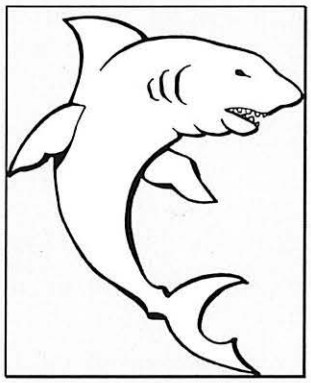
THE AUSTRALIAN NATIONAL PLAN OF ACTION

FOR THE

CONSERVATION AND MANAGEMENT OF SHARKS



PUBLIC CONSULTATION DRAFT

July 2002

Prepared for the Department of Agriculture, Fisheries and Forestry – Australia

by

the Shark Advisory Group with the assistance of Mary Lack, Shellack Pty Ltd.

CONTENTS

LIST OF TABLES

OVERVIEW

The National Plan of Action for the Conservation and Management of Sharks[1] (NPOA–Sharks) has been developed by the Shark Advisory Group (SAG) in response to the management and conservation issues identified in the Australian Shark Assessment Report (SAG 2001). The Assessment Report was compiled in accordance with the recommendations of the International Plan of Action for the Conservation and Management of Sharks (IPOA–Sharks) (FAO 1999a). The IPOA–Sharks suggests that member States of the FAO (of which Australia is one) should develop, voluntarily, an NPOA–Sharks if their vessels conduct target fisheries for sharks or their vessels regularly catch sharks in non-target fisheries. Since Australian vessels regularly take sharks as target and non-target catch this Plan has been developed to ensure the conservation and management of Australia's shark resources and their long-term sustainable use.

The NPOA–Sharks acknowledges that Indigenous people have a close, interdependent relationship with the aquatic diversity of Australia through traditional fishing practices over tens of thousands of years. Shark is important, traditionally, to Indigenous communities as a source of food and is also spiritually and culturally significant. The spiritual connection to shark varies regionally.

In Australia sharks are taken by commercial, Indigenous, recreational and game fishers and in shark control programs for bather protection. Sharks are taken as target species and as incidental catch, which is either retained or discarded. Sharks are also valued for their intrinsic contribution to marine ecosystems. While Australia's contribution to the total world shark catch is relatively small (less than 1.5%) sharks are a significant part (around 5%) of the total quantity of Australia's wild fish production. Management responsibility is shared between the six states, the Northern Territory and the Commonwealth Government.

There is concern over the increase of shark catches and the consequences this has for the populations of some shark species in several areas of the world's oceans (FAO 1999a). The relatively low market value of sharks has resulted in few countries managing their shark fisheries despite the inherently low productivity of sharks and their consequent vulnerability to overfishing and other impacts. While management of Australia's target shark fisheries is generally well regarded there is a need for a significant improvement in the management of the large number of shark species taken as byproduct or bycatch. The NPOA–Sharks has been developed to ensure that all Australia's shark species are managed sustainably regardless of fishery or jurisdictional boundaries. The NPOA–Sharks encourages those responsible for implementing actions under this plan to consider the FAO's Sustainable Development Reference System as a template.

As well as providing a more secure basis for the long term management and conservation of Australia's shark resources, the NPOA–Sharks will help to raise awareness, nationally and internationally, of Australia's commitment to the long-term sustainability of shark resources. The states, the Northern Territory and the Commonwealth Government have responsibility for implementation of actions identified in the Plan. However implementation will involve a wide range of stakeholders.

---

[1] In the NPOA–Sharks the term shark is taken to include all species of shark, skates, rays and chimaeras (Class Chondrichthyes) unless otherwise specified, in which case the term 'true sharks' refers to sharks only.

The success of the Plan will require increased cooperation between Australia's internal jurisdictions and by commercial fishers, Indigenous groups, conservation/environmental bodies, recreational and game fishing associations and scientific and research organisations. It will also require increased cooperation between Australia and other nations, particularly those with whom Australia shares shark stocks.

The Plan seeks to provide increased opportunities for Indigenous people to contribute to the management and conservation of sharks and to foster a greater awareness in all Australians of the cultural connections between Indigenous people and shark resources.

The NPOA–Sharks, contained in Part B of this document, has identified six broad themes to the issues identified in the Shark Assessment Report. These are:

1. Review existing conservation and management measures
2. Improve existing conservation and management measures
3. Improve data collection and handling
4. Undertake targeted research and development
5. Initiate focused education/awareness raising programs
6. Improve coordination and consultation

The NPOA–Sharks identifies a total of 47 actions across these six themes and specifies the priority, timeframe and responsibility for each action. These actions will promote the ecological sustainable development of shark stocks by:

- improving the ability of all resource users to identify shark species
- developing consistent, compatible, reliable and secure data sets across all resource users
- facilitating coordination of shark research
- promoting a consistent approach to risk assessment of shark species and an agreed risk management framework
- improving stock assessments for target shark species so that they can be managed sustainably
- ensuring that information from, and the views of, all resource users are included in management decision making
- raising the level of awareness of the cultural importance of sharks to Indigenous people;
- reducing shark bycatch
- where ecologically sustainable, developing markets for shark bycatch
- improving the understanding of the impacts of changes to the marine environment on shark species and the impact of shark fishing on the ecosystem
- providing for the recovery of over-exploited shark populations.

These outcomes are consistent with the objectives of the IPOA–Sharks. A review of the NPOA–Sharks every four years will assess to what extent these objectives have been achieved.

PART A

The need for a National Plan of Action for the Conservation and Management of Sharks

PART A THE NEED FOR A NATIONAL PLAN OF ACTION

Introduction

The National Plan of Action for the Conservation and Management of Sharks (NPOA–Sharks) presented in Part B of this document has been developed by the Shark Advisory Group (SAG) in response to the management and conservation issues identified in the Australian Shark Assessment Report (SAG 2001). The Assessment Report was compiled in accordance with the recommendations of the International Plan of Action for the Conservation and Management of Sharks (IPOA–Sharks) (Food and Agriculture Organisation of the United Nations (FAO) 1999a). The IPOA–Sharks is reproduced in full at Appendix A. The IPOA–Sharks suggests that member States of the FAO (of which Australia is one) should develop, voluntarily, an NPOA–Sharks if their vessels conduct target fisheries for sharks or their vessels regularly catch sharks in non-target fisheries. Since Australian vessels regularly take sharks as target and non-target catch the NPOA has been developed to ensure the conservation and management of Australia's shark resources and their long-term sustainable use.

Worldwide concern for the sustainability of shark stocks stems from the low productivity of shark stocks in general and the particularly low productivity, naturally small population size or rarity of some species of shark. Shark stocks can be rapidly depleted and can be slow to recover from the effects of overfishing. These characteristics imply that the precautionary approach is particularly applicable to this group of fishes (FAO 2000).

The objectives of this Plan are those identified in the IPOA–Sharks. Those objectives are:

i. to ensure that shark catches from target and non-target fisheries are sustainable
ii. to assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use
iii. to identify and provide special attention, in particular, to vulnerable or threatened sharks
iv. to improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States
v. to minimise unutilised incidental catches of sharks
vi. to contribute to the protection of biodiversity and ecosystem structure and function
vii. to minimise waste and discards from shark catches in accordance with article 7.2.2. (g)[2] of the Code of Conduct for Responsible Fishing (FAO 1995) (for example, requiring the retention of sharks from which fins are removed
viii. to encourage full use of dead sharks
ix. to facilitate improved species-specific catch and landings data and monitoring of shark catches
x. to facilitate the identification and reporting of species-specific biological and trade data.

---

[2] Article 7.2.2 of the Code of Conduct for Responsible Fishing requires management measures to provide that "pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species are minimised, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques." The full text of the Code can be found at http://www.fao.org/fi/agreem/codecond/codecon.asp

The NPOA–Sharks relies heavily on the FAO's technical guidelines for the conservation and management of sharks (FAO 2000). The guidelines identify four elements of the IPOA-Sharks:

- species conservation
- biodiversity maintenance
- habitat protection
- management for sustainable use.

Each of these four elements is addressed by actions identified in this Plan. The guidelines also refer to the Sustainable Development Reference System (SDRS) as described by the FAO (1999b). The SDRS has four dimensions - economic, social, ecological and governance. The NPOA-Sharks encourages those responsible for implementing actions under this plan to consider this framework as a template. Many aspects of the SDRS are already reflected in Australia's fisheries management regimes and are consistent with Australia's framework for ecologically sustainable development (ESD) of fisheries, endorsed by the then Standing Committee on Fisheries and Aquaculture[3] for national application of sustainability indicators.

The NPOA–Sharks has been developed in consultation with stakeholders representing all resource users (commercial, Indigenous, recreational and game fishers, and shark control programs), management, fisheries policy, Indigenous research and scientific agencies in each jurisdiction, and government and non-government environment and conservation agencies. Those individuals and agencies involved in the development of the NPOA-Sharks are listed in Appendix B.

It is believed that the actions identified in this Plan, building on Australia's existing structures for conservation and management of sharks, will result in significant progress over the next four years. However, it would be unrealistic to expect that all of the issues identified in this report will be fully addressed in that time frame. The NPOA–Sharks is a living document. The status and effectiveness of conservation and management of sharks in Australia will be subject to ongoing reassessment and regular review. It is planned that a second assessment of Australian conservation and management measures for shark be initiated in 2004 and a review of the NPOA–Sharks be conducted on the basis of the outcomes of that assessment. State, Northern Territory and Commonwealth Governments have major responsibility for implementation of actions identified in the Plan. However implementation will involve a wide range of stakeholders. The Plan specifies priorities, timeframes and responsibilities for the actions identified in the Plan. A review of the Plan every four years will assess to what extent its objectives have been achieved.

As well as providing a more secure basis for the long term management and conservation of Australia's shark resources, the NPOA–Sharks will help to raise awareness, nationally and internationally, of Australia's commitment to the long-term sustainability of shark resources. Australia will ensure that implementation of the NPOA–Sharks is consistent with its obligations under relevant international treaties and agreements, eg, the Convention on Biological Diversity.

The success of the Plan will require increased cooperation between Australia's internal jurisdictions, and by commercial fishers, Indigenous groups, conservation/environmental bodies, recreational and game fishing associations and scientific and research organisations. It will also require increased cooperation between Australia and other nations, particularly those with whom Australia shares shark stocks, for example, Indonesia, East Timor and Papua New Guinea. This international cooperation may require the development of bi-lateral and multi-lateral arrangements and an increased focus by regional fisheries management organisations on shark management issues.

---

[3] The Standing Committee on Fisheries and Aquaculture has been replaced by the Marine and Coastal Committee.

In the NPOA–Sharks, as in the FAO guidelines (FAO 2000), the term 'shark' is taken to include all species of shark, skates, rays and chimaeras (Class Chondrichthyes) unless otherwise specified, in which case the term 'true sharks' refers to sharks only, that is, separate from skates, rays and chimaeras. The term 'shark catch' is taken to mean shark that is caught, either as target, byproduct (retained for sale) or bycatch (discarded, either dead or alive, or killed as a result of interaction with fishing gear) by commercial, Indigenous, recreational and game fishing sectors and in shark control programs.

The reader is encouraged to refer to the Shark Assessment Report (SAG 2001) for a detailed review of the status of shark stocks and management in Australia[4] However some background information on Australia's shark fisheries is provided below. This is followed by a discussion of the conservation and management issues identified in the Shark Assessment Report. The NPOA–Sharks, which specifies the actions to be taken to address these issues, is contained in Part B together with details of the processes for implementation and review of the Plan. A glossary and a list of abbreviations are provided.

Background

Shark species

Of the 1025 species of chondrichthyans identified worldwide nearly 300 species are found in Australian waters and more than half of these are endemic to Australia. The Shark Assessment Report (SAG 2001) identified 178 species that have been recorded as shark catch from Australian waters. Of these, 60 species and 5 families have been identified as "of concern" (see Appendix C)[5]. These "species of concern" include those on the Red List compiled by the International Union for Conservation of Nature and Natural Resources (IUCN 2000), those that have been assessed against the IUCN criteria by Pogonoski et al. (2002) and those identified as potentially of concern on the basis of consistently high catch rates recorded in Commonwealth logbooks. It is acknowledged that as more information on these species becomes available and as more comprehensive risk assessments are possible, the conservation status ascribed to these species will change. There is also some doubt that the listing criteria used for assessment against the IUCN categories are directly applicable to marine species. The conservation status of the species in Appendix C should, therefore, be regarded as the best available at this point in time rather than a definitive statement of the relative conservation status of shark species found in Australian waters. Appendix C is not intended to pre-empt the outcomes of the more thorough risk assessments that will be undertaken as actions arising from this NPOA.

Shark fisheries

There are seven recognised commercial target shark fisheries in Australia targeting school shark (*Galeorhinus galeus*), gummy shark (*Mustelus antarcticus*), dusky shark (*Carcharhinus obscurus*), whiskery shark (*Furgaleus macki*), sandbar shark (*C. plumbeus*) and blacktip sharks (Australian blacktip shark (*C. tilstoni*) and spot-tail shark (*C. sorrah*)). Sharks are also targeted in two shark

---

[4] The Shark Assessment Report can be viewed at http://www.affa.gov.au/

[5] The Shark Assessment Report identified 53 species and 5 families as "of concern" however a more recent report (Pogonoski et al. 2002), which was not available to the SAG when developing the Shark Assessment Report, has reassessed many shark species found in Australian waters against the IUCN criteria. These updated assessments are included in Appendix C.

control programs[6] and by recreational and game fishers. Sharks are taken as bycatch and/or byproduct in more than 70 other commercial fisheries. Some targeting of shark species may occur in many of these fisheries. Shark is also taken for traditional purposes by Indigenous fishers and for use in the aquarium trade. The fisheries in which sharks are taken and jurisdictional responsibility for these fisheries are listed in Table 1.

Jurisdiction for Australian marine resources, including sharks, rests with the six States, the Northern Territory and the Commonwealth. In general terms the States/Northern Territory have jurisdiction over waters from their shoreline out to 3 nautical miles and the Commonwealth has jurisdiction for waters outside these limits to the edge of the 200 nautical mile Exclusive Economic Zone (EEZ). However agreed alternative jurisdictional arrangements for particular species, fisheries or methods are reflected in agreements made under the Offshore Constitutional Settlement (OCS) between the Commonwealth, States and the Northern Territory. The OCS allows stocks to be managed through either a Joint Authority of State/Northern Territory and Commonwealth bodies or under the management of a single jurisdiction throughout a species' range. The States/Northern Territory and the Commonwealth have used the OCS to rationalise management arrangements for shark species (see SAG 2001 pp. 24-27 for further detail).

Australia's shark catch in 2000/01 was valued at over $36m (Table 2). Catch of shark from Commonwealth shark fisheries (target and non-target) was valued at just over $20m. The Commonwealth's Southern Shark Fishery (SSF) alone contributed approximately one-third of the total value of Australia's shark catch.

Shark management

Across the target shark fisheries the main management measures include individual transferable quotas (ITQs), individual transferable effort, limited entry and gear restrictions. In the non-target shark fisheries various management measures have a direct impact on shark catch. These include minimum size limits for some shark species, trip limits for shark byproduct, bans on finning (that is, the practice of removing the of fins from a shark and the torso discarded to the sea), bans on the retention of shark products and bans on the use of wire traces and long shanked hooks. Other measures, such as the use of bycatch reduction devices (BRDs) and turtle excluder devices (TEDs) and bans on the use of monofilament gillnets may have an indirect impact on shark catch. Of these measures only minimum size limits and some trip limits are specific to particular shark species.

The Shark Assessment Report indicates that management of sharks in target shark fisheries in Australia is generally sound, although there remains room for improvement. A major effort is underway to rebuild the school shark stock in the SSF, which is considered overfished. Whiskery shark in the Western Australian target shark fishery is also considered overfished. For the relatively small number of shark species targeted in these fisheries there exists monitoring and stock assessment regimes and scientific knowledge is generally regarded as adequate. However, for the bulk of the shark species found and caught in Australian waters, largely as bycatch or byproduct, there is a lack of biological and catch data and the level of resolution at which data are collected is variable, and generally, not fine enough. Apart from specific protection afforded to nine shark species under Commonwealth and/or State/Northern Territory legislation (see Appendix C) there are few species-specific management measures for bycatch and byproduct shark species.

---

[6] Shark control programs are designed to protect bathers by removing dangerous shark species from swimming beaches.

