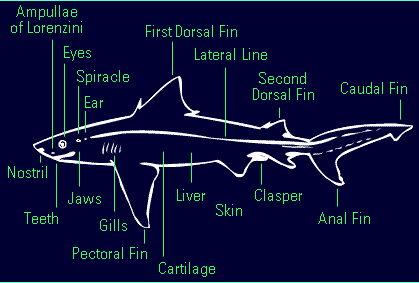
<https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#clasper>

callout: A single shark may run through upwards of 50,000 teeth in its lifetime.

The shark pictured here is a composite. Moreover, it's a male composite. Finally, we only touch on some of the fascinating facts and functions of selected body parts. (Click on them in any order you wish.) For more complete information on shark anatomy and physiology, see [The Hunt](https://www.pbs.org/wgbh/nova/sharks/world/hunt.html) and the books listed below and under [Resources.](https://www.pbs.org/wgbh/nova/sharks/resources.html)

  
  
**Skin**  
As if sharks didn't have enough teeth, their entire bodies are covered with them. Or something very like them called denticles. Denticle means "small tooth" and, indeed, the shark's teeth likely evolved from this tooth-like scale. Denticles face backward, and victims of shark attack often have their skin scraped off where it passed against the grain of these abrasive scales. In former days, shark skin, or shagreen, was made into sandpaper-like gloves to work fine, inlaid furniture, and in Japan it formed the hilts of the finest samurai swords.  
  
**Teeth**  
If you lose a tooth as an adult, that's it; you either get a false tooth or leave a hole in your gums. Not so with sharks: their teeth are endlessly replaceable. A single shark may run through upwards of 50,000 teeth in its lifetime. They don't last long in the shark: Captive lemon sharks have been shown to replace the teeth in their lower jaw every 8.2 days and those in their upper jaw every 7.8 days. But once out of the shark, they last seemingly forever, for they are one of the hardest biological materials known (shark teeth have been used as weapons and even drill bits).  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Jaws**  
With a device known as a gnathodynamometer (literally "jaw power meter"), scientists can gauge the strength of shark jaws. The maximum force so far recorded as applied to a single tooth was [132 pounds,](https://www.pbs.org/wgbh/nova/units.html) which converts to a tooth-tip pressure of 42,674 pounds per square inch. (This came from a shark only six and a half feet long.) As if force were not enough, a shark's upper and lower jaws can work independently and in opposition to each other—imagine a combination saw and scissors and you'll about have it.  
  
**Eyes**  
Unlike other fishes, sharks have mobile pupils and some sophisticated optical tricks for controlling retinal illumination. The tapetum lucidum, the same structure that gives eyeshine to certain animals at night, increases a shark eye's sensitivity to light at night, allowing the shark to see in dimly lit conditions; during the day it darkens. A shark, unlike most fish, can close its eyes, and some sharks have a third eyelid that closes protectively over the eye as they attack prey, for instance, or swim through a kelp forest or coral cave.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Ampullae of Lorenzini**  
Named after the 17th-century anatomist who first described them, these skin pores stipple the head and body of sharks. They connect to long, jelly-filled tubes ending in blind sacs called ampullae, which contain sensory cells and nerves connecting to the brain. The cells enable sharks to home in on hidden prey, which, like all animals, give off weak electric fields. Sharks can also detect the presence of ocean currents and make long migrations by sensing the seabed's local geomagnetic signature. The smooth dogfish, for one, can detect a change in direction of intensity of five billionths of a volt per centimeter.  
  
**Lateral line**  
Stretching from head to tail down the flanks of sharks, the lateral-line system consists of fluid-filled sensory canals with tiny, hair-like receptors. These are similar to the [ampullae of Lorenzini](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#ampullae) but are sensitive to vibrations. Acting like a body-length ear, the system helps sharks and other fish sense objects in the ocean. To them, the lateral line, which has been dubbed "distant touch," is like having a long arm with which to touch a rock or another fish.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Nostrils**  
You use your nose to breath and smell, but the shark only smells through its nostrils. And its olfactory sense is extremely sensitive: It can detect less than one part blood per million parts seawater. Typically, sharks following a scent will weave back and forth through the water like hounds on a fox hunt, holding to the odor's strongest concentration until they find its source.  
  
**Gills**  
Sharks breath by passing seawater over their gills, which harbor tiny filaments that comb oxygen out of the water and shuttle it to the circulatory system. (The gills also get rid of waste products such as carbon dioxide.) Some sharks actively open and close their mouths, pumping water over the gills; others simply leave their mouths open and keep swimming. This is called ram-jet ventilation.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Spiracle**  
Contrary to popular thought, not all sharks have to keep swimming to breath. Some, like the whitetip reef shark, sit still on the seafloor for long periods, breathing just fine. Many bottom-dwelling species, whose mouths are often pressed to the seabed, inhale through a vestigial gill called a spiracle, found just behind the skull on the upper part of the head.  
  
**Ear**  
Sharks don't talk, sing, or listen to Mozart, so they never evolved the sophisticated, sound-amplifying ears of mammals. Instead, they have a simpler internal ear that is remarkably good at picking up the sounds sharks like to hear, such as those generated by the low-frequency vibrations of wounded fish struggling or splashing about at the surface.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Claspers**  
These special extensions of the pelvic fin are unique to cartilaginous fishes. Only males have claspers, which Aristotle thought were used to clasp the female during mating (hence the name). In fact, during mating, the male passes one of his two claspers over his cloaca—the chamber into which the reproductive, intestinal, and urinary systems discharge in many fishes—thus forcing semen into a groove in the clasper. He then rotates this clasper so it's facing forward and inserts it into the cloaca of a receptive female.  
  
**Caudal (Tail) Fin**  
The tail fin is the shark's engine room, providing the power it needs to speed through the water. It's tough if not impossible to assess the speed of sharks in the wild, but captive sharks exhibit cruising speeds of between 1.2 and 3 miles per hour. The mako, great acrobat of the shark world, has been known to leap almost 20 feet out of the water. Such a height, tests have shown, would require a starting speed of 22 miles per hour.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
**Pectoral Fins**  
Like wings on an airplane, the low-slung pectoral fins provide the shark with a planing surface to aid lift during swimming. The pectorals also help in steering and turning and are used to brake forward motion. For all their swimming prowess, sharks, unlike bony fishes, cannot swim in reverse (though some can use their fins to "crawl" backwards).  
  
**Dorsal Fins**  
The rigid first dorsal fin serves as a stabilizer, while the second dorsal fin found on some species aids in rolling. Sharks in the order Lamniformes—the most diverse order, which includes the hammerheads and requiem sharks—also sport an anal fin that juts from the mid-line of the belly just back of the vent.  
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**Liver**  
Sharks have no air bladder to help keep them buoyant, as most fishes do. Instead the liver, which takes up as much as 90 percent of the body cavity and 25 percent of the weight in certain species, is saturated with lighter-than-water oils that help give the shark a boost. Nevertheless, while deepwater sharks are often neutrally buoyant, many shallow-water species will sink unless they swim continually, as their bodies are slightly denser than water.  
  
**Cartilage**  
Ancient sharks probably had some bone in their skeletons but gained no evolutionary advantage from it. So over time they switched to cartilage, which is the stuff that makes up human ears and noses. Since cartilage is less dense and more elastic than bone, it aids sharks in buoyancy and maneuverability. Sadly for paleontologists, cartilage doesn't preserve well, and fossil skeletons are as rare as fossil teeth are numerous.  
[**(back to clickable shark diagram)**](https://www.pbs.org/wgbh/nova/sharks/world/clickablesans.html#map)  
  
Principal sources:  
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