Department of Sustainability and Environment

Action Statement

Flora and Fauna Guarantee Act 1988 No. 185

Great White Shark

Carcharodon carcharias

Description and Distribution

The Great White Shark, also known as the White Pointer or White Shark is a close relative of the mako and porbeagle sharks and part of the fast swimming family Lamnidae (mackerel sharks). The shark has a large, torpedo shaped body that grows to about 6 meters in length and can weight up to about 3 000kg (Smith & Pollard 1997). Its colouring is distinctively grey with a white underbelly. A pointed snout, large pectoral and first dorsal fins, crescent-shaped tail, large black eyes and large serrated, triangular shaped teeth also distinguish this species. The teeth are positioned in rows in the jaw and as one is broken or lost it is replaced by a tooth from the next row.

They are usually solitary animals and are found throughout temperate seas and oceans in the northern and southern hemispheres, occasionally penetrating tropical zones. A heat-exchanging circulatory system allowing the shark to maintain a body temperature up to 14˚C above that of the surrounding seawater (Goldman *et al.* 1996), makes it possible for the shark to tolerate a range of temperatures. Great white sharks are considered to be a migratory species within their range area and may travel on a seasonal basis (Fergusson 1996). Individuals are capable of swimming long distances and for extended periods. Satellite records from a juvenile male shark tagged in south eastern Victoria in March 2001 indicated that the individual covered 2 946 km in 113 days with a swimming speed generally ranging between 1.2-3.3 km per hour (Malcolm *et al.* 2001).

In Australia, their range extends Across southern Australia between Moreton Bay in southern Queensland and North West Cape in Western Australia. In Victoria, larger individuals (3.5–4.5 m) tend to aggregate in particular locations coinciding with breeding sites of the Australian Fur Seal. These include Lady Julia Percy Island, Seal Rocks, Kanowna Island and The Skerries (Warneke 1995). Great White Shark juveniles (<2.5 m total length) are known to aggregate in coastal waters off the Ninety Mile Beach in Eastern Victoria which is likely to be an important juvenile feeding area (Walker 1998; Walker *et al.* 1998).

Habitat

Limited information is available on important habitat for great white sharks. Individuals are generally found in the surface layer of waters above the continental shelf, which slopes gradually from the land to about 200 metres in depth, before dropping to the ocean floor. They have been seen in the vicinity of islands, rocky reefs and often near seal colonies and have also been caught on longlines set down the continental slope at 1280m (Malcolm *et al.* 2001).

Juveniles tend to occur in areas separate from larger individuals and are mostly encountered inshore in the vicinity of the open coast beaches. Some of these areas appear to be seasonally important and may be related to pupping grounds (Malcolm *et al.* 2001).

Life history and ecology

Great White Sharks are long lived at up to 30 years, and have a slow development

and reproduction rate. Females are thought to only become reproductively mature at about 12-15 years and males at about 9-10 years (Compagno *et al.* 1997). Gestation periods are estimated to exceed 12 months, when up to 10 fully developed and independent pups are produced. Females only breed every 2-3 years (Malcolm *et al.* 2001).

2001). Great White Sharks are oophagous, where the embryos are nourished by a supply of unfertilised eggs, which the female continues to ovulate during pregnancy (Malcolm *et al.* 2001). This reproductive strategy combined with their naturally low abundance levels makes the great white shark susceptible to depletion with small increases in mortality.

The Great White Shark is an apical predator with few natural predators, and then only at smaller sizes. Larger individuals target larger prey including marine mammals such as dolphins, porpoises and seals. Fish, turtles and invertebrates such as squid, crabs, abalone and other gastropods are also eaten and form the diet of smaller individuals (Compagno 1984).

The shark is assumed to play an important role in the marine ecosystem by, among other things, controlling the population and maintaining the genetic fitness of its prey (Environment Australia 2001).

Conservation Status

Internationally, the Great White Shark is listed as 'vulnerable' on the International Union for the Conservation of Nature Red List of Threatened Species (IUCN 2000). It is also protected in South Africa (1991), Namibia (1993), Florida and California, Malta and the Maldive Islands.