Table 1 Australian shark fisheries

Fishery	Jurisdiction
Target Fisheries	
Southern Shark Fishery	Commonwealth
Northern Shark Fishery	Three Joint Authorities (the Commonwealth and Western Australia, Queensland and the Northern Territory respectively)
Gulf of Carpentaria (7-25nm)	Queensland
Southern Demersal Gillnet and Demersal Longline Fishery	Joint Authority (Commonwealth/Western Australia)
West Coast Demersal Gillnet and Demersal Longline Fishery	Western Australia
Western Australian North Coast Shark Fishery	Western Australia
Shark Control Program	New South Wales
Shark Control Program	Queensland
Target and Non-Target	
Tasmanian Scalefish Fishery	Tasmania
Game fishing	All States and the Northern Territory[1]
Recreational Angling	All States and the Northern Territory[1]
Indigenous fishing	Commonwealth; All States/Northern Territory
Non-Target	
South East Trawl Fishery	Commonwealth
South East Non-trawl Fishery	Commonwealth
Victorian Inshore Trawl Fishery	Commonwealth
Great Australian Bight Trawl Fishery	Commonwealth
Northern Prawn Fishery	Commonwealth
Western Deepwater Trawl Fishery	Commonwealth
Northwest-Slope Trawl Fishery	Commonwealth
Eastern Tuna and Billfish Fishery	Commonwealth
Southern and Western Tuna and Billfish Fishery	Commonwealth
Southern Bluefin Tuna Fishery	Commonwealth
Heard Island and McDonald Island Fisheries	Commonwealth
South Tasman Rise Trawl Fishery	Commonwealth
Northern Finfish Trawl Fishery	Commonwealth
Coral Sea Fishery	Commonwealth
East Coast Deepwater Trawl Fishery	Commonwealth
Macquarie Island Fishery	Commonwealth
Queensland East Coast Trawl Fishery	Queensland
Queensland Line Fisheries	Queensland
Torres Strait Prawn Fishery	Joint Authority (Commonwealth/Queensland)
Gulf of Carpentaria (to 7nm)	Queensland
Other Western Australian fisheries[2]	Western Australia
Other Northern Territory fisheries[2]	Northern Territory
New South Wales Fish Trawl	New South Wales
New South Wales Ocean Trap and Line	New South Wales
New South Wales Ocean Prawn Trawl	New South Wales
New South Wales Ocean Haul	New South Wales
New South Wales Estuaries	New South Wales
Victorian Bay and Inlet Fisheries	Victoria
Victorian Ocean (general)	Victoria
Victorian Inshore Otter Trawl	Victoria
Tasmanian Rock Lobster Fishery	Tasmania
South Australian Marine Scalefish Fishery	South Australia

1. Under the *Fisheries Management Act 1991* (FMA 1991) charter (game) fishing is regarded as commercial fishing and hence comes under the Australian Fisheries Management Authority's (AFMA) management responsibility. To date AFMA has exerted very limited control on charter fishing. While the FMA 1991 does not apply to recreational fishing it gives AFMA the power to manage recreational fishing under a Management Plan should this be warranted. To date AFMA has not found it necessary to do so. However recreational catch will be taken into account in the management plans being developed for the Commonwealth tuna fisheries.
2. See Appendix D

Source: SAG 2001

Table 2 Value of Australia's commercial shark catch, 1998/99 – 2000/01, $'000

Fishery/State	1998/99	1999/00	2000/01
Southern Shark Fishery	15 396	9 436	12 688
South East Non-trawl Fishery	17	21	20
South East Trawl Fishery	2 569	1 468	1 873
Other Commonwealth fisheries	5 267	4 587	5 723
New South Wales	1 260	1 259	1 152
Victoria	532	385	220
Tasmania	938	764	673
South Australia	na	na	na
Western Australia	4 575	3 608	4 755
Northern Territory	1 416	2 213	2 401
Queensland	4 558	5 691	6 651
Total	36 528	29 432	36 156

na not available

Source: ABARE 2002

Shark catch

Commercial catch levels

The reported Australian shark catch is dominated by shark landed in the commercial target shark fisheries and to a lesser extent by shark retained as byproduct in other commercial fisheries. Bycatch of shark remains largely unidentified and unquantified. Data on reported commercial landings of shark over the period 1996/97 to 1998/99 are provided in Table[7]3 These data do not reflect total shark mortality from commercial fishing since they exclude some of the catch of shark retained as byproduct in some Commonwealth fisheries, unrecorded bycatch in Commonwealth and state fisheries and cryptic fishing mortality (see SAG 2001 pp. 12-14 for further detail).

Table 3 Recorded commercial landings of shark (tonnes, whole weight) 1996/97-1998/99

Fisheries	Nature of catch	1996/97	1997/98	1998/99
Southern Shark Fishery [1]	Target	3611	3300	3437
WA Shark Fisheries	Target	1588	1489	1579
NT Shark Fishery	Target	643	481	315
Queensland [1]	Target & non-target	679	723	723
New South Wales	Non-target	707	465	391
Victoria [1]	Non-target	124	133	153
Tasmania [1]	Target & non-target	200	165	147
South Australia [1]	Target & non-target	483	426	581
Western Australia	Non-target	248	253	240
Northern Territory	Non-target	39	65	39
South East Trawl Fishery [1]	Non-target	863	906	817
Great Australian Bight Trawl Fishery	Non-target	210	212	172
Total		**9 394**	**8 618**	**8 593**

1: these figures are for calendar years 1997, 1998 and 1999

Source: SAG 2001

[7] The data in Table 3 will be updated to include 1999/00 and 2000/01 when the data is available

Other catch

Where data on shark catch from Indigenous, recreational and game fishing and shark control programs are available they are by number of shark taken rather than by weight. It is therefore not possible to aggregate commercial and non-commercial shark catch data accurately.

Shark mortality in shark control programs is well reported and total catch is small in comparison to commercial catch levels. However this does not preclude these programs having an impact on particular species in localised areas. Data available on shark catch by recreational and game fishers suggests that it too is relatively small. However, recreational fishing data, like commercial fishing data, fails to account for cryptic fishing mortality and as a result total mortality incurred by recreational and game fishers is likely to be higher than the available catch data suggest.

The NPOA–Sharks acknowledges that Indigenous people have a close, interdependent relationship with the aquatic biodiversity of Australia through traditional fishing practices over tens of thousands of years. Shark is important, traditionally, to indigenous communities as a source of food and is also spiritually and culturally significant. The spiritual connection to shark varies regionally. The level and nature of catch of shark by Indigenous people for traditional purposes may be clarified by the results of the current National Recreational and Indigenous Fishing Survey (NRIFS) but the quantity is thought to be very low. It is hoped that the survey will confirm whether total catches of particular species, eg rays, warrant further consideration.

While the total shark catch from these sources may be low in comparison to the commercial catch, these resource users have the potential to have a significant impact on particular species or local populations since the impact is a function of both the quantity taken and the vulnerability of the species. The catch of shark taken by these non-commercial sectors can have an impact on the effectiveness of management arrangements for commercial fisheries if it is not reflected in these arrangements. Likewise, the impact of management measures for the commercial sector on the operations of Indigenous, recreational and game fishers needs to be taken into account.

Species caught

While 178 species of chondrichthyans have been reported as taken in Australian waters two-thirds of the reported Australian shark catch in 1998/99 was comprised of 15 species or groups of sharks (Table 4). Twenty seven per cent of the recorded shark catch in 1998/99 was unidentified.

Table 4 Reported shark catch by species 1998/99 (%)

Species	%
Gummy shark (*Mustelus antarcticus*)	27.7
School shark (*Galeorhinus galeus*)	8.9
Dusky shark (*Carcharhinus obscurus*)	4.5
Sawsharks (*Family Pristiophoridae*)	4.5
Dogfish (*Family Squalidae*)	4.1
Sandbar shark (*C. plumbeus*)	3.3
Unidentified blacktip sharks (*Family Carcharinidae*)	2.4
Whiskery shark *(Furgaleus macki)*	2.4
Black shark (*Dalatias licha*)	2.0
Wobbegongs (*Family Orectolobidae)*	1.6
Australian black tip shark *(C. tilstoni)*	1.5
Hammerhead shark (*Family Sphyrnidae*)	1.5
Australian angel Shark (*Squatina australis*)	1.5
Fiddler rays (*Family Rhinobatidae*)	1.3
Elephant fish (*Family Callorhinchidae*)	1.3
Other shark species (27 species)	4.9
Shark unidentified	26.6

Source: SAG 2001

Issues in the conservation and management of sharks

The Shark Assessment Report identified 24 conservation and management issues. These issues have been clarified and refined in the NPOA–Sharks consultation process. The revised list of 18 issues is set out in Box 1 and linked to the NPOA objective(s) (see p. 3) to which it relates. A brief discussion of each issue follows and includes reference to the actions proposed by the Plan (see Table 6) to address each issue. Where relevant, recent initiatives (introduced since the Shark Assessment Report was prepared) consistent with these actions are listed to indicate the progress already being made in response to the issues identified.

Box 1 Issues addressed by the NPOA-Sharks

1. The need to improve identification of shark species by all resource users (Objectives ix and x)
2. The need for secure, accessible and validated data sets that are consistent over time with compatible resolution between jurisdictions over the full range of each species from all resource users (Objective ix)
3. The need for an improved understanding of markets for and trade in shark products (Objectives vii, viii and x)
4. The need for coordination of shark research (Objectives iv and vii)
5. The need for continued effort to maintain and improve the standard of stock assessments for target shark species in dedicated shark fisheries (Objective i)
6. The need for reliable assessments for bycatch and byproduct shark species (Objectives i and ii)
7. The need for assessment of the adequacy of management for all shark species and more innovative approaches to dealing with identified shark management issues (Objectives i and ii)
8. The need for improved understanding of the impacts of and, where required, implementation of better management for recreational and game fishing (Objective iv)
9. The need to reduce cryptic fishing mortality of shark species (Objectives v and vii)
10. The need for an assessment of shark harvesting and handling practices (Objective ii)
11. The need for a better understanding and, where necessary, recognition in management arrangements, of shark fishing by Indigenous people (Objective iv)
12. The need for risk assessments for all shark species from all impacts on those species (Objectives ii, iii and vi)
13. Where necessary develop strategies for the recovery of shark species and populations (Objective iii)
14. The need to reduce or, where necessary, eliminate shark bycatch (Objectives v and vii)
15. The need for a better understanding of the effects of shark fishing, control programs and management practices on ecosystem structure and function (Objective vi)
16. The need to reduce the impact of environmental degradation on sharks (Objectives ii and vi)
17. The need for more information on the impact on sharks of sound waves in the marine environment (Objectives ii and vi)
18. The need for more information on the impact on sharks of electromagnetic fields, for example, high voltage electric cables and shark protection devices (Objectives ii and vi)

Issue 1. The need to improve identification of shark species by all resource users

An unknown proportion of the recorded catch of shark in Australian fisheries is incorrectly identified and 27% is recorded as "shark" or "other shark". The collection of accurate shark species data is difficult since shark species are inherently more difficult to identify than most of the bony fishes. This situation is exacerbated by the inadequate provision in some logbooks and catch returns for the recording of species information, particularly for non-target species, poor shark species identification by skippers, crew and other resource users and in some instances a failure to comply with logbook requirements.

As the significance of the impact of target fishing on non-target species has become recognised logbooks are being revised to provide for recording of non-target shark species. Alternative data collection and validation programs are also being implemented. Bans on finning (that is bans on the practice of removing the fins from a shark and the torso discarded to the sea) have also been introduced in many fisheries with one of their objectives being to improve shark species identification since identification from fins alone can be very difficult. In the absence of adequate monitoring there is some concern as to the effectiveness of finning bans as a means of improving shark species identification. (The issue of finning is discussed in more detail under Issue 7.)

There are a number of shark species guides available or under development in Australia. However the information contained in these guides is not always in a form appropriate for use on vessels and is often not region- or fishery-specific. To be effective such guides need to cover all chondrichthyan target, byproduct and bycatch species in a region and, where appropriate, include Indigenous species names.

Shark-NPOA actions to address Issue 1	**Action Nos 5, 18, 41, 42**
Recent initiatives consistent with NPOA actions:	
1(a)	AFMA and Fisheries Research and Development Corporation (FRDC) project to develop a field guide for sharks and rays caught in Australian fisheries (CSIRO - due June 2002)
1(b)	FRDC project "Biology and stock assessment of the thickskin (sandbar) shark, *Carcharhinus plumbeus*, in Western Australia and further refinement of the dusky shark, *Carcharhinus obscurus*, stock assessment" will produce a shark species guide for fishers of tropical shark species and develop a technique for identification of shark species from dried fin sample. (Western Australian Fisheries (WAF) – due June 2002)
1(c)	Identification posters for the grey nurse shark (*Carcharias taurus*), a protected species, have been produced and distributed over the last 12 months to scuba diving clubs and shops in New South Wales (NSW) and Queensland.
1(d)	The following actions have been undertaken as part of the implementation of Bycatch Action Plans (BAPs) in Commonwealth Fisheries:
•	A pamphlet detailing common sawsharks and dogfishes has been distributed by AFMA to operators in the Great Australian Bight Trawl Fishery (GABTF) and the South East Trawl Fishery (SETF)
•	Logbooks in the Southern Squid Jig Fishery (SSJF) now allow for the recording of protected shark species
•	Existing species identification guides have been disseminated to operators in the Southern Shark Fishery (SSF) and the South East Non-trawl Fishery (SENTF). Guides are being developed on protected species.
•	An education program for operators in the tuna fisheries has been established, including the distribution of shark species identification information, to encourage more thorough logbook completion
1(e)	FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch fisheries" has established pilot observer programs to determine shark catch (CSIRO/Queensland Department of Primary Industries (DPI)/Northern Territory Department of Primary Industry and Fisheries (NTDPIF)/WAF/Bureau of Rural Sciences (BRS) - due June 2002)
1(f)	Bans on finning were introduced in the Northern Prawn Fishery (NPF) in February 2001 and in the SSF, the SENTF, GABTF and the SETF in January 2002.
1(g)	FRDC project "Rapid assessment of sustainability for ecological risk of shark and other chondrichthyan bycatch species taken in the SSF, SENTF, SETF and GABTF" will address taxonomic uncertainties in southern chondrichthyan fauna. (Marine and Freshwater Fisheries Research Institute (MAFRI)/CSIRO – due 2004/05)

Issue 2. The need for secure, accessible and validated data sets that are consistent over time with compatible resolution between jurisdictions over the full range of each species from all resource users

Work underway in some jurisdictions to improve data collection on sharks. However the majority of the shark data currently collected do not provide an accurate basis for quantification of total shark mortality because of:

- the difficulty in identifying and hence quantifying the catch of individual species (see issue 1)
- the failure to record all discards of shark (target, bycatch and sharks discarded after finning)
- the difficulty of converting, accurately, numbers of shark taken into weights in the absence of length at capture data
- double counting where data on the same fishery is collected by more than one jurisdiction
- variations across jurisdictions and fisheries in the form in which shark is landed[8]
- cryptic fishing mortality (unaccounted mortality).

The lack of standardisation, quantification and validation of shark catches in many Australian fisheries is a prime concern. Lack of standardisation of commercial shark catch and effort data across jurisdictions and fisheries is a significant impediment to data analysis. Logbooks from different jurisdictions collect different information, in different formats using different spatial (area and depth) and temporal (month, day and shot) resolutions. The accuracy of the data also varies. The credibility of stock assessments is compromised where data cannot be aggregated across fisheries/jurisdictions, where data are not available from some fisheries/jurisdictions or where the quality of the data is suspect. These issues are particularly significant where the same species is taken in more than one jurisdiction. There is a need to improve official statistics by avoiding double reporting of catch in some jurisdictions and by standardising the form for landed weights.

Unaccounted mortalities can arise from fishing by all resources users. The major causes include:

- predation mortality (shark taken with fishing gear but not identified as being caught because it is preyed upon before being brought on board and shark that are brought on board but are so severely damaged by prey or lice that they are discarded without being recorded)
- gear drop out (shark killed but dropped out of gear prior to the catch being brought on board)
- ghost fishing (shark killed by lost gear and waste from fishing vessels (eg bait bands)
- discards of shark that are by regulation (eg size regulation, bycatch limits, quota limits) not allowed to be landed and not recorded
- discards of shark for the purposes of high grading that are not recorded
- deliberate killing of sharks in response, for example, to sharks taking scalefish during landing
- post release mortality (live catch that is returned to the sea but fails to survive).

Of these causes it is possible to estimate damaged catch that is subsequently discarded, discards of fish that are not permitted to be landed, discards of fish for high grading and deliberate killing of sharks. However accurate records of these mortalities are unlikely to be provided in logbooks. The most appropriate approach is likely to be the use of targeted on-board monitoring exercises to

---

[8] Catches are variously reported as carcass weight with fins on, carcass weight with fins off and whole weight. Fishers land catches in either of the two carcass forms, often in both forms in the one fishery without specifying the carcass form. In a few cases the carcasses are filleted at sea, but they are never (or rarely) landed whole.

provide reliable estimates of these aspects of cryptic fishing mortality that can then be incorporated in stock assessments and risk assessments. The remaining causes, including post-release mortality, unsighted predation mortality, drop out mortality and ghost fishing are much more difficult, if not impossible, to quantify.

