PROPOSAL FOR INCLUSION OF SPECIES ON THE APPENDICES OF THE CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS

A. PROPOSAL: inclusion of *Carcharodon carcharias* on Appendices I and II.

B. PROPONENT: Government of Australia

C. SUPPORTING STATEMENT

1. Taxon

1.1 Class	Elasmobranchii
1.2 Order	Lamniformes
1.3 Family	Lamnidae
1.4 Species	*Carcharodon carcharias*
1.5 Scientific Synonyms	*Carcharias lamia* Rafinesque, 1810; *Carcharias verus* Cloquet, 1822; *Carcharias rondeletti* Bory de St. Vincent, 1829; *Squalus (Carcharias) vulgaris* Richardson, 1836; *Carcharodon smithii* Agassiz, 1838 or Bonaparte, 1839; *Carcharias atwoodi*, Storer, 1848; *Carcharodon capensis* Smith, 1849; *Carcharias vorax* Owen, 1853; *Carcharias maso* Norris, 1898 (not *Squalua (Carcharias) maou* Lesson, 1830); *Carcharodon albimors* Whitley, 1939 (Food and Agriculture Organisation of the United Nations, 1999).
1.6 Common Names	Great white shark, White shark, White pointer, White death, (English) Grand requin blanc, Ami, Lamea, Lamie, Lameo, le Carcharodonte lamie, le Grand requin, Pei can (French); Jaquetón blanco, Ca mari, Marraco, Salproig, Salproix, Gran tiburón branco, (Spanish); Squalo bianco, Carcarodonte, Cagnia, Cagnesca grande, Cagnia, Caniscu, Carcarodonte lamia, Carcarodonte di rondelet, Imbestinu, Lamia, Masinu feru, Pesce cane, Pesca can, Pesce can grande, Pesciu can, Pisci cani grossu, Pisci mastinu (Italian); Weisshai, Menschen fresser, Menchenhai, Merviel fras (German); Hohojirozame, Hitokiuzame, Oshirosame (Japan); Lamia (German); Niuhi (Hawaiian Islands); Gab doll (Malta); Tubarao branco (Portuguese) Gench, Kersch (Red Sea).

2. Biological Data

The great white shark, *Carcharodon carcharias* is a close relative of the mako and porbeagle sharks and is classified in the family Lamnidae (mackerel sharks). Great white sharks are coloured blue-grey to grey-brown on the upper surface and whitebelow; have a moderately stout, torpedo-shaped body; have large serrated triangular teeth; and have a distinctive lateral keel along the body midline immediately before a crescent shaped tail. Great white sharks grow to at least 6m in length (NSW Fisheries, 1997; Last & Stevens, 1994), although there are unconfirmed reports of specimens up to 7 metres (Mollet, Cailliet, Klimley, Ebert, Testi and Compagno, 1996). The White Shark also has a heat-exchanging circulatory system allowing it to maintain body temperatures up to 14^{o} C above that of the surrounding seawater (Goldman, Anderson, McCosker and Klimley, 1996).

Pregnant females are rarely reported. Little is known therefore about the reproductive rate and behaviour of the species. Compagno, Marks and Fergusson (1997) reported that the species might have an unusually low fecundity rate for elasmobranches, with both a long gestation period and with relatively few adult females being pregnant at any one time. Great white shark females do not reproduce before reaching 4.5 – 5.0 metres in length and have a litter of between two to ten pups

(sometimes as high as fourteen) (Francis, 1996). Males mature at about 3.6 - 3.8 metres. (Bruce, Malcolm and Stevens, 2001). Minimum ages at maturity for females and males are estimated to be 18 and 10 years respectively. The gestation period is unknown but is estimated to exceed 12 months (possibly 18 months) with females breeding only every 2-3 years (Bruce *et al*, 2001). This is typical of many K-strategists, making them vulnerable to exploitation. ('K-strategist' species are defined has having slow development, relatively large size, and producing only a small number of offspring at a time). Therefore, Great white shark populations are not adapted to cope with:

?? Unnatural and sustained declines in population numbers; or
?? Detrimental environmental impacts on habitats due to anthropogenic factors including pollution, increased fishing effort and beach meshing.

2.1 Distribution

The great white shark is widely distributed and located throughout temperate and sub-tropical regions in the northern and southern hemispheres. It is primarily found in the coastal and offshore areas of the continental and insular shelves and offshore continental islands. The great white shark is most abundant near the pinniped (Northern Elephant seal or sea-lion) colonies along the Central California Coast, the shelf waters of the mid-Atlantic Bight, the Great Australian Bight, and the Cape and KwaZulu-Natal provinces of South Africa (Fergusson, 1996). For a more in-depth list of range states, see "Range States".

