MANAGEMENT STRATEGY FOR NORTHERN AUSTRALIAN SHARK FISHERIES

PART I

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1. EXECUTIVE SUMMARY

Compared to fish, sharks are generally long-lived, have a low reproduction rate, mature late and have small populations. The vulnerability of sharks to overfishing is widely recognised and has lead to growing concern over the last decade about the potential impacts of the expansion of shark fisheries around the world. The Food and Agriculture Organisation (FAO) developed an International Plan of Action (IPOA) for the Conservation and Management of Sharks in 1999 as a framework to begin to address this issue. To respond to its obligations under this Plan, Australia released its National Plan of Action for Conservation and Management of Shark (NPOA – Sharks) in 2004. A Shark Implementation and Review Committee (SIRC) was formed to develop a strategy for the implementation of the NPOA - Sharks. As part of this strategy, the Northern Australian Fisheries Management (NAFM) Group – consisting of the Western Australian, Northern Territory, Queensland and Commonwealth agencies responsible for fishing – undertook to ensure that fisheries management, research and compliance programs in northern Australia ensured the long-term future sustainability of shark populations, their environment, and the people which depend on them.

From a national and international perspective the NAFM Group recognised there was a need to control the direct and indirect take of shark, protect nationally and internationally vulnerable species, and put in place processes to protect the ecosystem that these species rely on in northern Australian waters. It began this process by developing Operational, Research and Compliance Plans for Northern Shark Fisheries.

NAFM also commissioned the current report to develop an overarching Strategic Management Strategy for northern Australian shark fisheries. The report was needed to collate information on Australian and foreign fisheries that either target shark or take/interact with shark incidentally in northern Australia and assist NAFM in the direction and strategic management of these fisheries in line with the principles of Ecologically Sustainable Development (ESD).

The report was restricted to covering the commercial fisheries that target or interact with sharks in northern Australian waters from Cape York in Queensland through the Northern Territory to the Pilbara in Western Australia and included State and Territorial waters to the outer limit of the Australian Fishing Zone (AFZ). The area of the Torres Strait was not included. This region includes the Western Australia North Coast Shark Fishery (WANCSF), Joint Authority Northern Shark Fishery (JANSF), and shark fisheries managed by the Northern Territory Fishing Joint Authority (NTFJA) and Queensland Fishery Joint Authority (QFJA) as well as numerous other Australian and foreign fisheries that take or interact with northern shark populations.

The report has been prepared in two parts. Part 1 provides a brief review of general shark biology and provides fishery information and management arrangements on domestic and foreign fisheries that interact with northern shark. This was achieved by obtaining catch and effort data from each fishery in each jurisdiction based on a standard data request proforma and any data available on foreign fishing was also recorded. This was the major source of information used in the report but it was augmented with other information from the jurisdictions and available in the literature. This information was collated and analysed and a description of each

fishery is provided which includes: management arrangements; catch and value; effort; species caught; and any other issues. Key Points were identified that provided the basis for the strategic plan.

These fisheries were classified into three categories based on the targeting and retention of shark.

Target fisheries

Australian target fisheries either target shark for meat and take fin as a valuable byproduct or, target shark mainly for fin, with the meat often a low value byproduct. Sharks are a major target species for at least one fishery in each State and Territory jurisdiction. The Commonwealth has no specific shark target fisheries operating in northern Australian waters, but are involved and have responsibilities through their involvement in the Joint Authorities (JA) that are in place for many northern fisheries.

Byproduct fisheries

Shark is also taken in a number of fisheries in each jurisdiction as a bycatch and retained as byproduct. This means that at least some part of the shark is allowed to be retained for sale. Around 25 non-target fisheries catch shark as a byproduct and use all or some of the meat and/or fin based on the species taken, or other circumstances such as regulatory controls or limits. These fisheries contribute a significant portion of the total shark catch in some jurisdictions.

No-take fisheries

There are fisheries in all jurisdictions that catch shark as a bycatch but which must be discarded to comply with nil possession regulations. This does not mean that sharks are not caught in these fisheries. The aim of the no-take provisions is to encourage fishers to avoid areas inhabited by shark, modify fishing methods and areas fished to minimise interaction. Shark catches in some of these fisheries could contribute substantially to total shark mortalities.

Foreign fishing

Prior to the declaration of the AFZ in 1979, access by foreign vessels to within 12 nm of the coast was unrestricted. The AFZ was declared in 1979 giving Australia sovereignty and control of the marine resources in these waters. Since 1979, foreign fishing has not been permitted in northern Australian waters, except for traditional fishers in the area covered by the Memorandum of Understanding (MOU), or by specific agreement. All foreign fishing activity within or adjacent to the AFZ, including legal, illegal, traditional or industrialised could have significant consequences in Australian waters as their cumulative fishing impacts could be affecting the sustainability of northern shark stocks.

A discussion of each of these fisheries is provided and summarised below.

Shark is caught in target, byproduct and no take fisheries and Australian landings have increased over the last decade. This has been associated with changing fishing practices and introduction of new gear. Longline and gillnet are the main fishing methods that catch shark. Reported total annual landings during 2003 from target fisheries were 1,377t and 569t from bycatch fisheries. There is virtually no record of the amount or fate of discarded sharks. The demand for shark fin, mainly sold in

Chinese based communities, is a key driver for the increased shark fishing. There is a large potential supply of shark meat if a market could be developed for currently underutilised species. Although the Australian fleet that targets shark is not large, it accounts for about 80% of the $11million annual value of landed shark and directly employs 100-130 people. The target fishing fleet is valued at over $20 million with entitlements valued over $15 million.

Foreign catches are most likely very high, but little data is available. The northern shark fisheries cover an extensive area. Domestic fishing is generally restricted to inshore regions and foreign fishing is focussed offshore, but moving closer to Australian mainland. Illegal fishing is generally thought to be increasing. There is little information on the foreign fishing fleet but it is known that there are a large number of vessels which come from a variety of ports, jurisdictions and countries. Indonesian vessels are likely to comprise a major part of the foreign fishing fleet and shark stocks are considered to be severely depleted in Indonesian waters.

Although many northern shark species are caught, there are only a few species that are targeted. Species identification is generally difficult and inconsistent. Based on logbook data, the reported catch is made up of mainly 10 species, with the majority coming from the blacktip groups of sharks. Key species harvested in northern waters are the blacktip species, *Carcharhinus tilstoni C. limbatus* as well as *C. sorrah, (Spot-tail shark) C. plumbeus* (sandbar shark) in Western Australia, hammerheads, (*Sphyrrna lewini*, *S. mokarran*, *Eusphyra blochii*) and tiger shark (*Galeocerdo cuvier*). It is suspected that in some cases *C. sorrah* has been misidentified as the blacktip shark. Other important species are spinner shark (*C. brevipinna*), pigeye shark (*C. amboinensis*), milk shark (*Rhizoprionodon acutus*), bull shark (*C. leucas*), lemon shark (*Negaprion acutidens*) and sawfish (*Pristis sp*.) which are taken for fin, meat or both. These major species all have a broad distribution. Of these species nearly all have an inshore habitat except for one pelagic species (*S. lewini*) and one shelf species (*C. limbatus*).

There is little data available on the level of ecosystem impacts of these fisheries although there anecdotal reports of negative impacts. There are a number of protected/endangered/threatened (PET) species that interact with northern shark fisheries but there is minimal reporting of these interactions. Technical and operational adjustments in fishing practices can minimise or eliminate bycatch and Bycatch Plans are being implemented in a number of fisheries. A formal risk assessment process should be applied to determine the impact of shark fisheries on bycatch species and the ecosystem. Some shark species may be at some risk and five shark species have a high conservation status in Commonwealth waters. In WA the dusky shark, *C. obscurus* and sandbar shark, *C. plumbeus*, are currently overexploited and the implementation of remedial management action for both is being undertaken.

Little known about the life history of most northern shark species and there are few, if any, reliable assessments. As such the potential for species to be overexploited and threatened generally has not been well identified. Rapid assessment techniques are a possible solution. Key research issues in the northern shark fisheries are that data collection is not standardised and research is fragmented across the different jurisdictions. There is no overarching research group but a research strategy is being developed under the NAFM Group.

Sound management of northern Australian shark fisheries is hindered by the multiple national and international jurisdictions involved. There are straddling stocks that are under pressure from foreign fishing fleets as well as domestic fisheries. Australian fisheries are operating under Offshore Constitutional Settlement (OCS) arrangements and an Operational Plan for the Sustainable Use of Northern Australian Shark Resources (OPSUNASR) has been developed. Most jurisdictions have industry associations and Management Advisory Committees in place. Shark fisheries that export product must be approved for export under the *Environment Protection and Biodiversity Conservation (EPBC) Act* and vessels and processors must be registered for export by the Australian Quarantine Inspection Service (AQIS).

Compliance in the northern shark fisheries is faced with an extensive area that needs to be patrolled. This, and the multi-jurisdictional management and the varying regulatory controls in each jurisdiction make compliance very difficult with limited resources. There needs to be clarification of levels of mutual recognition between the jurisdictions. There is little fisheries management and compliance outside the AFZ. Enforcement of illegal fishing is undertaken by the Australian Government, but tends to be of lesser importance compared to immigration and customs breaches in northern waters.

Whilst NAFM has key role in coordinating research, management and compliance of northern shark fisheries within Australia, there is no formal Management Advisory Committee (MAC) or similar forum in place for foreign consultative arrangements. Formal consultation with Indonesia is a high priority.

Part 2 of the report provides strategic analysis and options for complementary and consistent management, research and compliance for domestic and foreign shark fishing activity in northern Australian waters. The following three strategic goals for the northern shark fisheries were developed:

1. *Shark Target Fisheries are to be well managed with sustainable levels of harvested shark species, no species over-exploited and minimal interaction with non target and PET species*
2. *Non-Target Fisheries that interact with shark are to have negligible mortalities of shark and PET species with incentives to ensure mortalities are minimal*
3. *Maintain a functioning ecosystem which supports the life history of all shark species with negligible impact on shark and PET species or at a community and habitat level.*

To achieve these goals, three Strategic Programs were identified; Management, Research and Compliance. Within the Strategic Programs, a number of Sub Programs were identified, each with specific aims and a range of outputs which will assist in achieving the desired strategic outcome for Management, Research and Compliance for northern Australian shark fisheries. The ongoing development and implementation of operational plans for research, management and compliance are major components of the process.

Based on an assessment of the critical issues, management of the resource was considered an urgent requirement in the short to medium term and in some instances needs urgent attention. Many of these arrangements could commence without the

need for further research, or additional compliance, as they are of an administrative nature. Other areas need further research to underpin management direction and additional compliance capacity to ensure that the objectives of management were met.

Another key finding was the varying levels and standards each jurisdiction operates at with respect to the three Strategic Programs. This was especially relevant in the resolution of fishing activity where it proved difficult to gather even basic catch and effort data by fishery, gear and species for a 5 year period from all jurisdictions.

There was also an obvious need to integrate sustainable shark fishing into the broader principles of ecosystem based management. This may prove difficult within the complex multi-jurisdictional management arrangements currently in place for the northern shark fleet. It is imperative that the risks of continuing with the existing multi-jurisdictional system be ascertained, including a review of the existing OCS arrangements. This must be considered not only in respect to the domestic fleet, but also in the context of the large, expanding and generally uncontrolled foreign fishing fleet operating, legally and illegally, adjacent to, or within the AFZ.

Effective utilisation and management of the northern shark stocks will only be achieved with the allocation of adequate resources and specific actions to create a unified and powerful group to achieve the strategic goals. Specific operational plans developed for management, research and compliance along with the various working and assessment groups are the key to achieving the proposed outputs and actions. Much of this work has commenced with most plans well advanced. The Operational Plan came into force in January 2005, the Compliance Plan in May 2005 and a draft Research Plan is to be completed in time for NAFM 2005.

2. INTRODUCTION

The vulnerability of sharks to overfishing is widely recognised and has lead to growing concern over the last decade about and the potential impacts of the expansion of shark fisheries around the world (Walker 2003). Submissions to the Convention for International Trade in Endangered Species (CITES) during the mid 1990s called for trade restrictions as a means of controlling shark harvest. This prompted the Food and Agriculture Organisation (FAO) to develop a world-wide process to deal with this issue through the development of an International Plan of Action for the Conservation and Management of Sharks (IPOA – Sharks). A full list of acronyms used in this report is at Appendix I.

As part of Australia‟s response to its obligations under the IPOA-Sharks, the National Plan of Action for Conservation and Management of Shark in Australia (NPOA – Sharks) was developed. The SPIRC was formed in 2004 to develop a strategy for the implementation of the NPOA. SIRC recognised that there were a number of fisheries management groups already in place which could assist in the implementation of the NPOA.

The Northern Australian Fisheries Management (NAFM) Group is a government group representing the Western Australian (WA), Northern Territory (NT), Queensland (QLD) and Commonwealth (Cwlth) agencies responsible for fishing. The Group meets on an annual basis to consider issues of fisheries management, research and compliance across northern Australia.

Each jurisdiction has a Fisheries Act as the head legislation for the management of fisheries along with a range of regulations, management plans and other subordinate legislation that controls the use of, and protection of aquatic and marine resources. There are also other Commonwealth legislation, instruments and arrangements that significantly impact on resource users and managers. These are outlined below.

Queensland	Queensland Fisheries Act 1994
	Fisheries Regulations 1995
	Fisheries (Gulf of Carpentaria Inshore Fin Fish Management Plan 1999)
Northern Territory	Fisheries Act
	Fisheries Regulations
Western Australia	Fisheries Resource Management Act (1994)
	Fisheries Resource Management Regulations (1995)
	North Coast Shark Fishing (Professional Notice) 1993
	Net Hauling Restrictions Notice (1991)
Commonwealth	Fisheries Administration Act 1991

Fisheries Management Act 1991

NPF Management Plan

EPBC Act (1999)

Offshore Constitutional Settlements

At the last NAFM meeting held in Darwin in August 2004, one of the major areas of discussion related to the current status and future strategic direction of shark and shark fisheries across northern Australia. In line with the NPOA – Sharks, NAFM wanted to make sure that fisheries management, research and compliance programs in northern Australia ensured the long-term future sustainability of sharks, their environment, and the people which depend on them.

Australia has about 170 shark species of which at least 80 species are found in northern Australian waters (Last and Stevens 1994) (Appendix II). The NAFM raised many issues that related to the sustainability of these shark stocks. These issues were similar to those identified in the NPOA – Sharks and by many of the general public. They included:

- concerns about a perceived decline in shark stocks and the need for a greater focus on species conservation and sustainable use;
- concerns regarding the increased targeting of shark for fin and changing fishing patterns;
- the need for full utilization of harvested animals and minimisation of waste;
- biodiversity, ecological considerations and the impacts of harvesting top order predators on ecology and ecosystems;
- the need to reduce bycatch;
- the need for more effective management arrangements, especially in developing fisheries, or ones with significant levels of latent effort;
- a desire to improve or develop consultative and timely reporting processes;
- the need to improve data collection and focus cost effective research;
- putting in place enforceable regulatory arrangements; and,
- concerns about the levels and impacts of foreign fishing activity.

From a national and international perspective there is an acknowledged need to control direct and indirect take of shark and protect nationally and internationally vulnerable species. Within Australia, there is no single body is responsible for overall management or utilisation of the northern shark resources. The shared arrangements are complex with a series of Memorandum of Understandings (MOUs) and other Offshore Constitutional Settlement (OCS) arrangements in place between WA, NT, Qld and the Commonwealth. More importantly, there are no formal arrangements in place between Australia and other countries in the region regarding the management of these sharks, other than the general outlines covered in the IPOA – Sharks.

Currently, there are few countries in the region other than Australia that have significant management arrangements in place to administer their shark fisheries. It is

partly due to the success of the management of Australian fisheries in northern waters that increasing international fishing pressure is being placed on our northern shark resources. Countries with less stringent management have significantly reduced shark stocks in the region, which has resulted in Australia"s well managed northern stocks now being targeted to supply the large, expanding and lucrative international markets for shark fin and meat.

NAFM recognised that it was in a good position to improve the sustainable management of shark stocks in northern Australia in line with obligations under the NPOA – sharks. During 2004 it began this process by developing an Operational Plan for the Sustainable Use of Northern Australian Shark Resources. In conjunction with this, NAFM commissioned the current report to develop a management strategy for northern Australian shark fisheries. The report was needed to draw together information available on fisheries that either target shark as a principal species, or take/interact with shark incidentally in northern Australia, including both Australian and foreign fisheries. The report is designed to assist NAFM in the direction and strategic management of these fisheries and was prepared in line with the principles of Ecologically Sustainable Development (ESD), taking into account ecological, economic, social and governance issues involved in managing northern shark stocks.

3. METHODS

At the NAFM workshop held in Darwin during 2004, the group developed an outline of the information requirements they considered necessary to develop a Northern Australian Shark Strategic Plan. It was decided that the report would be restricted to the commercial fisheries in northern Australian waters from Cape York in Queensland through the Northern Territory to the Pilbara in Western Australia and include State and Territorial waters to the outer limit of the Australian Fishing Zone (AFZ). This equates to a sea area of over 1,500,000 km^2 and includes the Western Australia North Coast Shark Fishery (WANCSF), Joint Authority Northern Shark Fishery (JANSF), and shark fisheries managed by the Northern Territory Joint Authority (NTJA) and Queensland Fishery Joint Authority (QFJA) (Figure 1). The area does not include the Torres Strait.

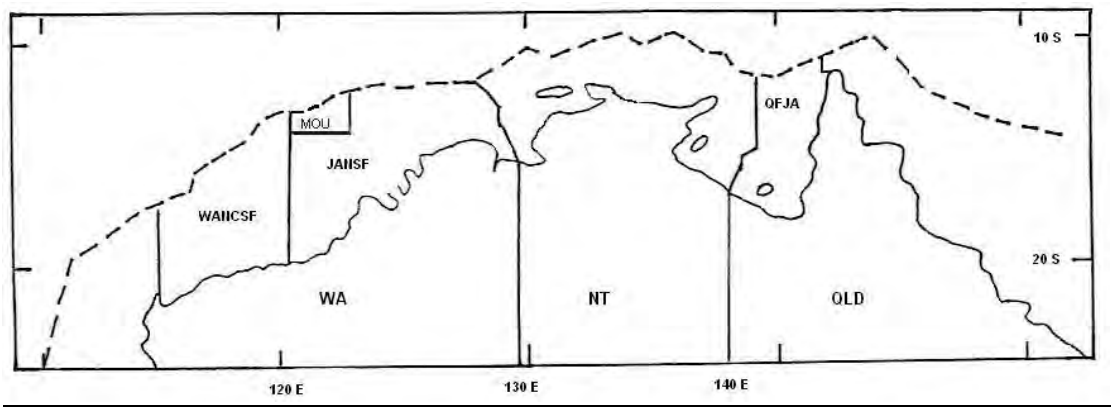


Figure 1: Area Covered by Northern Shark Fisheries

Key personnel in each jurisdiction were identified by NAFM to assist and contribute to the development of the plan. These people also agreed to facilitate the provision of available data on the fisheries in their jurisdiction that interacted with sharks.

A data request pro-forma (Appendix III) was developed and provided to each jurisdiction in order that similar data was obtained in a similar format with a view to developing a base level of information on the fisheries and species involved. Other available data sources were also utilised and are listed in the bibliography and references.

This data was collated and analysed and an understanding of the status of fisheries that are interacting with shark was developed. Key Points were identified that provided the basis for the strategic plan. The plan seeks to ensure effective management, research and compliance across the range of fisheries in northern Australia that interact with sharks, including foreign fishing.

There are over thirty Australian fisheries that interact with shark in northern waters. These fisheries were classified into three main categories based on the targeting and retention of shark. The classification was:

- Target fisheries – that target shark for meat, fins or both;
- Byproduct fisheries – that take shark and are permitted to retain incidental catch and utilise all or some of the product;
- No-take fisheries – that catch or interact with shark, but do not utilise the species due to regulatory constraints.

Foreign fishing was considered separately and was classified as being either legal or illegal.

This report has been prepared in two parts. Part 1 of the report reviews general shark biology, provides fishery information and management arrangements on domestic and foreign northern fisheries that interact with shark, briefly reviews ecosystem impacts, economics and marketing aspects and identifies Key Points.