A suggested approach to the nature and methods of collection of shark data in commercial fisheries is provided in Appendix E. The Plan seek to ensure:

- routine monitoring of
  - relative abundance of target, byproduct and bycatch species from, ideally, fishery independent survey or from fishery dependent indices
  - catch, landings, discards, length-frequency composition, and, for target and valuable byproduct species, age-frequency composition, and
- determination of
  - spatial distribution and critical habitats of each species
  - availability, catchability, and selectivity for each type of fishing gear encountered by each species (semi-quantitative estimates for bycatch species)
  - the proportion of population breeding and fecundity as they relate to length and, for target and byproduct species, age for each species
  - growth rates for each target and bycatch species and maximum age for each bycatch species
  - trophic and predator-prey relationships though quantitative feeding studies.

The accuracy and lack of standardisation of shark catch data from other resource users (recreational, game and Indigenous fishers, shark control programs, illegal foreign fishers and foreign fishers fishing shared stocks on the high seas or in their EEZs (for example, Indonesia, East Timor and Papua New Guinea) is also of concern. Data from these users are either not collected at all or vary in nature, resolution, reliability and frequency. These data have not been used in stock assessment or risk assessment processes to date.

Shark-NPOA actions to address Issue 2	**Action Nos 19, 20, 21, 22, 23, 24, 25, 28, 45**
Recent initiatives consistent with NPOA actions:	
2(a)	A process for ongoing fixed station monitoring has been designed and agreed for the SSF to provide abundance indices of target species and for catch length and age composition and breeding condition of target species and valuable byproduct species. Monitoring is expected to commence in August 2002.
2(b)	The following initiatives under Commonwealth BAPs have improved the collection of shark catch data:
•	A pamphlet on common sawsharks and dogfishes has been distributed to operators in the GABTF and SETF
•	Logbooks in the SSJF now allow for the recording of protected shark species
•	Existing species identification guides have been disseminated to operators in the SSF and SENTF.
•	An education program for operators in the tuna fisheries has been established, including the distribution of shark species identification information, to encourage more thorough logbook completion
2(c)	Logbooks for charter boat operators have been introduced in NSW, Western Australia and Northern Territory
2(d)	The results of the NRIFS are expected to be available in the second half of 2002.
2(e)	Catch and effort data available on northern shark fisheries has been collated, and conversion ratios for shark fin to whole animal are being determined, in the FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch fisheries" (CSIRO/QDPI/NTDPIF/WAF/BRS - Phase 1 due June 2002)
2(f)	FRDC projects "Rapid assessment of sustainability for ecological risk of shark and other chondrichthyan bycatch species taken in the SSF, SENTF, SETF and GABTF"; and "Northern Australian sharks and rays: the sustainability of target and bycatch species, Phase 2" to be undertaken during 2002/03–2004/05 will collect data for ecological risk assessment of chondrichthyan species in southern and northern Australia and will ensure the compatibility of data sets and data accessibility.

Issue 3. The need for an improved understanding of the markets for and trade in shark products

The domestic and international markets for Australian shark products are poorly understood. A better understanding of the relationship between demand and supply of shark products and trends in market demand may help to predict future changes in fishing patterns and facilitate proactive management responses. Utilisation of shark products could also be enhanced by a better understanding of the nature of the market for shark products that are generally discarded, such as unmarketable flesh, shark cartilage, liver oil, bile, stomach bags, skin, fins, livers and embryos. However, attempts to increase utilisation of shark must be consistent with ecological sustainability of the species in question and with legislative requirements regarding threatened shark species

International trade conventions such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) can supplement traditional fisheries management tools. Australia has listed the great white shark (*Carcharodon carcharias*) on Appendix III of CITES and supports listing of whale shark (*Rhincodon typus*) on Appendix III.

Australia also has an interest in the source of its imports of shark products. This interest derives from our international responsibility to promote sustainable fisheries management in other countries and the recognition that many of the shark species taken in Australian waters are from stocks shared with other countries. The import of shark products from fisheries that are not sustainably managed may compromise the effectiveness of Australia's efforts to manage its fisheries sustainably.

Monitoring of international trade flows in fisheries products can be a useful adjunct to fisheries management. However, Australia's trade codes for shark products fall well short of the product specifications recommended by FAO (2000) and CITES[9](2002) and constrain meaningful analysis of trade data.

Shark-NPOA actions to address Issue 3	**Action Nos 26, 30, 31, 32**
Recent initiatives consistent with these actions:	
3(a) Australia listed the Great White Shark on Appendix III of CITES in October 2001.	

Issue 4. The need for coordination of shark research

The large number of fisheries in which sharks are taken and the multi-jurisdictional management arrangements in Australia have resulted in a largely uncoordinated approach to shark research. While various Commonwealth and State research plans that include shark, there is no overarching plan. The need for greater coordination of shark research has been recognised by the SAG and by the FRDC. This is reflected in the FRDC's recognition, in agreeing to fund the southern and

[9] Decision 11.151 of CITES instructs the CITES secretariat to "continue to liaise with the World Customs Organisation to promote the establishment and use of specific headings within the standard tariff classifications of the Harmonised System to discriminate between shark meat, fins, leather, cartilage and other products."

northern ecological risk assessments of chondrichthyan species, of the need for greater integration and broader monitoring and oversight of these projects.

Identification of national research priorities would assist the funding application process and ensure a consistent approach to shark research. The following research needs have been identified in the process of developing the NPOA:

- rapid risk assessments for all shark species, particularly bycatch and byproduct species including assessments of all impacts on these species
- research on threatened species (for example, research identified in recovery plans)
- accurate identification and quantification of shark species taken as byproduct and bycatch
- determination of relative productivities, catchabilities and gear selectivities for shark species for the purposes of refining risk assessments
- research in to bycatch reduction techniques, including research into gear modifications to minimise interactions
- improved stock assessments for target shark species
- mapping of shark species' distributions, biological productivity and migration patterns and determination of the availability of species to existing fisheries for the purposes of improving risk assessments
- mapping of critical habitats, which for some species includes nursery areas and aggregation sites for feeding, mating and pupping
- the impact of shark management and conservation measures on ecosystem structure and function;
- the impact of changes to the marine environment, including seismic surveys, the introduction of electromagnetic fields and ecotourism, on shark populations
- the impact of natural environmental variations on shark populations
- catch of shark by non-commercial sectors including traditional Indigenous fishing and recreational fishing
- the cultural significance of sharks to Indigenous people
- the sustainability of fisheries from which Australia imports shark products, particularly fisheries for shared/straddling stocks
- market research

Some of these needs are at least partially addressed by current projects including:

- FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch fisheries" (CSIRO/QDPI/NTDPIF/WAF/BRS - Phase 1 due June 2002)
- FRDC project "Biology and stock assessment of the thickskin (sandbar) shark *Carcharhinus plumbeus*, in Western Australia and further refinement of the dusky shark *Carcharhinus obscurus*, stock assessment" (WAF – due June 2003)
- Australian Council for International Agricultural Research (ACIAR) project "Artisanal shark and ray fisheries in eastern Indonesia: their socioeconomic and fisheries characteristics and relationship to Australian resources" (CSIRO/Murdoch University/Indonesian Agencies – due June 2003)
- FRDC program "Tropical resource assessment program: Phase 2: model application and validation" (QDPI - due June 2003)
- FRDC project "National application of sustainability indicators for Australian Fisheries" (WAF)
- AFMA project "Ecological risk assessments for Commonwealth fisheries" (CSIRO/MAFRI/BRS – due December 2003)
- AFMA project "Rapid assessment of blue shark stocks" (CSIRO - due December 2002)

- FRDC project "Shark and other chondrichthyan byproduct and bycatch estimation in the SEF Trawl and Non-trawl Sectors" (MAFRI)
- FRDC project "Rapid assessment of sustainability for ecological risk of shark & other chondrichthyan bycatch species taken in the SSF, SENTF, SETF, and GABTF" (MAFRI/CSIRO - due 2004/05)
- AFMA project "Southern Shark Monitoring" (MAFRI)

Shark-NPOA actions to address Issue 4	Action Nos 43

Issue 5. The need for continued effort to maintain and improve the standard of stock assessments for target shark species in dedicated shark fisheries.

Stock assessments have been conducted for the main species/groups of shark caught in the target shark fisheries. These assessments are considered valid but need to be continually updated. The level of uncertainty is high for many of the assessments and there is a need to improve the robustness and reliability of all assessments and to maintain or increase research and monitoring. For example, the main indicator of stock abundance in existing shark stock assessments continues to be catch per unit effort (CPUE) data from logbooks and catch returns. CPUE is not necessarily an accurate measure of stock abundance. Increased effort needs to be devoted to the collection of fishery-independent data that will allow the development of more appropriate abundance indices.

Shark-NPOA actions to address Issue 5	Action Nos 11, 15, 38

Recent initiatives consistent with NPOA actions:

5(a) A process for ongoing fixed station monitoring has been designed and agreed for the SSF. This process will provide abundance indices of target species and for catch length and age composition and breeding condition of target species and valuable byproduct species. Monitoring to commence in August 2002.

5 (b) FRDC project "Biology and stock assessment of the thickskin (sandbar) shark, *Carcharhinus plumbeus*, in Western Australia and further refinement of the dusky shark, *Carcharhinus obscurus*, stock assessment" (WAF - due June 2003)

Issue 6. The need for reliable assessments for bycatch and byproduct shark species

Whereas some catch data exist for byproduct shark species they are often poorly quantified and inaccurate. Little is known about catch levels of shark bycatch. Total removals of each shark species must be known if overfishing of these species is to be averted.

While improving the identification and quantification of byproduct and bycatch species (see Issues 1 and 2) is an important prerequisite to a better understanding of sustainable catch levels of these species the quantity of the species taken will not in itself provide a basis for effective management. An indication of the vulnerability of these species to fishing operations in terms of their own biological productivity and the nature of the fishing operation itself is required. The nature of the appropriate and feasible assessment of these species will vary and may range from qualitative or quantitative risk assessments to full-scale stock assessments. Given that little information is currently available on these species the focus initially will be on risk assessments to determine the vulnerability of these species to fishing operations and other impacts (see Issue 12).

Shark-NPOA actions to address Issue 6	Action Nos 14, 27, 28, 38
Recent initiatives consistent with NPOA actions:	
6(a)	FRDC project "Shark and other chondrichthyan byproduct and bycatch estimation in the SEF Trawl and Non-trawl Sectors" (MAFRI)
6(b)	FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch fisheries" (CSIRO/QDPI/NTDPIF/WAF/BRS - Phase 1 due June 2002)
6(c)	AFMA project "Ecological risk assessments for Commonwealth fisheries" (CSIRO/MAFRI/BRS - due December 2003)
6(d)	Risk assessments of Western Australian shark fisheries are expected to be completed by December 2002.
6(e)	AFMA project "Rapid assessment of blue shark stocks" (CSIRO - due December 2002)
6(f)	FRDC project "Rapid assessment of sustainability for ecological risk of shark & other chondrichthyan bycatch species taken in the SSF, SENTF, SETF, and GABTF" (MAFRI/CSIRO - due 2004/05)

Issue 7. The need for assessment of the adequacy of management for all shark species and more innovative approaches to dealing with identified shark management issues

Fisheries management arrangements in Australia have developed, historically, on the basis of fishing methods used to take target species. This, together with the State/Commonwealth jurisdictional arrangements has inevitably resulted in a number of shark species being taken in more than one fishery under the same jurisdiction and/or in fisheries under different jurisdictions. The OCS between the States/Northern Territory and the Commonwealth has attempted to address this issue.

Regional agreements for complementary management of shared and highly migratory species have been agreed for much of Australia, other than for northern Australia. Shark stocks fished by Australian operators are shared with other nations, for example, Indonesia in the North, or are fished on the high seas by other nations. In these circumstances there is a need for bilateral and regional fisheries management arrangements to ensure all shark stocks are managed adequately. Stock assessments will require the sharing of data, hence standardisation of data collections both domestically and internationally within various regions (see Issue 2).

The adoption of the concepts of ESD and ecosystem-based fisheries management has dictated the need for increased cooperation between fisheries in which the same species of shark is taken; between jurisdictions (domestic and international) having management responsibility for the same species; and between fisheries management and environmental agencies/groups.

Three of the key management issues facing shark management in Australia are:

- sustainable management of fisheries that take species of different productivity. For example differences in productivity between school and gummy sharks, between whiskery and dusky sharks and between target finfish and generally less productive, lower economic value, and sometimes protected or threatened, shark species.
- sustainable management of species taken in two or more fisheries. The lack of coordination of data collection, assessment and research and consistent and complementary management arrangements across fisheries, jurisdictions and resource users pose significant risks to

sustainable management of shark species. These issues can be particularly significant where the fisheries involved extend across international boundaries.

- effective measures to reduce shark bycatch and remove incentives to target sharks only for their fins. A management measure for shark that has been applied in the past to vessels fishing under bilateral agreements in the Australian Fishing Zone (AFZ) and more recently adopted in many Australian domestic fisheries is the banning of shark finning. The adequacy of this management measure, which generally allow fins to be landed only when attached to or accompanied by the trunk, needs to be assessed against the objectives being pursued. These can include any or all of the following:
  - to ensure that the species from which the fins were derived can be identified so as to improve overall shark species identification and/or to monitor compliance with prohibitions on the take of protected species and bycatch limits
  - to ensure that any shark products sold are taken from sharks that comply with legal minimum lengths and any upper size limits such as those imposed to support the Australian food standard for maximum mercury levels
  - to preclude the practice of finning of live sharks
  - to provide a disincentive for targeting sharks only for their fins
  - to minimise the underutilisation of discarded shark trunks.

The extent to which the bans are contributing to these objectives has not been subject to any rigorous assessment and there are concerns as to the bans' effectiveness in meeting the various objectives. There remains concern, for example, that the bans may not be effective in reducing overall shark mortality since sharks may still be caught but discarded whole.

The adequacy of Australia's management of the above issues, and shark species generally, is assessed by the following processes that seek to ensure that fisheries are managed sustainably.

- Commonwealth/state/Northern Territory fisheries agencies are accountable against legislation that seeks to ensure that a precautionary approach to fisheries management is adopted and that ESD is pursued.
- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires that all Commonwealth fisheries be strategically assessed. These assessments are made against Commonwealth Guidelines for the Ecologically Sustainable Management of Fisheries.
- The EPBC Act (Part 13A) also requires that each fishery (Commonwealth and state) that exports product be required to undergo an ecological sustainability assessment.
- A framework for self-assessment of fisheries against ESD criteria has been developed by the then Standing Committee on Fisheries and Aquaculture.
- Fisheries that are not captured by these processes, for example, State fisheries that service only the domestic market, are increasingly, although not comprehensively, covered by State requirements to undergo environmental assessments. For example, under NSW legislation management strategies and environmental impact statements are required for all fisheries.

Shark-NPOA actions to address Issue 7	Action Nos 1, 2, 3, 5, 6, 10, 11, 16, 44, 46, 47
Recent initiatives consistent with NPOA actions:	
7(a)	The risk assessment component of the following projects will highlight those species most in need of specific management and enable an assessment of the adequacy of management arrangements for those species:
•	FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch fisheries" (CSIRO/QDPI/NTDPIF/WAF/BRS - Phase 1due 2002)
•	AFMA project "Ecological risk assessments for Commonwealth fisheries" (CSIRO/MAFRI/BRS - due December 2003)
7(b)	Fisheries management strategies and environmental impact statements are now required for each major commercial fishery, recreational fishery, recreational charter fishery, fish stocking programs and shark control program NSW
7(c)	Management arrangements for byproduct species such as dogfish *(Centrophorous harrisonni, C. uyato and C. moluccensis*), which are considered to be at risk, are being reviewed by AFMA
7(d)	FRDC project "Rapid assessment of sustainability for ecological risk of shark and other chondrichthyan bycatch species taken in the SSF, SENTF, SETF, and GABTF" (MAFRI/CSIRO - due 2004/05)
7(e)	Environment Australia (EA) is preparing a national recovery plan for grey nurse shark. This is due for completion by end 2002. Queensland Parks and Wildlife's report on a recovery plan for grey nurse shark is expected by November 2002. NSW released a draft recovery plan for grey nurse shark in May 2002.
7(f)	EA is preparing a national recovery plan for great white shark. This is due for completion by end 2002.
7(g)	Management of shark taken as an incidental catch in Northern Territory fisheries targeting other species is the subject of a review that is expected to be completed by early 2003.
7(h)	Management of the Western Australian Demersal Gillnet and Demersal Longline Fishery is under review. Revised arrangements are expected to be in place by 2005.
7(i)	AFMA agreed in October 2001 that the SSF, SETF, SENTF, Victorian Inshore Trawl Fishery and GABTF will be managed under a common plan, the Southern and Eastern Scalefish and Shark Fishery Management Plan, to be determined in 2003
7(j)	Australia has listed the great white shark and supports listing of whale shark on Appendix III of CITES.
7(k)	ACIAR project "Artisanal shark and ray fisheries in eastern Indonesia: their socioeconomic and fisheries characteristics and relationship to Australian resources" (CSIRO/Murdoch University/Indonesian Agencies – due June 2003)
7(l)	EA has assessed the Heard Island and McDonald Island Fishery, the Queensland Spanner Crab Fishery, the Tasmanian Abalone Fishery and the Tasmanian Rock Lobster Fishery as ecologically sustainably managed under the EPBC Act. A further 27 fisheries are being assessed. All Australian export fisheries (around 100) must be assessed by 1 December 2003. Strategic assessments for two-thirds of Commonwealth managed fisheries must be started by 2003 and all fisheries must be covered by agreements by 2005.

