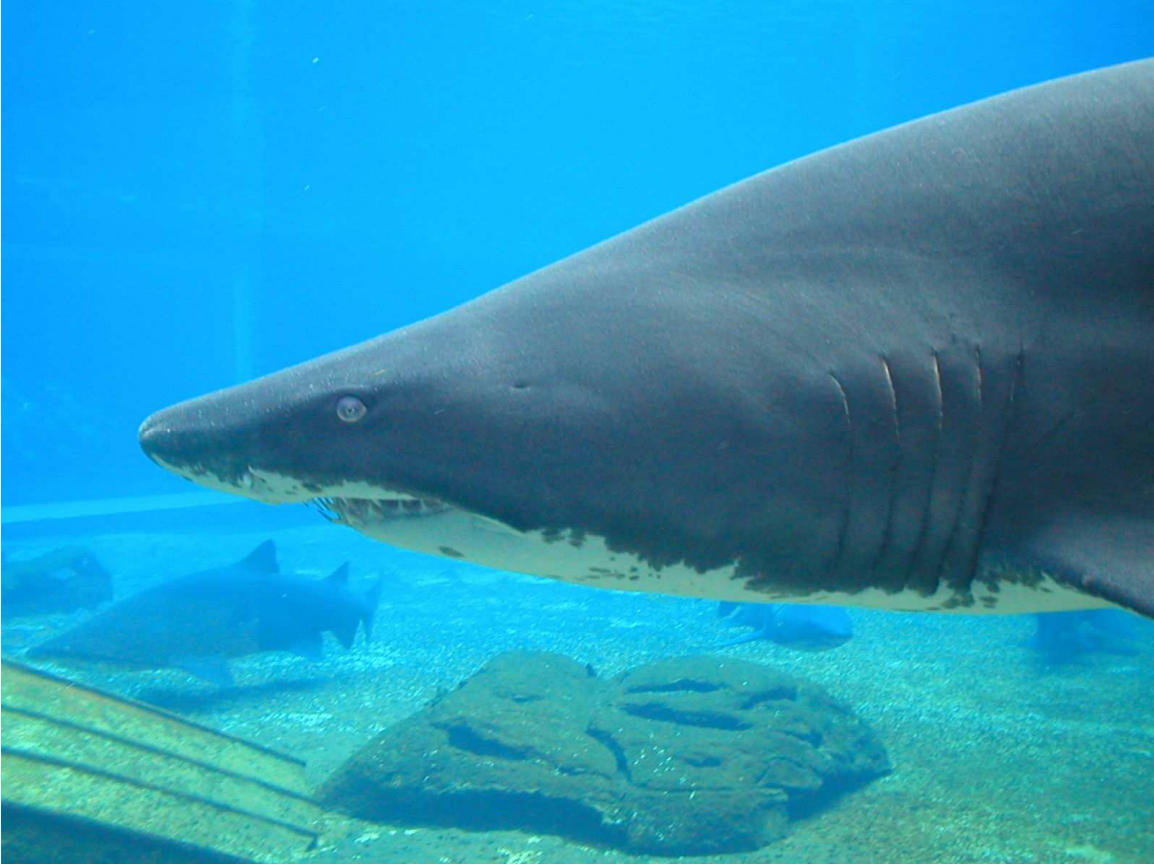


Sharks



Sharks are fish of the group belonging to the Elasmobranchii, the subclass of cartilaginous fishes (their skeletons consist of cartilage and not true bone as with most other fishes). Other cartilaginous fishes include skates, rays and guitarfish.



There are currently about 500 species of sharks identified and they come in all sizes. While most sharks average at about 1m in length, the whale shark can reach up to 20m and the lantern sharks are less than 30cm.

These wonderfully evolved creatures have been around for over 300 million years and have evolved very little over the last 65 million years. They are the perfect predator of the oceans and we still have much to learn from them.

Physiology

Sharks have 5-7 gill slits per side (commonly five). Water moves over the gills and oxygen is extracted from the water through a series of capillaries in the gill area.

The skin of a shark is very different from that of bony fish – instead of overlapping scales, they have a latticework of tiny tooth like projections called dermal denticles or ‘skin teeth’. It creates a hydro-dynamic surface and assists in streamlining the body. The teeth of a shark are very much like the denticles in structure and, unlike your teeth that are set in a socket in your jaw, a shark’s teeth are set in its gums and are constantly replaced by layered rows of teeth behind it – it is believed that some shark species can produce up to 20 000 teeth in its lifetime!