Part 2 of the report provides strategic analysis and options for complementary and consistent management, research and compliance within a timeline for domestic and foreign shark fishing activity in northern Australian waters.

The strategic analysis considered a broad range of scenarios ranging from leaving the current fishing pressures and practices in place to imposing stringent controls, including closures and significantly reduced fishing activity. The overall aim of the report is to provide a framework to achieve the best possible outcome for governance, the resource, ecosystem and users, acknowledging the principles of ESD.

4. GENERAL SHARK BIOLOGY

Populations of sharks are generally viewed as having a low productivity (Walker 1998). Compared to bony fishes which have external fertilisation of thousands of eggs, sharks have internal fertilisation and produce fewer offspring. Reproductive methods of sharks range from species laying eggs to species bearing live young. The

majority bear live young, though gestation fecundity and age of maturity can vary enormously; with gestation ranging from 6-22 months and litter sizes from ranging 2–40 pups and age of maturity ranging from two to 25 years for some species (Last and Stevens, 1994).

Shark species are considered to be more vulnerable to fishing pressure than bony fish (teleosts) because they have low biological productivity due to their slow growth rates, lower reproductive capacity and low natural mortality. This has a major consequence for fisheries in which catch shark is caught (retained or discarded), as only a relatively small percentage of the population can be sustainably removed each year.

Unfished shark populations will usually consist of a large number of age classes and have relatively stable recruitment with relatively little variability in response to environmental variations. If such populations are fished sustainably, catch levels should not vary much from year to year under relatively constant fishing pressure. If overfished, shark populations will take many years to recover. As changes or recoveries are usually slow in most shark populations a precautionary approach is best adopted when dealing with shark fisheries. Although some shark species have high productivity, fishing mortality of less than 10% per year and closer to 5% is generally recommended for most shark fisheries (Tricas *et. al.* 1997). In a similar manner, multi-species fisheries in which sharks are caught need to be managed cautiously due to the low productivity of many sharks.

Many shark species have spatially discrete and complex stock structures and are not evenly distributed across all areas. Some species have broad geographic distributions, whilst others have very restricted ranges and can be easily overfished. Some species also have critical habitats which may need special controls so as to not interfere with productivity. This includes migration routes, nursery, pupping, mating and other areas of congregation.

Such an extensive area covers a number of marine bioregions and consequently a wide range of shark habitats and species. To assist in understanding the potential impact of different fisheries and fishing methods on the various shark species, we have classified sharks into four habitat types: inshore coastal, shelf, deepwater and pelagic. In addition, because the impact of any particular fishing method on a shark species also depends on the species distribution relative to the fishery, we have classified the distribution of the various species as broad, localised or patchy (Table 1, Appendix II).

Sharks play an important role in the ecosystem and there are many species that are apex predators in the food chain (Last and Stevens 1994). They are therefore important for ecological balance in fish communities and indiscriminate removal could upset the balance of marine ecosystems.

Table 1: Shark Habitat and Distribution Definitions

Habitat	Definition
Inshore Coastal	coast and shallow water
Shelf	less than 200m depth, but not coastal

Deepwater	depths greater than 200m, associated with bottom
Pelagic	upper open ocean
Distribution	
Broad	found in most northern Australian waters
Localised	found across northern Australian waters but restricted to certain locations
Patchy	recorded from small patch(es) ~100 - 250 km across

PART ONE: STATUS OF NORTHERN SHARK FISHERIES – RESULTS

The following sections consider the status of the various fisheries that interact with northern shark species. They are considered by fishery type: target, byproduct or no-take and jurisdiction.

5. AUSTRALIAN TARGET FISHERIES

These fisheries target shark mainly for meat and take fin as a valuable byproduct or, target shark mainly for fin, with the meat often a low value byproduct.

Sharks are a major target species for at least one fishery in each State and Territory jurisdiction. The Commonwealth has no specific shark target fisheries operating in northern Australian waters, but are involved and have responsibilities through their involvement in the Joint Authorities (JA) that are in place for many northern fisheries.

KEY POINTS
- There is a major targeted shark fishery in each State and Territory jurisdiction
- No Commonwealth shark target fishery, but the Commonwealth is involved in the management of JA managed fisheries

Following is a brief synopsis of relevant WA, NT and Qld shark target fisheries. Further specific details can be found at Appendix IV, or through the responsible agencies.

5.1. WA - Target Fisheries

Management Arrangements

Shark fishing commenced north of Shark Bay in the 1980"s. WA has two major shark fisheries in northern waters with a current total of 14 licences, 8 in the Western Australia North Coast Shark Fishery (WANCSF) and 6 in the Joint Authority Northern Shark Fishery (JANSF).

The WANCSF extends from 22^{o} S, 114^{o} E to 123^{o}45 E and is a WA managed fishery allowing the use of longlines and droplines in the Pilbara and western Kimberley area (Figure 1).

Since 1995 there has also been the JANSF which covers waters from 123°45 E to the NT border and is managed by way of a JA between WA and the Commonwealth (Figure 1). This fishery covers the eastern Kimberley‟s permitting the use of gillnets and longlines.

Both fisheries are input controlled and have spatial restrictions.

Catch and value

Shark catches in the target fisheries have risen significantly from 80t in 1995 to over 250t, valued at over $0.7M in 2003 (Appendix III, Figure 2). Note that due to strong seasonality of catches in some years, the apparent discrepancy between these values and those reported by the Dept. of Fisheries for financial years is an artefact of the reporting period. The most recent data shows that annual catch since 2003 exceeds 450 t, valued at $1.4M.

Details of discards are not recorded and the volumes, species and fate is unknown.

Effort

Effort has also increased significantly over the last few years reaching the equivalent of around 300,000 hook days in 2003. Effort has been standardised between gear (longline and net), based on 3m of net equalling one hook day (Appendix III, Figure 2).

In 2003, over 80% of fishers used longline with effort evenly distributed between the WANCSF and JANSF.

Around 14 vessels can currently participate in the northern shark fisheries with 11 active in 2003. The Fishery had been considered to be underexploited but a recently completed stock assessment of the sandbar shark, the indicator species for the WANCSF, has now shown that effort should not be allowed to increase.
Vessels are not limited to a maximum length.

Species

Logbook data indicates that blacktip, sandbar, hammerhead, tiger, lemon and pigeye are the main species groups reported (Appendix III).

Other issues

The WA northern shark fishery is expected to undergo significant changes following discussion of the status of the sandbar stocks with industry members.

WA proposes to prohibit processing at sea to ensure that fins are on the carcasses of all sharks, except for sawfish which must also have the head and saw in place. There have been reports of illegal dumping of shark at sea and it is hoped that these measures will minimise such activities.

WA is also proposing restrictions, including closures, to ensure sustainability and meet National Plan of Action (NPOA) requirements, with a view to ensuring that the current open access policy in non target fisheries and increased fin prices do not lead to increased activity.

A code of practice for responsible fishing is being developed between Industry and Government.

KEY POINTS
- Catches rising
- Effort increasing
- Fishery is most likely underexploited
- State and Commonwealth fishery interaction
- A code of practice for responsible fishing is being developed

5.2. NT - Target Fishery

Management Arrangements
The fishery is managed under a JA with the Commonwealth with the NT responsible for day to day management.

There are a total of 17 NT shark licences which have been subject to a 3:1 licence reduction scheme since 1999 which has seen licence numbers reduced from 38. Under this scheme new entrants either have to buy three restricted licences and combine them into one unrestricted licence or purchase a licence that has already been combined.

Licensees can use either longlines and/or pelagic gillnets. Bottom set nets have been prohibited for a number of years to reduce interaction with sawfish and marine turtles.

Catch and value
The NT shark fishery is considered to be fully fished. The shark caught under target shark fishery licences represent over 95% of the total shark landings in the NT. NT shark fishery catches decreased from 617t in 1995 to 257t in 1999, but have now increased to 899t in 2003 and is valued at $6.8M (Appendix III, Figure 3). Longlining represented 4% of the total shark catch in 2002 and 13% in 2003.

The netting component of the shark fishery takes similar volumes of grey mackerel to the total reported shark catch.

Details of discards are not recorded and the volumes, species and fate is unknown.

Effort
Effort has followed a similar pattern to the catch, decreasing from 1013 boat days in 1995 to 572 in 1995 and then a strong increasing trend to 1801 boatdays in 2003 (Appendix III, Figure 3). Licence numbers have more than halved since 1995. Longlining represented 5% of the total shark effort in 2002 and 11% in 2003.

Vessel participation rates have ranged from 12-19 per year and averaged around 13 since 1996. All vessels in the NT are generally restricted to a 25m maximum length.

Species

Logbook data indicates that blacktip, hammerhead, tiger, bull and milk sharks, as well as sawfish, make up the majority of catch (Appendix III).

Other

Changes to the Fisheries Regulations have reduced the amount of gear permitted in the fishery by over 20%. This has been achieved by reducing the maximum net length from 2,500 m to 2,000 m and setting a maximum longline length of 15 nm, down from 20 nm, with a maximum of 1000 hooks set per licence. To further reduce efficiency, autobaiting has been banned.

Total effort has been capped at 1,833 fishing days (the theoretical maximum is around 7,000 days). This has been set as 1,599 net days and 234 line days with an agreed method of individual allocation in place.

To minimise interaction with sawfish, turtles and the seabed, nets must be set at least 2m above the seabed. The take of sawfish is prohibited. The compulsory use of VMS is proposed. Observer coverage is approximately 4 to 6 trips per year.

The amount of fins permitted is based on the amount of shark meat on board the vessel (Table 2). Fins do not need to be attached to shark carcasses.

KEY POINTS

- JA fishery
- Catches rising
- Effort increasing
- Fully fished
- Limited entry
- Licence reduction scheme in place
- New measures introduced to reduce effort and interactions
- Prohibition on the take of sawfish
- VMS proposed

5.3. QLD - Target Fishery

Management Arrangements

Queensland‟s two target shark fisheries are administered by the Queensland Fisheries Joint Authority in accordance with Queensland law

The target shark fishery operating in waters between 7 and 25nm from the coast (territorial sea baseline) consists of five licences, each authorising the use of up to 1,200 metres of mesh net. These licences were first issued in 2000. The fishery is referred to as the N9 fishery.

The other target shark fishery operates in waters beyond 25nm of the coast. This fishery is also mesh net fishery with each of the five operators authorised to use varying lengths of net from 1,400 metres up to 2,500 metres. Unlike the former fishery, operators in this fishery operate under non transferable permits issued by the QFJA. These permits were issued as a result of the 1995 Offshore Constitutional Settlement.

Both have observer programs in place and vessels are equipped with VMS.

Catch and value

The shark caught in the N9 fishery represents approximately 55% of the total shark landings in the GoC. This fishery has averaged around 225t, valued at around $1.3M during the last four years (Appendix III, Figure 4). Grey mackerel is also a valuable component of the fishery.

Details of discards are not recorded and the volumes, species and fate are unknown.

Effort

Effort has generally been decreasing and has ranged between 350 to 500 boat days and averaged around 415 boat days since the licence type came into force in 2000 (Appendix III, Figure 4). Vessels are limited to a maximum of 20m.

Species

Logbooks don‟t currently record catch to species level, but observers have identified the main catch as blacktip (approximately 65-70%) hammerhead, milk and spinner sharks (Appendix III).

Other

Qld fishers must possess shark product that is consistent with the number of fins on board the vessel.

KEY POINTS

- Catches steady
- Effort decreasing
- Limited entry
- JA fisheries

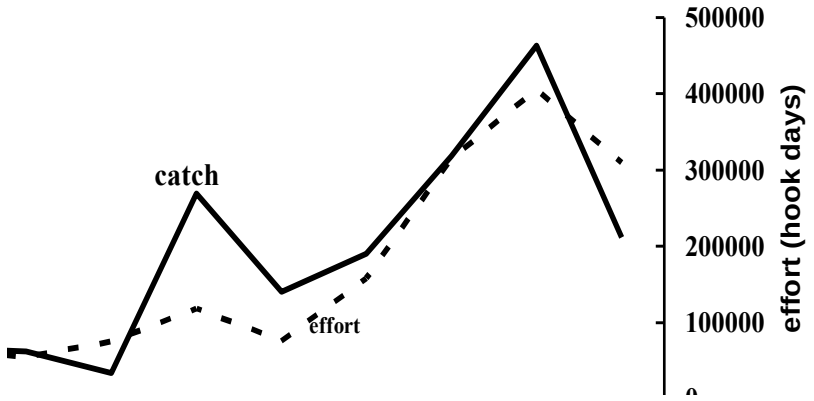


Figure 2: WA Target Shark Catch and Effort 1995–2003

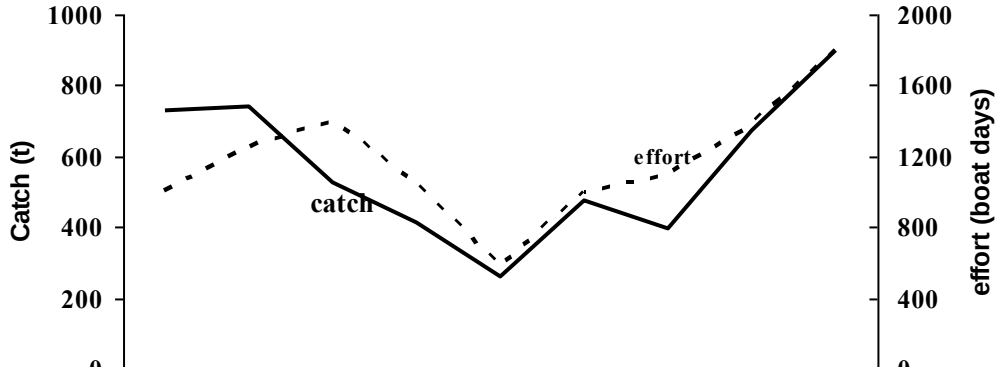


Figure 3: NT Target Shark Catch and Effort 1995–2003

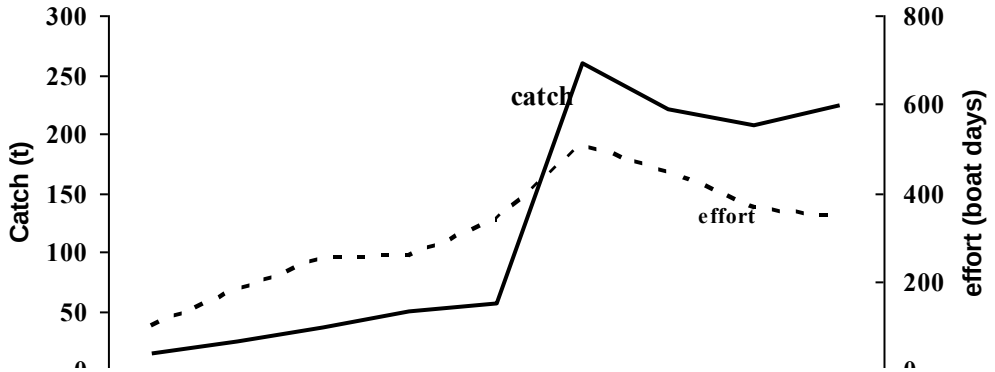


Figure 4: QLD Target Shark Catch and Effort 1995–2003

6. AUSTRALIAN BYPRODUCT FISHERIES

Shark is taken in a number of fisheries in each jurisdiction as a bycatch and retained as byproduct. This means that at least some part of the shark is allowed to be retained for sale. Around 25 non target fisheries catch shark as a byproduct and use all or some of the meat and/or fin based on the species taken, or other circumstances such as regulatory controls or limits.

These fisheries contribute a significant portion of the total shark catch in some jurisdictions.

KEY POINTS

- Around twenty five northern Australian fisheries take shark as a byproduct

Following is a brief synopsis of the relevant fisheries in each jurisdiction. Further specific details can be found at Appendix IV or through the responsible agencies.

6.1. WA - Byproduct Fisheries

Management Arrangements
Between 2001 and 2003 these non-target byproduct fisheries in WA represented 26, 21 and 51% of the total shark landings from WA‟s northern waters. In 2003 these fisheries reported about 258t of shark with an estimated value of $0.8 million (Appendix III, Figure 5). After 2003 the byproduct fisheries are reported to account for <20% of the total shark catch in northern waters.

No specific shark bycatch limits are in place in northern WA fisheries. However, limits apply for species that are totally protected, Commonwealth managed and specified commercial species as provided for in the Fisheries Resource Management Regulations.

Catch and value
These non-target byproduct fisheries in WA represent over 50% of the total shark landings from WA‟s northern waters. In 2003 these fisheries reported about 258t of shark with an estimated value of $0.8 million (Appendix III, Figure 5).

Details of discards are not recorded and the volumes, species and fate is unknown.

Effort
There is no clear understanding of effort expended to catch shark as a byproduct or the associated fleet in WA.

Species
Logbook data indicates that blacktip, pigeye, tiger and hammerhead are the main species groups identified, but the majority is reported as „other‟ shark (Appendix III).

Other issues
WA is in the process of revising management arrangements to cope with the largely uncontrolled take of shark in northern waters and to attempt to resolve management conflicts with the Commonwealth in overlapping fisheries. This may necessitate a review of the OCS arrangements, possible closures or reductions in levels of access.

KEY POINTS
- Twelve fisheries, plus the „open access‟ fisheries can take shark as a byproduct
- Represents a large proportion of total shark catch in northern WA waters
- Effort not known
- No specific shark bycatch limits
- Poor species identification

6.2. NT - Byproduct Fisheries

Management Arrangements
Three NT fisheries are permitted to retain shark as a byproduct. These are the barramundi inshore gillnet (24 licences), coastal line (58 licences) and coastal net (14 licences) fisheries. Licence conditions limiting shark bycatch and fin/meat ratios are in place.

In addition, a number of licence types have bait net entitlements which allow the use of small mesh nets (100 or 300m of 65 mm net) to take bait for their fishing operation. There are around 220 of these entitlements in place with no shark catch restrictions. The entitlement attached to crab licences (49 licences) is the main one currently in use and is considered a crucial aspect for operations of that fishery in remote areas.

Catch and value
The non-target byproduct fisheries catch of shark has remained relatively constant over the last five years and equates to about 5% of the total shark landings from NT waters. The majority (55%) is taken under the restricted bait net entitlement attached to mud crab licences. These fisheries landed about 50t of shark in total with an estimated value of $0.3M in 2003 (Appendix III, Figure 6). The level of catch has not shown an increase over time.
Details of discards are not recorded and the volume, species and fate is unknown.

Effort
There is no clear understanding of effort expended to catch shark as a byproduct or the associated fleet in the NT.

Vessels are restricted to a maximum of 25m.

Species
Logbook data indicates that most catch is reported as shark „general" and is utilised as bait in the crab fishery, or retained for fin or meat sales in other fisheries (Appendix III).

Other
Barramundi gillnet, coastal line and coastal net licence holders have a possession limit equivalent to 500kg of shark at any time as well as uniform fin to meat ratios (see Table 2, Appendix IV).

The use of restricted bait nets is being reviewed.

KEY POINTS
- Three fisheries can take shark as a byproduct
- Significant latent effort with restricted bait net entitlements
- Catches not increasing
- Represents small proportion of total shark catch in NT waters
- Effort expended targeting shark not known
- Bycatch limits in place for three fisheries
- No limits for restricted bait nets

6.3. QLD - Byproduct Fisheries

Management Arrangements
Shark is taken as a byproduct in a number of other Queensland licensed fisheries in the GoC.

There are eighty seven barramundi licence holders (N3 licence) permitted to use set mesh nets up to a maximum length of 360 or 600m depending on the area of operation (i.e. rivers/creeks, foreshores, offshore waters out to 7 nm). A majority of these licences have a recorded shark catch. No major shift towards targeting shark has been noted.

Commercial line fishers operating under licences issued by the QFJA (L4 and L5 licences) can use line and hook apparatus out to 25 nm. In recent years licence numbers have reduced from 105 to 47. In 2003, only 3 licences recorded shark catch. Two QFJA permits have also been issued. These fisheries target Spanish mackerel.

The above licences also authorise the use of bait nets, however, the take of sharks with these nets is prohibited.

Catch and value

Queensland‟s non-target shark fisheries in the GoC take approximately 45% of the total shark catch. Shark catches peaked at over 454t, but by 2003 this had decreased to 197t, valued at $1.2M (Appendix III, Figure 7). The major influence in the reduction of this catch was the establishment of the N9 fishery, which transferred much of the effort from the N3 fishery.