Issue 8. The need for improved understanding of the impacts of and, where required, implementation of better management for, recreational and game fishing

Management of recreational anglers and charter boat operations varies across the States and the Northern Territory. Some states require recreational fishing licences and impose catch limits on shark species and some have introduced licences and logbooks for charter boat operators.

The best estimates available suggest that the overall catch of shark by recreational and game fishing are relatively insignificant in comparison to commercial catches. In the absence of reliable data on shark species taken, the data available may, however, disguise impacts on specific species. For example, there is concern about the possible level of catch of protected species such as grey nurse sharks by recreational fisheries. In addition the sublethal effects of tag and release programs are not reflected in estimates of catch by the game fishing sector.

Shark-NPOA actions to address Issue 8	Action Nos 8, 20, 41
Recent initiatives consistent with NPOA actions:	
8(a)	NAFM convened a recreational fishing workshop in May 2002 to discuss key management issues including resource allocation.
8(b)	The Amateur Fishermen's Association of the Northern Territory and Primary Industry and Fisheries, Northern Territory hosted the third World Recreational Fishing Conference in May 2002. The Conference covered ESD, management, research, value, development and indigenous fishing.
8(c)	Identification posters for the grey nurse shark (*Carcharias taurus*), a protected species, have been produced and distributed over the last 12 months to scuba diving clubs and shops in NSW and Queensland
8(d)	WAF has conducted regional recreational surveys on the west coast, Gascoyne, Pilbara/West Kimberely and plans to survey the south coast. The surveys will determine retained and released/discarded catch of sharks
8(e)	The impact and interests of the recreational and game fishing sectors will be reflected in the management plans for the SWTBF and the ETBF which are expected to come into force on 1 July 2003.
8(f)	In April 2001 RecFish Australia released "The national research and development plan for the recreational sector", an FRDC project
8(g)	An FRDC funded workshop in October 2002 will develop principles for rights-based management for the recreational fishing sector that are compatible with the frameworks applying to other fishing sectors.

Issue 9. The need to reduce cryptic fishing mortality of shark species

The definition of bycatch used in this plan (all discarded catch and catch that is not landed but that is killed as a result of interaction with fishing gear) includes all forms of cryptic fishing mortality, that is, mortality that is unaccounted for in quantifying removals from shark stocks.

As well as accounting for cryptic fishing mortality by quantifying it wherever possible (see Issue 2) it is also necessary to minimise the mortality arising from the sources of cryptic fishing mortality. There is scope to reduce mortality arising from ghost fishing, discards of dead undersized sharks or catch in excess of byproduct or quota limits, discards of dead fish for high grading purposes and discards of live shark through changes to management measures (for example, seasonal closures or permanent area closures, gear modification) and education programs.

Shark-NPOA actions to address Issue 9	Action Nos 25, 41
Recent initiatives consistent with NPOA actions:	
9(a)	FRDC is working with stakeholders to develop a national strategy on the survival of released fish. At present this is focused on recreational fishers. A "National strategy for the survival of line-caught fish – a review of research and fishery information" is expected in May 2002.

Issue 10. The need for an assessment of shark handling practices for the conservation and management of sharks

Australia places a high value on animal welfare as this contributes to our international reputation as a clean-green and responsible producer of animals and animal products. In line with Australia's general approach to animal welfare, there is a need to undertake an assessment of the handling practices in all fisheries where shark is caught. An assessment could cover:

- the "chase" of the shark common in game fishing;
- the practice of finning of live sharks;
- the practice of towing live sharks back to shore; and
- the keeping of live shark in aquaria either for display or for restaurant use.

Shark-NPOA actions to address Issue 10	Action Nos 5, 40
Recent initiatives consistent with NPOA actions:	

10(a)	Bans on finning were introduced in the NPF on 1 Feb. 2001 and in the SSF, the SENTF, GABTF and the SETF on 1 Jan. 2002 and are under consideration in South Australia and other Queensland's fisheries.

Issue 11. The need for a better understanding and, where necessary, recognition in management arrangements, of shark fishing by Indigenous people

The development of fisheries management arrangements, including those for shark fisheries, has to date failed to take into account both the impact of fishing by Indigenous people on shark stocks and the impact of management of commercial and other fisheries on traditional Indigenous uses of, and cultural values attached to, sharks.

It is expected that the NRIFS will confirm the widely held view that the total quantity of shark caught by Indigenous fishers is insignificant in comparison to catch by the commercial fishing sector. It is hoped that the survey will determine whether the Indigenous catch of certain shark species, for example, rays, warrants further consideration. However, it is unclear whether the survey will provide reliable information on total shark catch let alone species catch and to what extent this information will assist management.

Indigenous fishers can provide valuable information on the identification, protection and removal of threats to habitat for a range of species including shark. However, customary protocols and issues surrounding intellectual property rights must be considered when seeking this information.

The impact of management of commercial and other shark fisheries on Indigenous uses of shark resources can be addressed by:

- increased representation of Indigenous people in decision-making processes together with capacity building of the communities and the representatives selected on decision-making bodies
- improved understanding of Indigenous fisheries as fisheries distinct from commercial and recreational fisheries
- improved understanding of the rights of Indigenous people to customary use of biodiversity as spelt out in Article 10(c) of the Convention on Biological Diversity
- better understanding of the Indigenous aspirations to share equitably from the benefits derived through commercial exploitation of Australia's aquatic biodiversity.

Shark-NPOA actions to address Issue 11	**Action Nos 9, 20, 36, 37, 44, 45**
Recent initiatives consistent with NPOA actions	
11(a)	WAF is preparing an Aboriginal Fishing Strategy to consider how to gain information and advice on customary fishing catches in a culturally appropriate manner and to establish appropriate consultative mechanisms. Final report due July 2003.
11(b)	An Indigenous Fisheries Strategy is being developed in NSW in consultation with Aboriginal communities, NSW Department of Aboriginal Affairs and the NSW Aboriginal Land Council. NSW has included Indigenous representation on all of their management advisory committees (MACs) as well as the Fisheries Resource Conservation and Assessment Council that advises the Minister
11(c)	AFMA have been actively encouraging Indigenous participation on MACs where a Commonwealth fishery interacts with traditional fishing rights
11(d)	A National Heritage Trust (NHT) funded study to describe Aboriginal fisheries of NSW is being conducted by the Centre for Indigenous Fisheries, School of Environmental Science, Southern Cross University
11(e)	The Aboriginal and Torres Strait Islander commission (ATSIC), the Australian Seafood Industry Council (ASIC) and AFMA are collaborating to develop indigenous commercial fishing interests
11(f)	ATSIC released a discussion paper "Offshore Water Rights Discussion Booklet" in February 2002

11(g)	Aboriginal Consultative Committees have been formed in the Northern Territory to recognise specific cultural needs and aspirations of indigenous stakeholders by providing a forum within which these stakeholders can participate.

Issue 12. The need for risk assessments for all shark species from all impacts on those species

Little is known about the biology and catch vulnerability of the wide variety of shark species taken as bycatch in shark target fisheries and in other fisheries. Appendix C lists the 60 species of shark regarded as "species of concern". The determination of the risk status of those species is a priority and will be addressed through the risk assessments of sharks committed to under this Plan.

Ecological risk assessments being conducted for Commonwealth fisheries will provide an evaluation of risk assessment methodologies and, where sufficient data exist, an initial application of these to species including shark species. They will address target, byproduct, bycatch and broader ecological impacts of each fishery. The assessments will categorise species into high, medium or low risk profiles based on their susceptibility to capture by various fishing methods and the ability for the species to recover. The initial assessments will be based on existing data and will identify gaps and deficiencies in the data.

The studies being undertaken on northern and southern shark species will provide the data to implement the most appropriate methodology. These risk assessments will evaluate shark species on the basis of relative biological productivity, relative abundance (rarity) and catch vulnerability (that is, catchability by availability by selectivity).

Shark-NPOA actions to address Issue 12	**Action Nos 22, 27, 28, 44**
Recent initiatives consistent with NPOA actions:	
12(a)	EA have made the following changes to threatened species listed under the EPBC Act:
-	The grey nurse shark (East Coast population) and the speartooth shark (*Glyphis Sp. A*) have been added to the list of Critically Endangered species
-	The northern river shark (*Glyphis sp. C*) has been added to the list of Endangered species
-	The grey nurse shark (West Coast population) and the whale shark *(Rhincodon typus*) have been added to the list of Vulnerable species
12(b)	The southern dogfish (*Centrophorous uyato*), Colclough's shark (*Brachaelurus colcloughi*) and the endeavour dogfish (*Centrophorous moluccensis*) are under consideration for inclusion on the threatened species list under the EPBC Act.
12(c)	A 'Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes' has been prepared by Pogonoski et al. (2002) for EA.
12(d)	Australia has listed the great white shark on Appendix III of CITES and supports the listing of whale shark on Appendix III. Australia has also advocated a role for the CITES Animals Committee and for CITES Parties in identifying shark species for possible listing on CITES' Appendices.
12(e)	AFMA project "Ecological risk assessments for Commonwealth fisheries" (CSIRO/MAFRI/BRS - December 2003)
12(f)	FRDC project "Rapid assessment of sustainability for ecological risk of shark & other chondrichthyan bycatch species taken in the SSF, SENTF, SETF, and GABTF" (MAFRI/CSIRO - due 2004/05)
12(g)	FRDC project "Northern Australian sharks and rays: the sustainability of target and bycatch species, Phase 2" (CSIRO/MAFRI – due 2004/05)

Issue 13. Where necessary develop strategies for the recovery of shark species and populations

Legislation in some States and the Commonwealth provides for the listing of threatened species and the development of recovery plans for threatened species. Such legislation may need to be invoked for some species found to be severely depleted or at high risk, although the lack of consistent national legislation may constrain the effectiveness of such actions. Recovery plans for the species listed as threatened under the EPBC Act and the NSW *Fisheries Management Act 1994* are being developed.

Management action is being taken in respect of the school shark in the SSF, which is considered to be overfished, and the range of species of deepwater dogfish and deepwater chimaeras in south-east Australian waters which are considered to be at high risk from trawl fisheries because of their low biological productivity and their concentration on the continental slopes. It is unclear whether these measures will allow rehabilitation. Western Australia is considering revision to the management strategy for whiskery shark to replace the current limit reference point of 40% of virgin biomass by 2010.

Shark-NPOA actions to address Issue 13	**Action Nos 13, 39**
Recent initiatives consistent with NPOA actions:	
13(a)	NSW Fisheries and EA, in consultation with the dive industry, have developed a code of conduct for diving with grey nurse shark[10]
13(b)	Habitat critical to the survival of the grey nurse shark has been identified on the East Coast of Australia in the draft Commonwealth Recovery Plan for grey nurse shark. The plan is expected to be finalised by end 2002. The draft recovery plan for grey nurse shark released by NSW Fisheries in May 2002 proposes the listing, under the Fisheries Management Act 1994, of 13 critical habitats for grey nurse shark in NSW waters.
13(c)	Australia has listed the great white shark, and supports listing the whale shark, on Appendix III of CITES
13(d)	NHT project "Status of freshwater elasmobranchs in Northern Australia" (CSIRO)
13(e)	NHT project "Designing protected areas for grey nurse sharks off eastern Australia" (CSIRO)
13(f)	NHT project "Site fidelity, residence times and home range patterns of white sharks around pinniped colonies" (CSIRO)
13(g)	Woodside Energy funded project "Movements and feeding ecology of whale sharks at Ningaloo Reef, Western Australia" (Australian Institute of Marine Science/CSIRO)
13(h)	Draft national recovery plans for grey nurse and great white sharks include the following actions:
•	Develop a population dynamics model for the grey nurse shark and white shark to assist understanding of population status, rates of recovery and population structure and distribution
•	Relevant States to develop appropriate mechanisms to conserve sites identified as habitat critical to the survival of threatened shark species and associated foraging areas in their respective jurisdictions. These mechanisms would include establishment of effective marine protected areas (such as 'no take' sanctuary zones) and/or seasonal or permanent closures of sites to commercial and recreational fishing

[10] The code can found at http://www.ea.gov.au/coasts/species/sharks/greynurse-code.html

Issue 14. The need to reduce or, where necessary, eliminate shark bycatch

The National Bycatch Policy (MCFFA 1999) provides a policy mandate to all Australian fishing agencies to manage the impact of fishing on non-target species and in particular to address the level of bycatch in many fisheries. In response the Commonwealth has adopted a policy on bycatch (Commonwealth of Australia 2000). A key component of the Commonwealth policy is the development of BAPs for the main Commonwealth Fisheries.

Shark-NPOA actions to address Issue 14	**Action Nos 3, 7, 17**
Recent initiatives consistent with NPOA actions:	
14(a)	AFMA have banned wire traces in the SWTBF
14(b)	Industry in the SETF has supported field trials of various bycatch reduction technologies and this has resulted in voluntary uptake of gear modifications by some SETF fishers.
14(c)	A draft code of practice to increase survival rates of released bycatch has been developed in the SWTBF
14(d)	Wire traces and long shanked hooks have been banned in all WA fisheries other than target shark fisheries
14(e)	Western Australia has announced that regulations to prevent the use of "pot hooks" attached to rock lobster pots and similar unusual fishing methods such as attaching hooks to nets, mooring lines and anchor ropes will be introduced for the 2002/03 rock lobster season.
14(f)	The compulsory use of TEDs and BRDs was introduced in the NPF in April 2002 and the compulsory use of TEDs was introduced in the Torres Strait Prawn Fishery in March 2002.
14(g)	WAF has announced the phase in of compulsory use of TEDs and BRDs in the Broome and Kimberley Prawn fisheries from July 2002 with BRDs being compulsory for all nets by 2003.

Issue 15. The need for a better understanding of the effects of shark fishing, control programs and management practices on ecosystem structure and function

There is very little known about the effects of commercial shark fishing or shark management and conservation measures on ecosystem structure and function. Fishing for shark species has impacts on the ecosystem from which those sharks are removed. Target shark fisheries also take bycatch of other species (including threatened species or species at risk). Some of this catch is accounted for while some is not (cryptic fishing mortality of non-shark species).

Management and conservation measures for sharks also have differential impacts on the ecosystem. For example, shark control programs not only kill shark species that can harm humans but also result in the mortality of benign shark species and other marine species. Some management arrangements recognise this and include measures to minimise the ecosystem wide impacts of fishing (for example limits on the retention of non-target species).

The impact of the protection and subsequent increase in the population of apex predators, such as sharks, on ecosystem structure is largely unknown and warrants further investigation. The trophic impacts of management are a component of the strategic assessments and ecological sustainability assessments of fisheries to be conducted under the EPBC Act (see section 2.3.2 of the Guidelines for the Ecological Sustainable Management of Fisheries (EA 2001[11])

[11] The Guidelines can be found at http://www.ea.gov.au/coasts/fisheries/assessment/guidelines.html

Shark-NPOA actions to address Issue 15	Action Nos 4, 29, 33, 35, 38
Recent initiatives consistent with NPOA actions:	
15(a)	In accordance with requirements of the EPBC Act and the *Western Australian Fish Resources Management Act 1994* WAF commenced ESD assessment and reporting in the gillnet and longline fisheries that target sharks in April 2002. The process is expected to be completed by the end of 2002.
15(b)	Strategic assessment of Commonwealth fisheries and approval of all Australian export fisheries under the EPBC Act include ecosystem reporting and assessment.

Issue 16. The need to reduce the impact of environmental degradation on sharks

The maintenance of habitats used by sharks for feeding or as nursery areas can be a critical factor in determining the survival of shark species. Freshwater sharks are particularly vulnerable to environmental degradation since their habitats are usually more accessible to sources of habitat degradation and they inhabit a less stable and proportionally smaller habitat than those in the broader marine environment. Nursery areas for some marine species occur in shallow inshore areas, which are also vulnerable to habitat modification associated with land-based human activity. A further source of environmental degradation relates to the disposal of heavy metals such as mercury into freshwater and marine waterways increasing the accumulation of these metals in higher order predators such as sharks. Coastal development and other sources of marine pollution and ecotourism activities, such as the feeding of sharks for diving, may also lead to degradation of marine habitats.

Shark-NPOA actions to address Issue 16	Action Nos 12
Recent initiatives consistent with NPOA actions:	
16(a)	A habitat study of eastern Bass Strait, an important part of the SSF, is being undertaken by CSIRO
16(b)	Critical habitats for grey nurse sharks have been identified in waters off Queensland and NSW as part of the development of national, NSW and Queensland recovery plans for grey nurse shark
16(c)	The significance of certain areas to the survival of great white sharks is under investigation in the NHT project "Site fidelity, residence times and home range patterns of white sharks around pinniped colonies" (CSIRO)
16(d)	National recovery plans will be developed for *Glyphis sp. A* and *Glyphis sp. C* by 2005 and for whale shark by 2007

Issue 17. The need for more information on the impact on sharks of sound waves in the marine environment

There is concern that high energy, low frequency sound waves produced by air guns used in seismic surveys could cause mortality or sublethal injury to marine organisms, or might modify the feeding or mating activity of marine mammals, fish and other organisms. The impact of seismic surveys on the marine environment is largely unquantified and a precautionary approach needs to be taken until such time as research is conducted to determine the likely impacts.