In Australia, the species is listed as 'vulnerable' under the **Environment Protection and Biodiversity Act 1999** and is therefore protected in Commonwealth waters. It is also protected under fisheries legislation in the waters of all States and Territories of Australia.

In Victoria, it was declared as 'Protected Aquatic Biota' in 1998 under the **Fisheries Act 1995** and was listed as 'threatened fauna' in 1998 under the **Flora and Fauna Guarantee Act 1988**. In its final recommendation for the listing as threatened fauna in Victoria (SAC 1998), the Scientific Advisory Committee determined that the taxon is:

- prone to future threats which are likely to result in extinction; and
- very rare in terms of abundance or distribution.

Decline and Threats

The Great White Shark is highly vulnerable to over-exploitation and increases in natural mortality. Internationally, research suggests that even small increases in natural mortality can have a significant impact on local populations. In a single location, removal of just four Great White Sharks seriously reduced, and possibly eliminated, the entire local population (Ainley *et al.* 1985).

Internationally, evidence from beach netting, game fishing and commercial captures all suggest declining captures of the great white shark indicating that the populations of the species are diminishing. Evidence also suggests that the population may have declined by at least 20% over the last 10 years or three generations and the decline, in its major range areas, is considered to be ongoing (Environment Australia 2001).

Although it is protected in parts of its range, the great white shark is still globally threatened by human related activity. The principle threats to the Great White Shark populations are direct target fishing for teeth, jaws and fins, commercial fishing bycatch or direct killing when they become a nuisance to fishing and fish farming operations (Bruce 1992). Great White Shark teeth and jaws have significant economic value (Malcolm *et al.* 2001), which promotes targeting the species in fisheries where they would usually form part of the incidental catch. These products are often sold on the black market, making it difficult to quantify the true impact on the population (Compagno *et al.* 1997).

In Australia, populations of Great White Sharks were significantly reduced by targeted game fishing which reached its height in the 1950s and targeted killing in the 1970s following the release of the 'Jaws' feature film. Fishers generally targeted the largest and oldest individuals, removing the most reproductively productive members of the population. While tag and release practices became popular during the 1980s and 1990s the survival rates of released individuals are not clear and the impact on the populations is unknown.

Great White Sharks are now protected in Australia but are still threatened by human activity. It has been estimated that around 500 human-related Great White Shark mortalities may occur annually in Australian waters (Shark Assessment Group 2001). Commercial fisheries are considered to be the key threat to the species in Australia, where they are taken as a bycatch (Environment Australia, 2002). About 40% of sharks captured in fisheries are released alive, however, post-release survival rates are unknown (Malcolm *et al.* 2001).

Great White Sharks are also threatened by shark control programs designed to reduce the risk of shark attacks on bathers in NSW and Queensland waters, which continue to take small numbers through beach meshing and drumline techniques, and may also be caught by recreational game fishers. The degradation of inshore waters used as nursery areas could also have an impact on breeding and/or juvenile survival.

The Victorian waters adjacent to the coastline are central within the distribution of the species in Australia. Great White Sharks were protected in Victorian waters in 1998 through the **Fisheries Act 1995**. However juveniles may occasionally be unintentionally hooked in low numbers in the Victorian commercial snapper fishery east of Wilsons Promontory. By-catch of the species in other fisheries is considered to be negligible. While recreational fishers target shark species generally, this is not considered to pose a significant threat to great white sharks as the species being targeted are mainly pelagic and most fishing takes place at the edge of the continental shelf, where few great whites are found (Walker 1999). No beach control programs (shark meshing) occur in Victoria.

Previous Management Action

Several international agreements have been put in place to encourage nations to reduce impacts on the marine environment and in particular shark populations. In Australia, these agreements have been incorporated into domestic arrangements and are outlined below.

International Arrangements

United Nations Convention on the Law of the Sea is an international treaty signed in 1982 to protect and preserve the marine environment. This Convention is principally related to fisheries and the United Nations General Assembly Resolution 49/118 called upon States (sovereign nations) to take into consideration the effects on associated or dependent species when establishing conservation and management measures for target fisheries. As a result of this resolution, the United Nations Food and Agriculture Organisation developed a Code of Conduct for Responsible Fisheries to address fisheries by-catch in 1995.