Details of discards are not recorded and the volume, species and fate is unknown.

Effort

There is no clear understanding of effort expended to catch shark as a byproduct or the associated fleet in Qld

N3 vessels are limited to a maximum of 14 m, L4 and L5 line fisheries to 20 m.

Species

Logbooks don‟t currently record catch to species level, but observers have identified the main species as Carcharhinus sp, shovelnose, hammerhead and pigeye sharks (Appendix III).

Other

From December 2002 shark has to be landed in trunk form and body numbers must equate to fin quantities in possession (Table 2).

The N3 fishery is in the process of licence reduction and it is proposed to have a shark bycatch limit in place in 2005. There is a proposal to put in place a nil shark bycatch limit for the L4 and L5 line fisheries.

KEY POINTS

- Six fisheries can take shark as a byproduct
- Catches significant but decreasing
- Represents large proportion of total shark catch in GoC
- Effort expended targeting shark is unknown
- Poor species identification
- Bycatch limits proposed

6.4. Commonwealth - Byproduct Fisheries

Management arrangements

The Commonwealth has control over all byproduct taken when fishing for target species by fisheries under its jurisdiction. Limits on bycatch are determined in conjunction with the relevant States/Territory by way of MOU‟s under OCS arrangements.

There is no dedicated Commonwealth managed shark fishery in northern Australian waters, but three fisheries, the North West Shelf Trawl Fishery (NWSTF), Western Deepwater Trawl Fishery (WDWTF) and Western Tuna and Billfish Fishery (WTBF) may retain shark as a byproduct.

The NWSTF operates from 114o E to 125o E in waters outside the 200m isobath to the outer limit of the AFZ. The fishery is a trawl fishery targeting crustacean. In 2003 there were landings of around 100t, of manly scampi. In the mid 1980‟s, activity was greatest with landings of around 1,000t. Those wishing to participate in the fishery must receive a permit to operate from AFMA. The fishery is limited entry with 7 transferable permits issued for a 5 year period.

The WDWTF operates from 114o E to 115o 08‟ E in waters outside the 200 m isobath to the outer limit of the AFZ by trawling, targeting demersal finfish species. Only around 20% of the fishery is in the area covered by this report. Those wishing to fish in the fishery must receive a permit to operate from Australian Fisheries Management Authority (AFMA). The fishery is limited entry with 11 transferable permits issued for a 5 year period.

The NWSTF and the WDWTF are often grouped together as the Western Trawl Fisheries (WTF).

The WTBF currently has 124 permits, including 90 longline permits, and is managed as the SWTBF. The fishery targets various tuna species by pelagic longline, purse seine, line and pole. The northern area is almost solely fished by longline and shark is caught as a bycatch of the longline fishery operation. Current limits restrict each vessel to a 20 shark possession limit per trip which must be retained as headed and gutted trunks with fins attached. Large numbers of sharks, predominantly blue sharks, are discarded due to the limit. No wire traces are allowed in this fishery with no limit on the trace strength if other materials are used.

Catch and value

Retained Commonwealth shark catches in northern waters in 2003 were about 62t with the vast majority sold for fin. Based on a fin return of 3% of live weight, this values the catch at around $0.1M in 2003. The catch was mostly from the WTBF with negligible amounts reported in the NWSTF and the WDWTF (Appendix III), Figure 8).

The WTBF discards around 11,000 sharks per year, most likely due to compliance requirements arising from a 20 shark per vessel limit. Details of discards are not recorded and the volume, species and fate is unknown from the NWSTF and WDWTF.

Effort

There is no clear understanding of the fleet or effort expended to catch shark as a byproduct in these fisheries.

The NWSTF effort has decreased from a peak of 588 days fished in 2001 to 237 in 2004. In the mid 1980‟s NWSTF activity was greatest with 21 vessels operating, but this had fallen to 8 vessels in 2004.

The WDWTF effort increased to a peak of 413 days fished in 2002 with a reduction to 189 days in 2004. In the late 1980‟s WDWTF activity was greatest with 20 vessels operating, but this has decreased to 7 vessels in 2004.

NWSTF and WDWTF vessels are often Northern Prawn Fishery (NPF) vessels that are not involved in other fisheries during the two extensive NPF seasonal closures (around December to April and late May to the end of September).

Effort in the WTBF peaked at 6,173,664 longline hooks in 2001 and has decreased since. In 2003 effort decreased by 20% from the previous year and then again by 60% in 2004 to 1,470,393 longline hooks. Over the last 6 years there has been an average of 33 longliners fishing with 29 operating in 2003. Most fishing takes place south of Port Hedland, with negligible activity in the area extending from the Kimberly‟s to Qld. Twenty nine vessels longlined in the WTBF in 2003 and averaged 33 vessels over the last 6 years. Twelve vessels longlined in 2004. Effort decreased even further in 2004

Species

Logbook and observer data indicates that most of these fisheries take pelagic shark species, such as mako, bronze whaler, blacktip, blue and oceanic whitetip shark (Appendix III).

Other

The WTBF extends from Cape York, through NT and WA to the SA/VIC border. AFMA is developing a management plan for the WTBF which will see the current delineation of the fishery at 34°S removed. The Management Plan will put in place Statutory Fishing Rights (SFR) and Individual Transferable Quota (ITQ) for key species.

This removal of the lines will enable 44 previously southern permit holders to fish north of 34°, and may have the potential to significantly impact on the shark stocks of northern Australia. An independent observer program is proposed to complement existing arrangements and minimise bycatch. It has been estimated by the Humane Society International (HIS) that the entire Australian tuna longline fleet, not just the WTBF, has an incidental catch of around 50,000 sharks per year (www.hsi.org.au).

The WDWTF and the NWSTF fisheries are currently under review as WA and the Commonwealth is seeking to resolve resource use and allocation issues. This will necessitate a revisiting of the existing OCS arrangements.

Permits in the near future will oblige fishers to land shark with fins attached. An integrated scientific monitoring program has been implemented to validate catches, bycatch and other relevant data.

KEY POINTS

- Three fisheries can take shark as a byproduct
- Landings low and mainly from WTBF
- Effort known
- Bycatch limits in place, or proposed
- Significant discards possible and species and fate unknown
- Some overlap in Cwlth and State/Territory fisheries
- Amalgamation of WTBF and STBF to occur soon

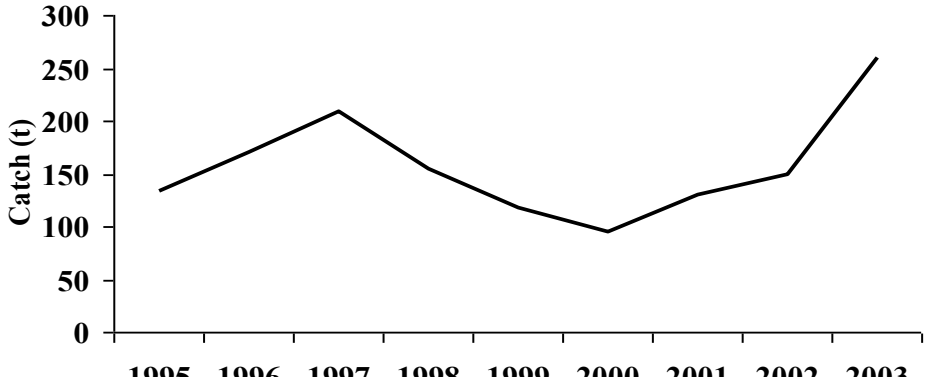


Figure 5: WA Byproduct Shark Catch

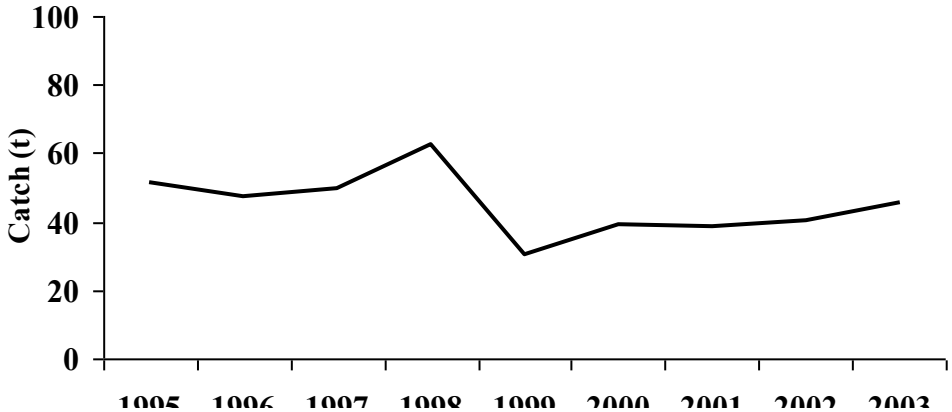


Figure 6: NT Byproduct Shark Catch

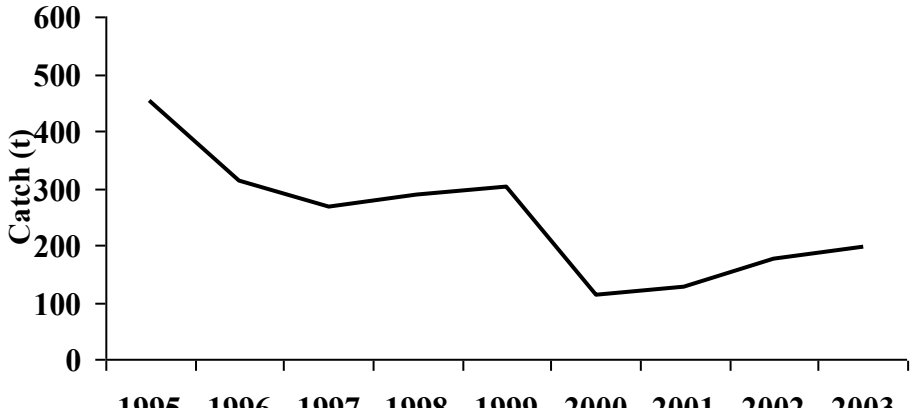


Figure 7: QLD Byproduct Shark Catch

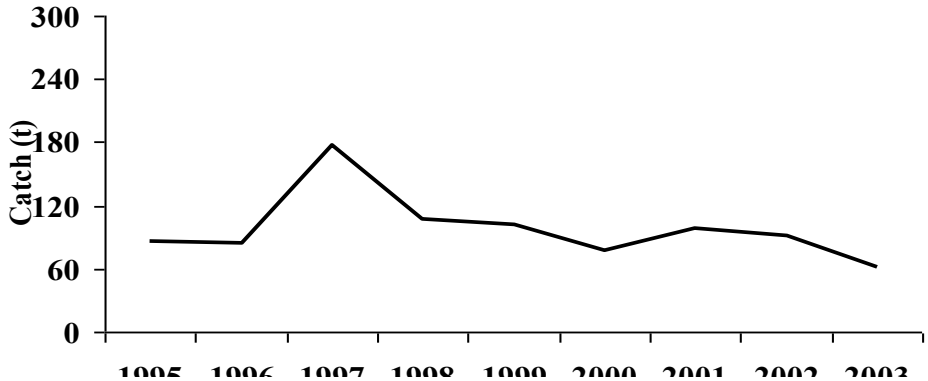


Figure 8: Commonwealth Byproduct Shark Catch

6.5. Table 2: Fin/Meat Conversion Factors Used by Jurisdictions

Jurisdiction	Conversion Factors/Possession Requirements
WA	Green - 3% of whole weight of shark
NT	Green – 6.5% trunk weight, 13% fillet weight Dry - 3% trunk weight, 6% fillet weight
Qld	Number of fins equal number of bodies/fillets
Cwlth	Headed and gutted with fins attached
IUCN	2% live weight, 5% trunked weight

7. AUSTRALIAN NO-TAKE FISHERIES DETAILS

There are fisheries in all jurisdictions that catch shark as a bycatch but which must be discarded to comply with nil possession regulations. This does not mean that sharks are not caught in these fisheries. The aim of the no take provisions is to encourage fishers to avoid areas inhabited by shark, modify fishing methods and areas fished to minimise interaction. Shark catches in some of these fisheries could contribute substantially to total shark mortalities.

Following is a synopsis of relevant fisheries in each jurisdiction.

7.1. WA – No-take Fisheries

All northern WA fisheries may retain shark that is caught, except for protected species.

7.2. QLD – No-take Fisheries

Two fin fish trawl licences operating outside 25 nm in the GoC are not permitted to be in possession of shark. Vessels are limited to a maximum of 20m and operate under a quota system.

Observers noted 12 species of shark and sawfish in the catch. Details of discards are not recorded on logbooks and the volumes, species and fate is unknown, but the shark catch is believed to not be great.

7.3. NT – No-take Fisheries

The Demersal line and trap (60 licences), Spanish mackerel (19 licences), Timor Reef Line and Trap (12 licences) and the one Fish Trawl licence have had nil shark possession provisions in place since 2002. These fisheries generally operate in offshore waters. Vessels range in size from 10–25m.

Historical shark landing in these fisheries have been quite low. Demersal catches peaked at 5t in 1996 and averaged 3.5t until the prohibition. From 1995 until the prohibition, Timor Reef and Trawl catches of shark were negligible.

Details of discards are not recorded on logbooks and the volumes, species and fate is unknown.

7.4. Commonwealth – No-take Fisheries

The NPF targets prawns, scampi, scallops and bugs and operators have gear, SFR. Vessels range in size from 14-30m.

The fishery has had a nil shark possession limit since 2002. During 1994 to 2000 there were between two to 46 tonnes annual landings of shark reported. This included around 46 species and accounted for 4% of the total bycatch.

Observers reported 56 shark species in the catch. This represented around 4% of the total weight of bycatch before the use of Turtle Excluding Devices (TED) which were introduced in 2000. This has been reduced by around 80% since their introduction

with many larger sharks over 1m in length being excluded. It has also removed the incentive to target shark and to avoid areas of high shark concentration.

The NPF allows trawling from Cape York to Cape Londonderry in WA with up to 102 vessels entitled to fish in 2003. This has decreased to 88 in 2004. Further reductions in fishing capacity are proposed. A range of management measures have seen vessel numbers reduced from over 300 boats in 1977. Effort has reduced in the NPF due to this restructuring from a peak of 23,500 days fished in 1995 to 12,600 in 2003.

Details of discards are not recorded and the volumes, species and fate is unknown.

The fishery has two extensive temporal closures as well as significant spatial closures.

KEY POINTS
- Six fisheries from all jurisdictions cannot retain shark
- Catch is unknown
- Significant discards possible and species and fate unknown

8. FOREIGN FISHERIES

(NB. data has now been provided by the AFMA Observer section, for Japanese fleet fishing. As soon as possible information will be provided on the Thai Taiwanese trawl and gillnet fishing meaning that this section will need rewriting.)

Prior to the declaration of the AFZ in 1979, access by foreign vessels to within 12 nm of the coast was unrestricted. Annual shark catches in all northern waters between Australia, Indonesia and Papua New Guinea were likely in excess of 5,000t and possibly over 25,000t. Such a figure is not unrealistic as Taiwanese gillnetters alone caught shark, tuna and mackerel in the vicinity of 25,000t between northern Australia and Papua New Guinea (Stevens n.d.).

The AFZ was declared in 1979 giving Australia sovereignty and control of the marine resources in these waters. Since 1979, foreign fishing has not been permitted in northern Australian waters, except for traditional fishers in the area covered by the MOU, or by specific agreement.

All foreign fishing activity within or adjacent to the AFZ, including legal, illegal, traditional or industrialised could have significant consequences in Australian waters as their cumulative fishing impacts could be affecting the sustainability of northern shark stocks.

8.1. Historical Foreign Fishing Production

Fishing has taken place by Indonesian fishers in northern waters since the 1700"s when Macassans fished for trepang all across northern Australia. This activity ceased around 1900.

After the declaration of the AFZ in 1979, foreign fishing access to the GoC was excluded, mainly to protect the NPF. Foreign fishing then shifted offshore under

bilateral or joint arrangements. Activity slowly reduced until it ceased completely in 1991, except for Japanese longlining activity off WA which continued until 1997.

Japanese stern trawlers fished in waters adjacent to northern Australia in the late 1950"s. Catch and effort information is not available.

Thai and Taiwanese pair trawlers operated in the 1970"s. Catch and effort information was not available.

The Taiwanese gillnet fleet was active during the period 1974-86. After the declaration of the AFZ total allowed catches for the fleet were set at 10,000t. Arrangements allowed up to 30 vessels (30-45m in length) using up to 20km of gillnet. With nets of this length it was taking 6 to 9 hours to haul the gear. Effort and catch peaked in the early 1980"s with shark catches averaging around 6,000t during 1977 to 1984.

In 1984 the Taiwanese gillnet fishery"s allowable catches were reduced to 2,000t to be taken by no more than eight vessels. Fishing ceased in 1986 as a result of regulatory requirement by the Australian Government to reduce net length to a maximum of 2,500m. This reduction arose from concerns relating to possible overexploitation of stocks and excessive cetacean interaction. Fishing no longer proved economically viable for the Taiwanese fleet. The catch was mainly blacktip with meat and fins retained from nearly all species taken. More specific catch and effort information was not available.

Eight Australian/Taiwanese longliners, under joint arrangements, fished during 1990 and 1991 with shark catches of 1,700t reported during this period. More specific catch and effort information was not available.

Japanese tuna longliners operated north of 34o S and outside 50nm from 1987 to 1997 with shark representing over 30% of their total reported catch. Shark landings of over 386t of shark, taken by between 55 to 99 vessels, were reported during that period. Most fishing took place offshore with little activity north of the Kimberley"s. Effort ranged from just over 7,000 fishing days to 1,900, averaging 4,200 per year. The major shark catch was pelagic species, such as mako, bronze whaler and blue shark.

Although significant resources were expended collecting data on many of these foreign fisheries through logbooks, observer programs and radio reporting systems, it appears that much of the data has been lost, misplaced or was damaged during transfer from various data bases and organisations. Analysis that was undertaken also showed that much of the data was inaccurate, poorly recorded and generally not of much use for assessments, as the Catch per Unit of Effort (CPUE) information it generates is highly suspect.

8.2. Current Foreign Fishing Production

It is partly due to the success of the management of Australian fisheries in northern waters that increasing pressure is being placed on these resources. Countries with less stringent management arrangements have significantly reduced shark stocks over a wide area and Australia"s well managed stocks are now being targeted to supply the large, expanding and lucrative market for shark fin and meat.

Area of the MOU

In 1974 an MOU was developed between Australia and Indonesia allowing subsistence fishers to fish within 12nm of some Australian islands and reefs (Cartier, Browse and Adele Islands and Ashmore, Scott and Seringapatan Reefs).

A new arrangement came into place in 1989 allowing limited subsistence fishers in the area covered by the MOU (Figure 1).

These fishers use vessels that are termed Type 1 and 2 by the Commonwealth and are traditional sail powered vessels up to 15m. They come mainly from Roti, Kupang and south Sulawesi.

There is no licensing or logbooks for fishers in this area, but it is believed that the number of vessels working in the area have reduced over recent years. This is possibly because the area has been heavily fished and this has lead to some of those fishers seeking shark stocks in other areas, including within the AFZ.

Actual catches taken in the area of the MOU were not available, but reports from some environmental groups claim that shark stocks have been severely depleted from large areas.

Other fishing activity close to and in AFZ

This fishing used to be mainly seasonal, taking place during April to November to take advantage of favourable weather conditions, but now vessels fish all year round when ever conditions are reasonable.

These fishers use vessels that are termed Type 3 by the Commonwealth, which means they are motorised, and range from around 15m to industrial vessels up to 30m in length. These fisheries have been divided into two types for the purpose of this report, motorised Indonesian vessels and larger industrialised vessels that are often not Indonesian vessels, but crewed by Indonesians.

Many of the people involved have a historical and traditional involvement in fishing and have no other real option to earn an income or provide sustenance for their families.

Overall Indonesian fishing activity has increased with vessels from the major ports of Dobo tending to fish around Money Shoals and those from Merauke fishing in the GoC. Fishing activity from Tananbar has remained steady with most fishing activity taking place around Evans Shoals.