Studies have shown that noise associated with air guns can influence the behaviour of some species of mammals, fishes and squid. Further, damage to hearing organs has been reported for some species of fishes while mortality has been reported for planktonic organisms, usually at very close range to the source of the noise (DISR 2001).

Shark-NPOA actions to address Issue 17:	Action Nos 28
Recent initiatives consistent with NPOA Actions:	
17(a) The Commonwealth Department of Industry, Tourism and Resources (DITR) is currently undertaking a Strategic Environmental Impact Assessment of Offshore Petroleum Exploration and Appraisal Activities in Commonwealth Waters under the EPBC Act	

Issue 18. The need for more information on the impact on sharks of electromagnetic fields, for example, high voltage electric cables and shark protection devices

Chondrichthyan species have acute electroreception and magnetoreception. The introduction of electromagnetic fields into the marine environment can potentially have a significant impact on shark populations. For example, the proposal to lay high voltage direct current sub-sea cables for linking electricity grids across Bass Strait (Basslink) raised concerns about the potential impact on shark populations in the SSF. Similarly the possible impact on sharks of the increasing use of personal protection devices by divers may be of concern.

Changes made in April 2002 to the BassLink proposal, which will see the adoption of a 'two-cable configuration' to replace the monopole cable originally proposed, appear to have largely addressed the concerns that were held for the impact on movement rates of shark species. However there is a need for fundamental research to be undertaken so that credible information is available to inform the debate surrounding any future proposals of this type.

The impact on sharks of the use of personal protection devices by divers also warrants further investigation. These devices generate an electrical field that, it is believed, is detected by the shark through its sensory receptors known as Ampullae of Lorenzini, found on the snouts of all sharks. Once detected by the shark's sensors the field causes muscular spasms that result in the shark being repelled from the area. It is possible that these devices could have a significant impact on the endangered grey nurse shark that is found to aggregate in certain areas. The use of these devices in grey nurse shark critical habitat sites could have a significant impact on the shark's behaviour and biology. Given the depleted nature of the stocks of this species consideration should be given to prohibiting the use of such devices in areas of critical habitat to the grey nurse shark.

Shark-NPOA actions to address Issue 18	Action Nos 12, 28, 34

PART B

National Plan of Action for the Conservation and Management of Sharks

PART B NATIONAL PLAN OF ACTION

Introduction

Australia's NPOA–Sharks, set out in Table 6, responds to each of the Issues discussed in Part A. Actions are presented for each of the following six themes:

1. Review existing conservation and management measures
2. Improve existing conservation and management measures
3. Improve data collection and handling
4. Undertake targeted research and development
5. Initiate focused education/awareness raising programs
6. Improve coordination and consultation

The Plan includes an agreed set of actions (including time frames), priorities and responsibility for implementation. A brief discussion of timeframes, priorities and responsibilities is provided below. The Plan links each action to the issue(s) it addresses by reference to the numbered issues in Box 1. Linkages between the objectives of the IPOA–Sharks and the issues and actions of the Australian NPOA–Sharks are shown in Appendix F.

Table 6 is followed by a description of the risk management approach recommended by the Plan, the processes for monitoring and review of the Plan and the performance indicators to be used in assessing the Plan's effectiveness.

Setting Priorities

Each action identified in Table 6 has been allocated a priority ranking (1A, 1B, 1C, 2 or 3). The distinction between 1A and 1B is made in order to acknowledge that, while all priority 1 actions need to be initiated as soon as possible, the feasible time frame for completion of these actions will vary. It is considered feasible that actions categorised as 1A and 1B can be initiated within the first year of the Plan and that actions with a 1A rating can be completed within 18 months of the Plan, while projects categorised as 1B will take longer than 18 months to complete. An action with a priority ranking of 1C is considered to be high priority but the C ranking acknowledges that implementation of that action is dependent on the completion of another action or other work underway. Good examples of this are those actions that rely on the results of risk assessments to be carried out under this Plan.

There are a large number of actions in each priority category. No attempt has been made in the Plan to schedule the implementation of actions within categories. The group charged with implementation of the NPOA will address this. It is also acknowledged that while this is a national plan the regional distribution of shark species together with the involvement of seven jurisdictions with varying degrees of responsibility for management of these species will inevitably result in some variation in the feasible timing and implementation of actions.

The broad interpretation of each priority category is provided in Table 5.

Table 5 Interpretation of Priorities

Priority	Action Initiated	Action Completed	Management funding (where required)	Research funding (where required)
1A	Within 12 months	Within 18 months, if not sooner	Funding identified immediately on an emergency basis if necessary	Advise funding bodies of the reasons for the high priority Submit funding proposals as a matter of urgency
1B	Within 12 months	In shortest possible timeframe	Funding identified immediately on an emergency basis if necessary	Advise funding bodies of the reasons for the high priority Submit funding proposals as a matter of urgency
1C	Within 12 months of prerequisite work completed	In shortest possible timeframe	Need for funding foreshadowed in management budgets	Advise funding bodies of reasons for the priority of the research required Submit funding proposals based on expected timing of completion of prerequisite work
2	Within 3 years	Within 3 years	Need for funding included in next management budget following adoption of the NPOA	Advise funding bodies of reasons for the level of priority of the research required Submit funding proposals in the next round of funding proposals following adoption of the NPOA
3	Within 4 years if not sooner	As soon as feasible		Advise funding bodies of reasons for the high priority of the research required

Allocating Responsibility

Responsibility for implementation of each action has been allocated to the relevant government agency or agencies that are ultimately accountable for ensuring sustainable shark populations. The agencies shown in bold type in Table 6 have primary responsibility for implementation. In many cases "All fisheries agencies" (that is, the agencies responsible for fisheries management in each state, the Northern Territory and the Commonwealth) are identified as having that primary responsibility. However the Plan is not intended to be too prescriptive about how responsibilities under the Plan are met. As acknowledged above the nature and extent of that responsibility and the priority of specific actions will inevitably vary across the jurisdictions. In some cases, for example, a state may have handed jurisdiction for the bulk of its shark catch to the Commonwealth, in which case the Commonwealth will have the prime responsibility, however the state may retain some residual responsibility in terms of shark bycatch in other fisheries. In other cases a particular agency may take the lead in identifying appropriate measures to address an action and other jurisdictions may simply draw on, or contribute in a minor way to, the outcomes.

The cooperation of other stakeholders will be a critical determinant of the Plan's success. The primary stakeholders associated with each action (commercial, Indigenous, recreational and game fishers, conservation agencies and other government agencies) are therefore also identified in the Plan as having responsibility for successful implementation of actions. It is not intended however that implementation of the NPOA–Sharks be restricted to those agencies/stakeholders identified against each action in Table 6. In carrying out their responsibilities under the Plan each agency will adopt its usual consultative processes. This will provide any interested party with an opportunity to play a role in implementation of the actions specified in the Plan. While particular groups, for example non-government organisations, cannot be required by the NPOA–sharks to carry out specific actions, many of these groups have expertise which will be of considerable assistance to those who are ultimately responsible for ensuring that actions are implemented.

Table 6 Australia's National Plan of Action for the Conservation and Management of Sharks

THEME 1: REVIEW EXISTING CONSERVATION AND MANAGEMENT MEASURES	**Priority**	**Responsibility[1]**
1. By July 2004[2] a. assess current management arrangements for shark stocks against the objectives of this Plan and the issues that this Plan seeks to address b. in particular, assess whether these arrangements are consistent with ecological sustainability of shark stocks and a precautionary approach, and are enforceable c. address any deficiencies within 12 months of that assessment **Issue 7**	1A	**All fisheries agencies** EA State/NT conservation agencies
2. By July 2004 a. assess current management arrangements against the requirements of recovery plans for listed threatened shark species b. address any deficiencies within 12 months of that assessment **Issue 7**	1A	**All fisheries agencies** EA State/NT conservation agencies
3. By July 2004 a. assess the effectiveness of current shark bycatch reduction measures in reducing shark mortality, paying particular attention to - the effectiveness of limits and bans on retention of shark byproduct - the effectiveness of "generic" limits on shark byproduct in non-target fisheries b. address any deficiencies identified in these assessments c. encourage the adoption of effective shark bycatch reduction measures **Issues 7, 14**	1A	**All fisheries agencies** Commercial fishers
4. By December 2006 a. assess the impact of current shark bycatch reduction measures in order to detect any unintentional increases in bycatch of other species, particularly threatened species b. assess the impact of bycatch reduction measures for other species on shark bycatch **Issue 15**	3	**All fisheries agencies** Commercial fishers
5. By July 2004 a. assess whether finning bans requiring fins to be landed when either attached to or accompanied by trunks are being implemented effectively and are achieving their objectives b. identify any deficiencies and address these **Issue 1, 7, 10**	1A	**AFMA** **Fisheries agencies in Tasmania, Victoria, NSW, Western Australia** Commercial fishers

[1] Agencies with major responsibility for implementation of each action are indicated in bold type.

[2] The time frames given assume that the NPOA-Sharks is adopted by December 2002. Timeframes will be extended to reflect any delay in adoption of the Plan.

THEME 1 (cont): REVIEW EXISTING CONSERVATION AND MANAGEMENT MEASURES	Priority	Responsibility[3]
6. By December 2005 review the effectiveness of Offshore Constitutional Settlement arrangements in the management of sharks, identify any deficiencies and take action to develop cooperative management arrangements to address these **Issue 7**	2	**AFFA** **All fisheries agencies** Commercial fishers
7. By December 2005 assess the ecological impacts of shark control programs (including drum lines and nets) on shark species and populations and review the need for these programs weighing up the ecological impacts against the level of risk to bathers **Issue 14**	1B	**Fisheries agencies in Queensland (Qld) and NSW** Conservation groups Qld and NSW conservation agencies
8. By December 2005 review the effectiveness of management measures for recreational and game fishing in achieving ecological sustainability of shark species **Issue 8**	2	**All fisheries agencies** Recreational fishers Game fishers
9. By July 2004 assess the impact of existing management measures for sharks on Indigenous shark fishing **Issue 11**	1A	**All fisheries agencies** **Indigenous fishers**

[3] Agencies with major responsibility for implementation of each action are indicated in bold type.

THEME 2: IMPROVE MANAGEMENT AND CONSERVATION MEASURES	Priority	Responsibility
10. By July 2004 ensure that management arrangements include precautionary management triggers for target shark species and pre-determined management responses should these triggers be reached **(Issue 7)**	1A	**All fisheries agencies**
11. By July 2004 ensure that, where a species is taken in two or more fisheries within a jurisdiction or in two or more jurisdictions (domestic or domestic/international) a. Processes are in place to collect/report data from all fisheries and jurisdictions involved in the management of that species uniformly and are included, when data become available, in subsequent stock assessments or risk assessments conducted for that species b. the potential of 'regional' or 'across-fishery' approaches to shark management have been assessed and introduced where possible c. effective communication and consultation mechanisms between all stakeholders are in place; and d. management measures are complementary **(Issue 5,7)**	1A	**All fisheries agencies** Commercial fishers
12. By December 2003 a. initiate action to identify critical habitats for shark species b. consistent with any existing recovery plans, protect and remove threats to critical habitats of currently listed threatened shark species within statutory timeframes giving consideration to banning the use of personal protection devices in critical habitat of the grey nurse shark i. protect and remove threats to critical habitat of these new species listed and protected under federal and state legislation species within 5 years of listing/becoming protected ii. protect and remove threats to critical habitat for other shark species, eg pupping grounds for species that have known pupping aggregations, in the shortest feasible time frame **(Issue 16, 18)**	1B	**All fisheries agencies** **EA** State Conservation agencies Conservation NGOs Commercial fishers Indigenous fishers Recreational fishers Game fishers
13. Within 12 months of risk assessments being completed identify those species requiring rehabilitation and develop rehabilitation strategies for these species based on the requirements set out in Guidelines 1.2.1 and 1.2.2 of the Commonwealth Guidelines for the Ecologically Sustainable Management of Fisheries (EA 2001) **(Issue 13)**	1C	**All fisheries agencies** EA State/NT conservation agencies Commercial fishers Conservation NGOs
14. Within 12 months of a risk assessment finding of "high risk" for a shark species initiate management and research actions to minimise risk including the introduction of precautionary management triggers **(Issue 6)**	1C	**All fisheries agencies** **EA** Commercial fishers Indigenous fishers Recreational fishers Game fishers

THEME 2 (cont): IMPROVE MANAGEMENT AND CONSERVATION MEASURES	**Priority**	**Responsibility**
15. By July 2004 identify areas of uncertainty in stock assessments for target shark species and ensure that research efforts for these species are focused on reducing this uncertainty **(Issue 5)**	1A	**AFMA, Fisheries agencies in NT, Qld, WA and Tasmania (Tas.)**
16. By July 2004 implement processes to ensure that the scientific research potential of sharks caught in shark control programs is maximised **(Issue 7)**	1A	**NSW and Qld fisheries agencies Scientific agencies**
17. By December 2005 ensure effective bycatch reduction methods are developed and introduced in all fisheries in which shark are caught as bycatch giving significant priority to species identified as 'high risk": - in fisheries taking species currently identified by risk assessments or other processes as being at "high risk" methods should be introduced by 2003 - where "high risk" is identified after the adoption of this Plan, methods should be introduced within 12 months of identification **(Issue 14)**	1C	**All fisheries agencies** Scientific agencies Research funding bodies Commercial fishers
18. By July 2004 investigate the potential for DNA identification kits for use in identifying the species from which imported shark fins have been derived **(Issue 1)**	1A	**EA AQIS Customs**

THEME 3: IMPROVE DATA COLLECTION AND HANDLING	Priority	Responsibility
19. Within 6 months of this Plan being adopted prepare a submission to all fisheries agencies seeking commitment to and proposing a process to achieve inter-jurisdictional data compatibility at the level recommended by FAO (2000) and including consideration of the recommendations in Appendix E of this Plan **(Issue 2)**	1A	**AFFA** All fisheries agencies ASIC
20. By December 2005: a. assess the findings of the National Recreational and Indigenous Fishing Survey to - identify gaps in existing monitoring and data collection programs for recreational, game and Indigenous fishing - determine the nature and frequency of future national surveys - determine the nature and role of State/Northern Territory recreational fishing surveys - determine its adequacy for reporting on the issues for the whole of Australia b. where necessary introduce appropriate and effective supplementary or alternative data collection mechanisms to ensure adequate information on recreational, game and Indigenous fishing is collected for management purposes **(Issues 2, 8, 11)**	2	**AFFA** State/NT fisheries agencies Indigenous fishers Recreational fishers Game fishers
21. By July 2004 ensure that where possible processes for the validation of shark catch data from commercial fisheries using observer, monitoring and/or fishery-independent research programs have been initiated **(Issue 2)**	1A	**All fisheries agencies** Commercial fishers Indigenous fishers Recreational fishers Game fishers Shark control programs
22. By July 2004 ensure that processes for the collection of data necessary for risk assessments of shark species (including availability, catchability, productivity, distribution) have been implemented **(Issues 2, 12)**	1A	**All fisheries agencies**
23. By December 2005 develop protocols whereby data can be shared between relevant agencies, including relevant regional fisheries management organisations, yet remain secure through appropriate confidentiality agreements that protect commercially sensitive information and intellectual property rights **(Issue 2)**	2	**All fisheries agencies** **AFFA** Commercial fishers Indigenous fishers
24. By December 2005 ensure data are well managed in data bases such that data are secure, have automated internal verification and validation checks, are corrected for double reporting and have procedures for efficient data extraction, exchange and summarization **(Issue 2)**	2	**All fisheries agencies**
25. By July 2004 a. ensure, where feasible, that monitoring/observer programs collect data on quantifiable aspects of cryptic fishing mortality as an input to stock assessments and risk assessments b. evaluate the sublethal effects of gamefishing, the scientific benefits of targeted/permitted tag and release activities and, where possible, the extent of cryptic fishing mortality arising from game fishing **(Issue 2, 9)**	1A	**All fisheries agencies** CSIRO EA State/NT conservation agencies Game fishers

THEME 3 (cont):	IMPROVE DATA COLLECTION AND HANDLING	Priority	Responsibility
26. By December 2005 a. assess availability of Australian export and import data for shark products against the recommendations of the FAO (FAO, 2000) and CITES decisions on trade codes b. identify deficiencies and address these **(Issue 3)**		2	**AFFA** Conservation NGOs AQIS Customs Australian Bureau of Statistics Importers/Exporters Commercial fishers

