

The Evolution of sharks

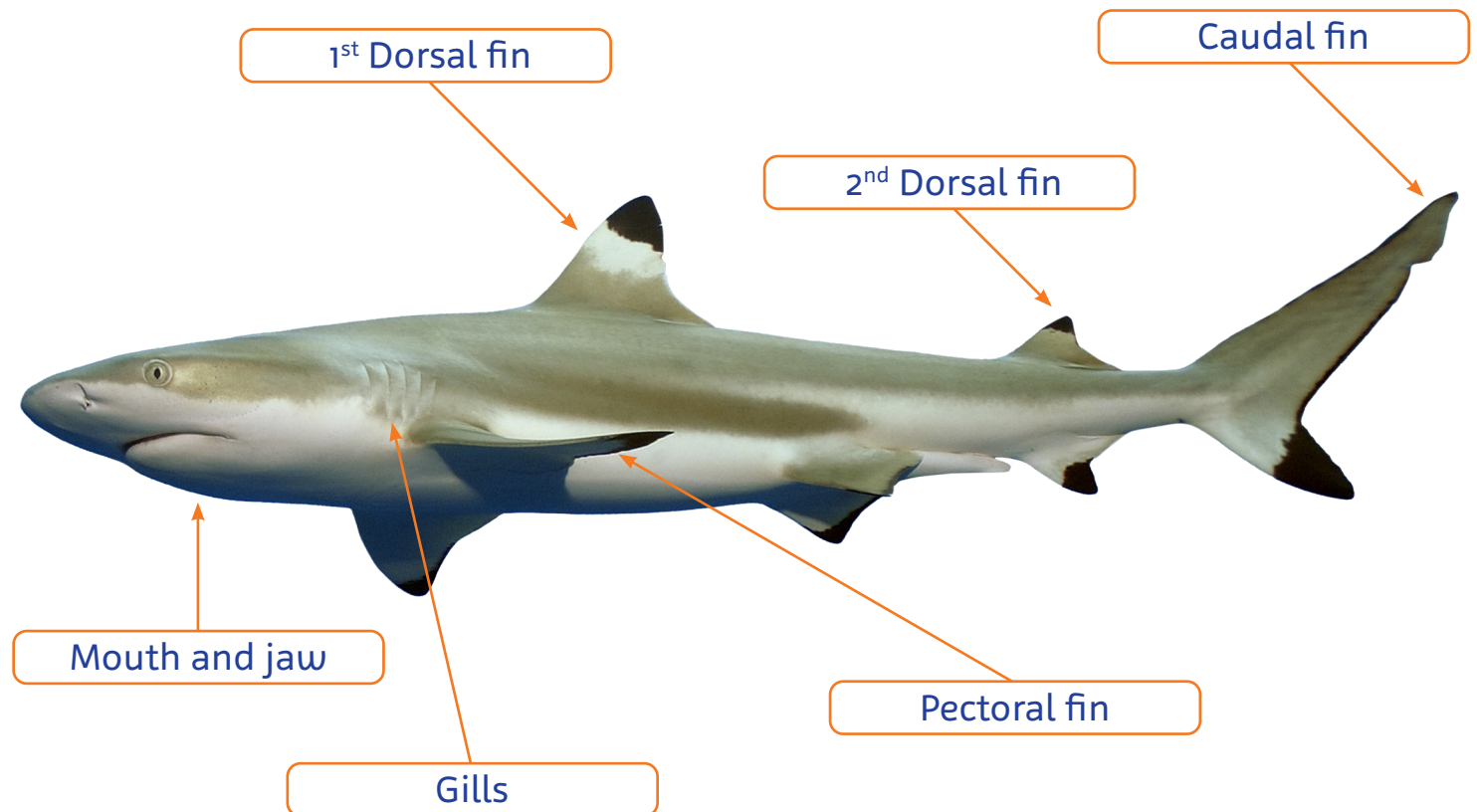
We care for several species of shark across our SEA LIFE aquariums – but did you know that sharks are well known for having survived many external stressors through an evolutionary process called ‘natural selection’?

All species **evolve** over time (over hundreds of thousands of years!), very small changes take place due to them needing to adapt to their changing environment, predators, prey and/or disease. Sharks have been evolving for 450 million years. During this time, there have been many adaptations, and hundreds of different species of sharks have evolved.

