

## Student Information Sheet 4

### The Role of Sharks in the Ecosystem

#### Background

Sharks are part of a group of fishes called Chondrichthyes. This group includes sharks, rays, skates and the chimaeras. All the fishes in this group have a skeleton made of **cartilage** instead of bone like most other fishes. Cartilage is similar to bone but it lacks the chemical that makes bone hard. Your nose and ears are strengthened by cartilage rather than bone.



The great white shark  
(*Carcharodon carcharias*)  
(© Ken Hoppen, oceannotions@primus.com.au)

Worldwide, there are about 370 shark species and almost half (170 species) are present in Australian waters.

Sharks are found in a broad range of marine habitats from shallow coastal waters to the deep ocean (deeper than 2000 metres) and from the **tropics** to the polar regions. Some live in the open surface waters of the ocean and others spend their lives on the seafloor.

#### Distribution

Geographic and depth distributions are known for most shark species and this information is constantly being updated as a result of continuing research. Although this data can tell us about the areas sharks are inhabiting, it does not tell us about their preferred habitats, population sizes, movement patterns or other factors that might help to find out their role in the ecosystem.

The use of **shark-tagging** provides some of this information. Standard tags have a unique identification code printed on them. They are inserted into a shark when it is caught. If the shark is recaptured the code is written down, the shark is measured (if possible) and the location is noted down. This information is given to researchers who use it to try to understand more about sharks.



The spotted wobbegong (*Orectolobus maculatus*) may grow up to three metres long. This camouflaged shark commonly ambushes passing prey, that includes teleost fishes, crabs, rock lobsters and octopuses.  
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More advanced tags provide the exact location of the shark by sending information to a satellite. The researchers then download the information from the satellite and they can follow the movements of sharks quite accurately. Unfortunately, this satellite technology is very expensive and limits scientific investigations to key species such as the grey nurse shark (*Carcharias taurus*), which is critically endangered on the eastern coast of Australia.

### Feeding

Sharks feed on an extremely wide range of prey items with very different methods. At one end of the feeding scale are the whale shark (*Rhincodon typus*) and the megamouth shark (*Megachasma pelagios*), which are both filter feeders. They move through the water with their mouths wide open and let water, filled with **plankton**, flow through their mouths and gill-rakers, where they sieve out the plankton. At the other end of the feeding scale are the great white shark (*Carcharodon carcharias*) and the broadnose sevengill shark (*Notorynchus cepedianus*) that feed on a range of **invertebrates** and **vertebrates**, including a high number of marine mammals.



Whale sharks (*Rhincodon typus*) are filter feeders. They swim with mouth agape filtering food from the water as it passes over the gills (© Ken Hoppen, oceannotions@primus.com.au).

Sharks that live on or near the seafloor generally have mouths underneath the body with many small teeth. Wobbegongs live on the seafloor and are **ambush predators** that use their wide jaws and sharp teeth to grab unsuspecting passing prey.

Examining the stomach contents of sharks is the best way to understand the diets of sharks and their possible role in their environment. Studies have clearly shown that there is a change in the diet of some sharks as they grow larger and are able to take larger or harder-bodied prey, such as crabs.

A difficulty with studying shark diets like this is that the same species of sharks may have different diets depending on their location. Some sharks may be particular about what they eat and search for specific prey types, but other sharks may be opportunistic, feeding on whatever they find. Scientists are only now starting to understand the flexibility of shark diets.



Many of the pelagic species, such as the whaler sharks (Family Carcharhinidae) are fast swimmers with ventrally placed mouths and relatively large teeth (© Andrea Marshall).

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### Food webs

Sharks are usually perceived as apex predators—top level predators—in marine ecosystems. However, while all sharks are high-level predators, not all are true apex predators.

For example, the great white shark has a large number of marine mammals in its diet making it a very high level predator, whereas the zebra shark (*Stegostoma fasciatum*) feeds only on **molluscs** and so is considered to be a lower level predator.

Removal of top-level predators can cause a 'top-down' effect on organisms lower in the food webs. This has been clearly demonstrated in some parts of the oceans where a predator's population was reduced so much that the population of the main prey began to explode. Because there were then so many of the prey they began to eat themselves out of food, changing the ecology of the whole area.



The great white shark (*Carcharodon carcharias*) has the highest trophic level (4.5) due primarily to marine mammals making up about 20 percent of its diet.  
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Gummy sharks (*Mustelus antarcticus*) are a principal target in the southern fisheries off the coasts of New South Wales, South Australia, Tasmanian, Victoria and Western Australia.  
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It is very difficult to determine what the effect of shark extinction might be on marine ecosystems because it is very difficult to conduct the research needed to find out. However, it is thought that, for example, if the great white shark were to become extinct there might be a population explosion of seals, sea lions, small **cetaceans** and other shark species, as these are its main prey.

### Conclusion

Our current understanding suggests that the role of high level predators is important in maintaining the ecosystem and their removal will have unknown effects on the remaining animals and plants. Further study is needed to understand both the biology of various sharks and the way their habitats work.

**In short, a sharks role.....?**

**To eat (and be eaten).**

Alex Gaut adapted this information sheet for children (which is suitable for primary school students) from the information sheet compiled for the general public by © Mike Bennett (m.bennett@uq.edu.au).

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