Shark species that enter into estuaries are able to cope with salt water and reverse osmosis in fresh water. The Zambezi Shark (Bull Shark) has been recorded to travel as far as 194km upstream.

Locomotion

Sharks have a lack of connections between their vertebrae and this makes them very flexible. They have a large liver that stores energy, and this is especially useful during pregnancy.

Unlike bony fish, sharks do not have swim bladders (gas bladders used to control buoyancy) and instead they rely on their livers (which contain an oily substance called squalene that is less dense than water) to act like a sack of buoyant oil to keep them afloat or becomes more dense in cooler water. Their broad head area and accentuated pectoral fins also assist in providing lift.

The tails of sharks are asymmetrical, with the upper part of the fork usually longer than the lower one. Bony fish have symmetrical tail fins. The shark swims by sweeping its tail from side to side by means of lateral muscle contractions. Due to its large-sized liver, a shark can store large amounts of energy which enables it to swim very fast (like the elegant but swift White Shark). A shark cannot use its pectoral fins to brake like a bony fish does – instead it avoids a sudden object with a very quick swerve.

Senses

Sharks have very good eye sight – even in dim light - but cannot see in colour. They have two eyelids but cannot close them and instead have a third eyelid called a nictitating membrane that covers the eye when the shark wishes to protect it – like during feeding or attack.

Sharks have special organs that assist them in picking up even the slightest movement in water. Like other fish, they have lateral lines – fluid-filled canals just under the skin that run along the side of the body, which opens to the water through small openings. Sensory cells called neuromasts in the canals pick up the slightest vibrations in the water and messages are sent to the brain.

Another sensory organ, which is unique to cartilaginous fish, is the Ampullae of Lorenzini. These are jelly-filled canals in the snout and head area of the sharks that pick up electric pulses given off by all living things – they are called electro-receptors and enable sharks to locate prey even if it's buried in the sand.

Sharks have a great sense of smell and can pick up minute amounts of blood in vast quantities of water. The olfactory lobes (the part of the brain responsible for processing information about odours) take up the largest part of the shark's brain.

Feeding

A shark's diet depends on the species of shark and where in the ocean it is found. Big sharks like the great white will eat seals, fish, large squid, other sharks and turtles. A floating whale carcass quickly turns into a feeding frenzy of sharks gorging themselves on the rich blubber. Smaller sharks will feed on molluscs, shellfish and smaller fish and other sharks still, specifically the basking shark and whale shark are filter feeders and feed on zooplankton and nekton (tiny squid and fish). Their large mouths engulf huge volumes of water which is filtered by way of a sieve-like structure occurring inside the five pairs of gill slits on either side of the head.

Feeding of sharks in captivity is a more complex process. Almost all fish in captivity, sharks included, need to be closely monitored for weight issues. They gain weight very easily as access to food is made less challenging. In an aquarium it is necessary to balance the needs of the animals with the needs of a paying audience who wish to watch them eat. Out of season this is easily achieved by feeding less often but in peak season daily feeds of the exhibit are required so we balance this by feeding the different species on different days, targeting certain species, even though there may be more than one species in an exhibit, like the Large Sharks exhibit for example. Approximately 60 kilograms of feed (mainly fish) are offered weekly to over ten large sharks, some in small pieces for the guitar fish, other in appropriate sizes for the large sharks.

Reproduction

Sharks mate belly to belly and the male uses his claspers to transfer sperm into the female (internal fertilisation). The gestation period can be from 6 to 12 months depending on the species.

Female sharks produce their young in one of three ways:

Oviparous (egg producing) e.g. cat sharks:

Many can hold eggs until just a few weeks before they hatch. The egg moves through a shell gland and is laid onto the sea bed in an egg case (also known as a Mermaids Purse) which attaches to the substrate by means of tendrils.

Nutrients from the water can pass through the casing and, once the embryo has fully developed, the little pup hatches out of the capsule and into the sea.

Ovoviviparous (live-egg producing):

The eggs hatch inside the female and the shark foetuses are attached to an egg yolk. There may be many unfertilized eggs and intrauterine cannibalism can occur in which case the one foetus will eat the other yolks as well as the other embryos. The ragged-tooth shark is an example of a shark that has this method of reproduction. The shark pups are born live.

Viviparous (live producing):

Embryos develop with a placental attachment and the shark pups are born live e.g. Zambezi sharks .

