



# Shark Senses

TOPIC C: FORM AND FUNCTION  
TEACHER RESOURCE



## Background Notes

- We have five senses (sight, touch, hearing, smell, taste).
- It used to be thought that sharks had six senses but it is now said that they have eight unique senses: sight, touch, hearing, smell, taste and a distant sense of touch (lateral line), electroreception (ampullae of Lorenzini) and pit organs.

## HEARING

- Sharks can hear sounds one kilometre away.
- A shark's special ability is to pick up on irregular, really deep (low frequency) sounds. These sounds are the ones made by sick or injured fish which are easy food (prey) for sharks.
- Sharks can also better hear sounds in front and above them (similar to how our vision is best in front of us) which is where their food normally is.
- A shark's ear is seen as a small opening (about the thickness of a texta) further back along their body from their eyes.

## SMELL

- Sharks have an amazing sense of smell – they can smell an injured fish hundreds of metres away.
- Most of a shark's brain is used for processing smells.
- We use our nose to breathe and to smell; a shark just uses its nose to smell.
- Sharks have two external nostrils (like us). However, each nostril has an 'incurrent and an excurrent opening' that leads to a sensory sac.
- Sharks smell through the water that passes through their nostrils as they swim. In comparison, we smell small particles in the air.
- Hammerhead sharks have their nostrils as far apart as possible so that they can smell across an even larger area. Once they sniff something out they swing their head from side to side to find which way it is to the food.
- Sharks such as wobbegongs and bamboo sharks have 'whiskers' near their nostrils or all around their head. Packed with extrasensory cells, these are thought to enhance smell.

## TOUCH

- Sharks have a distant sense of touch.
- Sharks have a line that runs all the way along their body called a lateral line.
- The lateral line is packed full of millions and millions of tiny cells filled with 'jelly'. Just like the jelly we eat, this jelly loves to wobble! Any movement or vibrations in the

water causes the jelly in the cells to wobble and this wobbling passes a message onto the shark's brain.

- Amazingly, this line of wobble-able cells gives sharks a distant sense of touch and enables sharks to feel fish that are more than 100 metres away.

## SIGHT

- Sharks can see about 10 times better than us in low light conditions, such as in deep water or at the start or the end of the day.
  - This is a good time for hungry sharks to be able to see, as it is when all the nighttime fish get up and all the day time fish are going home (or vice versa) so it is like rush hour in the ocean.
  - Sharks can see really well in this light as they have tiny silvery plates, like mirrors, at the back of their eyes. These reflect light, sending it back out to be reused again.
  - By reusing the light that enters their eyes, sharks have more light to see with.
- Sharks have built-in sunglasses.
  - Around each of those tiny mirrors in shark's eyes are containers with a dark ink inside.
  - When it is bright, the dark ink-like substance covers the tiny mirrors stopping the light from being reflected, cutting out the glare and enabling a shark to see in the middle of the day or in shallow water – just like a pair of sunglasses!
- Sharks can see about 20–30 metres away. How does this compare to us?
  - Because of the way light travels through water, humans can only normally see about 20–30 m underwater. Shark eyesight is actually quite similar to human eyesight.
- Sharks can only see in black and white.
- Sharks see faster than us.
  - A shark can detect movement about twice as fast as us.
  - This helps sharks react quickly; especially when chasing prey.
  - Imagine seeing everything alike 2x fast-forward on a DVD.
- Some sharks also can't see right in front of themselves because of where their eyes are positioned.

## ELECTRORECEPTION – THE 6TH SENSE OF A SHARK

- Sharks can detect a heartbeat!
- Every time we breathe, every time our heart beats or we move our muscles even just a tiny bit, we give off energy and this creates an electric pulse around us. We can't pick up on this but a shark can! This ability is called electroreception.
- Sharks can detect weak electrical fields at short ranges.

- A shark uses electroreception to find food buried in the sand or if it's out hunting at night.
- A shark's ability to pick up on electrical pulses is better than that of any other animal.
- Pulses are detected by a network of specialised gel-filled pores in the shark's nose called ampullae of Lorenzini.
- This ability not only helps sharks find food but can also protect baby sharks. Some species of sharks give birth to eggs that are attached to the seafloor or hidden amongst seaweed. As the baby sharks grow they are able to detect predators approaching and will slow their breathing to make themselves less detectable.
- These specialised cells can also detect minute changes in water temperature.
- This helps sharks track their prey as fish often congregate at thermal boundaries – areas of the ocean where waters of different temperatures meet
- The gel in those pores create an electrical current in response to differences in water temperatures. These currents, in turn, cause electrically sensitive nerve cells to fire. This is how the shark detects small changes in water temperature, thus leading it to waters rich in fish.
- A difference in temperature as small as one degree Celsius resulted in a voltage as large as 300 microvolts. The experiments suggest that the gel could enable the shark to detect water temperature changes as small as 0.001 degrees Celsius.

## SENSORY PITS

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- Formed by the overlapping of two large 'skin teeth' (dermal denticles – the tiny tough scales that cover the skin of sharks and rays are actually modified teeth and covered in hard enamel) scales guarding a slight depression in the skin. At the bottom of the pit is a cluster of sensory cells that resemble a taste bud.
- Sensory pits are found along a shark's back, sides and lower jaw.
- Their precise function has not yet been determined but are thought to pick up on physical factors such as water currents.

## TASTE

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- Scientists are not sure how developed a shark's sense of taste is. Some fish 'taste' the water as it passes through their lungs (called gills), thus the way sharks smell could also be considered 'tasting' the water.
- Sharks have taste buds inside their mouths. These taste buds have not been studied extensively. Taste may be responsible for a shark's final acceptance or rejection of prey items.
- Some sharks seem to prefer certain foods over others and have been known to spit out things that they don't like.
- Also helping sharks decide what they will eat is their teeth! A shark's tooth isn't fixed into its jaw like ours is.
  - When a shark opens its mouth its teeth open out as well giving it an even bigger bite!
  - Sharks teeth can also be pushed down and this helps a shark know if they are biting something hard or something soft and juicy and good to eat.

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