These fishers catch a range of product, but often only retain the shark fin, not the meat. They will use lines or nets depending on what they can afford or have experience in using.

Recent research based on two islands in Indonesia that use traditional boats assessed the fishing activity and impact in the area. There was a fleet of 50 to 100 boats which

fish for up to eight months per year. This equates to between 12-24,000 boat days just from this area.

Each boat had 6-7 lines using 15-17 hooks/line with vessels around 18m in length. Some of these vessels now have electronic aids such as sounders and GPS.

The actual catch was unknown, but it was estimated that around 2,500t of shark were taken, including any illegally caught in Australian waters. This was based on an estimate of just over 20,000 sharks being caught. This equates to around 71t of dried fin which would be valued at around $7M, based on an average price of $100/kg (Tables 3). Total removals from these two islands could however be more than double this. Catch taken from other ports are unknown, but could equal ten"s of thousands of tonnes of shark.

Recent newspaper reports estimated 800,000 sharks were taken by illegal fishing in northern Australian waters.

Industrialised foreign

These vessels are termed Type 3 and range in size from 15m to 40m depending on the fishing gear used and origin of the vessel. The larger vessels have radar, sounders, plotters, ice and GPS. In 1980 there were an estimated 2,500 trawlers, 3,700 purse seiners and 2,800 Danish trawlers operating in Indonesian waters (Bailey 1988). Recent reports estimate around 1500 trawl licences as well as hundreds of trawlers operating legally and illegally in Indonesian waters (Fegan 2003).

The industrialised fishery is increasing with numerous vessels from a number of Asian countries including Indonesia fishing in Indonesian waters. They are generally crewed by Indonesians.

These vessels include around 40 stern trawlers operating near Irian Jaya, 30-40 pair trawlers operating out of Ambon as well as hundreds of gillnetters and longliners using up to 25-30nm of gear operating all across northern Australia. Seasonally, trawlers are allowed to target squid off the north west of Australia, but rarely do.

The vessels catch a range of product and often retain meat as well as fins with shovelnose, blacktip and tiger sharks making up a large proportion of the shark catch. The actual amount caught is unknown, but would be significant with such extensive fishing pressure, and be worth tens of millions of dollars.

Cooperative research projects are proposed that will identify species taken and estimate fishing impact using a range of techniques, including genetic identification.

Recent Developments

It is believed that there are at least 50 Type 2 boats working out of Papella on the island of Roti targeting shark for their fins inside the Australian fishing zone. It is also believed that the numbers are higher, as much as 70.

Of a greater significance is the emergence of another style of Indonesian boat operating out of the ports of Kupang, West Timor and Papella on the island of Roti. These boats are small open boats of 9 - 12 m in length that are manned by 2-3 people

undertaking short trips into the Australian fishing zone. The boats are faster than any other Indonesian boat that have been encountered in the past, usually powered by single cylinder diesel engines (often two) and capable of speeds upwards of 20 knots.

The Kupang based boats target areas of the AFZ in Australia's north west around the oil rigs Challis Venture and Jabiru Venture. It is believed that there is about 50 of these boats based in Kupang. The boats that are based in Papella in Roti target an area known as the Lynher Bank south of Scott Reef. It is thought that as many as 100 of these bohdis are based at Papella.

The crews of bohdis enter the AFZ and usually only fish for one day before returning to port. Information obtained by the crew of the bohdis have indicated that very few sharks are required to break even. Three to five kg of shark fin pays for the trip. Most of those apprehended have freely indicated that average catches yield between 10 and 20 kg of shark fin.

KEY POINTS

- Extensive illegal fishing activity
- Foreign fishing is not permitted in AFZ, except in the area of the MOU
- Catches in waters adjacent to the AFZ are unknown, but are believed to be large
- Effort is increasing across a wide area
- Catch taken is very valuable
- Species identification not known
- Data not recorded
- Fishing practices changing
- Stocks are possibly depleted
- Inadequate controls in place

PART ONE: STATUS OF NORTHERN SHARK FISHERIES – DISCUSSION

9. OVERVIEW OF NORTHERN SHARK FISHERIES

In 1992 the Commonwealth prepared a Development Plan for the Northern Shark Fishery and issued 30 permits, 5 in WA, 16 in the NT and 9 in the GoC. The States and Territory still managed net fishing out to 12 nm and longline fishing to 3 nm until the new arrangements came into place in 1995 under the revised OCS settlement. This gave the States and Territory day to day management of the shark out to the AFZ either directly, or through JA"s.

For the purpose of this report, the Australian fisheries that interact with shark were classified into three main categories based on the targeting and retention of shark. The classification was:

- Target fisheries — that target shark for meat, fins or both;
- Byproduct fisheries — take shark and are permitted to retain incidental catch and utilise all or some of the product;
- No-take fisheries — catch or interact with shark, but do not utilise the species due to regulatory constraints.

Foreign fishing was considered separately and was classified as being either legal or illegal.

Shark are a major target species for at least one fishery in each State and Territory jurisdiction with reported current total annual landing in these fisheries of around 1,377t (Figures 9,10, Table 3). The Commonwealth has no fisheries operating in northern Australian waters that target shark, but retains management responsibility through the various JA"s under the OCS arrangements.

Shark is also taken as either a major byproduct, or a limited incidental catch by approximately another 30 fisheries with reported current total annual landing in those fisheries of around 569t (Figure 9, Table 3).

Landings of northern shark in domestic fisheries have shown a steady increase in volume and species over the last five to ten years with over 1,946t reported in 2003 made up of catches from target and byproduct fisheries (Figures 9, 10, Appendix III, Table 3). No fishery dependant information can be provided on the species, volume or fate of discards as in nearly all instances no records are kept.

The amount of shark discarded from all northern Australian fisheries (including no take fisheries) is not known, but could be significant.

The increase in shark landings seems to have coincided with greater interest in the sale of fins from captured sharks driven by the global fin market and increased demand for shark flesh and a shift to northern Australia of new fishers, including longliners.

Much of the historical domestic shark fishing activity in northern Australian waters was by pelagic gillnets, targeting blacktip sharks for the flesh trade, with fins as a valuable byproduct. These fisheries appear to be sustainable and catches are below sustainable yield estimates.

The use of longlines has increased over the last five years with much of this fleet targeting larger and different species of shark for their fins, with meat as a lower value byproduct of their operation. This has lead to greater overall effort in northern Australian fisheries that take shark, notwithstanding the significant licence reduction programs that are evident across most jurisdictions, in target and byproduct shark fisheries.

All the jurisdictions involved in the Australian component of the northern shark fisheries have a range of fishing legislation to control the harvest of shark from target, byproduct and no take fisheries (Appendix IV). There is, however, a distinct lack of solid consistent data on most shark species in northern Australia, so only general comments on the exploitation status of most species can be made.

Foreign fishing activity was unrestricted prior to 1979. Annual shark catches in all northern waters between Australia, Indonesia and Papua New Guinea were likely in excess of 5,000t and possibly over 25,000t.

Foreign fishing, which may impact on shark stocks in Australian waters, currently falls under three broad categories, illegal fishing within the AFZ, legal fishing

adjacent to the AFZ and legitimate subsistence fishing in the area of the MOU (Figure 1).

Table 3: Catch and Effort for Northern Shark Fisheries – 2003[1]

Jurisdiction	Target fishery catch (t)	Incidental fishery catch (t)	Discard (t)	Total (t)	Effort target fishery[2]
WA	253	260	unknown	513	310,000 hd
NT	899	50	unknown	949	1,801 bd
Qld	225 (av)	197	unknown	421	415 bd
Cwlth	Nil	62	unknown	62	Nil
Foreign[3].	5000-25,000	N/A	unknown	5000-25,000	unknown

- based on jurisdiction excel data sheets
- hd = hookdays, bd = boat days
- Foreign is an estimate

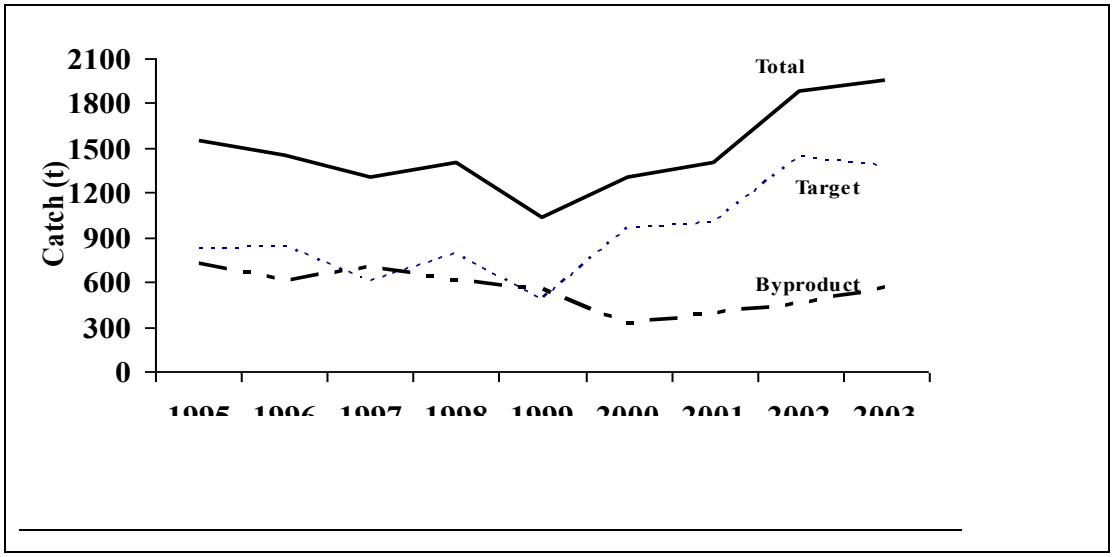


Figure 9: Shark Landings in Northern Australian Waters by fishery - 1995-2003

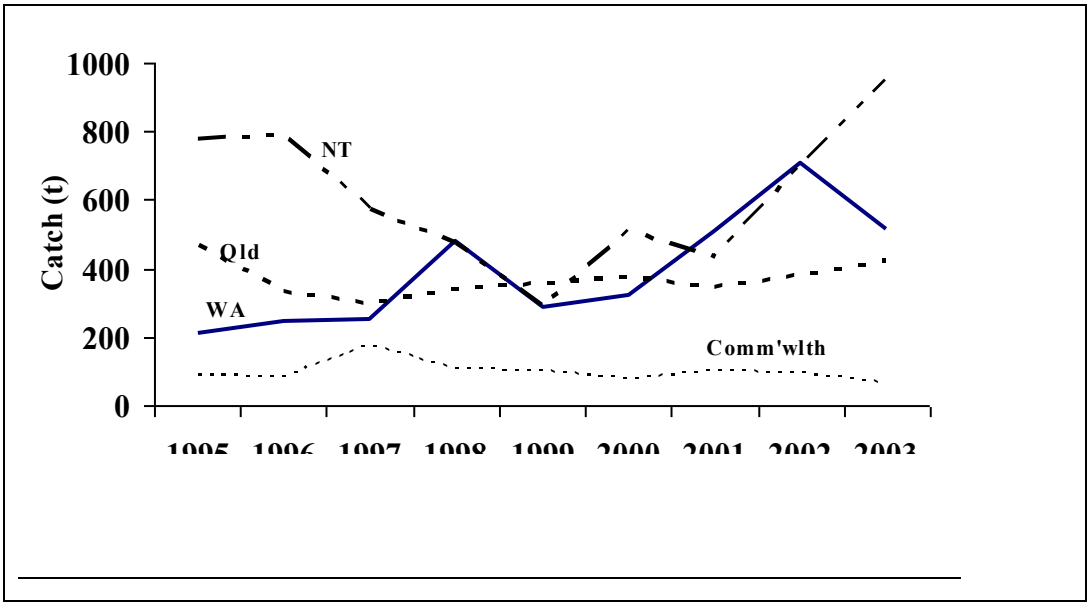


Figure 10: Shark catches by jurisdiction for all gear types 1995–2003

KEY POINTS

- Shark is caught in target, byproduct and no take fisheries
- Landings have increased
- Change of fishing practices and introduction of new gear
- Lack of solid, consistent and timely data
- No record of discards
- Foreign catches most likely very high, but little data available

10. SPATIAL EXTENT

Logbook data from the Australian fleets shows that much of the fishing targeting shark, takes place in the coastal and near shelf area, with little or no activity in deep or pelagic waters. Apart from fishing, coastal species, or species with a coastal component to their life cycle, may be impacted by any onshore activity, but most of northern Australia has little urban or commercial development on the coast at this stage. Any new major projects, such as damming of rivers or increased agricultural activity may require re-examination of habitat impacts.

Foreign fishing has occurred in northern waters for many years commencing with Macassan fishermen targeting trepang in the 1700"s. From the 1950"s, foreign fishing activity took place to within 12 nm of the coast. This was progressively phased out after the declaration of the AFZ in 1979. Illegal foreign fishing has historically been focused along the AFZ, but in recent times activity has moved closer to the Australian coast. Within the area of the MOU, fishing by Indonesians using traditional craft and methods is allowed (Figure 1).

Little information is available on specific areas fished, species range and critical habitats such as migration paths, breeding, pupping and nursery areas. The development of the Research Operational Plan (ROP) should ensure that resources are available to undertake this work.

Information relating to foreign fishing needs to be incorporated into existing information on domestic fishing to provide a more realistic overview of fishing activity in northern Australian waters. As no logbook system is currently in place for the foreign fishing some innovative techniques are being developed that use genetic tagging, the analysis of seized catch and other sources of positional data such as from Navy and Coastwatch.

Overall, under the current Australian fishing arrangements, there would appear to be a lower risk for species that have coastal and shelf habitat than offshore pelagic species which may be more susceptible to uncontrolled and more intense foreign fishing activity.

KEY POINTS
- Extensive areas covered by fishery
- Domestic fishing is generally inshore
- Foreign fishing is focussed offshore, but moving closer to Australian mainland

11. FISHING METHODS

Shark are taken by a wide range of fishing methods in northern waters, but the two main methods employed to target shark are mesh nets, gillnets and longlines. Both methods generally use power hauling devices to assist in retrieval of the fishing gear.

Mesh or gillnets work by ensnaring the sharks in the mesh of the nets. Nets can be set at various depths, using different mesh sizes and net configurations depending on the species being targeted, licensing requirements, or to try and ensure particular species are, or are not being taken. Mesh or gillnets account for around 60% of the total shark catch in northern waters.

Longlines use a series of baited hooks attached by branch lines to a main line. Depending on gear configurations and set times, many species caught by longlines are still alive when the gear is retrieved. Longlines account for around 25% of the total shark catch in northern waters. Experienced fishers can target, or exclude, many species by varying hook size/style, trace strength, depth set, area and time fished.

For both fishing methods, the amount and type of fishing gear used can also be influenced by the processing and storage capacity of the fishing vessel and crew numbers.

Incidental shark catches are also taken in small mesh, trawl and purse seine nets and by hand lines in non target fisheries.

Foreign fishing methods include longlines, gillnets, handlines and trawls.

KEY POINTS
- Longline mesh and gillnet are the main fishing methods
- Skilled operators can target or exclude species

12. TARGET AND BYPRODUCT SPECIES

The exact number of species taken by fisheries that interact with northern sharks is not known. There is estimated to be around 80 species present in northern waters, made up of approximately 33 from inshore coastal, 13 from shelf, 20 from deepwater and 12 from pelagic waters (Table 2 and Appendix II). Of these species, only a small number are targeted for commercial purpose. A few others species are taken as incidental catch which are utilised to some degree or discarded.

Over 30 species have been recorded in logbooks. Based on logbook data, the reported catch is made up of mainly 10 species, with the majority coming from the blacktip groups of sharks.

Key species harvested in northern waters are the blacktip species, *Carcharhinus tilstoni C. limbatus* as well as *C. sorrah, (Spot-tail shark) C. plumbeus* (sandbar shark) in WA, hammerheads, (*Sphyrrna lewini*, *S. mokarran*, *Eusphyra blochii*) and tiger shark (*Galeocerdo cuvier*). It is suspected that in some cases *C. sorrah* has been misidentified as the blacktip shark (Figure 11). These species are taken for meat as well as fin and all are broadly distributed (Table 4).

Other important species taken are spinner (*C. brevipinna*), pigeye (*C. amboinensis*), milk shark (*Rhizoprionodon acutus*), bull shark (*C. leucas*), lemon (*Negaprion acutidens*) and sawfish (*Pristis sp*.) which are taken for fin, meat or both.

These major species taken in the fishery all have a broad distribution. Of these species nearly all have an inshore habitat except for one which also may have a pelagic distribution (*S. lewini*) and one shelf species (*C. limbatus*) (Appendix II).

Observer information confirms the species composition, but actual weight of catch, harvest rates and fate of discards are not established and will vary from operation to operation.

Fully utilised species like the blacktip group, which are taken for meat and fins and absorbed by existing markets, tend to have a more comprehensive and lengthy time series of data and are more readily and accurately identified.

Some species have only recently been targeted and are taken mainly for their fin value because the meat is not considered high quality. New markets for flesh are only now being developed for these species. A time series of quality data is not readily available for these species and the identification is often not of a high a standard.

It appears that many species of shark are misreported, underreported or unreported. This is for a number of reasons, but is often because it is difficult for fishers to accurately distinguish less common and rarely encountered species.

A guide such as that published by Daley (1993) that can be used at sea and onshore to enable identification of species in various forms, such as whole, trunk and fins, along with adequate reporting systems such as modified logbooks would greatly improve the reporting and verification of species and associated catch data.

Five shark species have a high conservation status in Commonwealth waters, but two of these species (grey nurse and white shark) rarely occur in northern waters. Others occur mainly in areas outside commercial shark fisheries. Interactions would appear to be limited with freshwater sawfish, whale shark, speartooth and northern river shark. The status of these species in State and Territory waters is unclear at the time of preparation of this report.

Even less is known about the breakdown of species taken by the foreign fleet and the influences this may have on Australian shark stocks. Collaborative observer programs are proposed, along with the development of genetic tagging and other methods to identify species taken to gauge the impact caused by foreign fishing on the northern shark stocks.

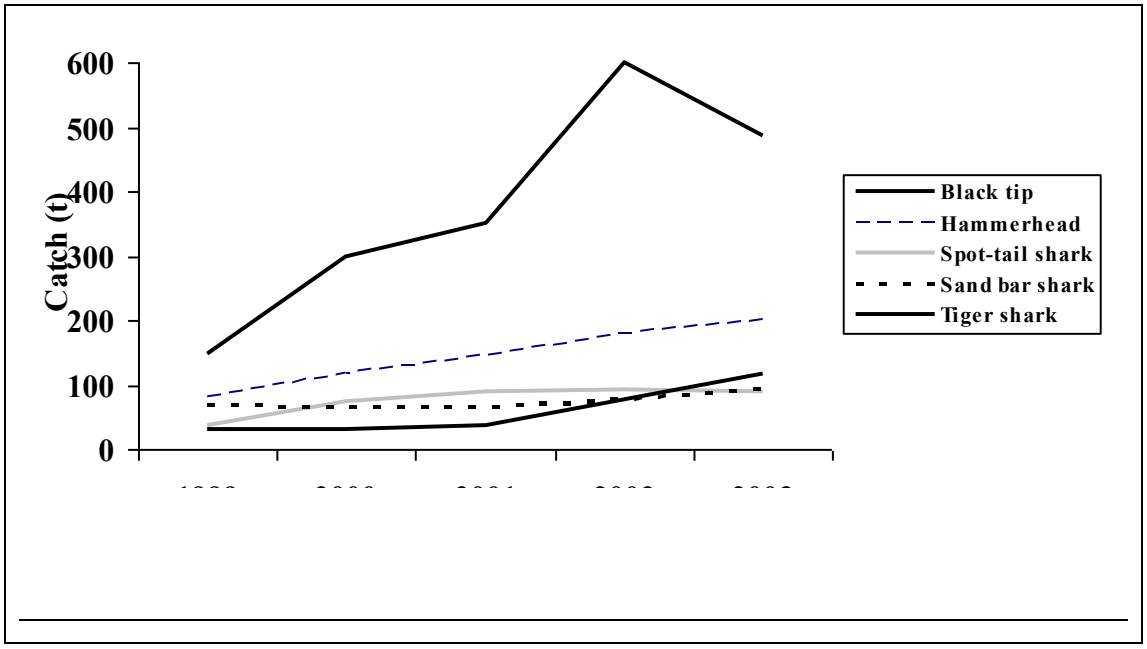


Figure 11: Top 5 shark species captured by all gear types in northern Australian Waters 1999–2003

Table 4 Northern Australian Shark Top Species By Catch, Distribution, Habitat and Use

Species	Distribution	Habitat [a]	Major Use
Black tip shark *Carcharhinus tilstoni C. limbatus*	Broad	S,I	Meat and fin
Hammerhead sharks *Sphyrrna lewini, S. mokarran, Eusphyra blochii)*	Broad	I, P	Fin and meat
Spot-tail shark *C. sorrah*	Broad	,I	Meat and fin
Sandbar shark *C. plumbeus*	Broad	S	Meat and fin
Tiger shark *Galeocerdo cuvier*	Broad	I	Fin and meat
Bull shark *C. leucas*	Broad	I	Fin and meat
Lemon shark *Negaprion acutidens*	Broad	I	Fin and meat
Milk shark *Rhizoprionodon acutus*	Broad	I	Fin and meat
Pigeye shark *C amboinensis*	Broad	I	Fin and meat
Sawfish *Pristis sp*	?	I	Fin and meat
Spinner shark *C . brevipinna*	Broad	I	Meat and fin

[a]D-Deepwater, S-Shelf, I-Inshore coastal, P-Pelagic

KEY POINTS
- Many species
- Few species targeted
- Species identification difficult and inconsistent
- Take of sawfish may be significant in some jurisdictions

13. BYCATCH

Bycatch is considered to be fish and other marine species that are caught, but not retained because they are unmarketable, protected, or illegal to be in possession of, or damaged by fishing gear. Under the principals of ESD there has been a significant push to reduce bycatch and/or to ensure full utilisation of species taken. Catch taken incidentally and retained is termed byproduct.