THEME 4: TARGETED RESEARCH AND DEVELOPMENT	Priority	Responsibility
27. By July 2004 evaluate the methodologies for risk assessment and adopt a single national risk assessment framework, consistent across species, fisheries and other impacts, for shark species and a timetable for carrying out risk assessments **(Issues 6,12)**	1A	**All fisheries agencies** Scientific agencies Research funding bodies EA State/NT Conservation agencies
28. Initiate risk assessments for all target, byproduct and bycatch shark species including, as far as possible, the risks associated with all impacts on these species, in accordance with the agreed national risk assessment framework and risk assessment timetable and ensure that the data necessary to undertake these risk assessments is collected **(Issues 2, 6, 12, 17,18)**	1C	**All fisheries agencies** Scientific agencies Research funding bodies EA State/NT Conservation agencies
29. By July 2005 develop shark habitat mapping projects that encompass critical habitat for shark species **(Issue 15)**	2	**All fisheries agencies** Scientific agencies Research funding bodies
30. By December 2005 assess sustainability of shark fisheries in countries from which Australia imports shark products, paying particular attention to countries fishing shark stocks shared with Australia, and identify possible responses to situations where those fisheries are considered unsustainable **(Issue 3)**	2	Northern Territory Scientific Agencies Research funding bodies
31. By December 2004 initiate an assessment of opportunities for increasing utilisation/value adding of shark products and encourage commercial fisheries to exploit these opportunities subject to the long-term sustainable harvest of shark species **(Issue 3)**	1A	**Commercial fishers** Seafood Services Australia ASIC Scientific agencies Research funding bodies All Fisheries agencies
32. By December 2006 initiate an examination of the nature of the current and emerging domestic and international markets for shark products to assess the impact on catches **(Issue 3)**	3	**AFFA** Research funding bodies Seafood Services Australia ASIC
33. Within 12 months of evaluations of benign methods of shark control (such as aerial surveillance and the use of pingers) being completed, and where these evaluations demonstrate that such methods are at least equally effective as the current lethal methods (nets and drum lines) in removing dangerous sharks from bathing areas, adopt benign methods of shark control **(Issue 15)**	1C	**Fisheries agencies in Qld &NSW** Research funding bodies
34. By December 2006 initiate research to determine the impact on the biology and behaviour of sharks of electromagnetic fields including personal shark protection devices **(Issue 18)**	3	**EA** **DISR** All fisheries agencies Research funding bodies Tourism operators

THEME 4 (cont): TARGETED RESEARCH AND DEVELOPMENT	Priority	Responsibility
35. By December 2006 ensure that the impact of shark management and conservation measures on ecosystem structure and function have been assessed **(Issue 15)**	3	**AFFA** **EA** All fisheries agencies Research funding bodies
36. By July 2004 produce an information paper on Indigenous shark fishing highlighting the traditional, cultural and spiritual significance of sharks to Indigenous people so as to better accommodate these issues in the development of management arrangements **(Issue 11)**	1A	**AFFA** **ATSIC** **Indigenous researchers** Research funding bodies Indigenous fishers
37. By December 2005 identify gaps in knowledge about Indigenous shark fishing and, where the need is identified, develop research proposals to address these gaps **(Issue 11)**	2	**All fisheries agencies** **ATSIC** Scientific agencies Research funding bodies Indigenous fishers Indigenous researchers
38. By December 2006 initiate development of appropriate new methods for modelling the population dynamics of chondrichthyans in the ecosystem and develop a basis for distinguishing between natural variation and trends in the system so as to assist in understanding population status, rates of recovery, population structure and distribution **(Issues 5, 6, 15)**	3	**All fisheries agencies** **EA** Scientific agencies Research funding bodies
39. By December 2005 develop a quantitative framework to assess the recovery of listed threatened species **(Issue 13)**	2	**EA** Scientific agencies Research funding bodies All fisheries agencies State/NT conservation agencies
40. By December 2003 initiate a review of shark handling practices to identify any areas of concern and possible solutions where the need is identified for the conservation and management of sharks. **(Issue 10)**	2	**EA** **HSI** Scientific agencies Commercial fishers Recreational fishers Game fishers

THEME 5: UNDERTAKE EDUCATION AND AWARENESS RAISING	Priority	Responsibility
41. By July 2004 introduce a community education strategy aimed at the general public, commercial, recreational, Indigenous and game fishers. The strategy should aim to a) raise national awareness of the vulnerability of particular shark species and in particular their role in the marine ecosystem, the cumulative impact of shark bycatch, the need to return sharks to the sea and to maximise their chances of survival b) educate resource users about the rationale for and use of recorded shark catch data c) raise national awareness of the cultural significance of shark to Indigenous peoples d) develop an awareness amongst all resource users of the threatened species provisions, reporting requirements and penalties e) encourage the trial of techniques to improve shark species identification(eg photos taken with disposable cameras retention of unknown species for confirmation of species identification), by user groups f) encourage recreational, game fishing and tourist sectors to address specific issues relevant to those sectors **(Issues 1, 8,9)**	1A	**AFFA** **EA** **All fisheries agencies** Conservation groups Commercial fishers Indigenous fishers Indigenous researchers Recreational fishers Game fishers Tourism operators, eg cage divers, scuba operators
42. By July 2004 a. undertake an assessment of existing shark species identification guides and those under development b. ensure guides are culturally appropriate, including the use of Indigenous species names where appropriate c. develop a coordinated approach to production of region specific, waterproof species identification charts using existing species guides d. ensure the best available guides have been provided to all user groups, processors, compliance officers, observers and scientists involved in each fishery known to take sharks e. develop measures to monitor the effectiveness of the guides **(Issue 1)**	1A	**All fisheries agencies** Scientific agencies Commercial fishers Indigenous fishers Recreational fishers Game fishers

THEME 6: IMPROVE COORDINATION AND CONSULTATION	Priority	Responsibility
43. Within 6 months of this plan being adopted a. establish a sub-program for shark research in the Fisheries Research and Development Corporation (FRDC);or b. if, within 6 months of this plan being adopted, an FRDC shark subprogram has not been established form a shark research consultative forum to facilitate coordination and collaboration on shark research and develop a strategic plan which responds to the research needs identified in the NPOA **(Issue 4)**	1A	**AFFA** **FRDC** **Scientific agencies** **Indigenous researchers** Commercial fishers Indigenous fishers Recreational fishers Game fishers
44. By July 2004 identify and incorporate appropriate sources of advice on fishing for sharks by Indigenous people into shark management decision making processes where relevant **(Issues 7 11,12)**	1A	**All fisheries agencies** **ATSIC** **Indigenous researchers** Indigenous fishers
45. By December 2005 seek the advice of Indigenous representatives to identify and implement where necessary effective mechanisms for obtaining reliable catch information and advice from Indigenous communities **(Issues 2, 11)**	2	**All fisheries agencies** **ATSIC** **Indigenous researchers** Indigenous fishers
46. By July 2004 actively promote the implementation of the IPOA-Sharks and improved regional management of shark stocks and protection of threatened species in relevant regional fisheries management organisations and under other relevant international conventions e.g. CITES and the Convention on Migratory Species **(Issue 7)**	1A	**AFFA** **AFMA** **EA** Conservation NGOs
47. By July 2004 initiate negotiations for a bilateral agreement with Indonesia in relation to shared shark stocks and initiate discussions with Papua-New Guinea and East Timor **(Issue 7)**	1B	**AFFA** EA AFMA

The Risk Management Framework

One of the key constraints to developing effective management measures for many of the shark species taken in Australia is the lack of information about the species and their catch. There are a number of projects underway (as indicated in Part A) and others recommended in this NPOA that will redress this lack of information. They include projects to collate and collect additional information and projects to undertake risk assessments of shark species based on information that is available. These initial risk assessments will provide a basis for managers to decide whether management is warranted, taking into account the need for a precautionary approach where information is lacking. Over time, as additional data becomes available the risk assessments and management measures will be reviewed.

The NPOA–Sharks has indicated the benefits to be derived from a common national approach to risk assessment of shark species and gives the adoption of an agreed framework for management of risk associated with exploitation of these species a high priority. Such an approach will ensure that species are assessed, as far as possible, across their distribution on a consistent and holistic basis rather than within jurisdictional or fishery boundaries. This national approach will provide a strong basis for effective management of the risks associated with managing a large number of byproduct and bycatch species about which little information is currently available. An integral part of the NPOA–sharks is therefore a risk management framework that provides for the ongoing assessment and determination of appropriate management measures for these species as increased information becomes available and risk assessment procedures are applied. The broad outline of this risk management framework is described in Box 2.

Implementation and Review

Implementation

The lead agency in the development and implementation of the NPOA–Sharks is the Commonwealth Department of Agriculture, Fisheries and Forestry-Australia (AFFA). However, as Table 6 indicates, agencies in each jurisdiction and a broad range of stakeholders have an interest in implementation of actions under the Plan. It is therefore proposed that a broadly based implementation and review group be established.

It is envisaged that the implementation and review group will be a sub-committee under the Marine and Coastal Committee (MCC). Membership of the review group will be broader than the jurisdictions represented on the MCC and include representatives from commercial, recreational and Indigenous sectors, conservationists and science organisations.

The role of the Group will be to:

- develop a strategy for implementation;
- oversee implementation;
- provide any coordination required;
- develop a schedule for undertaking actions within each priority group;
- act as a central depository for advice by responsible agencies on progress;
- disseminate to all interested stakeholders annual advice on progress and any other information relevant to the conservation and management of sharks;
- prepare reports for FAO's Committee on Fisheries on progress in the implementation of the Plan;
- act as the Steering Committee for the proposed FRDC Shark subprogram;
- initiate and oversee updating of the Shark Assessment Report; and
- initiate and oversee the four yearly review of the Plan.

Box 2 Risk Management Framework

STEP 1 Assess Risk

- Adopt a national approach to risk assessment using current and recent developments:
  - identifies, as far as possible, all threats to (ie impacts on) each species;
  - prioritises species based on these threats;
  - prioritises threats to those species (eg commercial fishing, recreation fishing environmental degradation); and
  - includes stakeholder involvement.

- The risk assessment process should allow for:
  - the overall risk level of species to be related to the relative biological productivity, abundance and catch vulnerability (availability, vulnerability and selectivity)
  - the threats to that species to be identified and ranked (so that the main causes for a species at high risk are known).

STEP 2 Develop management response

- The information arising from STEP 1 allows the overall risk and the reasons behind that risk level to be assessed
- Managers can then deal with the high risk species and causal factors particularly those impacting on more than one species
- The appropriate management response will depend on the level of risk and cause
- Based on this information the actions outlined in the NPOA should be reviewed and prioritised accordingly
- Management actions detailed in the NPOA-Sharks should then be updated

STEP 3 Review management action to address risks

- Assess effectiveness of management actions and refine as necessary
- Reassess risk if necessary

Review

Completion of each action identified in this Plan is an output of the Plan. Monitoring of implementation and the review of the Plan will involve determining how many, and to what extent, these outputs have been produced. However the critical determinant of the Plan's success will not be measured by its outputs. The 2006 review of the Plan must judge the Plan's success on the extent to which the actions implemented under this Plan have achieved the objectives specified on P.5, that is, on the outcomes of the Plan. Performance indicators have therefore been developed for outcomes (Table 7) in order to supplement the monitoring of outputs. The performance indicators suggested will be subject to ongoing review and refinement.

Table 7 Performance indicators against IPOA-Sharks objectives

Outcomes sought (objectives)	Performance indicators
i. ensure that shark catches from target and non-target fisheries are sustainable;	• The % of Commonwealth fisheries in which shark is taken that meet the requirements of the strategic assessments under the EPBC Act (Target 100%) • The % of State/Northern Territory fisheries in which shark is taken that meet the requirements of sustainability assessments under the EPBC Act (Target 100%) • The % of State/Northern Territory fisheries in which shark is taken but that are not subject to sustainability assessments under the EPBC Act, that meet the requirements of ESD as assessed under the SCFA-ESD reporting framework (Target 100%)
ii. assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use	• The % of shark species taken by all sectors in Australian fisheries for which risk assessments have been conducted in accordance with the national risk management framework (Target 100%) • The % of high risk, threatened and protected species for which appropriate management responses have been implemented including the identification and protection of critical habitats (Target 100%)
iii. identify and provide special attention, in particular to vulnerable or threatened sharks;	• The % of shark species categorised as critically endangered, endangered, vulnerable or conservation dependent which have been protected by legislation (Target 100%) • The % of listed species for which recovery plans have been developed within the required timeframe (Target 100%) • The % of States/NT having legislation which provides for the development of recovery plans for protected species (Target 100%) • The % reduction in the number of protected species killed by commercial, indigenous, recreational and game fishers and in shark control programs (Target 70%) • The % of species that have been identified as requiring rehabilitation for which rehabilitation strategies are operational • The % of species that have rehabilitation strategies in place that are experiencing a recovery
iv. improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;	• An FRDC subprogram for sharks is operational and delivering research outputs consistent with the needs identified in the NPOA-Sharks • The % of shark management and research committees on which key stakeholders are represented (Target 100%) • The % of shark management and research committees that include participation of representatives from other fisheries/jurisdictions catching the same species (Target 100%)
v. minimise unutilised incidental catches of sharks;	• The % of fisheries in which shark is taken that have adopted shark bycatch mitigation measures (Target 100%) • Where baseline data exists, % reduction in shark bycatch (Target 50%) See also indicators for objectives vii and viii.
vi. contribute to the protection of biodiversity and ecosystem structure and function;	• Research underway to examine the ecosystem impact of shark management measures • No. of shark species classified as species of concern
vii. minimise waste and discards from shark catches in accordance with article 7.2.2. (g) of the Code of Conduct for Responsible	• Markets identified and accessed by operators for previously discarded shark products/species where retention of these species is consistent with ecologically sustainable management

	Fishing (FAO, 1995) (for example, requiring the retention of sharks from which fins are removed);	• The effectiveness of compliance and enforcement of finning bans has increased • See also indicators for objective v
viii.	encourage full use of dead sharks;	• See indicators for objectives v and vii
ix.	facilitate improved species-specific catch and landings data and monitoring of shark catches; and	• The number of fisheries agencies to have adopted a minimum data set for shark data in commercial fisheries consistent with the FAO Guidelines (Target 100%) • The % of fisheries in which validated commercial shark bycatch data is collected (Target 100) • The % of target shark fisheries in which processes for fishery-independent monitoring implemented (Target 100%) • Number of States/Northern Territory in which validated data on indigenous, recreational and game fisher catch of shark is collected (Target 7) • The extent of double reporting between jurisdictions in official shark statistics (Target 0) • The extent to which official shark statistics of all jurisdictions are recorded in standard carcass form as beheaded and gutted shark with all fins attached except for chimaeras where the pectoral fins and bellyflaps are removed (Target 100%)
x.	facilitate the identification and reporting of species-specific biological and trade date.	• The % of total shark catch classified as "unidentified" (Target 10%) • Trade codes for shark products imported to and exported from Australia provide improved species and product identification • The % of on-board monitoring programs collecting species specific biological data on sharks (Target 100% in relevant fisheries)

Appendix A The International Plan of Action for the Conservation and Management of Sharks

Introduction

1. For centuries artisanal fishermen have conducted fishing for sharks sustainably in coastal waters, and some still do. However, during recent decades, modern technology in combination with access to distant markets have caused an increase in effort and yield of shark catches, as well as an expansion of the areas fished.

2. There is concern over the increase of shark catches and the consequences which this has for the populations of some shark species in several areas of the world's oceans. This is because sharks often have a close stock-recruitment relationship, long recovery times in response to over-fishing (low biological productivity because of late sexual maturity; few off-spring, albeit with low natural mortality) and complex spatial structures (size/sex segregation and seasonal migration).

3. The current state of knowledge of sharks and the practices employed in shark fisheries cause problems in the conservation and management of sharks due to lack of available catch, effort, landings and trade data, as well as limited information on the biological parameters of many species and their identification. In order to improve knowledge on the state of shark stocks and facilitate the collection of the necessary information, adequate funds are required for research and management.

4. The prevailing view is that it is necessary to better manage directed shark catches and certain multispecies fisheries in which sharks constitute a significant bycatch. In some cases the need for management may be urgent.

5. A few countries have specific management plans for their shark catches and their plans include control of access, technical measures including strategies for reduction of shark bycatches and support for full use of sharks. However, given the wide-ranging distribution of sharks, including on the high seas, and the long migration of many species, it is increasingly important to have international cooperation and coordination of shark management plans. At the present time there are few international management mechanisms effectively addressing the capture of sharks.

6. The Inter-American Tropical Tuna Commission, the International Council for the Exploration of the Sea, the International Commission for the Conservation of Atlantic Tunas, the Northwest Atlantic Fisheries Organization, the Sub-regional Fisheries Commission of West African States, the Latin American Organization for Fishery Development, the Indian Ocean Tuna Commission, the Commission for the Conservation of Southern Bluefin Tuna and the Oceanic Fisheries Programme of the Pacific Community have initiated efforts encouraging member countries to collect information about sharks, and in some cases developed regional databases for the purpose of stock assessment.