The species that we know today (from the sand tiger shark to the nurse shark; the black tip reef shark to the hammerhead; and not forgetting the great white shark!) have evolved with slightly different characteristics. Characteristics which help them survive are known as ‘**adaptations**’.

Being able to adapt helps the species avoid becoming extinct. This process is known as **natural selection**. Individual organisms with the most useful characteristics are more likely to survive and reproduce, resulting in these characteristics being passed on to **offspring (inherited)**.

Anatomy of a Blacktip Reef Shark



Task 1

In the table below, identify why these adaptations would be an effective characteristic to be inherited by offspring. These adaptations are shared by many, but not all, species of shark.

Characteristic	Why might this adaptation have been inherited by sharks through natural selection?
Dorsal fins	The dorsal fins help a shark remain balanced in the water, keeping it stable and stopping it from rolling to the side. This means that sharks can swim in a straight line. This is an adaptation that helps all sharks to be effective swimmers.
Caudal fin (which sits at the end of the shark's body)	The caudal fin help generate thrust and speed, so that a shark can propel itself quickly through the water. This is an adaptation that means sharks are fast enough to catch their prey, making sure they remain effective hunters.
A flexible, protruding jaw	A large and flexible jaw developed in sharks so that they could catch and eat animals bigger than themselves as their prey. This adaptation has helped them to remain very high up in the food chain, as they could eat a number of other large species found in the sea.
The shape of the body (tapered at both ends)	The shape of a sharks body makes it very streamlined when travelling through the water, helping prevent drag, and therefore allowing the shark to swim as fast as possible. This is an adaptation that helps all sharks to be effective swimmers.
The ability to regrow teeth (infinitely)	Sharks developed very sharp teeth to grab their prey, but if they break a tooth, they quickly regrow new ones. This means that they are not prevented from hunting at all. This adaptation allows them to be a constant predator, never starve or never become prey to a different species (which may have happened if they could not hunt for periods).
A highly specialised sense of smell, with the ability to smell blood from injured prey over a long distance	By developing the ability to smell blood, sharks could track wounded or dying fish, which are as prey are easier to catch than healthy prey. This adaptation helped ensure that the shark could always catch plenty of prey to eat.

Changes in DNA over time are always occurring in all species. These can be as a result of inheritance, passing favourable traits to offspring or due to environmental changes which mean they adapt in order to have a better chance of surviving and passing on their genes. This is known as **genetic mutations**.

Task 2

In the table below, consider the reasons for why the following adaptations would be beneficial characteristics to inherit as part of natural selection. Use the important information about these species to help you.

Species of shark	Specific characteristic	Important information about this species of shark to consider	Why might this adaptation be a characteristic inherited through natural selection?
Blacktip reef shark	They give birth to live young, rather than laying eggs.	These sharks often fall prey to larger fish such as groupers, grey reef sharks, tiger sharks or even bigger blacktip reef sharks.	By birthing live young, their babies are less likely to be eaten – whereas eggs could form easy prey to other sharks, a baby Blacktip reef shark can swim away from prey and therefore have greater chance of survival.
	They have a unique adaptation called “countershading”, where their dorsal side is darker for camouflaging.		Countershading helps the blacktip reef shark be camouflaged amongst the sea bed. This can help it hide from predators that may be hunting it.
Nurse shark	Whilst most sharks need to keep moving so that water flows over their gills, nurse sharks can stop swimming, as they can pump water through their mouths and gills while they’re still.	Nurse sharks hunt a lot of their prey from the sandy bottom of the sea.	As nurse sharks hunt their prey from the sea bed, they will need to stay still and quiet so as not to disturb the prey they are hunting. The ability to breathe whilst still means that they can remain still rather than move, which would draw attention to them and scare any possible prey away.
Great white shark	Specific teeth structures mean their edges have saw-like features.	The great white shark is the world’s largest known predatory fish.	The saw like features of the great white shark’s teeth means that it can tear and rip their prey into smaller pieces whilst eating. As the largest predatory fish, they may eat other large creatures, so will need to break it down using these sharp teeth into smaller enough chunks to swallow.