Based on observer reports and Department of Environment and Heritage (DEH) assessments, there appears to be minimal interaction with unwanted or protected species in northern waters by the Australian fleet. The interaction with cetaceans was one of the key drivers to reduce foreign fishing activity in northern Australian waters.

In the gillnet component of the NT shark fishery, observers identified 60 species, 24 of which were sharks, that were caught during fishing trips. Seventy five percent were target species and fewer than 5% were bycatch and not retained. The balance was retained as byproduct for sale.

Observers in the tuna longline fishery operating off WA identified 46 bycatch species, with shark (mainly blue shark) dominating the bycatch. Over 95% of shark caught on longline were alive at time of capture and were released alive. The cryptic mortality of these released fish is not known. Much of this coverage was in waters south of the Pilbara region and in deep waters. The applicability of this information to waters further north is unknown. Based on experiences with the South Pacific tuna fleet, deep-set lines caught less sharks than shallow-set lines and less sharks were caught in tropical and sub tropical areas than in temperate areas.

A collaborative study by Commonwealth Scientific and Industrial Research Organisation (CSIRO) and state agencies will provide more information on the bycatch of these targeted shark fisheries. This information was not available at the time this report was produced.

The volume and types of bycatch in many instances have been reduced or eliminated by the use of technical or operational solutions.

An example of these technical solutions have been the use of TED‟s and Bycatch Reduction Devices (BRD) in the NPF to exclude certain species, such as sharks or turtles from trawl nets. The NPF identified 56 shark species in the catch which represented around 4% of the total weight of bycatch before the use of TED‟s. This is believed to have been reduced by around 80% since their introduction with many larger specimens over 1m in length being excluded. A Fisheries Research and Development Corporation (FRDC) project is underway to quantify impacts.

The use of particular hook types or sizes, line grade or net mesh size can also minimise bycatch of many species.

A very effective method to reduce bycatch has been to modify fishing operations, methods and gear to minimise interactions with non-target species. This has been achieved by reducing the amount of gear used, not setting gear in certain areas, at certain times, at certain depths, or by controlling the time that gear is in the water. The NT used such a technique in 1992 when it prohibited the use of bottom set gillnets to minimise marine turtle interactions

The economic impact on industry of many of these solutions has not been quantified, but often without them in place, fishing may have been forced to cease due to excessive negative impacts.

If no technical or operational method exists to reduce bycatch to an acceptable level, in some circumstances spatial or temporal closures may provide an alternative management option.

The introduction of any management controls that limit, or demand nil bycatch can lead to incentives to not report, underreport, additional discards and little chance to develop new markets.

A single Bycatch Operational Plan (BOP) for the Northern Shark Fisheries is being developed through NAFM as part of the Operational Plan for the Sustainable Use of Northern Australian Shark Resources (OPSUNASR).

KEY POINTS
- Minimal reported interaction with Protected Endangered Threatened (PET) species
- Fate of discards not well known
- Technical and operational adjustments can minimise or eliminate bycatch
- Bycatch Operational Plan is being developed

14. ECOSYSTEM

An important consideration in any wild harvest fishery is the relationship between the fishery and its effects on the total ecosystem as well as the intrinsic value and contribution of the species to the marine environment. Sharks are apex predators (lower numbers) as well as opportunistic scavengers and they are considered to be a valuable component of the marine ecosystem.

14.1. Domestic Ecosystem Impact

Due to the small amount of catch taken over a wide area as reported in DEH and WA ESD assessments, the northern shark fisheries currently have negligible trophic impacts. If catches or effort increase, this would need to be reassessed. This low impact has been challenged by many environmental groups which believe that the harvest of apex predators such as sharks has a catastrophic impact on the marine ecosystem.

In northern Commonwealth waters, the speartooth shark is considered critically endangered, the northern river shark is endangered and the grey nurse, whale shark and great white are considered vulnerable. Two species in WA, *C obscurus* (dusky shark) and *C. plumbeus* (sandbar shark), are believed to be overexploited.

Based on work undertaken in WA, the northern shark fisheries are generally rated as having a low risk of interacting with the protected species, such as speartooth and northern river sharks and freshwater sawfish because their distributions are generally confined to freshwater, inshore and estuarine areas away from the commercial shark fishing areas although it may also inhabit deeper offshore waters. Sawfish are considered at risk internationally and northern Australia may have one of the few viable populations in the world. The potential for interactions of the northern shark fisheries with some sawfish species needs to be assessed and DEH is preparing a recovery plan for relevant species.

White shark and grey nurse are rarely encountered in northern waters and therefore are not considered at risk. Whale sharks are extremely unlikely to interact with any line-based shark fisheries, and the risks of interaction with Australian fisheries gillnet is considered low due to the limited amount of gear set over a large area.

Turtles, whales and dolphins are considered similar to whale sharks in that they are believed to have a low level of interaction. However, one of the key drivers for removing foreign fishing, especially the netting fleet, was due to perceived excessive interactions with dolphins. Environment groups claim that there is extensive evidence, often unreported, of interactions with a range of protected species. The impact of discarded or lost foreign fishing nets on turtle populations is believed to be significant.

All protected species under the *Environment Protection Biodiversity Conservation (EPBC) Act* must be released, preferably, alive and any interactions must be reported to DEH. Since 2000, only eleven interactions have been reported to DEH, mainly relating to dolphin and to a lesser extent turtles. Most of these reports have come through the fisheries agencies, not from fishers and most when observers have been on board. This low number of reported interaction may actually relate to a lack of reporting by industry.

A comprehensive observer program could provide information that may resolve many of the issues in question relating to ecosystem impacts, but the costs of such a program may be prohibitive.

As there are no Shark Net Swimmers Protection Systems in place in the area covered by the northern shark fisheries, their impact is not considered in this report. If nets were installed their impacts would have to be assessed.

Further details on the ecosystem impacts on northern shark fisheries can be sourced in DEH reports (Table 5).

KEY POINTS
- Anecdotal reports of negative impacts
- Little data available to support level of ecosystem impacts
- There are a number of protected species that interact with northern shark fisheries
- Protected species interactions must be reported to DEH, but are currently likely to be underreported
- No Shark Net Protection Swimmers Protection Systems in area
- A formal risk assessment process should be applied to determine the impact of shark fisheries on the ecosystem

14.2. Foreign Ecosystem Impact

As foreign fishing activity is extensive and is relatively uncontrolled in waters adjacent to the AFZ and within the area of the MOU, it is believed that there have been significant ecological impacts, with shark stocks most likely overfished in a large number of areas.

The impacts of ghost fishing, negative interactions with protected species, reports of species paucity, trophic impacts and physical damage to the environment have not been quantified.

14.3. Department of Environment and Heritage Assessments

All fisheries that catch seafood that is to be exported from Australia must comply with the export provisions under the *EPBC Act* and are also assessed in terms of their potential impact on protected species.

A large number of northern Australian fisheries that target, or take shark in significant quantities have been, or are going through the DEH certification process. Fisheries are assessed as being:

- EXEMPT this allows export for a 5 year period
- WTO this allows export for a shorter period, so long as adjustments are made to the way the fishery functions to bring it closer in line with the Act requirements
- Prohibited no exports are allowed as the fishery has unacceptable impacts.

The northern fisheries that may interact with shark and status of their assessments are shown in Table 5. The DEH web page has the current status of all fisheries.

The key outcomes of the assessments showed that most northern Australian fisheries comply with the sustainability provisions of the *EPBC* Act, but many needed to improve their performance in respect to one or more of the following:

- improved stock assessments
- identification of interactions, target and byproduct species
- identification of critical habitats
- bycatch identification and reduction programs
- consultation processes
- enforcement risk analysis
- relevant targeted research and timely public reporting
- catch/effort data collected and analysed
- fishery objectives, indictors and measures developed
- monitoring systems put in place.

Table 5: DEH Status of North Australian Fisheries That May Interact With Shark and Have Sought Approval as at December 2004

FISHERY	JURISDICTION	DEH STATUS*
Shark fishery	NT	WTO
Demersal	NT	Exempt
Finfish trawl	NT	Exempt
Spanish mackerel	NT	Exempt
Mud crab	NT	Exempt
Timor reef	NT	Exempt
WANCSF/JANSF	WA	Initial assessment
GoC inshore finfish	Qld	WTO
GoC line fishery	Qld	WTO
GoC develop fin fish trawl	Qld	WTO
NPF	Commonwealth	Exempt
Western Trawl	Commonwealth	WTO
Western Tuna and Billfish	Commonwealth	Exempt

* details as to conditions of WTO and Exemptions are available at DEH web

15. RESEARCH AND ASSESSMENT

A sound understanding of stock size and structure, population dynamics and biology of shark species will help determine the appropriate scale and type of management required to ensure their sustainability. Unfortunately, because of the diversity in species, number of fisheries involved and the extensive areas covered, there has been little research and only few species specific stock assessments on northern shark species. It is unlikely that this situation will change in the near future.

Research and stock assessments have been undertaken on some species in specific areas, such as sandbar shark in WA and blacktip shark in northern waters.

WA has used the sandbar shark as an indicator species to assess the impacts arising from current fishing levels and to gauge the overall status of shark stocks. This species was chosen because it represents a large proportion of the total WA shark catch and it is believed that changes in this species abundance in response to fishing may be reflected in other species. The stock status of sandbar shark was assessed using a demographic model that incorporated age-specific exploitation rates derived from a tagging study: the model indicates that the stock can be considered overexploited.

Research in northern Australia on blacktip shark have found that the species group are considered a large single stock with restricted movement both along-shore and offshore. Tagging studies showed most movement restricted to around 50km, but some instances saw movement of over 1,200km.

Stock assessment work undertaken by CSIRO and the NT in the 1980‟s estimated blacktip Maximum Sustainable Yield (MSY) at 3,400t. More recent assessments estimate a yield of 2,000t from northern waters based on 6-7% of the blacktip stock being vulnerable to gillnetting. This assessments outcome believed that shark stocks should be increasing by 5-10% annually since the cessation of foreign fishing in the mid 1980‟s. However, the assessment calculated that stock numbers were in fact declining. This finding could be for a number of reasons, but was most likely due to one or a combination of the following:

- unreliability of data as it was based mainly on reported Taiwanese activity and unreliable CPUE data
- unreliability of assessment techniques used
- 1,500t of unreported catch; or
- depletion of inshore stocks.

Using standardised logbooks and reporting across northern Australia may assist to some extent in resolving this in future assessments. This is currently being progressed through a tri-state working group.

A National project looking at northern sharks and rays is assessing the sustainability of target and bycatch species in a collaborative way in northern Australia. The aim of the project is to identify the relative degree of sustainability risk for the species caught in the northern shark fishery (thereby indicating direction for mitigation actions and

further research), as well as gain a better understanding of the biology of species taken, life history parameters and the fate of species taken and discarded.

Based on rapid assessments techniques intrinsic mortality and rebound potential was determined for shark species in the Pacific. Assessments indicated that sharks which have a mortality rate of 16 or lower are high risk; above 16 to 38 are medium risk and over 38 are low risk.

Based on this rating most species in the northern shark fisheries would at best be at the top end of the low risk category and therefore may require further focussed and directed research on the impacts of fishing above and beyond what can be obtained solely from logbook data. Tagging or reference surveys have been suggested by researchers as possibly providing useful data to enhance assessments.

Innovative techniques may also need to be developed that can provide agreed and reliable assessments on a large scale. The rapid assessment techniques that are being applied to southern shark species may be useful in this respect. The use of fishery independent methods such as underwater acoustics or remote underwater video stations with baited attractants to help in these assessments have been investigated.

Although basic biological information is lacking on many species, as a general premise it would appear, that the sustainability of the more productive species, such as blacktips, are not threatened under existing Australian management regimes if fishing effort remains at current level.

One of the key issues with the northern shark stocks is the impact on straddling stocks that may move between national and international boundaries. This is particularly significant as there is believed to be increased pressure from a foreign fleet operating illegally inside, or directly adjacent to Australian waters and this may be placing heavy pressure on shared stocks. This pressure has lead to proposed closures on the Australian side by some jurisdictions to provide a level of protection to the overall shark stocks. However, as these species may be moving between jurisdictions it does not address the key problem relating to possible excessive foreign fishing activity.

Research on shark at this time has often been fragmented and not part of an overall operational plan. For this reason data collection has been localised and not standardised between agencies. NAFM has worked towards standardising protocols and methods for data collection, analysis, reporting and timeframes. As such, NAFM is developing a Research Operational Plan (ROP) as part of the encompassing OPSUNASR.

KEY POINTS

- Shark species have generally low productivity
- Recoveries are slow if overfished
- Little known about the life history of most species
- Often important as apex predators in the food chain
- Large number of species for which there is little information
- Few, if any, reliable assessments
- Key species not identified
- Rapid assessment techniques are a possible solution
- Overexploited and threatened species not identified

- Straddling stocks are under pressure from foreign fishing
- Five species have high conservation value in Commonwealth waters
- Data collection not standardised
- No overarching research group
- Research is fragmented

16. MANAGEMENT

No single body is responsible for the overall management or utilisation of northern sharks. The shared arrangements are complex with the management of the main northern Australian target shark fisheries undertaken by way of JA"s under the OCS arrangements along with a series of MOU"s covering roles and responsibilities between Commonwealth, NT, Qld and WA fishery agencies. The day to day management of these fisheries is generally undertaken by the States and Territory (Appendix IV).

Most of the fisheries that take shark incidentally as bycatch are managed by a single jurisdiction under OCS arrangements.

Management of foreign fishing is undertaken by the responsible foreign state, but if illegal activity takes place within the AFZ, or the area of the MOU, the Australian Government undertakes the necessary compliance actions.

For management to be most effective it should cover the whole stock unit. It has proven difficult in many instances to manage sharks within a multi-species fishery, as less productive species are depleted before faster growing and more productive species. This problem is exacerbated in multi-jurisdictional fisheries with international impacts on shared stocks.

Management arrangements for the Northern Shark Fisheries are being developed as part of the OPSUNASR. This may lead to the reviewing of existing OCS arrangements for northern sharks.

KEY POINTS

- Multiple national and international jurisdictions involved
- Australian fisheries under OCS arrangements
- Multi-species fishery
- Management Operational Plan is being developed

17. COMPLIANCE

17.1. Domestic Compliance

Compliance is undertaken by a range of agencies across northern Australia with some level of co-operation evident, especially between adjacent agencies.

The area of these fisheries is extensive and covers a wide range of licence types and vessels, with a number of fishers" having access entitlements in multiple jurisdictions. As each jurisdiction has differing legislation in place relating to the catching, processing and transporting (including transhipping) of shark meat and fins, this can lead to compliance difficulties, especially in relation to cross-border issues.

To date there has been no evidence of any increasing trend in offences. Most compliance focuses on gear and closure infringements and acquiescence with flesh/fin ratios and other landing provisions. No jurisdiction has reported more than a dozen offences to date against domestic fishers for breaches of controls on shark fishing.

Most agencies currently use a combination of at sea, in port, aerial inspection and recognisance to monitor the activity of the fisheries. However, due to the large area, number of fisheries and vessels involved and the limited human and capital resources available, extensive at seas Government funded surveillance is unlikely in the near future under existing arrangements.

This limited compliance capacity is evident for all jurisdictions especially their capacity to police the offshore fisheries, but an example from Qld highlights this point. The Queensland Boating & Fisheries Patrol (QBFP) is based in Townsville with a total of four compliance officers in the GoC. Two are located each in Karumba and Weipa. These officers have to cover around 1000km of coast line and over 200,000 km2 of ocean. In addition, the regional offices only have small vessels, so long range or offshore patrols must be arranged through Cairns.

With increased requirements to land product in particular forms, or comply with fin to meat ratios in most jurisdictions and possible additional closures, compliance activity and resources will need to increase and be coordinated to maximise compliance outcomes. The four jurisdiction involved in the northern shark fisheries are developing a Compliance Operational Plan (COP) for the northern shark fisheries as part of the OPSUNASR.

It is a possibility that shark fin will be included as a tier two (high risk) seafood product as part of the National Docketing System. This will require a substantial increase in resources to adequately monitor and enforce the complex paper trail, black market investigation and intelligence gathering this will necessitate. The sale of parts from protected species is an issue under the wildlife provisions of CITES.

Currently seized product is generally destroyed, although in some jurisdictions it can be given to Government, go to auction, tender or be sold by private contract.

Although not an enforcement role, scientific observer and crew member monitoring programs are in place in some parts of northern Australia to observe and record bycatch, shark species, their fate and any interactions with protected or vulnerable species.

In some highly controversial fisheries such as the USA West Coast Tuna Fishery, industry has funded 100% observer coverage to minimise concerns about perceived negative activities in the fishery. However, this is most likely a prohibitively expensive option in north Australian waters and many vessels are not adequately set up for such activity.

Increased observer coverage, industry self regulation and development of cooperative programs will be required to ensure a high level of compliance.

KEY POINTS
- Extensive area to patrol
- Multi-jurisdictional compliance
- Varying regulatory controls in each jurisdiction
- Clarification of levels of mutual recognition
- Compliance becoming more difficult with new regulations proposed
- Limited compliance resources for complex arrangements
- Limited observer programs in some fisheries
- Possibility of inclusion in National Docketing System
- Fate of seized product
- COP being developed

17.2. Foreign Compliance

The activity of foreign fishing and their compliance in Australian waters is administered by AFMA‟s Foreign Compliance Team and undertaken with the assistance of Australian Customs Service, Coastwatch and the Australian Defence Forces which undertake extensive patrols off the AFZ.

Illegal fishing is considered to be a direct challenge to Australia‟s sovereignty over our fisheries and the resources contained in the AFZ, as well as a serious breach against Customs and Quarantine.

The major incursions focussing on the take of shark come from Indonesian fishers; often local villagers seeking higher income than is available in local villages.

In 2004, 161 vessels were apprehended illegally fishing inside the AFZ. This most likely only represents a proportion of vessels fishing inside the AFZ, but due to insufficient resources it was not possible to apprehend and process all these vessels fishing illegally. The vast majority of vessels were smaller Type 3 Indonesian vessels, with only a very small percentage of larger vessels apprehended.

Due to a lack of available resources to apprehend and process all illegal fishers, some vessels were subject to what is termed, „administrative seizures‟. In those cases the catch and gear was confiscated but the vessel and crew were allowed to return to their own country. The current policy is to seize vessels, prosecute the vessel master and repeat offenders and deport the crew. Apprehended vessels are now seized and bought to port in northern Australia and disposed of (generally burnt) or bonded back to the apprehended fishing company.