7. Noting the increased concern about the expanding catches of sharks and their potential negative impacts on shark populations, a proposal was made at the Twenty-second Session of the FAO Committee on Fisheries (COFI) in March 1997 that FAO organize an expert consultation, using extra-budgetary funds, to develop Guidelines leading to a Plan of Action to be submitted at the next Session of the Committee aimed at improved conservation and management of sharks.

8. This International Plan of Action for Conservation and Management of Sharks (IPOA-SHARKS) has been developed through the meeting of the Technical Working Group on the Conservation and Management of Sharks in Tokyo from 23 to 27 April 1998[1] and the Consultation on Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries held in Rome from 26 to 30 October 1998 and its preparatory meeting held in Rome from 22 to 24 July 1998[2]

9. The IPOA-SHARKS consists of the nature and scope, principles, objective and procedures for implementation (including attachments) specified in this document.

Nature and Scope

10. The IPOA-SHARKS is voluntary. It has been elaborated within the framework of the Code of Conduct for Responsible Fisheries as envisaged by Article 2 (d). The provisions of Article 3 of the Code of Conduct apply to the interpretation and application of this document and its relationship with other international instruments. All concerned States[3] are encouraged to implement it.

11. For the purposes of this document, the term "shark" is taken to include all species of sharks, skates, rays and chimaeras (Class *Chondrichtyes*), and the term "shark catch" is taken to include directed, bycatch, commercial, recreational and other forms of taking sharks.

12. The IPOA-SHARKS encompasses both target and non-target catches.

Guiding principles

13. *Participation.* States that contribute to fishing mortality on a species or stock should participate in its management.

14. *Sustaining stocks* Management and conservation strategies should aim to keep total fishing mortality for each stock within sustainable levels by applying the precautionary approach.

15. *Nutritional and socio-economic considerations* Management and conservation objectives and strategies should recognize that in some low-income food-deficit regions and/or countries, shark catches are a traditional and important source of food, employment and/or income. Such catches should be managed on a sustainable basis to provide a continued source of food, employment and income to local communities.

Objective

16. The objective of the IPOA-SHARKS is to ensure the conservation and management of sharks and their long-term sustainable use.

Implementation

17. The IPOA-SHARKS applies to States in the waters of which sharks are caught by their own or foreign vessels and to States the vessels of which catch sharks on the high seas.

18. States should adopt a national plan of action for conservation and management of shark stocks (*Shark-plan*) if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries. Suggested contents of the *Shark-plan* are found in Appendix A. When developing a *Shark-plan*, experience of subregional and regional fisheries management organizations should be taken into account, as appropriate.

19. Each State is responsible for developing, implementing and monitoring its *Shark-plan*.

20. States should strive to have a *Shark-plan* by the COFI Session in 2001.

21. States should carry out a regular assessment of the status of shark stocks subject to fishing so as to determine if there is a need for development of a shark plan. This assessment should be guided by article 6.13 of the Code of Conduct for Responsible Fisheries. The assessment should be reported as a part of each relevant State's *Shark-plan*. Suggested contents of a shark assessment report are found in Appendix B. The assessment would necessitate consistent collection of data, including *inter alia* commercial data and data leading to improved species identification and, ultimately, the establishment of abundance indices. Data collected by States should, where appropriate, be made available to, and discussed within the framework of, relevant subregional and regional fisheries organizations and FAO. International collaboration on data collection and data sharing systems for stock assessments is particularly important in relation to transboundary, straddling, highly migratory and high seas shark stocks.

22. The *Shark-plan* should aim to:

- Ensure that shark catches from directed and non-directed fisheries are sustainable;
- Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;
- Identify and provide special attention, in particular to vulnerable or threatened shark stocks;
- Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;
- Minimize unutilized incidental catches of sharks;
- Contribute to the protection of biodiversity and ecosystem structure and function;
- Minimize waste and discards from shark catches in accordance with article 7.2.2.(g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed);
- Encourage full use of dead sharks;

- Facilitate improved species-specific catch and landings data and monitoring of shark catches;
- Facilitate the identification and reporting of species-specific biological and trade data.

23. States which implement the *Shark-plan* should regularly, at least every four years, assess its implementation for the purpose of identifying cost-effective strategies for increasing its effectiveness.

24. States which determine that a *Shark-plan* is not necessary should review that decision on a regular basis taking into account changes in their fisheries, but as a minimum, data on catches, landings and trade should be collected.

25. States, within the framework of their respective competencies and consistent with international law, should strive to cooperate through regional and subregional fisheries organizations or arrangements, and other forms of cooperation, with a view to ensuring the sustainability of shark stocks, including, where appropriate, the development of subregional or regional shark plans.

26. Where transboundary, straddling, highly migratory and high seas stocks of sharks are exploited by two or more States, the States concerned should strive to ensure effective conservation and management of the stocks.

27. States should strive to collaborate through FAO and through international arrangements in research, training and the production of information and educational material.

28. States should report on the progress of the assessment, development and implementation of their *Shark-plans* as part of their biennial reporting to FAO on the Code of Conduct for Responsible Fisheries.

Role of FAO

29. FAO will, as and to the extent directed by its Conference, and as part of its Regular Programme activities, support States in the implementation of the IPOA-SHARKS, including the preparation of *Shark-plans*.

30. FAO will, as and to the extent directed by its Conference, support development and implementation of *Shark-plans* through specific, in-country technical assistance projects with Regular Programme funds and by use of extra-budgetary funds made available to the Organization for this purpose. FAO will provide a list of experts and a mechanism of technical assistance to countries in connection with development of *Shark-plans*.

31. FAO will, through COFI, report biennially on the state of progress in the implementation of the IPOA-SHARKS.

Appendix A

Suggested Contents of a *Shark-plan*

I Background

When managing fisheries for sharks, it is important to consider that the state of knowledge of sharks and the practices employed in shark catches may cause problems in the conservation and management of sharks, in particular:

- Taxonomic problems
- Inadequate available data on catches, effort and landings for sharks
- Difficulties in identifying species after landing
- Insufficient biological and environmental data
- Lack of funds for research and management of sharks
- Little coordination on the collection of information on transboundary, straddling, highly migratory and high seas stocks of sharks
- Difficulty in achieving shark management goals in multispecies fisheries in which sharks are caught.

II Content of the Shark-plan

The Technical Guidelines on the Conservation and Management of Sharks, under development by FAO, provide detailed technical guidance, both on the development and the implementation of the *Shark-plan*. Guidance will be provided on:

- Monitoring
- Data collection and analysis
- Research
- Building of human capacity
- Implementation of management measures

The *Shark-plan* should contain:

A. Description of the prevailing state of :

- Shark stocks, populations;
- Associated fisheries; and,
- Management framework and its enforcement.

B. The objective of the *Shark-plan*.

C. Strategies for achieving objectives. The following are illustrative examples of what could be included:

- Ascertain control over access of fishing vessels to shark stocks
- Decrease fishing effort in any shark where catch is unsustainable
- Improve the utilization of sharks caught
- Improve data collection and monitoring of shark fisheries
- Train all concerned in identification of shark species
- Facilitate and encourage research on little known shark species
- Obtain utilization and trade data on shark species

Appendix B

Suggested contents of a shark assessment report

A shark assessment report should *inter alia* contain the following information:

- Past and present trends for:
- Effort: directed and non-directed fisheries; all types of fisheries;
- Yield: physical and economic
- Status of stocks
- Existing management measures:
- Control of access to fishing grounds
- Technical measures (including by-catch reduction measures, the existence of sanctuaries and closed seasons)
- Others
- Monitoring, control and surveillance
- Effectiveness of management measures
- Possible modifications of management measures

[1] See: "Report of the FAO Technical Working Group on the Conservation and Management of Sharks". Tokyo, Japan, 23-27 April 1998. FAO Fisheries Report No. 583

[2] See report: "Preparatory Meeting for the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries". Rome, 22-24 July, 1998. FAO Fisheries Report No. 584.

[3] In this document the term "State" includes Members and non-members of FAO and applies *mutatis mutandis* also to "fishing entities" other than States.

Appendix B Participants in the development of the NPOA-Sharks

The following individuals have been consulted, participated in meetings or workshops held by the SAG or provided comments on drafts of the NPOA-Sharks:

Name	Organisation	Name	Organisation
Allen Broadhurst	Oceanwatch	**Katrina Maguire**	AFMA
Andrew McNee	AFMA	**Kevin McLoughlin**	BRS
Anna Willock	TRAFFIC Oceania	**Liz Foster**	AFFA
Astrida Mednis	EA	**Mark Armstrong**	EA
Brian Jeffriess	Fishing Industry	**Mark Elmer**	QDPI
Brian Johnston	AFFA	**Mike Drynan**	AFFA
Craig Bohm	Marine and Coastal Community Network	**Nathan Evans**	AFFA
Crispian Ashby	FRDC	**Neil MacDonald**	South Australian Fishing Industry Council
Dave Walters	EA	**Nick Otway**	NSW Fisheries
David Harasti	NSW Fisheries	**Nicola Beynon**	Humane Society International
Dennis Witt	Tasmanian Fisheries	**Paul Murphy**	AFMA
Dianna Watkins	NSW Fisheries	**Peter Dundas-Smith**	FRDC
Fran Trippett	QPPI	**Peter Millington**	WA Fisheries (SAG Chair)
Gary Henry	NSW Fisheries	**Ray Clarke**	NT Fisheries
Geoff Diver	Fishing industry	**Ricky Chan**	University of NSW
Glenn Sant	TRAFFIC Oceania	**Rod Lenanton**	WA Fisheries
Graeme Williams	Game Fishermen's Association of Australia	**Rodney Dillon**	ATSIC
Hans Jusseit	Fishing industry/ASIC	**Russ Neal**	ASIC
Ilona Stobutzki	CSIRO	**Sara Williams**	Environment Australia
Ingrid Holliday	AFMA	**Sarah Scott**	AFFA
Jennifer Hoy	AFFA	**Sean Riley**	Tasmanian Fisheries
Jim Gillespie	QDPI	**Stan Jarzynski**	AFFA
Joanna Fisher	AFMA	**Steve Schnierer**	Southern Cross University
John Diplock	NSW Fisheries	**Steve Shanks**	SA Fisheries
John Harrison	Amateur Fishermen's Association of NT	**Terry Moran**	Fishing Industry/ASIC
John Stevens	CSIRO	**Terry Walker**	MAFRI
Jonathon Barrington	AFFA	**Tony Bigwood**	Environment Australia
Katherine Short	WWF	**Vanessa Atkinson**	Greenpeace

Appendix C Species of Concern

Common Name	Species Name	Status[1,2,3]	Common Name	Species Name	Status[1,2,3]
F. Hexanchidae			Bronze Whaler	*C. brachyurus*	A
Bluntnose Sixgill Shark	*Hexanchus griseus*	DD	Spinner Shark	*C. brevipinna*	LR/lc
Broadnose Sevengill Shark	*Notorynchus cepedianus*	DD/A	Bull Shark	*C. leucas*	LR/lc
F. Squalidae		A	Common Blacktip Shark	*C. limbatus*	DD
Gulper Shark	*Centrophorus granulosus*	DD	Oceanic Whitetip Shark	*C. longimanus*	LR/nt
Black Shark	*Dalatias licha*	DD/A	Blacktip Reef Shark	*C. melanopterus*	LR/nt
White-Spotted Spurdog	*Squalus acanthias*	LR/lc	Dusky Shark	*C. obscurus*	LR/nt
Southern dogfish[4]	*Centrophorous uyato*	VU	Sandbar Shark	*C. plumbeus*	LR/nt/A
Harrissons dogfish[4]	*Centrophorous harrissoni*	EN	Silkyshark	*C. falciformis*	LR/lc
F. Pristiophoridae		A	Tiger Shark	*Galeocerdo cuvier*	LR/lc
Common Sawshark	*Pristiophorus cirratus*	LR/cd	Speartooth Shark	*Glyphis sp. A*	CR/P
F. Brachaeluridae			Northern River Shark	*Glyphis sp. C*	EN/P
Colcloughs Shark[4]	*Brachaelurus colcloughi*	VU	Blue Shark	*Prionace glauca*	LR/lc/A
F. Orectolobidae			Whitetip Reef Shark	*Triaenodon obesus*	LR/lc
Spotted wobbegong	*Orectolobus maculatus*	DD	**F. Sphyrnidae**		
Banded wobbegong	*Orectolobus ornatus*	DD	Scalloped Hammerhead	*Sphyrna lewini*	LR/lc
F. Rhincodontidae			Great Hammerhead	*S. mokarran*	LR/lc
Whale Shark	*Rhincodon typus*	DD/P	Smooth Hammerhead	*S. zygaena*	LR/lc
F. Odontaspididae			**F. Squatinidae**		A
Grey Nurse Shark	*Carcharias taurus*	EN/P	**F. Rhynchobatidae**		
Sand Tiger Shark	*Odontaspis ferox*	LR/nt/P	White-spotted Guitarfish	*Rhynchobatus djiddensis*	LR/lc
F. Pseudocarchariidae			**F. Rajidae**		A
Crocodile Shark	*Pseudocarcharias kamoharai*	LC/lc	Maugean Skate[4]	*Raja sp. L*	EN
F. Megachasmidae			**F. Pristidae**		
Megamouth Shark	*Megachasma pelagios*	DD/P	Narrow Sawfish	*Anoxypristis cuspidata*	VU/A
F. Alopiidae			Dwarf Sawfish	*Pristis clavata*	EN
Thresher Shark	*Alopias vulpinus*	DD/A	Freshwater Sawfish	*P. microdon*	CR/P
F. Cetorhinidae			Wide Sawfish	*P. pectinata*	DD
Basking Shark	*Cetorhinus maximus*	DD/P	Green Sawfish	*P. zijsron*	EN/A
F. Lamnidae			**F. Dasyatididae**		A
White Shark	*Carcharodon carcharias*	VU/P	Freshwater Whipray	*Himantura chaophraya*	VU
Shortfin Mako	*Isurus oxyrinchus*	LR/lc/A	Porcupine Ray	*Urogymnus asperrimus*	LR/nt
Porbeagle	*Lamna nasus*	LR/lc/A	Estuary stingray	*Dasyatis fluviorum*	LR/nt
F.Triakidae			Bluespotted ribbontail ray	*Taeniura lymma*	LR/lc
Whiskery Shark	*Furgaleus macki*	LR/cd	**F. Myliobatidae**		
School Shark	*Galeorhinus galeus*	LR/cd/A	White-spotted Eagle Ray	*Aetobatus narinari*	LR/lc
Pencil Shark	*Hypogaleus hyugaensis*	LR/lc	**F. Mobulidae**		
Gummy Shark	*Mustelus antarcticus*	LR/lc/A	Manta Ray	*Manta birostris*	LR/lc
F. Carcharhinidae			**F. Callorhinchidae**		
Graceful Shark	*Carcharhinus amblyrhynchoides*	LR/nt	Elephant Fish	*Callorhinchus milii*	A
Grey Reef Shark	*C. amblyrhynchos*	LR/lc	**F. Chimaeridae**		
Pigeye Shark	*C. amboinensis*	DD	Ogilby's Ghostshark	*Hydrolagus ogilbyi*	A

1. UCN categories: Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Lower risk/near threatened/conservation dependent/least concern (LR/nr/cd/lc); Data deficient (DD); 2. Protected in some State/Territory and/or Commonwealth Waters (P); 3. Potentially of concern given consistent high catch rates in non-target fisheries (A); 4. Being considered for listing as a threatened species under the EPBC Act.
Sources: SAG 2001; Pogonoski et al. 2002

Appendix D Minor shark bycatch fisheries

Western Australia

Open West Coast (general) Licence
Pilbara Fish Trawl Fishery
Exmouth Gulf Beach Seine
Exmouth Gulf Prawn Trawl
Kimberley Gillnet and Barramundi Fishery
Northern Demersal Scalefish fishery
Abroholos Island Trawl Fishery
Cockburn Sound Fish Net Fishery
Cockburn Line and Pot Fishery
General Fish Trapping
Inner Shark Bay Line Fishery
Kimberley Demersal Trap Fishery
Kimberley Prawn Trawl
Nickol Bay Prawn Fishery
Onslow Prawn Fishery
Pilbara Trap Fishery
Shark Bay Seine Mesh Net Fishery
Shark Bay Prawn Trawl Fishery
Shark Bay Pink Snapper Fishery
Shark Bay Scallop Trawl Fishery
South Coast Salmon Fishery
Southern Rock Lobster Fishery
South West Salmon Fishery
South West Inshore Trawl Fishery
West Coast Rock Lobster Fishery
Windy Harbour Rock Lobster Fishery
South Coast Estuarine Fisheries
South Coast Trawl Endorsement
South West Coast Estuarine Fisheries
Leatherjacket Trap Fishery
Ningaloo Fish Trawl Fishery
West Coast Purse Seine Fisheries

Northern Territory

Coastal line
Restricted bait
Barramundi
Coastal net
Developmental coastal net
Finfish trawl
Spanish mackerel
Demersal
Bait net
Aquarium fish display

Source: SAG, 2001

Appendix E Suggested minimum data set for shark species in commercial fisheries

Data	Recommended method of collection	
	Target shark fisheries	Other shark fisheries
Species composition of catch		
- target species (determined by historical catch)	Logbook	
- byproduct	On-board monitoring[4]	On-board monitoring
- bycatch	On-board monitoring	On-board monitoring
- listed threatened species		
Quantity of retained catch		
- by target species		
- weight	Logbook	
- numbers	Logbook	
- Byproduct by species		
- weight	Logbooks	On-board monitoring
- numbers	Logbooks	On-board monitoring
-		
- Total Byproduct		
- weight		Logbooks
- numbers		Logbooks
Quantity of discarded catch		
- by target species		
- weight	On-board monitoring	
- numbers	On-board monitoring	
- reasons for discard	On-board monitoring	
- Bycatch by species		
- weight	On-board monitoring	On-board monitoring
- numbers	On-board monitoring	On-board monitoring
- reason for discard	On-board monitoring	On-board monitoring
- life status	On-board monitoring	On-board monitoring
- Total bycatch		
- weight	Logbooks	Logbooks
- numbers	Logbooks	Logbooks
- threatened species		
Product Form[5]		
- target species	Logbooks	
- whole		
- headed/gutted fins on		
- headed/gutted fins off		
- fillets		
- fins		
- Byproduct	Logbooks	On-board monitoring
- whole		
- headed/gutted fins on		
- headed/gutted fins off		
- fillets		
- fins		
Unaccounted shark mortality cryptic fishing mortality	On-board monitoring Specific research programs	On-board monitoring Specific research programs
Index of abundance[6]	Fishery independent survey of fish density	Fishery independent survey of fish density
Species targeted	On-board monitoring	On-board monitoring
Age data	Collection of vertebrae or dorsal spines by on-board monitoring	On-board monitoring
Sex	On-board monitoring	On-board monitoring
Length	On-board monitoring	On-board monitoring
Location: Lat/Longs	Logbook	Logbook
Date	Logbook	Logbook
Scale: Shot by shot	Logbook	Logbook
Fishing effort	Logbooks	Logbooks
Net length and soak time	Logbook	Logbook
Gear specifications[7]	Logbooks	
Vessel specs. inc. storage capacity	Logbooks	Logbook

[4] The form of on-board monitoring program appropriate will vary from one-off data collection exercises, monitoring conducted as part of a specific research program to ongoing programs such as the SETF's Integrated Scientific Monitoring Program.