Smaller specimens (below 3 metres) are mostly restricted to temperate waters, with newborn and young fewer than 176 centimetres in length (Cailliet *et al.*, 1983 *in* Francis, 1996) reported from New Zealand, Australia, South Africa, the eastern North Pacific, the western North Atlantic, and the Mediterranean (Francis, 1996).

2.2 Population

Population Status

Available data on absolute or total population numbers for the Great white shark are extremely limited. However, studies on sharks indicate that the Great White is uncommon to rare compared to most sharks and there is anecdotal evidence from game fishing and beach meshing statistics to indicate that the population is in decline. The Great white shark is listed as 'Vulnerable' on the 2000 IUCN World Conservation Union Red List of Threatened Species (IUCN, 2000). This listing recognises that a decline of at least 20 per cent has been observed, inferred or suspected over the last ten years, or over three generations.

Sport-fishing data from the east coast of North America and south-eastern Australia indicate declines in the proportions of Great white sharks taken relative to other shark species caught over the last several decades (Bruce, 1992; Casey and Pratt, 1985). For example, a study by Pepperell (1992) recorded a decline in the number of Great white sharks relative to other sharks caught by game fishers off the coast of south-eastern Australia of 1:22 in the 1960s, to 1:38 in the 1970s to 1:651 in the 1980s (other sharks largely consisted of shortfin, mako, blue, tiger and, until 1979, grey nurse). This decline in numbers is also reflected in sport fisheries data from the eastern United States, where the proportion of Great white sharks taken relative to other shark species dropped from 1:67 in 1965 to 1:210 in 1983 for the mid-Atlantic Bight (Casey and Pratt, 1985).

Declining catch rates in shark nets in Natal have also been reported. A longitudinal study off the KwaZulu-Natal coast between 1966 and 1993 saw a decline in Great white shark numbers, with the authors calculating the decline in the latter part of the study (between 1973 and 1993) as significant, (Cliff, Dudley and Jury, 1996). In Australia, Great white sharks are also caught in beach protection programs in Queensland and New South Wales. A total of 498 Great white sharks have been captured by beach meshing between 1950 and 1996 (an average of eleven per year). Catch per unit effort (CPUE) from beach meshing in New South Wales and Queensland has shown a gradual and irregular decline and there has also been a decrease in average length of Great white shark caught in NSW, consistent with a decline in the fishery. The average length of Great White's caught between 1950-1970 was 2.5m, 2m between 1970-1990 and down to 1.7 m in the 1990s (NSW Fisheries, 1997).

2.3 Habitat
White Sharks appear to move through developmental habitats as they grow. The identification of the White Shark habitat may be difficult given the unknown nature of their developmental needs at various life stages.

Within its range states, the Great white shark is often found close to the surf-line and even within shallow bays in continental coastal waters. In waters along the continental shelf, Great white sharks generally occur near the surface or at the bottom from 16 to 32 metres depth rather than mid water depths (Goldman *et al.* 1996).

Coastal areas are a preferred habitat.

2.4 Migrations
The Great white shark is capable of swimming long distances and for extended periods. For example, offshore tracking of a large shark with sonic tags indicated that it moved 190 kilometres in 2.5 days at an average cruising speed of 3.2 kilometres per hour (Carey *et al.* 1982 *in* Bruce 1992). Recent tracking of a satellite-tagged Great white shark recorded 2,946 km (use km or kilometers) over 113 days.

While Great white sharks are also considered to be a migratory species within their home range, it is possible that they may also move in and out of these areas on a seasonal basis (Fergusson, 1996). There is evidence that some larger non-breeding individuals have a wider temperature range and penetrate tropical waters where carcharinid sharks are located, and also pass through the waters off oceanic islands. Recent research now shows evidence of Great white sharks migrating to other countries. A tagged Great white shark was recently recaptured over 3500 km from the point of tagging. This particular shark was tagged at North Neptune Islands off South Australia in August 1999 and recaptured on the west coast of North Island, New Zealand, in January 2002 (B. Bruce, CSIRO Marine Research, Hobart, pers comm 2002). Recent research by Boustany *et al*., 2002) confimed the offshore movents of white sharks tagged in California to as far west as Hawaii. Captures of adult specimens at the Azores Islands also indicate that some degree of transoceanic migrations over considerable distance may occur (Compagno 1984a *in* Fergusson 1996). In the case of the Azores this may be as a (largely) west-to-east nomadic journey within the Gulf Stream from North America (Fergusson, 1996).