In the past seized product was destroyed, or sold. The policy is to now destroy all shark fin seized.

For illegal foreign fishing offences in Australia‟s northern waters penalties of up to $500,000, plus forfeiture of vessels and catch are possible under existing legislation. Smaller vessels generally face a fine in the vicinity of $3-5,000, the equivalent of 20-40kg of fin. With respect to forfeiture and seizing of product, the compliance agencies must take cognizance of United Nation Codified Law of the Sea (UNCLOS) provisions for security and fair valuation of goods.

There are allegedly Chinese syndicates funding illegal fishing into Australian waters (McLean 2005). In addition there is reportedly extensive illegal fishing activity within Indonesian waters (Fegan 2003).

Given the rising prices for fin there is no indication that illegal fishing activity will decrease and more vessels are being detected closer to the Australian mainland within the AFZ.

KEY POINTS
- Large increase in foreign fishing activity
- Enforcement of legal and illegal foreign fishing undertaken by Australian Government
- Illegal fishing of secondary importance compared to illegal immigrants and customs breaches
- Challenge to Australia"s sovereignty
- Extensive area to patrol
- Little compliance outside AFZ
- Fate of seized product

18. CONSULTATIVE ARRANGEMENTS

As a general rule those who contribute to the mortality of sharks should be represented in the formal consultative process. Other important stakeholders with a governance, economic, social interest, or dependence on the species should also have the opportunity to participate.

18.1. Domestic Consultative Arrangements

Northern Australian fisheries management, research and compliance issues are discussed and considered at the annual NAFM meeting. This forum seeks to put in place complementary and cooperative arrangements for northern fisheries.

The Directors of NT, WA and Qld fisheries agencies and AFMA attend NAFM, as well as key fishery staff. The Group workshops major issues such as the status and direction of the northern shark fisheries and identify regional priorities. NAFM has a key role in the future directions for northern shark fisheries. A working group has been established to develop complimentary catch reporting systems, while a northern stock Assessment Group (SAG) has been established to provide advice on the status of shark stocks. Both groups met for the first time in early 2005.

Individual jurisdictions also have their own formal and informal consultative processes as outlined briefly below.

WA Consultative Arrangements

The WA shark industry has formed the Northern Shark Industry Association (NSIA).

Formal consultation takes place through the WA Demersal Net and Hook Fisheries MAC.

NT Consultative Arrangements

The Government regularly meets with the NT Offshore Net and Line Licensee Committee to discuss matters relating to the shark fishery. This includes an annual Government and industry workshop.

There is a formal MAC in place with representatives from commercial, conservation, recreational, Indigenous, compliance, research and management providing expert advice to the Director.

The issue of incidental catch in other fisheries is discussed with those particular associations.

QLD Consultative Arrangements

The recently formed GoC Commercial Fisherman‟s Association (GoCCFA) represents GoC fishers and seeks to resolve resource and access issues in the GoC in a collaborative way.

GoC Fishery Management Advisory Committee (GULFMAC) meets biannually to discuss broad fishery issues within the GoC and undertakes workshops on specific or fishery related issues. GULFMAC has representatives from each commercial sector in the region as well as recreational, charter, indigenous, scientific, environmental and government representatives. NT and Commonwealth representatives also attend. GULFMAC provides advice to the NTJFA and the QFJA.

Commonwealth Consultative Arrangements

Northern Prawn Fishery MAC (NORMAC) is a body that represents the interests of those involved in the NPF or who are responsible for the activities and actions of the northern prawn fleet. NORMAC has an independent chair, representatives from industry, recreational, conservation and research, AFMA, a state government representative along with DEH. Operational Handbooks are prepared and distributed annually and cover compliance issues such as closures and bycatch.

WESTMAC is a body that represents the interests of those involved in or responsible for the activities in northern fisheries in WA including the NWSTF and WDWTF and meets annually. Public meetings are held along with committee meetings.

The tuna industry undertakes consultation through Western Tuna and Billfish MAC (WESTUNAMAC) which has an independent chair, industry, representatives from recreational, conservation and research, AFMA, research and a state government representative along with DEH as an observer. WESTUNAMAC meets 3 to 4 times per year.

KEY POINTS

- NAFM has key role in coordinating research, management and compliance
- Most jurisdictions have industry associations and MAC‟s

18.2. Foreign Consultative Arrangements

As well as deterring illegal fishers by way of enforcement, the Australian Government also seeks to tackle the problem at the source, by attempting to minimise incursions. This is achieved by distributing free maps of Australia‟s maritime boundary, liaison visits to key Indonesia fishing ports and providing support for alternate fishing projects including tourism and aquaculture through AusAID and the World Bank. This approach however does not appear to have significantly reduced instances of illegal fishing. Formalising some form of consultative arrangement with Indonesia is a high priority.

In the 1980‟s significant resources were directed to the technical transfer of new industries to the home ports of illegal fishers, but this program has ceased.

KEY POINTS
- No formal MAC or similar forum in place
- Formal consultation with Indonesia is a high priority

19. ECONOMICS AND FLEET

Little is known about the economics and value of the northern shark fleet and what effects this has on fisher activity. Economic drivers are often the key to increased fishing activity, but like many fisheries, no economic survey has been undertaken on the northern shark fisheries to determine harvest costs and profitability.

19.1. Domestic Economics and Fleet

There are a number of vessels, fishers and entitlement owners who have access rights in multiple jurisdictions across northern Australia. This indicates that the northern shark fisheries may be harvested as a larger fishery managed by multiple jurisdictions. To some extent this has been acknowledged by agreements between State/Territory jurisdictions to not permit licence splitting and by the linking of adjacent entitlements.

The Australian fleet has target and non-target vessels in the fishery. There are a total of 30-40 target vessels (Table 6). There are also 5-600 vessels permitted to take shark as bycatch and around 200 cannot retain any portion of shark they catch (Table 3).

Vessel sizes range from around 10m to 25m in the shark fisheries, but this varies from jurisdiction to jurisdiction, often due to regulatory restrictions limiting the size of vessel permitted. The fishing fleet that takes shark in northern Australia is varied and extensive and not well understood. There would appear to be significant latent effort in the northern shark fisheries, especially in the non-target fisheries and some unrestricted target fisheries.

Most, if not all shark vessels have GPS, sounders, plotters, power hauling equipment, satellite communication and sufficient freezer capacity to stay at sea for extended periods. The use of larger vessels could increase the efficiency of these fisheries, but could also significantly increase pressure on the resource as vessels could stay at sea for longer periods, carry more crew and have more gear. Many non-target fishers such as trawlers, tuna boats and offshore vessels are also well equipped, but some of the vessels in the coastal fisheries may not be as well equipped.

The type of vessel and participation rates in the fishery have changed with the significant demand and high price commanded for shark fin in the Asian market.

The northern Australian fleet that targets shark is estimated to be valued in the vicinity of $20–30 million. This could increase if more specialised vessels enter the various fisheries.

The value of shark landings in northern Australia in 2003 was valued at around $11 million with over 70% of the value coming from the target fisheries with the balance from byproduct fisheries (Table 7). The attributable value of discarded catch is not known.

Table 7 shows that the NT shark fishery shark landing were the most valuable at $6.8 million, but that all fisheries contributed to the economy, especially in the remote northern areas of Australia where there is often little other economic activity.

The northern shark target fisheries in 2003 provided direct employment to 100-130 people (Table 7). Crews and skippers wages in most fisheries are based on a percentage of the value of the catch and this would generally be the case in northern shark fisheries. Most vessels would have between 2 to 4 crew members, plus a skipper. Flow on effects, additional indirect employment and employment arising from the take of shark in the byproduct fisheries is unknown.

The 40 to 50 licence entitlements to target shark in northern Australia are estimated to be valued in the vicinity of $15–25 million (Table 7). Any licence value that can be attributed to the take of shark in byproduct fisheries is unknown.

It has been estimated that approximately 10-20% of total operating costs, including depreciation, can be attributed to fuel costs in the shark target fishery. A trip from Darwin could require up to 10,000l of fuel. Trip durations vary depending on a range of factors, but would generally be between 10-20 days.

The cost to set up 15nm of longline is between $25-30,000. Bait costs around $1.50 to $1.70/kg and 15nm of line would require around 200kg of bait per day. The cost to set up 2,000m of gillnet is between $20-40,000.

There are also a range of other annual costs that would need greater analysis than is possible in this report to accurately identify expenditure, but some that have been estimated are:

- insurances $20-30,000
- repairs and maintenance $20-50,000
- AQIS fees and requirements $3,000
- licence fees $2,000
- wharf or mooring fees $1,000

The vast majority of Australian fisheries jurisdictions allow at sea processing for most species, however many jurisdictions require shark to be landed in either whole carcasses, trunks or certain volumes of flesh per fin ratio. The prohibition of processing at sea may impact on the profitability and economic efficiency of fishing

operations, especially if customers require filleted or other form of shark and legislative requirements do not allow it.

As new markets are developed for shark flesh from species previously not retained, this may increase the return to the vessel. With a reported global shortage of fish protein, further markets could be developed that provide a better return for fishers on flesh and therefore greater incentive to maximise return on each shark.

KEY POINTS
- Little is known on the economics and associated drivers
- Fishers may have access in multiple jurisdictions
- Target fleet not large, but byproduct and no take fleet is
- Landings of shark valued at $11M
- Value of discarded catch unknown
- Over 80% of landings from the target fleet
- Direct employment of 100 - 130 people in target fisheries
- Target fishing fleet valued at over $20M and entitlements at over $15M
- Legislative requirements could affect profitability

19.2. Foreign Economics and Fleet

The foreign fleet that may impact directly or indirectly on Australian shark stocks is very complex and includes legal and illegal vessels from a range of ports and countries.

Up to 80 traditional style sailing vessels (Type 1 and 2) have at times legally fished within the area of the MOU during the fishing season. This has decreased to around 20 vessels in recent years, most likely due to decreased resources within the area. These traditional vessels are generally small (less than 15m) and are valued at under $5,000. They travel from a number of Indonesian ports to fish for extended periods and then return to their island homes with fin, meat and a range of other products they are permitted to take.

There are also a large number of fishing vessels that range in size from the small subsistence type vessels of 15m to large commercial ships over 40m in length. It is estimated that there is in excess of a 1,000 vessels fishing adjacent to Australian waters, with some possibly at times venturing into Australian waters to take a range of fish and shark species. These vessels come from many countries including Indonesia, China, Thailand, Japan, Korea, Taiwan and Malaysia and are often crewed by Indonesians. In recent years, detected incursions into Australian waters have been almost entirely Indonesian vessels.

Estimates of the value of vessels ranges significantly depending on the size and type of vessel. As an example, a small motorised Indonesian vessel is worth between $2-8,000, larger ice boats $50-60,000 and trawlers well over $100,000.

The smaller motorised vessels have a crew of around 6 men plus a skipper who work on a share basis. Vessels work on having a quick turn around with a view to having six short or three longer voyages each month. Vessels with a standard 6-7 lines, each with 15-17 hooks and one anchor per line would cost around $150 to set up. The cost

of fuel and food works out to between $280-$1,100 per trip depending on the port of departure, distance to fishing ground and time at sea.

These boats need to catch around 11kg of fin (which equates to around 4-500 kg of live shark) to cover their costs. Fin prices vary from port to port and based on size and quality range from $30 for 40cm fin to over $170 for 60cm plus specimens. A good trip would result in around 20kg of fin, which would equate to around $60-100 per crew member and double that for the skipper. The costs of the voyage are deducted by those who finance the trip before any profits are distributed between the crew and captain.

Indonesian skippers report that they often do not make a profit when fishing in Indonesian waters after costs are deducted. This provides a greater incentive to fish in Australian waters where stocks are more abundant.

Much of the increased foreign fishing activity in Australian waters is due to the reduction of stocks outside Australian waters. The use of stern and pair trawlers is also believed to have further reduced the resources available to artisanal and the local commercial shark fleet outside the AFZ. This has severe implications for the sustainable management or Australian resources as stocks are further depleted in other areas, greater pressure will be placed on Australian stocks.

It is probable that fin traders are financing illegal foreign fishing activity to take Australian resources. This has seen the fleet increase over the last five years.

Fuel is currently heavily subsidised in Indonesia, but this is likely to be reduced in the future as this is a huge financial burden on the Government. This will significantly impact on the economics of the fleets.

KEY POINTS

- Illegal fishing increasing
- Large number and type of vessels
- Little information on fleet
- Vessels come from a number of ports and jurisdictions
- Shark stocks severely depleted in Indonesian waters
- Provides direct employment to a large number of Indonesians
- Impact of reduction in Indonesian fuel subsidies unknown

Table 6: Vessel Details that Interact with Northern Shark – 2003.

Jurisdiction	Target Vessel No's		Byproduct Vessel No's		No Take Vessel No's	Total Vessel No's	
	Permit	Active	Permit	Active	Permit	Permit	Active
WA	14	11	294*	116*	0	308*	127*

NT	19	11	97	61	92	208 + 220 bait	72
Qld	10	3	87 + bait	59	2	250	62
Cwlth	NIL	NIL	132	57	102	234	57
Foreign	UNKNOWN						

* does not include „open access" licences details

Table 7: Value of Northern Shark Fisheries Catch, Vessels and Entitlements – 2003.

Jurisdiction	Target fishery ($M)	Byproduct fishery ($M)	Total Shark ($M)	Target Fleet		
				Direct employed	Access value ($M)	Value of fleet ($M)
WA	**0.7**	**0.7**	**1.4**	**20-35**	**3.5 - 7.5**	**6-10**
NT	**6.8**	**0.3**	**7.1**	**70-80**	**8.5 – 12.5**	**9.5 – 13.5**
Qld	**1.3**	**1.2**	**2.5**	**10-15**	**2.0 – 4.5**	**4 – 9.0**
Cwlth	**0**	**0.1**	**0.1**	**-**	**N/A**	**N/A**
TOTAL Australian	**8.8**	**2.3**	**11.1**	**100-130**	**14-24.5**	**19.5-32.5**
Foreign	UNKNOWN					

20. MARKET INFORMATION

The greatest volume of shark traded worldwide is used for flesh, providing an important lower priced protein source. Shark meat production worldwide is reported to be about 63,000t, but it is believed that this represents only about 10% of the total amount of shark meat consumed.

The greatest concern at the moment however relates to the increased demand for shark fin and its possible impacts on shark resources. In 1992, the International Union for Conservation of Nature and Natural Resources (IUCN) estimated that over 4,000t of shark fin was harvested worldwide with a value of over $1.5B, with most going to Chinese based markets. It is estimated that this has grown at greater than 6% per year since. Estimates for 2003 of dry fin into China were over 11,600t, likely to be valued

at over $4B. Depending on conversion factors (2 or 3%) this would equate to 380,000 to 580,000t of live weight shark.

Shark fin is sold in various forms, including frozen green, brined, dried with skin on or off, processed as fin nets (cartilaginous fin needles boiled separated and packaged dry or wet) or canned shark fin soup. A large bowl of shark fin soup can cost $350.

Fins are graded based on species, size and the number and quality of the „fin needles". Larger fins are generally worth more and „white" fin are worth more than „black" fin. White fin comes from sawfish, and shovelnose sharks. Most others shark fin is termed black fin.

There are specialised fin markets throughout the world with Hong Kong purchasing between 50–80% of the world total for processing, often in Guangdong Province, China before redistribution.

Markets are growing in China (as disposable income increases with economic development), Singapore and most other regions with a large Chinese population, including Australia.

With the liberalisation of trade in China, fin is now also going directly into China, side stepping the traditional Hong Kong brokers. This in itself may be generating additional demand.

Due to decreased shark resources in many countries, especially our near neighbours, underutilised stocks in Australian waters are now being targeted to supply the large and expanding market for shark fin.

20.1. Domestic Marketing

In the past, the sale of shark fin was often a side line for crew in many fisheries. However, that has changed in recent years due to the expanding market for fin.

The key driver for the increased interest in Australia"s northern shark has been the growing demand for shark fin. Shark fin soup has been eaten for over 2000 years and is one of the world"s most expensive seafood products. Prices to fishers can vary greatly based on size, species and quality and range from around $20/kg for small frozen fins to over $200/kg for large sets of white fins. When these reach retail markets as fully processed shark fin they can fetch over $1,000/kg

The flesh of shark is also a valuable product and is generally sold as fillet or trunks. It is often marketed as flake and is very popular in the fish and chip trade. The fisher receives between $2.50/kg to $5.00/kg for shark meat depending on the form and species.

Uses have been developed for the larger sharks and new species that may have been discarded in the past. Some are being exported for between $1-$4.00/kg to the fisher for processing into seafood balls or tempora. In Australia there is a legislative maximum permissible concentration of mercury allowed for shark of 0.1 mg/kg. This

may preclude the sale of meat from larger specimens for human consumption in Australia.

Most shark meat and fins are purchased by fish traders who consolidate, process and distribute the product to various wholesale and retail markets within Australia and overseas.

The lesser eating quality, or poorly handled shark can be used as crab bait and/or to produce fertilizer for a return of between $0.25-0.60/kg to the fisher. This low price and use is often criticised. However, such a price would place this meat on a par, value-wise, with some of the lower valued product such as silver trevally, yellow tail or luderick. With the value of fin added this can make the total value per animal significant.

Further markets are required to fully utilise all the shark meat that is caught in northern Australian waters.

Due to the high levels of urea in the tissue of some sharks it is crucial that they are quickly chilled or frozen to retard the conversion of urea to ammonia in the tissue.

Sharks also provide oil, liver, skin, cartilage, jaws, vertebra, intestines, leather and shagreen.

As of 1 December 2004 all fisheries, including those that take shark, that are exporting from Australia must comply with DEH provisions under the EPBC Act relating to sustainability and ecosystem impacts (Table 5).

Product destined for export as well as vessels and processing plants, must meet food safety and AQIS standards. The NT intends to make it mandatory for all longline vessels to be AQIS registered so that additional overseas markets for shark meat can be developed.

KEY POINTS

- Demand for fin is key driver for increased shark fishing
- Fin is mainly sold in Chinese based communities
- Fin value based on size, species and quality
- Large potential market for shark meat
- Fishery must be DEH approved for export
- Vessels and processors must be AQIS registered for export
- What is an acceptable use for shark

20.2. Foreign Marketing

Australia is only a small supplier of shark meat and fin on the international scene, compared to the major countries of Spain, Taiwan, Indonesia, UAE and Brazil. However, it is quite possible that shark from Australian waters, taken illegally, could be included in sales from Indonesia and possibly from some of the Taiwanese fishing in, or adjacent to the AFZ.

Shark is supplied to China/Hong Kong from over 125 countries and re-exported to around 75, with China, Singapore, Malaysia and Thailand the major consumers of shark fin, although any destination with a Chinese population will purchase fin.

Much of the processing happens in Guangdong Province, China and fin is now being imported directly, bypassing the traditional brokers from Hong Kong. As trade is liberalised in China and tariffs, taxes and other economic barriers are removed the need to use a third party to avoid these costs is reduced.

It is difficult to get a clear understanding of exact volumes of shark product being traded, as often production figures are duplicated as they are traded between the various transit points and also due to non reporting. In 2002 around 15% of fin arrived into China by air which has 100% screening, but over 65% came in by sea and screening is under 1%.

In addition to the fin trade, the demand for shark meat is increasing significantly. It has been reported in recent years that China alone has undergone a 10 fold increase in shark meat consumption.

PART 2: STRATEGIC DIRECTIONS FOR MANAGEMENT, RESEARCH AND COMPLIANCE

From a national and international perspective the NAFM group recognised there was a need to:

- control the direct and indirect take of shark;
- protect nationally and internationally vulnerable species; and,
- put in place processes to protect the ecosystem that these species rely on in northern Australian waters.

The first step in this process was to collect and evaluate information in Part One of this Northern Australian Shark Fishery Management Strategic Plan. This was to ascertain the status of research, management and compliance in all jurisdictions that interact with sharks in northern Australian waters.

Catch and effort data were obtained from each jurisdiction (WA, NT, Qld and the Commonwealth) based on a standard data request proforma (Appendix III). This process was used so that data in a similar format was obtained from all jurisdictions. This was to provide a base level of information on the shark fisheries and species involved in northern Australian waters, recognizing that shark catch especially when taken as bycatch has been historically poor in many jurisdictions.