[5] See discussion on Product Form below.

[6] For those species for which stock assessments are required

[7] See discussion on Gear specifications below

Product Form

Ideally the form of catch data needs to be standardised across all jurisdictions. Where this is impracticable standard conversion factors should be applied.

The following basis for standardisation is suggested for consideration under Action 19:

- Fishers should be required to report shark weights for the form in which they are landed and where practical all sharks be landed in the carcass form where a carcass is defined as a beheaded and gutted shark with all fins and, for males, the claspers attached.

  Leaving the claspers in tact enables monitoring the sex of sharks after landing ashore. The practice of removing claspers varies throughout industry and some industry members have recently begun arguing that leaving the claspers on mature animals degrades the product.
- Fishers should be required to report chimaera weights for the form in which they are landed and where practical all chimaeras be landed in the carcass form where a carcass is defined as a beheaded and gutted chimaera with all fins and, for males, the claspers attached, except for the pectoral fins and belly flaps which are removed.
- The issue of standard reporting of skates and rays needs to be addressed. There is a growing practice of retaining the outer margins of the discs (pectoral fins) of the animal and discarding the rest of the animal for several large-sized species. This involves removing a relatively small proportion of the animal and might be regarded as wasteful and analogous to finning.

- Official statistics of catch weights should be published as standard shark carcass weights and, where shark weights are reported by fishers in a different form, the weights are converted to the standard carcass form for publication purposes.

Gear Specifications

Gear specifications should include, as appropriate to fishing method:

- mesh size,
- number of meshes deep,
- filament thickness for gillnets, hook-size for longlines,
- mesh-sizes;
- dimensions of wings and codends of trawl nets,
- length of foot rope,
- height of headrope,
- wing spread, and door spread.

Appendix F Links between the IPOA-Sharks and the Australian NPOA-Sharks

IPOA–Sharks Objectives	Issues in the Conservation and Management of Sharks in Australia	Relevant Actions in Australian NPOA-Sharks
i. ensure that shark catches from target and non-target fisheries are sustainable	5. The need for continued effort to maintain and improve the standard of stock assessments for target shark species in dedicated shark fisheries	11, 15, 38
	6. The need for reliable assessments for bycatch and byproduct shark species	14, 27, 28, 38
	7. The need for assessment of the adequacy of management for all shark species and more innovative approaches to dealing with identified shark management issues	1, 2, 3, 5, 6, 10, 11, 16, 44, 46, 47
ii. assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;	6. The need for reliable assessments for bycatch and byproduct shark species	14, 27, 28, 38
	7. The need for assessment of the adequacy of management for all shark species and more innovative approaches to dealing with identified shark management issues	1, 2, 3, 5, 6, 10, 11, 16, 44, 46, 47
	10. The need for an assessment of shark harvesting and handling practices	5, 40
	12. The need for risk assessments for all shark species from all impacts on those species	22, 27, 28, 44
	16. The need to reduce the impact of environmental degradation on sharks	12
	17. The need for more information on the impact on sharks of sound waves in the marine environment	28
	18. The need for more information on the impact on sharks of electromagnetic fields, for example, high voltage electric cables and shark protection devices	12, 28, 34
iii. identify and provide special attention, in particular to vulnerable or threatened sharks;	12. The need for risk assessments for all shark species from all impacts on those species	22, 27, 28, 44
	13. Where necessary develop strategies for the recovery of shark species and populations	13, 39
iv. improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;	4. The need for coordination of shark research	43
	8. The need for improved understanding of the impacts of and, where required, implementation of better management for recreational and game fishing	8, 20, 41
	11. The need for a better understanding and, where necessary, recognition in management arrangements, of shark fishing by Indigenous people	9, 20, 36, 37, 44, 45
v. minimise unutilised incidental catches of sharks	9. The need to reduce cryptic fishing mortality of shark species	25, 41
	14. The need to reduce or, where necessary, eliminate shark bycatch	3, 7, 17

vi. contribute to the protection of biodiversity and ecosystem structure and function;	12. The need for risk assessments for all shark species from all impacts on those species	22, 27, 28, 44
	15. The need for a better understanding of the effects of shark fishing and shark management practices on ecosystem structure and function	4, 29, 33, 35, 38
	16. The need to reduce the impact of environmental degradation on sharks	12
	17. The need for more information on the impact on sharks of sound waves in the marine environment	28
	18. The need for more information on the impact on sharks of electromagnetic fields, for example high voltage electric cables and shark protection devices	12, 28, 34
vii. minimise waste and discards from shark catches in accordance with article 7.2.2. (g) of the Code of Conduct for Responsible Fishing (FAO, 1995)	3. The need for an improved understanding of markets for and trade in shark products	26, 30, 31, 32
	9. The need to reduce cryptic fishing mortality of shark species	25, 41
	14. The need to reduce or, where necessary, eliminate shark bycatch	3, 7, 17
viii. encourage full use of dead sharks;	3. The need for an improved understanding of markets for and trade in shark products	26, 30, 31, 32
ix. facilitate improved species-specific catch and landings data and monitoring of shark catches; and	1. The need to improve identification of shark species by all resource users	5, 18, 41, 42
	2. The need for secure, accessible and validated data sets that are consistent over time with compatible resolution between jurisdictions over the full range of each species from all resource users	19, 20, 21, 22, 23, 24, 25, 28, 45
x. facilitate the identification and reporting of species-specific biological and trade data	1. The need to improve identification of shark species by all resource users	5, 18, 41, 42
	3. The need for an improved understanding of markets for and trade in shark products	26, 30, 31, 32

Glossary[8]

Associated and/or dependent species: species associated with or dependent upon harvested species, for example species that are predator or prey of the harvested species.

Availability: relationship between the spatial distribution of fishing and the spatial distribution of a species

Biological diversity, biodiversity: the variability among living organisms from all sources (including marine and other aquatic ecosystems and the ecological complexes of which they are part). Includes 1) diversity within species and between species; and 2) diversity of ecosystems.

Biodiversity maintenance: Biodiversity is the variety of living organisms in all their forms and defined in terms of genetic diversity, species diversity and ecosystem diversity and the interrelations between genes, species and ecosystems. The number of species and within-species genetic variability of shark and other chondrichthyan species is naturally low compared with those of many other taxonomic groups. The loss of species, the loss of individual populations within a species, or loss of genetic variation within a species or population, and consequential loss of ecological processes reduce biodiversity and benefits to human kind. Loss of biodiversity can be caused by increased mortality, loss or degradation of habitat, change of environment, and changes in competition with other species, resulting from the introduction of exotic or genetically altered species or from other ecological changes.

Bycatch: species that are discarded from the catch or retained for scientific purposes, and that part of the "catch" that is not landed but is killed as a result of interaction with fishing gear. This includes discards of commercially valuable species.

Byproduct: species that are not the target species, but are retained because they are commercially valuable

Catchability: proportion of the population removed by one unit of fishing effort.

Critical habitat: habitat that is deemed to be crucial at some phase of the life-history of a particular species)

Discards: the portion of the catch that is disposed, dumped, or trashed as it is unsaleable or of lower value, dead, or alive, during or after fishing operations

Ecologically sustainable: use of natural resources within their capacity to sustain natural processes while maintaining the life-support systems of nature and ensuring that the benefit of the use to the present generation does not diminish the potential to meet the needs and aspirations of future generations.

Ecosystem: the biotic (living) community and its abiotic (non-living) environment

Finning: the practice of removing the fins from a shark and discarding the torso to the sea

Fishery-independent data: information gathered independently of normal commercial fishing operations

Gillnet: a net used to tangle or snare fishes

Habitat protection: Anthropogenic activity such as fishing, aquaculture, ecotourism, dredging, mining, catchment area clearing, dumping, nutrient enrichment, pollution, or introduction of exotic organisms can lead to broad-scale degradation of a species habitat range or loss of critical habitat such as nursery, pupping and mating areas or migration lanes of a species. Special habitat protection or habitat restoration programmes might be required where a species abundance or range has been reduced as a result of habitat loss.

Listed threatened species: listed under the EPBC Act or under fisheries management or wildlife conservation legislation in place in the States/Northern Territory

High Grading: the practice of discarding low value species for higher valued species

Management for sustainable use: Sustainable use requires an understanding of the biophysical and ecological systems and requires maintaining stocks at, or restoring to, levels above those capable of producing maximum sustainable yields. The concept of sustainable catch has to be viewed within the constraints that ecosystems are in dynamic equilibrium and shift between different states depending on natural oscillations in the environment such as El Niño, on anthropogenic stress such as fishing and other activities impacting ecosystems, and, possibly, on climate change. Managing shark resources for sustainable use involves controlling fishing mortality

---

[8] Where terms used in the NPOA-Sharks are defined in the Guidelines for the Ecologically Sustainable Management of Fisheries (EA 2001) those definitions have been adopted.

through limiting fishing effort and/or catch and through biological controls such as legal minimum lengths, prescribed mesh-sizes or hook sizes of the fishing gear, closed seasons and closed areas.

Live finning: The practice of removing the fins from the torso of a live shark with the torso discarded to the sea

Management regime: In this document, refers to the policies, plans, action plans, strategic research plans, and all documentation that relates to the operations and management of the fishery.

Optimal utilisation: achieving sustainable use while minimising discards and waste

Overfishing: can be defined in two ways which can act independently or concurrently: 1) "recruitment overfishing", where fishing activities are causing a reduction in recruitment in succeeding years and cause the mortality of too many fish in total, too many pre-productive fish, or too many fish that have only spawned a few times. The end result is that the stock can no longer replenish itself adequately. 2) "growth overfishing": where fishing activities lead to a reduction in the size of the individuals of a species, as a consequence of which few specimens grow to the size for optimum yield.

Precautionary approach: used to implement the precautionary principle. In the application of the precautionary principle, public and private decisions should be guided by: 1) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and 2) an assessment of the risk-weighted consequences of the various options.

Precautionary principle: the lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

Productivity: when applied to fish stocks the term productivity gives an indication of the birth, growth and death rates of a stock.

Recovery Plan: a comprehensive plan that details, schedules and costs all actions including research necessary to support the recovery of a species or ecological community that has been listed as threatened under state or federal legislation.

Reference point: an indicator level of fishing (or stock size) to be used as a benchmark for assessment or decision making.

Rehabilitation: the rebuilding of a significantly depleted species or ecological community

Species conservation: Some species of shark need 'special protection' (or 'special management'). This is because some species of shark have particularly low productivity, naturally small populations (rare), a spatially small distribution range, or a distribution range within regions of high anthropogenic impact where they might be threatened or have their populations severely depleted. Such species may need special protection through management action such as prohibition of their capture, prohibition of specific fishing gears, or closed areas to their capture or use of specific fishing gears.

Stock: in the strict sense, a distinct, reproductively isolated population. In practice, a group of individuals of a species in a defined spatial range that is regarded as having a relatively low rate of exchange with others of the species.

Underutilisation: failure to exploit all available uses for all components of shark taken

Abbreviations

ACIAR	Australian Council for International Agricultural Research	**IUCN**	International Union for Conservation of Nature and Natural Resources
AFFA	Agriculture, Fisheries and Forestry-Australia	**MAC**	Management Advisory Committee
AFMA	Australian Fisheries Management Authority	**MAFRI**	Marine and Freshwater Research Institute
AFZ	Australian Fishing Zone	**MCFFA**	Ministerial Council on Forestry, Fisheries and Aquaculture
ASIC	Australian Seafood Industry Council	**NAFM**	Northern Australian Fisheries Managers
ATSIC	Aboriginal and Torres Strait Islander Commission	**NGO**	Non-government Organisation
BAP	Bycatch Action Plan	**NHT**	National Heritage Trust
BRD	Bycatch reduction device	**NPF**	Northern Prawn Fishery
BRS	Bureau of Rural Sciences	**NPOA-Sharks**	National Plan of Action for the Conservation and Management of Sharks
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora	**NRIFS**	National Recreational and Indigenous Fishing Survey
CPUE	catch per unit effort	**NSF**	Northern Shark Fishery
CSIRO	Commonwealth Scientific and Industrial Research Organisation	**NTDPIF**	Northern Territory Department of Primary Industry and Fisheries
DITR	Department of Industry, Tourism and Resources	**PIRSA**	Primary Industry and Resources South Australia
EEZ	Exclusive Economic Zone	**OCS**	Offshore Constitutional Settlement
EA	Environment Australia	**QDPI**	Queensland Department of Primary Industries
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*	**RFMO**	Regional Fisheries Management Organisation
ESD	Ecologically sustainable development	**SAG**	Shark Advisory Group
ETBF	Eastern Tuna and Billfish Fishery	**SDRS**	Sustainable Development Reference System
FAO	Food and Agriculture Organisation of the United Nations	**SENTF**	South East Non-trawl Fishery
FRDC	Fisheries Research and Development Corporation	**SETF**	South East Trawl Fishery
GABTF	Great Australian Bight Trawl Fishery	**SSF**	Southern Shark Fishery
HIMI	Heard Island and McDonald Island	**SWTBF**	Southern and Western Tuna and Billfish Fishery
IPOA-Sharks	International Plan of Action for the Conservation and Management of Sharks	**TED**	Turtle excluder device
ITQ	Individual Transferable Quota	**WAF**	Western Australian Fisheries

References

Australian Bureau of Agricultural and Resource Economics (ABARE) 2002 *Australian fisheries statistics 2001*, Canberra

Bureau of Rural Sciences 2001, *Review of shark finning in Australian fisheries*, Canberra

CITES (2002) http://www.cites.org/eng/decis/11/151.shtml, viewed 22 May 2002

Commonwealth of Australia 2000, *Commonwealth policy on fisheries bycatch*

Department of Industry, Science and Resources (DISR) 2001, *Review of environmental impacts of petroleum exploration and appraisal activities in Commonwealth waters*, Canberra

Environment Australia 2001, *Guidelines for the ecologically sustainable management of fisheries, Canberra*

FAO 1995, *Code of conduct for responsible fisheries*, Rome

FAO 1999a, *The international plan of action for the conservation and management of sharks*, Rome

FAO 1999b, Indicators for sustainable development of marine capture fisheries. *FAO technical guidelines for responsible fisheries* No. 8, FAO, Rome

FAO 2000, Fisheries management. 1. Conservation and management of sharks. *FAO technical guidelines for responsible fisheries* No. 4, Suppl.1. FAO, Rome.

IUCN 2000, Red List http://www.redlist.org/

Ministerial Council on Forestry, Fisheries and Agriculture (MCFFA) 1999 *National Policy on Fisheries Bycatch*, AFFA, Canberra

Pogonoski, JJ, Pollard, DA and Paxton, JR 2002, *Conservation overview and action plan for Australian threatened and potentially threatened marine and estuarine fishes*, Sydney

SAG 2001, *Australian shark assessment report for the Australian national plan of action for the conservation and management of sharks*, Canberra