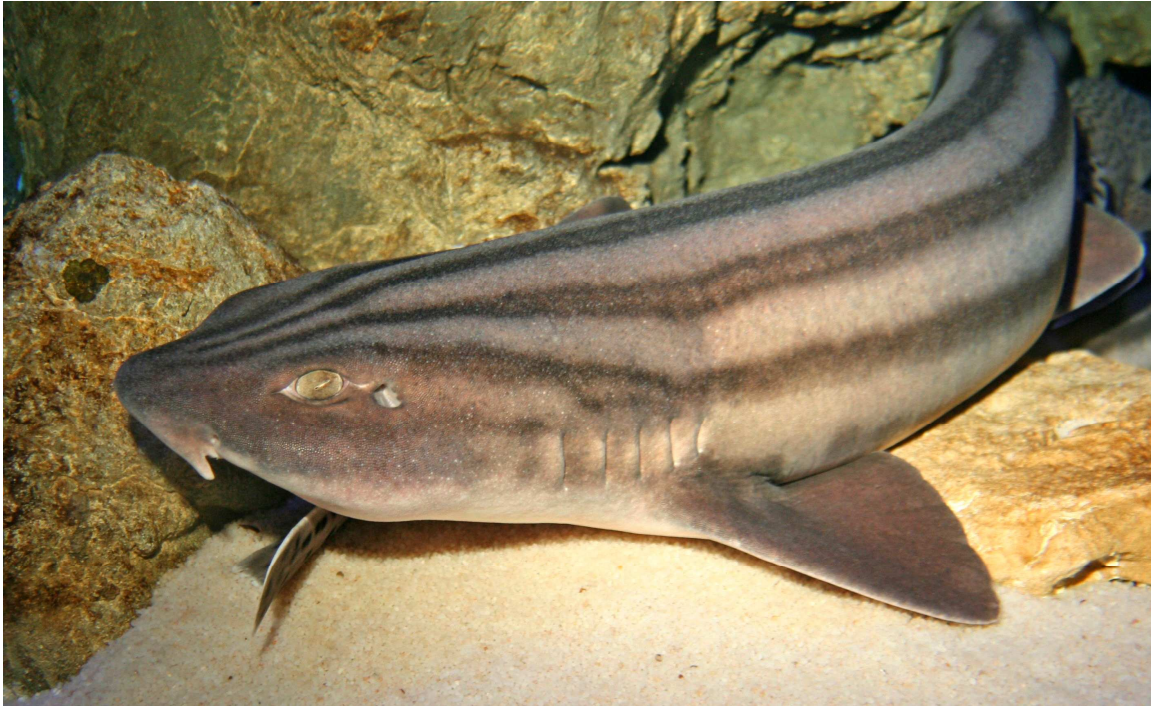
A shark can have a small litter like the ragged tooth shark with only two pups, or a large litter of up to 50 as found in the hammerhead shark. Small litters are often due to intra-uterine cannibalism.

Sharks occasionally breed in captivity but most times the pups are eaten before they can be removed from the tank. In the Snorkel Lagoon we at present have a young hound shark born over Christmas that is doing well

Sharks on exhibit

Sea World's fish, including the sharks, are mainly from the KwaZulu-Natal coast but also south towards the Cape and north into Mozambique. A few Spinner Sharks came from the nets when people were netting during the sardine run, as well as two Galapagos sharks that the collection team brought back from a trip to Walter Shoal, south of Madagascar. The collections team often attend the national fishing competitions and bring in any suitable animals caught by the anglers. Occasionally the Natal Sharks Board will offer Sea World animals caught in the nets too, like the Bowmouth Guitarfish – a recent addition.

Sea World has 18 shark species in six to seven different exhibits, with a total of more than 70 sharks!



Shark Attacks

There are various reasons why sharks attack people. Sharks may sometimes confuse people with their normal prey and this occurs particularly in dirty water when their vibration, chemical and electromagnetic sensors are more effective than their eye sight. It is also believed that surfers paddling on their boards (whom are sometimes the victims of shark bites) resemble the silhouette of seals – a favourite meal among white sharks. Sharks may also bite people due to territorial aggression or pure fright. Shark attacks are a potential danger that must be acknowledged by anyone that frequents marine waters, but it should be kept in perspective. Only 5 fatalities worldwide were reported in 2009.