In addition to the above, outcomes produced at NAFM 2004 and other supporting information provided by the jurisdictions was also used. Although other data sources and literature where available were utilised to build up an understanding of shark fishing in these waters, the data provided by the jurisdictions was the major source of information for Part 1.

These data were collated, analysed to allow an understanding of the status of the fisheries interacting with shark in northern Australian waters. KEY POINTS were noted throughout Part One of the Plan and these provided the basis for Part Two of the Plan which sets the direction for strategic management. With this in mind, the following three strategic goals for the northern shark fisheries were developed:

1. *Shark Target Fisheries are to be well managed with sustainable levels of harvested shark species, no species over-exploited and minimal interaction with non target and PET species*
2. *Non Target Fisheries that interact with shark are to have negligible mortalities of shark and PET species with incentives to ensure mortalities are minimal*
3. *Maintain a functioning ecosystem which supports the life history of all shark species with negligible impact on shark and PET species or at a community and habitat level.*

To achieve these goals, three Strategic Programs were identified; Management, Research and Compliance.

Within the Strategic Programs, based on the KEY POINTS raised in Part 1, a number of Sub Programs were identified, each with specific aims and a range of outputs

which will assist in achieving the desired strategic outcome for Management, Research and Compliance for northern Australian shark. The development and implementation of operational plans for research, management and compliance are major components of the process.

Each of the matters identified as a KEY POINT in Part One of the report have been incorporated into the tables that follow under one or more of the Sub programs. Following is a summary of the Programs and Sub Programs, along with the critical issues identified for each sub-program.

Based on an assessment of the critical issues, management of the resource was considered an urgent requirement in the short to medium term and in some instances needs urgent attention. Many of these arrangements could commence without the need for further research, or additional compliance, as they are of an administrative nature. Other areas need further research to underpin management direction and additional compliance capacity to ensure that the objectives of management were met.

Another key finding from the data analysis was the varying levels and standards each jurisdiction operates at with respect to the three Strategic Programs. This was especially relevant in the resolution of fishing activity where it proved difficult to gather even basic catch and effort data by fishery and species for a 5 year period from all jurisdictions. The value of the information collected in the production of Part 1 of the strategy will be enhanced by the development of cooperative arrangements between Industry and Government, as well as Agencies in the future.

There was also an obvious need to integrate sustainable shark fishing into the broader principles of ecosystem based management. This may prove difficult within the complex multi-jurisdictional management arrangements currently in place for the northern shark fleet. It is imperative that the risks of continuing with the existing multi jurisdictional system be ascertained, including a review of the existing OCS arrangements. This must be considered not only in respect to the Australian fleet, but also in the context of the large, expanding and generally uncontrolled foreign fishing fleet operating, legally and illegally, adjacent to, or within the AFZ.

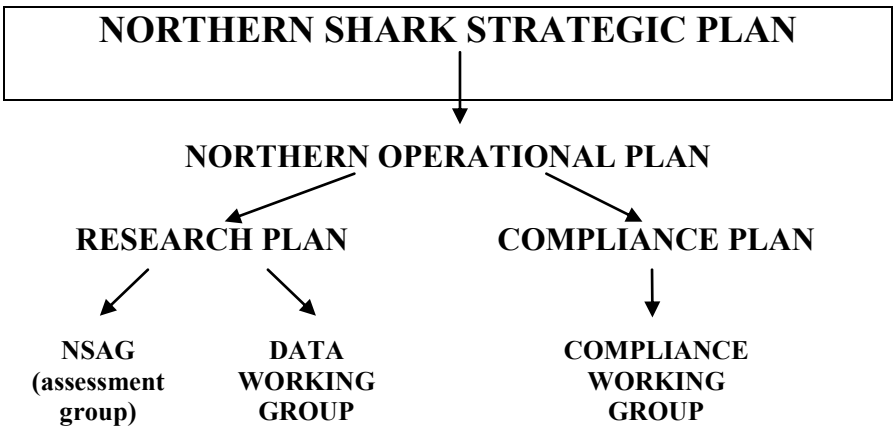
Effective utilisation and management of the northern shark stocks will only be achieved with the allocation of adequate resources and specific actions to create a unified and powerful group to achieve the strategic goals.

A series of outputs are mapped out in Appendices V – VII to assist those responsible for northern shark fisheries to move towards achieving the strategic goals. Specific operational plans developed for management, research and compliance along with the various working and assessment groups are the key to achieving the proposed outputs and actions. Much of this work has commenced with most plans well advanced with the Operational Plan coming into force in January 2005, the Compliance Plan in May 2005 and a draft Research Plan to be completed in time for NAFM 2005.

To assist in coordinating outcomes, Appendices V – VII cross reference specific outputs proposed for the Strategic Plan with the Operational Plans Actions (**Op Plan Actions**) and Priority Levels (**Op Plan Priority**), the Compliance Plans Recommendations (**Comp Plan Rec #**) and suggested timeframe (**Comp Plan Time**). If no timeframe was proposed, **NTS** (No Timeframe Specified) is noted. Matters

relating to the need to undertake Risk Assessments in the Compliance Plan are noted as (**RA**) as no specific recommendation identification number was noted.

This will see a structure as below:



Due to the difficulties encountered when attempting to collect northern shark fisheries data it would be a valuable ongoing legacy of this strategy if the data tables in Appendix II, the associated figures and the Appendix were updated for review at the annual NAFM. Representatives of the agencies responsible for fisheries management from QLD, NT and WA have already met to develop a plan to share data in a common format (Data Working Group). This plan will be further considered at the 2005 NAFM meeting to ensure the data collected is suitable for use by the Northern Stock Assessment Group (NSAG).

The outputs for each sub program seek to develop a process for all jurisdictions within agreed timelines to establish, at the very least, a base level of information and capacity in an organised, coordinated and complementary way so as to improve management of the northern shark stocks and fisheries.

It is acknowledged that that there are a large number of proposed outputs, and this will require prioritisations based on agency resources, the needs of the fishery, status of shark stocks and the level of impacts on the ecosystem.

As previously mentioned many of the outcomes can be achieved relatively simply through administrative actions and require few resources. It is acknowledged that some of the proposed outcomes are beyond the direct control of NAFM and its members or fall outside some organisations legislative guidelines, but many are critical to having sustainable shark fishing in northern Australia and as such, methods should be sought to achieve these proposed outcomes.

As not all jurisdictions are at the same standard in respect to meeting the strategic goals, this strategy is based on all jurisdictions moving towards achieving similarly high standards by 2010.

MANAGEMENT PROGRAM (Appendix V)

Sub Programs	Critical Issues Addressed In Sub Program Outputs
• Catch Control	o not all fisheries are limit entry o the level of catch taken by non target fisheries o existing harvest levels are below the sustainable catch o no understanding of mortality parameters o impacts of existing processing controls o changes in fishing patterns and assessment of risks o foreign impacts are unknown
• Bycatch Controls	o bycatch limits not set in many fisheries o impacts of nil or limited bycatch limits o level and fate of discards unknown o measures to minimise bycatch and PET interactions o foreign impacts are unknown
• Effort Controls	o lack of methods to control effort o many fishing methods and fisheries o effort shift o target fleet not large o non target fleet large o significant latent effort o foreign impacts are unknown
• Gear Controls	o impacts of various gear types unclear o conflict between fisheries and jurisdiction
• Closures	o closure determination process unclear o implications and benefits of closures unknown
• Socio-Economic	o socio economic implications of decisions unknown o impacts of processing controls o industry value not adequately considered
• Consultation	o fragmented consultation processes o nil foreign consultation
• Jurisdictional Control	o multi jurisdictional access arrangements o OCS arrangements o taken by many fisheries and fishing methods o international considerations
• Governance	o NAFM to have coordinating role o lack of common legislative framework or goals o ESD/DEH assessments process o engagement with foreign agencies

RESEARCH PROGRAM (Appendix VI)

Sub Programs	Critical Issues Addressed In Sub Program Outputs
• Biological Data	o limited data on life history of sharks o no coordinated data collection program o straddling stocks o unknown stock structure for most species o negligible ecological data o negligible trophic data o foreign data unknown
• Catch Data	o catch by major species unknown in some jurisdictions o varying and inconsistent collection o no standardisation in collection o poor species identification o critical species not identified o no record of discards o foreign data unknown
• Effort Data	o varying and inconsistent collection o no standardisation in collection o little understanding of changed methods/ practices o foreign data unknown
• Socio-Economic	o negligible socio-economic data o no program in place to collect data o market opportunities for underutilised product o foreign data unknown
• Analysis	o not undertaken in a timely manner o few reliable assessments completed o rapid assessment techniques required o standardised and validated data sets o incorporation of foreign and domestic data o risk assessments of target, bycatch and byproduct
• Reporting	o lack of solid, consistent and timely outputs o large amount of unpublished data o data sharing arrangements o lag in publishing outcomes and extension o varying and inconsistent methods and standards
• Governance	o NAFM to have coordinating role o Lack of standardisation o No FRDC Shark Subprogram o Government and Industry cooperation o ESD/DEH assessment processes o lack of engagement with foreign agencies

COMPLIANCE PROGRAM (Appendix VII)

Sub Programs	Critical Issues Addressed In Sub Program Outputs
• Enforcement	○ effectiveness of existing controls ○ large area to patrol ○ enforcement capacity & new compliance method skills ○ use of new enforcement methods ○ limited foreign enforcement presence
• Self Compliance	○ codes of practice ○ Industry and Government interactions ○ observer programs ○ reporting of PET species interactions
• Extension / Communication	○ negative public perceptions ○ lack of an education program in many fisheries ○ lack of timely information distribution program
• Jurisdictional Control	○ illegal foreign fishing"s challenge to sovereignty ○ complex and inconsistent legislation ○ mutual recognition considerations ○ lack of regional coordination
• Governance	○ NAFM to have coordinating role ○ inconsistent dealings with seized product and vessels ○ no national docketing system for fin ○ lack of engagement with foreign agencies

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22. APPENDIX I: ACRONYMS USED IN REPORT

ACRONYM	DEFINITION
80M BGMF	80 Mile Beach Gillnet Managed Fishery
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AQIS	Australian Quarantine Inspection Service
AUSAID	Australian Agency for International Development
BPMF	Broome Prawn Managed Fishery
BRD	Bycatch Reduction Device
COP	Compliance Operational Plan
CPUE	Catch Per Unit Effort
CWLTH	Commonwealth
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Fisheries and Forestry
DEH	Department Of Environment And Heritage
EEZ	Exclusive Economic Zone
EPBC Act	Environment Protection Biodiversity Conservation
ESD	Ecological Sustainable Development
FAO	Food And Agriculture Organisation
FBL	Fishing Boat Licence (WA)
FRDC	Fisheries Research and Development Corporation
GoC	Gulf of Carpentaria
GoC CFA	GoC Commercial Fishermans Association
GPS	Global Positioning Satellite
GULFMAC	GoC Fishery Management Advisory Committee
IPOA	International Plan Of Action
ITQ	Individual Transferable Quota
IUCN	International Union for Conservation of Nature and Natural Resources
JA	Joint Authority
JANSF	Joint Authority Northern Shark Fishery
KGBMF	Kimberley Gillnet And Barramundi Managed Fishery
KPMF	Kimberley Prawn Managed Fishery
MOP	Management Operational Plan
MOU	Memorandum Of Understanding
MSY	Maximum Sustainable Yield
NAFMW	Northern Australian Fisheries Management Workshop
NBPMF	Nickol Bay Prawn Managed Fishery
NDS	National Docketing System
NDSFMF	Northern Demersal Scalefish Managed Fishery
NM	Nautical Mile
NORMAC	Northern Prawn Fishery MAC
NPF	Northern Prawn Fishery
NPOA	National Plan Of Action
NSIA	Northern Shark Industry Association
NT	Northern Territory
NWSTF	North West Shelf Trawl Fishery
OBPMF	Onslow Prawn Managed Fishery

OCS	Offshore Constitutional Settlement
OPSUNASR	Operational Plan for the Sustainable Use of Northern Australian Shark Resources
PET	Protected / Endangered / Threatened
PFTIMF	Pilbara Fish Trawl Interim Managed Fishery
PFTMF	Pilbara Fish Trap Managed Fishery
QBFP	Queensland Boating & Fisheries Patrol
QFJA	Queensland Fishery Joint Authority
QLD	Queensland
ROP	Research Operational Plan
SAG	Scientific Advisory Group
SPIRC	Shark Plan Implementation and Review Committee.
SFR	Statutory Fishing Rights
STBF	Southern Tuna And Billfish Fishery
SWTBF	Southern And Western Tuna And Billfish Fishery
TED	Turtle Excluding Device
UAE	United Arab Emirates
UNCLOS	United Nations Codified Law of the Sea
UNCLOS	United Nation Codified Law Of The Sea
VMS	Vessel Monitoring System
WA	Western Australia
WADNHFMAC	WA Demersal Net and Hook Fishery MAC
WANCSF	Western Australia North Coast Shark Fishery
WCDSCIMF	West Coast Deep Sea Crab Interim Managed Fishery
WDWTF	Western Deepwater Trawl Fishery
WESTUNAMAC	Western Tuna and Billfish MAC

23. APPENDIX II: SHARK SPECIES IN NORTHERN WATERS, DISTRIBUTION AND HABITAT

Common name	Species	Distribution	Major Habitat
Australian blacktip shark	*Carcharhinus tilstoni*	Broad	Inshore coastal
Australian sharpnose shark	*Rhizoprionodon taylori*	Broad	Inshore coastal
Banded catshark	*Atelomycterus* sp. A	Patchy	Shelf
Banded wobbegong	Orectolobus ornatus	Patchy	Inshore coastal
Bigeye sixgill shark	*Hexanchus nakamurai*	Patchy	Deepwater
Bigeye thresher	*Alopias superciliosus*	Patchy	Pelagic
Bignose shark	*Carcharhinus altimus*	Patchy	Shelf
Blackmouth lantern shark	*Etmopterus* sp. E	Patchy	Deepwater
Blacktip reef shark	*Carcharhinus melanopterus*	Broad	Inshore coastal
Blue shark	*Prionace glauca*	Broad	Pelagic
Bluntnose sixgill shark	*Hexanchus griseus*	Patchy	Deepwater
Bull shark	*Carcharhinus leucas*	Broad	Inshore coastal
Colcloughs shark	Brachaelurus colcloughi	Patchy	Shelf
Common blacktip shark	*Carcharhinus limbatus*	Broad	Shelf
Cookie-cutter shark	*Isistius brasiliensis*	Patchy	Pelagic
Creek whaler	*Carcharhinus fitzroyensis*	Broad	Inshore coastal
Dusky catshark	*Halaelurus* sp. A	Patchy	Deepwater
Dusky shark	*Carcharhinus obscurus*	Broad	Inshore coastal
Dwarf catshark	*Asymbolus* sp. A	Localised	Shelf
Endeaver dogfish	*Centrophorus moluccensis*	Patchy	Deepwater
Eqaulette shark	*Hemiscyllium ocellatum*	Broad	Inshore coastal
Fatspine spurdog	*Squalus* sp. D	Patchy	Deepwater
Fossil shark	*Hemigaleus elongata*	Broad	Shelf
Graceful shark	*Carcharhinus amblyrhynchoides*	Broad	Inshore coastal
Great hammerhead	*Sphyrna mokarran*	Broad	Inshore coastal
Grey carpet shark	*Chiloscyllium punctatum*	Broad	Inshore coastal
Grey gummy shark	*Mustelus* sp. A	Patchy	Deepwater
Grey nurse shark	*Carcharias taurus*	Broad	Inshore coastal
Grey reef shark	*Carcharhinus amblyrhynchos*	Broad	Inshore coastal
Grey sharpnose shark	*Rhizoprionodon oligolinx*	Localised	Inshore coastal
Gulper shark	*Centrophorus granulosus*	Patchy	Deepwater
Hardnose shark	*Carcharhinus macloti*	Broad	Inshore coastal
Lemon shark	*Negaprion acutidens*	Broad	Inshore coastal
Longnose hound shark	*Iago garricki*	Localised	Deepwater
Longsnout dogfish	*Deania qadrispinosa*	Patchy	Deepwater
Marbled catshark	*Atelomycterus macleayi*	Localised	Inshore coastal
Milk shark	*Rhizoprionodon acutus*	Broad	Inshore coastal
Nervous shark	*Carcharhinus cautus*	Broad	Inshore coastal
Northern wobbegong	*Orectolobus wardi*	Broad	Inshore coastal
Oceanic whitetip shark	*Carcharhinus longimanus*	Broad	Pelagic

Common name	***Species***	**Distribution**	**Habitat**
Pelagic thresher	*Alopias pelagicus*	Patchy	Pelagic
Pencil shark	*Hypogaleus hyugaensis*	Patchy	Shelf
Pigeye shark	*Carcharhinus amboinensis*	Broad	Inshore coastal
Pygmy lantern shark	*Etmopterus* sp. C	Patchy	Deepwater
Pygmy shark	*Euprotomicrus bispinatus*	Patchy	Pelagic
Reticulate swell shark	*Cephaloscyllium fasciatum*	Patchy	Deepwater
Sand tiger shark	*Odontaspis ferox*	Patchy	Deepwater
Sandbar shark	*Carcharhinus plumbeus*	Broad	Shelf
Sawfish	*Pristis sp.*	N/S	Inshore coastal
Sawfish freshwater	*Pristis microdon*	N/S	Inshore coastal
Scalloped hammerhead	*Sphyrna lewini*	Broad	Pelagic
Sharpnose sevengill shark	*Heptranchias perlo*	Localised	Deepwater
Shortfin mako	*Isurus oxyrinchus*	Localised	Pelagic
Sicklefin hound shark	*Hemitriakis* sp. A	Patchy	Shelf
Silky shark	*Carcharhinus falciformis*	Broad	Pelagic
Silvertip shark	*Carcharhinus albimarginatus*	Localised	Pelagic
Slender sawtail shark	*Galeus* sp. A	Patchy	Deepwater
Sliteye shark	*Loxodon macrorhinus*	Broad	Inshore coastal
Smalleye pygmy shark	*Squaliolus aliae*	Patchy	Pelagic
Speartooth shark	*Glyphis* sp. A	Patchy	Inshore coastal
Speckled carpet shark	*Hemiscyllium trispeculare*	Broad	Inshore coastal
Speckled catshark	*Halaelurus boesemani*	Patchy	Shelf
Speckled swell shark	*Cephaloscyllium* sp. E	Patchy	Deepwater
Spinner shark	*Carcharhinus brevipinna*	Broad	Inshore coastal
Spot-tail shark	*Carcharhinus sorrah*	Broad	Inshore coastal
Tasselled wobbegong	Eucrossorhinus dasypogon	Broad	Inshore coastal
Tawny shark	*Nebrius ferrugineus*	Broad	Inshore coastal
Tiger shark	*Galeocerdo cuvier*	Broad	Inshore coastal
Velvet dogfish	*Zameus squamulosus*	Localised	Deepwater
Weasel shark	*Hemigaleus micrstoma*	Broad	Shelf
Western angel shark	*Squatina* sp. B	Localised	Shelf
Western highfin spurdog	*Squalus* sp. C	Patchy	Deepwater
Western longnose spurdog	*Squalus* sp. E	Localised	Deepwater
Whale shark	*Rhincodon typus*	Broad	Pelagic
Whitecheek shark	*Carcharhinus dussumieri*	Broad	Inshore coastal
White-spotted gummy shark	*Mustelus* sp. B	Patchy	Deepwater
Whitetip reef shark	*Triaenodon obesus*	Broad	Inshore coastal
Winghead shark	*Eusphyra blochii*	Broad	Inshore coastal
Zebra horn shark	*Heterodontus zebra*	Patchy	Shelf
Zebra shark	*Stegastoma fasciatum*	Broad	Inshore coastal

24. APPENDIX III: SUMMARY OF STATE/TERRITORY/COMMONWEALTH DATA SHEETS

QUEENSLAND DATA SHEETS

Jurisdiction	Queensland								
Fishery	N9								
Gear	Net								
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	13	23	35	50	56	259	220	206	224
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	3	4	4	3	3	5	5	3	3
Total Days fished	100	180	253	256	338	507	447	368	344
Estimated effort									

