

STUDENT MASTER

How to Read a Shark

Sharks are amazing, often misunderstood animals. A shark's shape and other adaptations in the shark's body provide important clues as to where that species of shark lives, how it hunts, what it eats, and the role it plays in its ecosystem. The key to "reading" a shark is to examine these features and adaptations.

Procedure

1. Read the Background article beginning on the next page before coming to class.
2. Examine each of the preserved shark specimens, models, or shark pictures provided by your teacher.
3. Use the shark diagram to identify each shark's external organs, including the gill slits, spiracles, fins, eyes, jaws, lateral line, Ampulae of Lorenzini, and claspers.
4. Record data about your observations in the data table provided. You will need enough copies of the data table to answer the questions for all shark specimens.
5. When you are finished examining the sharks, use the Background article and data in your data table to answer the questions below. Record your answers on a separate sheet of paper.

Questions

- Q1. What are the basic characteristics of elasmobranch fishes?
- Q2. What body part does the shark use to move itself through the water?
- Q3. How do sharks defend themselves?
- Q4. How do sharks detect their prey?
- Q5. Leopard and sandbar sharks feed and live in estuaries. How are these sharks adapted for feeding in this particular habitat?
- Q6. In your own words, explain how the adaptations of a shark's body (its coloration, body shape, mouth position, fin position, and swimming style), indicate where that shark lives and feeds.

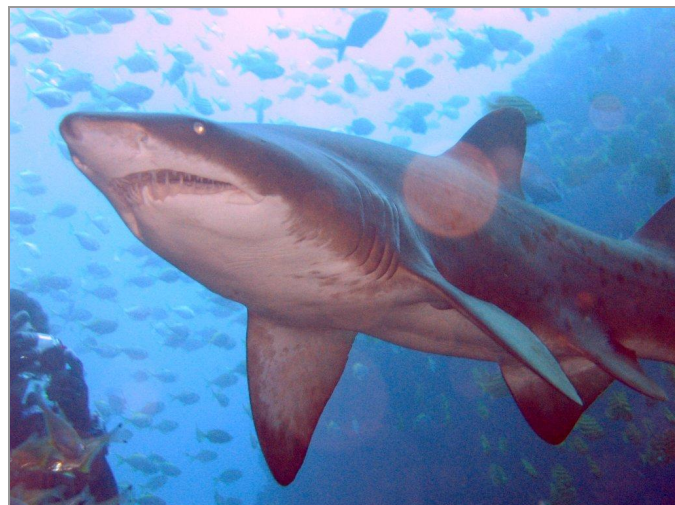
Background: How to Read a Shark

Fish are members of the phylum Chordata. That means that fish, like humans, are vertebrates and have backbones. All fish have a few major characteristics in common. Fish have backbones, live in the water, breathe through gills, swim using fins, and are cold-blooded. Fish also have several features that enable them to survive in their environment. They are all covered with scales, which serve as a protective outer covering. And fish have fins that enable them to swim, turn, stop, and remain upright in the water.

There are over 20,000 species of fish worldwide. Only about 400 of those fish species are sharks. Sharks and rays are elasmobranchs or cartilaginous fish, meaning that their skeletons are made of cartilage rather than bone like other fish. Elasmobranchs also have scales that are similar to their teeth, making their scaly outer coating extra protective and helping streamline their bodies so that they cut through the water with little effort.

Fish have adapted well to the different aquatic environments in which they live. By observing a fish's body shape, its behavior, mouth position, teeth shape, fin positions, and swimming style, you can figure out where the fish probably lives, how it lives, and sometimes figure out what it eats.

The same is true for sharks. Looking at a shark's body features and exceptional adaptations provide clues as to where that shark lives, how it hunts, what it eats, and the role it plays in its ecosystem. If you try, you can “read” a lot about a shark from its features.



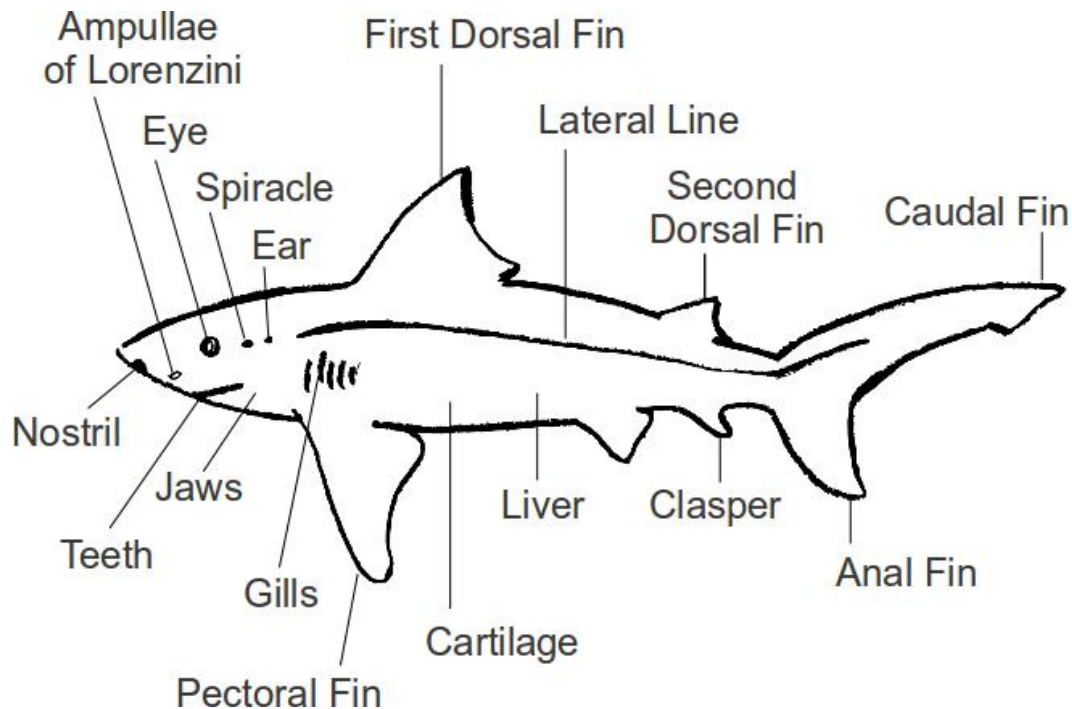
A Grey Nurse shark (*Carcharias taurus*)
Location: South West Rocks, NSW, Australia