Shark bite statistics over the past few years:

Attacks	2005	2006	2007	2008	2009
Durban Area	0	1	1	1	1
Fatal	0	0	0	0	0
Cape Town Area	7	5	4	3	6
Fatal	1	0	1	1	4

Sourced from KwaZulu Natal Sharks Board – www.shark.co.za

Precautions you can take to decrease the likelihood of shark bites:

- Do not swim at dawn or dusk as this is when sharks are feeding
- Avoid murky water
- Avoid thrashing around in the water
- Do not swim alone and if possible avoid being at the edge of a group as sharks will target loners
- Do not urinate in the water as it might spark curiosity
- Avoid areas where fish remains are dumped in the water e.g. near fishermen cleaning their catch
- Spear fishing increases your risk of being attacked as sharks will come after your catch
- Avoid wearing jewellery or bright colours that might attract attention from nearby sharks

Shark nets

One of the methods of protecting bathing areas from sharks has been off shore gill nets. Each set of nets comprises two rows laid parallel to the shore in such a way that the nets in the second row overlap the gaps in the first row. The nets are anchored in position by 35kg weights and float midway between the surface and the sea bed. The nets are made of strong synthetic rope and so they do not rust and are very durable. The KwaZulu-Natal Sharks Board is responsible for manufacturing, installing and maintaining all nets along the KwaZulu-Natal Coast. The nets are checked daily and all live animals are removed and released. Cape Town, where 4 out of the 5 shark fatalities of 2009 occurred is not a suitable place for shark nets due to the rough seas and strong winds of the Cape coast.

Research is being done on electric shark repellent to use instead of shark nets as the fatalities of sharks and other sea creatures are an unfortunate reality. A SharkPOD Diver Unit (POD - Protective Oceanic Device) has previously been deployed with much success as protection for divers against sharks.

Another means of reducing environmental impact is the introduction of drumlines in place of some of the remaining nets, such that beaches are protected with a combination of nets and drumlines. A drumline consists of a shark hook suspended from a large anchored float. The hook is baited regularly. The advantage of drumlines, in comparison with shark nets, is that they are more selective in terms of shark species captured and also take a considerably reduced bycatch of dolphins, turtles and rays.

Threats to sharks

Why should we be concerned about shark conservation? Many sharks are near the top of the food chain. They are believed to play an important role in regulating numbers of the prey animals on which they feed.

Sadly these creatures that both fascinate and frighten us are disappearing at the hands of a more skilled predator - people. Sharks are particularly vulnerable to

over-exploitation and many shark fisheries worldwide have collapsed. Sharks occur in low numbers relative to animals lower in the food chain. They are slow growing and mature late in life, producing few offspring compared to bony fishes. Like other slow growing fish, they have a slow recovery rate after being harvested.

About half of the world's total shark and ray catch is taken as bycatch. This means that the catch is unintentional, and is taken in fishing operations that are actually targeting other species. For example, as many as six million blue sharks may have been caught annually in recent years, mostly as bycatch. This kind of catch is very difficult for the fishing industry and the authorities to control.

One of the reasons for the increased specific targeting of sharks has been the growing trade in shark fins. Shark fin soup is an expensive delicacy and fishermen are able to sell fins for a much higher price than they are able to sell shark meat. Shark fin soup can sell for as much as R500 a bowl! This has led to the wasteful and inhumane practice of finning, in which the fins are cut off the sharks, which are often still alive, and the bodies are then dumped back in the ocean. Some countries, including South Africa, have now banned finning.

Sharks are also hunted by man for sport and for souvenir jaws. In most parts of the world sharks are highly prized as food from the flesh and fins, leather, liver oil (a known Vitamin A supplement), anticoagulants, corneas for transplants and cartilage for treatment of burns, treatment of arthritis and as a controversial and unproven "cure" for cancer.

Shark populations are also negatively impacted by pollution, degradation of estuaries, destruction of reefs and over-exploitation of the animals they prey on.

Sharks are fascinating creatures to watch underwater, and shark diving is becoming increasingly popular worldwide as we begin to appreciate the importance and magnificence of these creatures. The economic return of a living shark for dive tourism is many times that of the short term benefit of catching and selling the animal. It is possible that, with the growth of dive tourism, shark and fish watching could become the underwater equivalent of game drives. However, some people believe that the chumming that often goes hand in hand with shark diving and especially cage diving could have a negative impact by increasing the risks of shark attacks. This is because sharks may start to associate human presence with food. There has not been any scientific proof of this.

South Africa has agreed to participate in an international plan of action for the conservation and management of sharks, as called for by the United Nations Food and Agriculture Organisation.

What you can do to help

- Be mindful of what you wash down the drain. It all ends up in the sea.
- Do not litter! It also travels a long way to the ocean and could be eaten by sharks or other sea creatures.
- Do not buy shark curios, shark meat or shark fin soup.

Did you know?

- Sharks are social, and will meet to breed and some sharks may even hunt in packs.

- The White shark can keep a constant body heat which makes them more efficient predators.

- No Great White shark has ever been witnessed mating.