Rare mid-ocean records are also known from the Marshall, and Easter Islands (Fergusson, 1996), and there have been reports of sightings of the shark in the tropical south-west Indian Ocean, including Madagascar, Mauritius and Kenya. All the sharks in these cases appear to be large (greater than 4 metres). This suggests that equatorial waters may be a deterrent to large-scale movement but not a complete barrier. A possible mechanism is tropical submergence, where the shark descends into and travels within deeper, cool oceanic waters across the equatorial zone. Recent genetic research suggests linkages between worldwide populations may occur via migrating males, with females remaining regionally based (Pardini *et. al.* 2001).

3. Threat Data

3.1 Direct threats to the populations
The major direct threats to Great white shark populations are largely a result of human actions including:

- ?? direct and incidental fishing pressure,
- ?? protective beach meshing,
- ?? intensified targeted commercial and sports fisheries for trophies, and
- ?? incidental catch of the species in commercial and artisanal fisheries.

Though generally rare, Great white sharks appear to form local populations and the species is highly vulnerable to over-exploitation if there is strong fishing pressure within that area. For example, research off the Farallon Islands (USA) suggested that the removal of just four Great white sharks greatly reduced, and possibly eliminated the entire local population of Great white sharks (Ainley *et al. in* Cailliet *et al.* 1985). Direct pressure on Great white shark populations comes from being targeted for their teeth, jaws and fins, or when they become a nuisance to fishing operations (Bruce, 1992). Great white shark teeth and jaws have significant economic value (Compagno *et al.*, 1997). There is also reportedly a commercial market for neonates (Camhi, Fowler, Musick, Bräutigam and Fordham, 1998).

Beach meshing, often employed in areas of the Great white shark's preferred habitats, also threatens to reduce population numbers. Great white sharks caught by beach meshing programs are usually small (less than 3 metres), and in many cases, particularly off eastern Australia, are smaller than 2 metres. This suggests that these programs operate close to pupping grounds or in juvenile nursery habitats. However, while beach meshing undoubtedly is detrimental to smaller specimens, the widespread occurrence of similar small sized Great white sharks in areas where beach meshing is not undertaken suggests that nursery habitats are also probably widespread in Australia (B. Bruce, CSIRO Marine Research, Hobart, *pers. comm.*, 2002). Compagno 1996 (*in* Marshall and Barnett 1997) documented Great white shark mortality of 80% from entanglement and drowning in beach-meshing operations in Natal, South Africa.

Fishers generally target the larger sharks for their teeth and jaws, which could have a significant impact on population numbers in the long term as it is the reproductively active females and larger males that are being targeted. A further direct threat to the Great white shark is from sports fishing. Big game sports fishers such as Alf Dean and Bob Dyer from the 1950s, and the film 'Jaws' in the 1970s, led to a dramatic increase in game fishing for this shark (Ellis and McCosker, 1991). This direct targeting of Great white sharks, together with developments in fishing equipment and growth in human population and affluence, is likely to have increased its mortality rate in recent decades. While some sports fishers will release alive the Great white sharks that they target, others travel long distances in order to target this species as a trophy.

In general, an increased trade in shark products promotes the catch of the Great white shark as incidental catch of other shark and other fisheries. The Great white shark is an incidental catch of fisheries that use longlines, hook-and-line, fixed bottom gillnets, fish traps, herring weirs, and trammelnets, harpoons, and bottom and pelagic trawls, as well as purse seines (Food and Agriculture Organisation of the United Nations, 1999). Strong, Nelson, Bruce and Murphy (1996) found through studies in South Australia, that 10% of Great white shark were observed bearing short remnants (greater than 2 metres) of longlines and gill nets. Bruce (1992) found in the lower Spencer Gulf of South Australia that 30% of Great white sharks sighted had evidence of a previous encounter with commercial fishing gear. Of course, these were the fish that had survived their encounter with fishing equipment.

3.2 Habitat destruction

Increasing human population in coastal areas may lead to degradation of important inshore feeding and reproduction habitat for Great white sharks. Near-shore habitats serve as nursery and pupping areas for many sharks and their prey (Oliver, 1996). The proximity of Great white shark habitat to human populations further increases the chances of sharks being killed in fisheries or as a by-catch.

3.3 Indirect threats

The major indirect impacts on Great white shark populations appears to be habitat degradation (addressed above)

3.4 Threats connected especially with migrations

The direct and indirect threats to Great Whites Sharks, discussed above, are also likely to impact on the species during migration. For example, Great white sharks may be caught as by-catch in fisheries

while they are migrating following prey. Similarly, pregnant Great white sharks may be caught in protective beach mesh when migrating inshore to give birth.