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Shark Features

Fins: Fins give fish mobility, stability, and maneuverability. Fish use fins to swim, turn or steer, stop, and to stay in place. There are two types of fins: paired (two fins, one on either side of the body) and median (unpaired single fins, located along the middle top or bottom of the body).

- **Dorsal fins** are median fins that act as keels and prevent the shark from spinning or rolling. Dorsal fins keep a shark upright and stabilized in the water so it can swim straight. Some sharks have large, forward dorsal fins while other, slower sharks may have two dorsal fins of nearly equal size.
- **The caudal fin** (or tail fin) is an unpaired median fin. Fish use their caudal fin to move through the water and to maneuver. The caudal fin generates swimming power and assists in turning, slowing down, and stopping. For sharks, the shape and size of the caudal fin and dorsal fins provide clues about how fast that type of shark swims and whether that shark hunts for fast prey in the open ocean or something a bit slower, such as a horseshoe crab or clams, in the estuary. Fast sharks have crescent shaped tails with one large dorsal fin and a small second dorsal fin that reduces drag and increases the shark's speed in the water. In slower sharks, the upper lobe of the caudal fin is frequently longer and more prominent.
- **The anal fin** is an unpaired median fin located near the tail. The anal fin serves as a stabilizer. Not all sharks have an anal fin.
- **The pectoral fins** are paired fins used for steering. Pectoral fins are angled in a way that helps provide lift as a shark swims.
- **Pelvic fins** are also paired fins. Fish use pelvic fins for stabilizing and braking. Some fish have special adaptations for pelvic fins. Male sharks, rays, and skates use their modified pelvic fins for mating.



Body Shape: Fish tend to have body shapes suited for where they live and feed. Each shape has advantages for a different lifestyle. Most sharks are torpedo shaped, which is an ideal shape for fast, continual swimming. Fish with this body shape are well adapted for feeding and survival in open water because their body shape creates minimal drag as the fish swims through the water. Some sharks, such as the angel shark, have a body shape that is flattened from top to bottom. This body shape is ideal for living on the bottom.

Mouth and Teeth: Many fish have mouths on the bottom or underside of their heads instead of in front. This mouth position is useful for bottom feeding. Bottom feeding sharks, such as nurse sharks, also have barbels, small whisker like projections near the mouth, which help sense potential prey just below the sand or mud. Sharks are known for their teeth. Sharks teeth are not always the same. Different sharks have different teeth depending on what they eat. For example, some open ocean sharks that feed on large fish and turtles have teeth for cutting. Bottom feeding sharks that live closer to the shoreline may have teeth for gripping and crushing invertebrates.

Color and Pattern: The color and pattern of designs on a fish's body creates camouflage, which provides protection from predators. Some fish have stripes that run from tail to head, or color bands that run around the body. Other fish have spots or speckles. One clever use of different colors to create camouflage is called countershading. A fish with countershading is dark on top and light on the bottom. If you, or a predator, were to look down on the fish from above, the fish would seem to blend in with the darker, deeper water below. If you were below the fish and looking up, the lighter bottom of the fish might appear to blend in with the lighter water nearer the surface. Countershading is common in sharks that swim in the open ocean. In the case of sharks, countershading can make the shark a sneakier hunter.

Sensory organs: Sharks have eyes, of course. And sharks "noses" are so sensitive that they can "sniff out" as little as one part per ten billion of fish extract or blood in the water. But they also have other ways of sensing movement and vibration in the water. Like other fish, sharks have a lateral line running down their sides. The lateral line is a sensory organ. Sharks may actually be able to use their lateral lines to sense changes in magnetic fields and to sense the approach of severe storm systems. Elasmobranchs also have sensory organs called the ampullae of Lorenzini. These are very sensitive electroreceptors, able to pick up tiny electrical fields such as those given off by another organism's muscles. Clearly, these are useful adaptations to have for a shark hunting for food.

How to Read a Shark: Data Table

	Specimen #	Specimen #	Specimen #
Shark name			
1. Coloration:			
Are there signs of countershading? If so, describe it.			
Is the shark's coloration striped, banded, barred, or spotted? Describe how. If none of the above is present, describe the overall coloration.			
Explain how the shark's color is an adaptation for its habitat. In which habitat does the shark probably live?			
2. Look at the fins:			
How many dorsal fins are there?			
Describe the shape and size of the dorsal fin(s).			
Is the caudal fin forked or is the top lobe significantly longer than the lower?			
Describe the pectoral fins.			
From the fin descriptions, would you say that this shark was a fast or slow swimmer?			
3. Body Shape:			
Describe the shark's body shape.			
What is this shark's body shape probably adapted for?			

4. Mouth & Teeth:			
Are this shark's teeth shaped for cutting, grabbing, or crushing prey?			
Are there any barbels present? Is there a lateral line?			
Where does this shark probably feed?			
Predict from the above features of each shark:			
Its swimming style and speed (fast or slow).			
Its feeding style: open water or benthic (bottom).			