and everyone else 1320 feet away. Or you can take the kids onto the track and have them walk/jog a lap around the track, so they can see just how far $\frac{1}{4}$ mile is.

37. Taste

-Sharks have very sensitive taste buds in their mouth and will do a “test bite” to see if something is edible or part of their normal diet. People are NOT part of the normal diet of sharks.

-Scientists believe that modern teeth (in sharks) may have developed from taste buds.

SQ: If you were to bite a crayon or t-shirt (or another item in the classroom the kids would not eat) would it taste good? Would you want to eat it?

-Sharks do not have hands like we do, so they use their mouths to figure out what things are.

-Accidents happen when sharks bite something (people) and then let go because it is not food.

-A candy bar tastes good, but the wrapper it comes in does not. We know the wrapper doesn't taste good because we have learned it is not food. A shark learns by doing a test bite.

-We don't taste good, so they let go, but sharks have a lot of teeth and sometimes the bite can harm a person, but it is not the shark hunting down a human and trying to eat them.

This is a challenging section, but also a great opportunity to reiterate the fact that humans are not on the menu for sharks. Yes, accidents happen, but sharks do not hunt people and consider them food.

E. Touch

- Sharks have two components to their sense of feeling and touch.

-The first is actually touching an object, including a test bite, where they not only taste, but also feel the potential prey.

-The second is a bit more complex and includes a series of canals known as the lateral line. (See next slide)

38. LATERAL LINE (see the red line on each shark in the slide)

- The lateral line is a series of interconnected canals that run from the back of the shark's head to its tail.

- Each canal is made up of tiny pores, which allow water to penetrate the skin.
- Tiny hairs line the canal and allow the shark to detect movement in the water.
- The shark does not have to see an animal to know it is there, but can feel it by detecting movement or disturbance in the water.
- If you are in a swimming pool and your friend does a cannon ball you feel the wave, right? Imagine if you were at the opposite end of the pool and your friend wiggled his or her fingers very gently and you were able to feel that.

39. AMPULLAE OF LORENZINI

- Sharks have what is known as a 6th sense.
- This 6th sense refers to their ability to detect electrical pulses in the water.
- The black pores you can see in the image are the sensory organs that can detect these pulses. Every living thing gives off an electrical pulse. This gives sharks another tool for finding food.
- Metal objects such as boat propellers also give off pulses.
- Hammerheads and some other sharks can actually detect the very faint pulse given off by prey hiding motionless while buried in sand on the bottom.
- Sharks that are more active hunters will have more ampullae on their snout than less active species of sharks.

SQ: Do you think a healthy fish gives off the same pulse as an injured or dying fish?

* There is a printable poster of this slide

40. How Do We Learn About Sharks?

SQ: How do you think people learn about sharks?

SQ: How could you learn about sharks?

41. Ways to Learn Collage

- These images show a variety of ways we can learn about sharks.

42. Scuba Diving & Snorkeling

- In order to study sharks sometimes we need to dive in and get a closer look.

-Scuba Diving: SCUBA stands for self-contained underwater breathing apparatus. Divers use special equipment to be able to stay underwater, including an air tank they can breathe from.

-Snorkeling: People can use a snorkel, which looks like a pipe sticking up out of the water, to get air from the surface without having to lift their face out of the water.

SQ: Has anyone here been snorkeling? Do you have family members or friends who have been snorkeling or scuba diving?

SQ: How do you think snorkeling or scuba diving would allow people to learn about sharks?

SQ: What things could you learn by **OBSERVING** sharks in the ocean or an aquarium?

Scuba diving and snorkeling let people observe sharks and study them in their natural habitat. People can learn how they swim, what they eat and where they go.

43. Underwater Photo & Video

A great way to learn about any animal is by taking photos and videos.

SQ: What could we learn from looking at photos and videos of different animals?

-What they eat

-How they move

-Where they hide or spend time

-How they play

-How they act with other animals

SQ: Has anyone seen a television show with animals underwater?

SQ: What do you think would happen if you took a regular camera underwater?

-There are special housings made for cameras, so they can go in the water. The housings keep the cameras safe and dry. (Go Pros are an example of a camera you can take in the water)

44. Science & Research

SQ: How do you think **SCIENTISTS** learn about sharks?

SQ: What do you think scientists might want to find out about sharks?

-There are lots of ways scientists can learn about sharks.

-They can observe sharks in their natural **ENVIRONMENT** and take notes.

-Catch the sharks and see how long they are and how much they weigh (just like when you go to the doctor).

- They can take a DNA sample or a blood sample.

-They can study the DNA to figure out a shark family tree just like people can research their family trees.

45. Shark Tagging

- A really cool thing scientists can do is to put tags on sharks. There are lots of different tags and they can do different things.

- A simple tag might just give the shark an ID or “name.” If they catch the shark again they will know it has already been caught and they can take measurements again to see if it has grown.

- Acoustic tags can be used for tracking animal movements over a long time period.

-There are larger tags that are actually miniature computers. They record a lot of information while attached to the shark.

-Location

-Water temperature

- Depth

-Speed

* Shark Tracker Website: Students can follow different tagged sharks and see where they go. As a class, you can select a shark and see where it goes for a week or 2 weeks or even a month. This is a great way for students to see real life science in action. <http://www.nova.edu/ocean/ghri/tracking/>

46. We need your help

-Sharks need your help! They are in deep trouble and many species are **ENDANGERED** or critically threatened.

- Shark **CONSERVATION** involves protecting sharks and their habitats.

SQ: What do you think you could do to help sharks?

- RECYCLE

- Don't litter on land or in the water and pick up any litter that you see.

- Be a junior scientist and ask good questions about sharks.

- Be a shark advocate by telling other people how cool sharks really are and that they are NOT man-eating monsters.

- Get mom and dad or other family members to use canvas grocery bags instead of plastic.

- Have a reusable water bottle instead of buying new bottles of water

- Lots of things YOU can do and every little bit helps.

- Say NO to plastic straws

- Take our OFFICIAL SHARKS4KIDS PLEDGE TO SAVE SHARKS

47. The End