A further threat connected to migration is that not all States in the Great white shark's range have legislative protection for the species. Therefore, although the Great white shark is protected in Australia, a Great white shark migrating to another country, where no protection exists, could be targeted directly through fishing.

3.5 National and International Utilisation

Some of the uses for shark species in general include meat, skins, organs, and tissues for human consumption, carcass used for fish meal and fertiliser, cartilage for medicines, fins for shark-fin soup and even meat of small specimens for fish bait. Great white sharks have also been used for leather and its liver oil has generalised uses (Rose, 1996). The most prized products of the Great white shark are its teeth and jaws, particularly for sale to tourists and tourist shops, and the status that comes from its capture.

4. Protection Status and Needs

4.1 National Protection Status

In Australia, the Great white shark was listed as vulnerable under the *Environmental Protection Biodiversity Conservation Act, 1999*, and is therefore protected within the Australian Exclusive Economic Zone to 200 nautical miles offshore

The Great white shark is protected in a number of other range states. South Africa established the precedent for domestic protection of Great white shark, when it prohibited the intentional killing or sale of the species on 11 April 1991 (Rose, 1996). Namibia followed South Africa by becoming the second nation to protect the Great white shark in 1993.

In the United States, the species is protected from direct fishing under various State and national legislation. Further, the 1999 Fishery Management Plan prohibits the landing and sale of Great white shark throughout its range in US waters of the Atlantic Ocean and adjacent seas (US Fish and Wildlife Service, 1999). However, recreational tag and release is still permitted.

New Zealand has a ban on commercial targeting of the Great white shark, though the sharks may be sold if taken as by-catch (National Institute of Water and Atmospheric Research, New Zealand).

Malta protected the Great white shark in 2000 and is still the only Mediterranean State to have ratified the listing of the species on Appendix II of the Barcelona Convention in 1995.

4.2 International Protection Status

In 1996 the World Conservation Union (IUCN) listed the Great white shark as Vulnerable on its Red List of Threatened Species. This was confirmed on the Red List of 2000 (IUCN, 2000).

In response to concerns about the increasing trade in shark fins, the FAO Committee on Fisheries (COFI) has recognised the need for improved management of shark fisheries by adopting the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks). This Plan, although voluntary in nature, encourages nations to assess their shark resources, take action to manage directed and incidental fisheries and to develop regional action plans. Australia however was only one of 17 nations out of 125 nations that stated it was preparing a National Plan of Action on sharks (NPOA – Sharks) at the Conference of Fisheries (COFI) in February 2001. To date only two NPOA - Sharks have been produced.

Australia has also listed the Great white shark on Appendix III of CITES.

4.3 Additional protection needs

There is uncertainty over the abundance of the Great white shark and the species is subject to a number of ongoing threats. Due to the species being a 'K strategist' it is likely that it will take even longer to recover from further impacts.

Apart from international trade to and from Australia (due to Australia listing the Great white shark on Appendix III of CITES), there are no international trade regulations on Great white sharks and no international agreements to cooperate on Great white shark conservation. Only the United States, New Zealand and Australia South Africa have domestic arrangements for shark management or research programs.

Under the United Nations Convention on the Law of the Sea, 1982 Parties have an obligation to protect the marine environment within their exclusive economic zones and on the high sea in cases where they have jurisdiction.

Effective conservation for migratory species, including the Great white shark, requires a consistent and coordinated approach to the development and application of conservation measures throughout the full range of the species' habitat, regardless of which jurisdiction they fall within. This includes important feeding, mating and pupping sites, and migration routes between them.

Inclusion of the Great white shark in Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals would provide a framework in which to coordinate measures that may be adopted by range states to improve the conservation of the species.

5. Range States

The range states for the Great white shark are:

Western Atlantic: Newfoundland (Canada) to Florida (U.S.A.), Bahamas, Cuba, Northern Gulf of Mexico, Brazil and Argentina. Eastern Atlantic: France to Mediterranean, Madeira, Canary Islands, Senegal, Ghana, Congo, Liberia, Western Cape Province, South Africa. Western Indian Ocean: South Africa, Kenya & other coastal states, Seychelles Islands, Red Sea. Western Pacific: Siberia (Russia), Japan, the Koreas, China, Bonin Islands, the Philippines, Indonesia, Australia (Queensland, New South Wales, Victoria, Tasmania, South and Western Australia), New Zealand, New Caledonia. Central Pacific: Marshall Islands, Hawaiian Islands. Eastern Pacific: Gulf of Alaska to Gulf of California, Panama to Chile (Food and Agriculture Organisation of the United Nations 1999).

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