



Exhibit message

Sharks have an array of senses that allow them to detect prey a few centimetres to a few kilometres away.

Quick fact

Sharks have a great sense of smell, but it is actually no better or worse than the ability of other fish's sense of smell.

Fish and sharks detect many proteins released by injured animals, not just the red blood cells of bleeding prey. These proteins include amino acids and amines found in body fluids.

Graphic panel text

Shark Senses

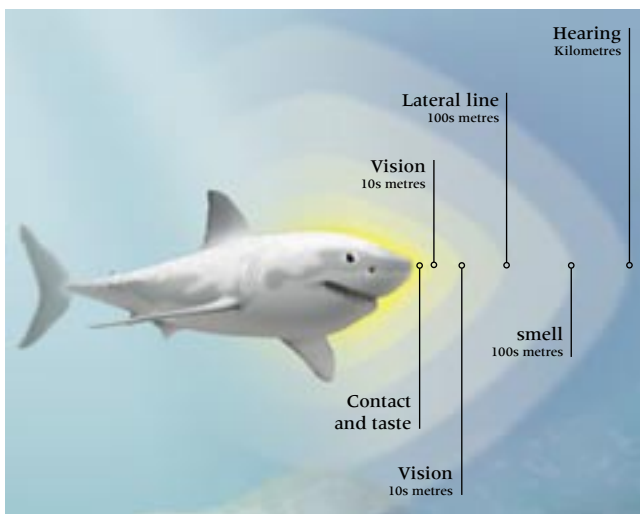


Illustration adapted from *Sharks in Question*.
The Smithsonian Answer Book.
Victor G. Springer & Joy P. Gold.

Taste testing

Sharks explore objects by biting and tasting them.

Some scientists believe that sharks prefer fatty animals such as seals, and they spit out less fatty pelicans and humans after tasting them.

Electric fields

Sharks have receptors along the front of their head to detect the electric nerve signals of prey.

These receptors may also detect changes in water temperature caused by prey nearby.

Lateral line

The shark has a row of receptors along the head and body called a lateral line.

Hairs lining the gel-filled receptors bend with vibrations, pressure changes and waves caused by moving animals.

Sense of smell

Like all fish, sharks can 'smell' proteins at tiny concentrations of one part protein to one billion parts water.

Sharks locate prey by comparing chemical concentrations between their left and right nostrils.

Want to know more about shark senses?

Just as humans might feel, smell and look at a piece of fruit to judge whether it's edible, sharks use their range of senses to select prey.

Shark senses include taste/touch, vision, detecting water pressure, electrosensory perception and hearing. They often use a range of senses to decide whether something is worth eating.

This range of exploratory techniques by a shark was shown in an experiment with floating seal-shaped and square-shaped boards.

The sharks did seem to be more curious about the seal-shaped boards, possibly because it looked like shadowy silhouette of a seal. However, they may have avoided the square-shaped board due to wariness, because this shape is rarely seen in Nature.

After seeing the boards, the sharks swam up to bump and feel the boards with their nose.

Then they grabbed the seal-shaped or square-shaped boards in their mouth to taste them. At this biting stage, sharks took one or two bites or carried the object in their mouth to assess if it was palatable enough to eat.



Hearing

Sharks have inner ears on each side of their head, connected to the surrounding water by tiny ducts.

Sound travels faster and farther in water than it does through air, so sharks hear sounds from a few kilometres away.

If a fish is struggling or splashing (often because it is wounded), it generates irregular sounds of varying frequencies. Sharks seem to be attracted to this irregular sound, rather than pure, continuous tones, as the irregular tones are probably identified as struggling fish.

Sense of smell

Sharks have similar talents to other fish in using smell to locate the position of prey (olfactory acuity) and being able to detect levels of chemicals (sensitivity).

Sharks are as sensitive to detecting proteins or amino acids as other fish. Depending on the type of amino acid (and its molecular weight), sharks can detect 1 part amino acid to 1 billion parts of water.

Lateral line (water pressure)

As prey swims through the water, they send out pressure waves. These changes in pressure can be detected by the shark's lateral line.

Along the side of the shark's body and head are fluid-filled canals. These canals are lined with tiny hair-like receptors. These canals and receptors form the shark's lateral line.

When pressure waves pass over the shark's lateral line, the hair-like receptors bend slightly. This bending sends a signal to the shark's brain, so the shark is aware that prey is swimming nearby.

The lateral line may also help the shark to maintain its balance as it swims along.

Vision

Scientists are unsure about the shark's ability to see colours, but they are very sensitive to light, movement and contrast.

Sharks seem to have a visual range up to 15 metres away (depending on the water quality and clarity).

The inside lining of the great white shark's eye (retina) has:

- a high density of cone receptors (used for daytime vision) at its centre of acuity and
- a reduced number of rod segments (used for night vision).

This may be why sharks mainly feed during the daytime and few sharks hunt during moonlit nights.

Ampullae of Lorenzini (electricity)

Sharks are able to pick up the direction and intensity of electricity generated by the nerves of prey.

The ampullae of Lorenzini are able to detect these weak electrical signals tens of centimetres away from the shark. The ampullae are long pore-like channels filled with gel and they are mostly found around the face and head of a shark.

The Earth's magnetic field also creates electric fields, which may help the shark to navigate using their ampullae.

Ampullae of Lorenzini (temperature)

New research indicates that gel in the shark's ampullae of Lorenzini may also detect changes in water temperature.

In laboratory tests, warm gel from the ampullae was better at conducting electricity than cooler gel.

The bodies of prey (and particularly schools of fish) can increase the temperature of the water slightly. Sharks may be able to detect changes in water temperature as little as 0.1 °C.

Touch and taste

Sharks gently bite an object to put it in contact with taste buds in the shark's mouth and pharynx.

Taste is usually used by the shark after other senses have been utilised. A shark will spit out an object that is poisonous or not to the shark's taste (such as less fatty prey).



Further information

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