International Plan of Action for the Conservation and Management of sharks was adopted by the United Nations Food and Agriculture Organisation Committee on Fisheries in 1999 in recognition of the expanding global impacts on populations of sharks, rays and chimaeras. The objective of the International Plan of Action is to ensure the conservation and management of sharks and their long-term sustainable use. All signatories are now required to develop a National Plan of Action to implement international objectives into local management arrangements (Anon 2000).

National Arrangements

National Plan of Action for the Conservation and Management of Sharks is currently being jointly finalised by the Commonwealth, States and Northern Territory and aims to implement local management arrangements that reflect international objectives.

Recovery Plan for White sharks (*Carcharodon carcharias*) in Australia (Environment Australia 2002) was released after the species was listed under the Environment Protection and Biodiversity Conservation Act 1999. Overall objectives of the Plan are to implement actions that will allow the recovery of great white shark numbers in Australian waters to a level where the species can be safely removed from threatened species schedules under the Act. This Recovery Plan applies to Commonwealth territorial waters and Commonwealth managed fisheries.

National Policy on Fisheries By-catch (AFFA 1999) was released after all Australian Governments agreed to develop a by-catch policy to address by-catch in all fisheries. By-catch arrangements are being incorporated into Fishery Management Plans for each Victorian managed fishery. The Commonwealth Government subsequently released the *Commonwealth Policy on Fisheries By-catch,* which applies to and requires the development of By-catch Action Plans for all Commonwealth managed fisheries.

Victorian Arrangements

The impacts of humans on shark populations are well recognised and Victoria has a long history in monitoring, research, and management for the conservation of sharks in Victorian waters. Arrangements to reduce the impacts of commercial fishing on shark populations have provided protection within Victoria's inshore waters, a habitat particularly significant for smaller individuals. These arrangements include:

- a ban introduced in 1988 on targeted commercial shark fishing using gillnet and long-line methods within Victoria's territorial waters (within 3 nautical miles).
- a ban introduced in 1989 on the use of mono-filament gillnets (made from a lighter material) in Victoria's territorial waters. While larger individuals are capable of breaking through such nets, entanglement, particularly for smaller individuals, is more likely to occur and result in a drowning.

- a trip-limit introduced in 1998 of 50-kilogram applying to the Victorian longline fishery, thereby reducing the incentive to land great white sharks caught as by-catch.

Further arrangements outlined below were implemented in 1998, including actions on recreational and other commercial fishing methods. These include:

- a ban introduced in 1998 on the killing, injuring or disturbing of great white sharks under the Victorian Fisheries Act 1995 after it was listed as a 'protected aquatic biota'.
- a ban introduced in 1998 on the use of mammal blood or any body part as berley to minimise the attraction of sharks to fish hooks, thereby reducing the catch or by-catch of the species.

Conservation Objective

Long Term Objectives

That the Great White Shark can survive, flourish and retain its potential for evolutionary development in the wild.

Objectives of this action statement

1. To continue applying and implement where appropriate, Victorian arrangements consistent with national approaches to minimise impacts on Great White Sharks;
2. To support national approaches for minimising impacts on Great White Sharks.

Intended Management Action

Many of the human activities which threaten Great White Sharks, including targeted shark fishing, the use of mono-filament gillnets, certain berleying practices, and the killing, injuring and disturbing individuals, are banned in Victorian territorial waters. The actions in this statement therefore aim to maintain these arrangements to protect the species in Victoria. In recognition that threats to great white sharks still occur outside Victoria, this action statement aims to support international and national arrangements to manage threats.

1. Encourage recreational and commercial fishers to report interactions with great white sharks in Victorian territorial waters.

   Responsibility: DPI

2. Continue to apply existing arrangements that protect great white sharks in Victorian territorial waters.

   Responsibility: DPI

3. Implement measures, where appropriate to Victoria, as specified in the White Shark Recovery Plan and the National Plan of Action for the Conservation and Management of Sharks.

   Responsibility: DPI

4. Incorporate actions to protect the Great White Shark in management plans for fisheries that may pose a threat to this species.

   Responsibility: DPI

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: http://www.dse.vic.gov.au

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