Jurisdiction	Queensland								
Fishery									
Gear	Lline								
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	4	4	3	1	1	1	0	3	2
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	8	5	7	2	5	3	2	6	3
Total Days fished	53	86	37	13	40	34	16	64	41
Estimated effort									

Jurisdiction	Queensland								
Fishery									
Gear	Net								
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	450	309	263	287	301	113	125	173	195
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	60	55	52	52	40	45	50	58	54
Total Days fished	1923	1781	1614	1481	1536	964	1524	1662	2062
Estimated effort									

NORTHERN TERRITORY DATA SHEETS

Jurisdiction	Northern Territory								
Fishery	A1 Coastal Line								
Gear									
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	**5.7**	**2.7**	**3.3**	**1.4**	**1.7**	**7.6**	**5.1**	**12.0**	**8.5**
Shark - General	2.2	0.9	1.3	0.9	0.7	6.1	2.1	5.1	3.9
Black Tipped Shark	0.2	0.1					0.0		0.1
Unspecified shark	3.3	1.7	2.1	0.5	1.1	1.5	3.0	7.0	4.5
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

Jurisdiction	**Northern Territory**								
Fishery	**A2 Coastal and bait Net**								
Gear									
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	**5.9**	**9.1**	**4.2**	**2.8**	**3.4**	**6.7**	**12.4**	**10.1**	**5.4**
Shark - General	2.9	4.3	2.3	1.2	1.5	2.6	5.8	4.9	2.8
Unspecified shark	2.9	4.8	1.9	1.6	1.9	4.1	6.6	5.2	2.6
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

Jurisdiction	**Northern Territory**										
Fishery	**A5 Shark Fishery**										
Gear	**Drifting Gillnet, Longline**										
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**		**2003**	
Gear								DG	LL	DG	LL
Total retained shark catch (live weight tonnes)	**729.0**	**739.4**	**525.3**	**411.6**	**257.4**	**472.0**	**393.4**	**620.0**	**50.0**	**676.3**	**223.0**
Black Tipped Shark	230.5	256.7	188.7	105.5							
Tilstoni Shark (Blacktip)				63.3	103.7	222.1	186.2	383.1	2.8	400.0	10.2
Spot-tail Shark	1.3			25.0	35.9	73.7	85.8	76.3	2.4	80.0	9.1
Hammerhead	14.0	7.1	6.1	23.5	63.0	105.8	104.2	114.6	2.8	138.8	24.1
Tiger Shark					8.7	5.9	1.2	0.2	11.0	0.0	60.4
Sawfish	1.2	0.3	0.5	1.2	11.4	23.0	16.0	24.5	1.5	26.9	2.1
Other important species											
Grey Nurse								0.03			
Total discarded shark catch (t)											
No. of entitlements								19		19	
No. boats	19	19	14	13	10	14	17	13		13	
Total Days fished Longline	0	1	0	5	21	20	11		74		203
Total Days fished Drift net	1008	1256	1406	1033	551	978	1083	1310		1598	
Estimated effort									52840		170600

Jurisdiction	**Northern Territory**								
Fishery	**A7 Barramundi**								
Gear									
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	**22.6**	**15.6**	**23.0**	**34.8**	**1.3**	**4.8**	**3.4**	**1.9**	**4.8**
Shark - General	9.4	7.4	17.0	32.1	3.5	7.2	0.0	0.1	0.4
Black Tipped Shark	5.2	1.7	2.0	1.1	0.1	2.1	1.2	0.7	1.6
Hammerhead	2.0	0.0							
Sawfish	1.3	0.2	0.7	0.0				0.1	0.1
Java Shark		4.0							
Unspecified shark	4.7	6.2	3.2	1.6			2.1	1.0	2.8
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

Jurisdiction	**Northern Territory**								
Fishery	**Restricted bait net**								
Gear									
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	**14.6**	**15.0**	**16.0**	**22.2**	**19.3**	**15.1**	**16.1**	**15.1**	**27.2**
Unspecified shark	14.6	15.0	16.0	22.2	19.3	15.1	16.1	15.1	27.2
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

Jurisdiction	**Northern Territory**								
Fishery	**Finfish trawl**								
Gear	**Trawl**								
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch[a] (live weight tonnes)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.1**	**0.0**
Unspecified shark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

[a]Shark banned from being retained

Jurisdiction	**Northern Territory**								
Fishery	**Demersal gillnet**[a]								
Gear	**gillnet**								
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total retained shark catch (live weight tonnes)	**2.6**	**5.3**	**3.4**	**1.6**	**5.0**	**5.0**	**1.4**		
Unspecified shark	2.6	5.3	3.4	1.6	5.0	5.0	1.4		
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Estimated effort									

aShark captured by demersal gillnet banned from being retained in 2001

WESTERN AUSTRALIAN DATA SHEETS

Jurisdiction: **WA**
Fishery: **Open Access**
Gear **Trolling**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**4.1**	**9.0**	**7.5**	**1.2**	**6.8**	**9.0**	**3.7**	**1.4**	**0.1**
shark, bronze whaler			3.3			0.0	0.3		
shark, blacktip	2.3				5.6	8.1	0.7	0.6	0.0
shark, other	1.8	9.0	4.2	1.2	1.2	0.9	2.7	0.8	0.1
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: **WA**
Fishery: **Open Access**
Gear **Handline**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**12.0**	**6.7**	**12.1**	**9.2**	**2.7**	**2.7**	**2.2**	**2.1**	**4.2**
shark, blacktip	4.7	0.3	6.2	0.1	0.0	0.0		0.0	0.0
shark, bronze whaler	0.2	0.2	0.3	0.1	1.8	0.4	0.0	0.0	
shark, thickskin (sandbar)		0.1		0.1		0.0	0.0	0.5	0.0
shark, hammerhead									0.0
shark, tawny nurse					0.3				
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: **WA**
Fishery: **Open Access**
Gear **Dropline**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.0**	**0.5**	**0.3**	**0.4**	**0.1**	**0.9**	**0.7**	**0.8**	**0.3**
shark, blacktip		0.1		0.0					
shark, bronze whaler		0.1	0.1						
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: **WA**
Fishery: **Open Access**
Gear

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: WA
Fishery: Open Access
Gear Longline

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**1.1**	**0.0**	**0.2**	**0.0**	**0.4**	**0.5**	**17.2**	**44.2**	**160.5**
shark, blacktip							2.4	19.5	23.0
shark, tiger							2.4	6.3	29.7
shark, pigeye							3.2	6.0	24.0
shark, hammerhead							4.0	2.4	17.6
shark, bull (river whaler)									5.2
Other important species									
sawfish									3.7
shark, grey nurse									<0.1
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: WA
Fishery: Open Access
Gear Gillnet

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**61.7**	**76.2**	**110.3**	**66.4**	**34.1**	**19.9**	**21.9**	**25.4**	**23.1**
shark, blacktip	0.3	2.3	2.2	8.3	1.9		1.8	2.6	8.3
shark, thickskin (sandbar)	0.1	2.5	22.0						
shark, bronze whaler	4.9	17.0		1.2	0.1	0.4	0.2		
shark, hammerhead	0.1	1.1	10.3	4.8	0.1				
shark, grey nurse		8.7	5.4	0.2					
Other important species									
sawfish, narrow								1.4	3.8
sawfish, green									1.5
sawfish, dwarf									0.2
sawfish									<0.1
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort									

Jurisdiction: WA
Fishery: Exmouth Gulf Beach Seine
Gear Beach Seine

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
shark, other									
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats									
Total Days fished									
Effort (shots)	440	269	320	140	62	124	34	54	117

Jurisdiction: WA
Fishery: Exmouth Gulf Prawn Trawl
Gear Demersal trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**4.0**	**13.7**	**7.1**	**4.7**	**5.4**	**4.3**	**3.9**	**2.1**	**1.2**
shark, blacktip									
shark, other	4.0	13.7	7.1	4.7	5.4	4.3	3.9	2.1	1.2
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	16	16	16	15	15	13	13	13	13
Total Days fished	3150	3069	3266	3068	2916	2467	2469	2345	2522
Effort (shots)									

Jurisdiction: WA
Fishery: Kimberley Gillnet and Barramundi
Gear Demersal gillnet

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**3.1**	**3.2**	**3.5**	**2.5**	**2.5**	**2.6**	**4.4**	**3.2**	**4.6**
shark, wobbegong	0.2								
shark, blacktip			0.0		0.1		0.1	0.3	0.2
shark, pigeye								0.0	
shark, other	2.9	3.2	2.7	2.1	1.5	1.7	2.5	2.1	0.4
sawfish									3.7
shovelnose/fiddler rays									0.1
skates and rays, other			0.8	0.5	1.0	0.9	1.8	0.8	0.2
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	10	10	9	8	7	7	7	7	8
Total Days fished									
Effort (km gillnet hr)	5737	6990	5682	3979	2867	2428	2606	2131	3329

Jurisdiction: WA
Fishery: Kimberley Prawn
Gear Demersal Trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.7**	**0.6**
shark, other	0.2				0.0			0.7	0.6
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	12	15	10	19	15	8	14	21	24
Total Days fished	738	654	649	888	825	514	1134	1324	1171
Effort									

Jurisdiction: WA
Fishery: Nikol Bay Prawn
Gear Demersal trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**1.0**	**0.3**	**0.4**	**0.1**	**2.4**	**1.5**	**1.8**	**0.3**	**2.3**
shark, other	1.0	0.3	0.4	0.1	2.4	1.5	1.8	0.3	2.3
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	11	11	13	12	13	16	11	11	14
Total Days fished	851	638	858	486	939	1255	245	647	735
Effort									

Jurisdiction: WA
Fishery: Onslow\ Prawn
Gear Demersal trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch	(live weight tonnes)								
Total retained shark catch (live weight tonnes)	**0.1**	**0.5**	**0.4**	**0.1**	**0.3**	**0.6**	**1.0**	**0.0**	**0.0**
shark, other	0.1	0.5	0.4	0.1	0.3	0.6	1.0	0.0	0.0
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	9	9	6	7	6	6	10	12	8
Total Days fished	881	880	717	784	740	605	643	1010	783
Effort									

Jurisdiction: WA
Fishery: Pilbara trap
Gear Fish trap

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.6**	**0.0**	**0.1**	**1.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**
shark, bronze whaler									
shark, blacktip									
shark, other	0.6	0.0	0.1	1.1	0.1	0.1	0.0	0.0	0.0
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	6	5	8	4	5	4	3	2	2
Total Days fished									
Effort (pot hr)	368679	403763	449249	448673	745460	367308	442920	470400	438284

Jurisdiction: WA
Fishery: Pilbara trawl
Gear Fish trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch	(live weight tonnes)								
Total retained shark catch (live weight tonnes)	**44.6**	**59.6**	**66.4**	**69.0**	**63.2**	**52.3**	**72.5**	**68.7**	**61.9**
shark, wobbegong									
shark, thickskin (sandbar)									1.5
shark, blacktip	0.0								
shark, hammerhead									
shark, other	44.6	59.6	66.4	69.0	63.2	52.3	72.5	66.7	58.7
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	11	10	10	10	7	9	8	5	5
Total Days fished	1583	1539	1390	1295	1139	956	1162	1040	843
Effort									

Jurisdiction: WA
Fishery: Kimberley Fish trap
Gear Fish trap

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
shark, wobbegong		0.0	0.0						
shark, bronze whaler									
shark, thickskin (sandbar)									
shark, blacktip									
shark, other	0.0	0.1	0.1						
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	10	7	8						
Total Days fished									
Effort (pot hr)	629240	763520	1020520						

Jurisdiction: WA
Fishery: JANSF
Gear

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**27.9**	**59.6**	**19.5**	**36.0**		**20.0**	**95.4**	**68.2**	**9.7**
shark, blacktip	26.2	57.3	18.1	31.4		15.9	87.7	65.7	7.7
shark, hammerhead	1.2		0.2	2.7		0.1	4.7	2.2	0.8
shark, other	0.4	2.3	1.2	2.0		4.0	2.8		
sawfish									1.1
skates and rays, other							0.2	0.2	
Other important species*									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	2	2	2	2	2	2	2	2	
Total Days fished									
Effort (km gillnet hr)	2880	7540	1680	2050	0	792	18048	9408	360

Jurisdiction: WA
Fishery: JANSF
Gear Longline

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch									
(live weight tonnes)	**9.2**	**0.3**	**14.3**	**36.3**	**12.1**	**21.2**	**59.6**	**92.1**	**12.3**
shark, blacktip	9.2		9.9	25.6	8.0	16.5	52.0	81.6	3.2
shark, pigeye									4.4
shark, tiger								0.4	3.4
shark, grey reef								2.6	
shark, oceanic whitetip								2.4	
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats			2	2	1	2	2	2	1
Total Days fished									
Effort no hooks	62300	21800	30380	34650	16600	28104	68600	93180	12000

Jurisdiction: WA
Fishery: WANCSF
Gear "Dropline", longline

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch									
(live weight tonnes)	**43.3**	**15.1**	**6.8**	**250.7**	**156.5**	**187.1**	**227.2**	**395.9**	**231.7**
shark, thickskin (sandbar)	1.8	2.1	0.3	81.3	57.6	64.0	63.3	77.2	89.5
shark, tiger		2.2	1.7	34.7	15.1	23.6	29.1	55.9	22.8
shark, hammerhead		0.9		31.4	16.1	11.7	29.7	52.2	16.9
shark, blacktip	0.5		1.2	13.4	15.6	31.0	18.9	41.4	22.5
shark, lemon					2.1	4.2	23.2	60.6	21.4
Other important species									
Sawfish								0.1	
Total discarded shark catch (t)									
No. of entitlements									
No. boats	4	5	7	7	4	7	4	6	5
Total Days fished									
Effort no hooks	1346	30742	44504	82915	59346	129296	240400	310074	297500

COMMONWEALTH DATA SHEETS

Jurisdiction: Commonwealth
Fishery: Western Tuna And Billfish Fishery
Gear Longline, Minor line, Purse seine. Pole

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (Whole weight tonnes)	**10.9**	**38.4**	**28.2**	**65.1**	**92.4**	**63.1**	**95.3**	**90.2**	**61.4**
Bronze whaler	0.0	16.8	7.3	15.1	29.6	15.6	25.3	19.5	19.3
Shortfin Mako	1.2	1.8	4.8	6.2	18.1	19.7	17.9	9.5	6.3
Blue shark	0.2	4.3	0.4	7.1	10.5	12.2	10.0	21.1	5.7
Oceanic Whitetip Shark			0.0	2.6	4.8	8.1	19.2	24.7	11.8
Blacktip sharks				5.7	9.5	2.1	1.5	2.1	9.3
Tiger Shark	0.1	3.4	1.1	5.5	7.3	1.5	3.1	2.3	1.3
Other important species									
Dusky Shark						1.3	5.5	2.6	2.1
Total discarded shark catch (no. of fish)									
Blue Shark	859	569	944	302	704	1,257	2,168	3,120	2,726
Bronze Whaler	1,331	565	1,279	112	568	355	1,106	1,074	2,333
Crocodile Shark			0	1	50	142	192	1,887	3,799
Oceanic Whitetip Shark			7	8	137	202	988	895	858
Blacktip sharks			0	66	154	515	57	120	441
Scalloped Hammerhead	21	21	147	104	87	168	153	344	321
Other important species									
Grey Nurse			0		1	1	1		2
No. of entitlements									
No. boats	200	210	235	263	270	245	239	211	208
Total Days fished	7,239	8,226	10,663	13,297	15,992	17,273	18,132	17,888	16,109

Jurisdiction: Commonwealth
Fishery: Japanese Tuna Longline Fishery
Gear Longline

Year		1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch	(live weight tonnes)	72.3	41.6	144.7	0	0	0	0	0	**0**
Short finned mako shark (whole)		15.3	12.4	51.0						
Porbeagle shark (whole)		0.8	0.0	2.0						
Bronze whaler shark (whole)		19.3	6.7	38.0						
Blue shark (whole)		15.0	11.2	35.1						
Other shark (whole)		21.8	11.3	18.6						
Other important species										
Total discarded shark catch (no. of fish)										
Other shark		4,671	4	2						
Blue shark		857	62	184						
Bronze whaler shark		1,331	56	9						
Porbeagle shark		27	0	0						
Short finned mako shark			0	0						
Other important species										
No. of entitlements										
No. boats		87	55	68						
Total Days fished		5,102.0	1,899.0	2,768.0						
Note no fishing 1998–2004										

Jurisdiction Commonwealth
Fishery: Northern Prawn Fishery
Gear Trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	2.6	1.8	3.7	3.4	42.6	8.9	11.2	0.0	**0**
Other shark (Filletted)					8.4	6.9	4.2		
Other shark (Fins only kept)					33.1	0.3			
Other shark (Headed and gutted)						0.1			
Other shark (Trunked)					1.1	0.8	6.7		
Other shark (whole)	2.6	1.8	3.7	3.4	0.0	0.8	0.3	0.0	
Other important species									
Total discarded shark catch (t)									
No. of entitlements									
No. boats	128	125	127	129	130	129	121	118	114
Total Days fished	23,547	21,714	22,160	20,861	23,304	18,314	16,433	16,687	12866
Note: Retaining shark catch banned									

Jurisdiction: Commonwealth
Fishery: North West Slope Trawl Fishery
Gear Trawl

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.2**	**0.08**	**0.05**
Other important species									
Total discarded shark catch (t)									
Blacktip sharks									0.05
Dogfishes							1.2		
Ghost shark								0.08	
Elephantfish							0.02		
Other important species									
No. of entitlements									
No. boats						8	12	11	7
Total Days fished						354	588	310	316

Jurisdiction: **Commonwealth**
Fishery: **Western Deepwater Trawl Fishery**
Gear **Trawl**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total retained shark catch (live weight tonnes)	0.9	0.4	0.9	0.0	0.0	2.9	2.2	0.5	0.9
Blacktip sharks						1.4	1.1	0.3	0.5
Gummy Shark	0.3	0.1	0.0			1.0	0.7	0.2	0.2
School Shark	0.3	0.2	0.4			0.2	0.1		0.1
Bronze Whaler			0.4			0.1	0.0		
Angel sharks			0.0			0.2	0.1		
Green-Eyed Dogfish	0.1	0.0	0.0						
Other important species									
Total discarded shark catch (t)									
Shortfin Mako							0.4		
Thresher Shark							0.7		
Dogfishes							0.3		
Spurdog						0	0.1	0.2	
Angel sharks							0.1		
Other important species									
No. of entitlements									
No. boats	7	3	4	4		4	3	6	6
Total Days fished	134	105	165	49		125	323	413	353

25. APPENDIX IV: STATE/TERRITORY/COMMONWEALTH MANAGEMENT ARRANGEMENTS

N/S=information not supplied
Type* T = target, B = byproduct, N = No Take

Jurisdiction	Fishery	Type	Gear Type	Area	Vessel Length	No's Permit	Active Permit	Possession Limit	VMS	Others
QLD	N9	T	1200m net 162.5 -245 mm	7-25 nm	20m	5	3	No limit	Y	Limited entry, Observers VMS
	QFJA	T	2500 m	25 nm +		5	1	No limit	Y	Limited entry, Observers Under review
	N3 barra	B	360m creek 600m foreshore 162.5 -245 mm	0-7 nm	14	90	N/S	Limit proposed	N	Limited entry, Observers 2005 buyback
	L4/5	B	3 line 6 hook	0- 25 nm	20m	47	N/S	Nil limit proposed	N	Limited entry
	N6 n7	B	bait net	N/S	N/S	N/S	N/S	No limit	N	Limited entry
	Fish Trawl	N	Trawl	25 nm +		2	2	nil	Y	Limited entry

Jurisdiction	Fishery	Type	Gear Type	Area	Max. Vessel Length	No's Permit	Active Permit	Possession Limit	VMS	Others
NT	Shark	T	Longlines, Gillnet	3 zones HW to AFZ	25	17	13	No limit	N	Limited entry, Effort reduction, Observers
	Barramundi	B	1000m Gillnet	HW to 3 nm from LW	25	24	22	Limit	N	Limited entry
	Coastal line	B	Line and trap	HW to 15 nm	25	58	24	Limit	N	Limited entry
	Coastal net	B	300m Net 65 mm	Zoned - HW to 3 nm	25	14	2	Limit	N	Limited entry
	Demersal	N	line, trap	15 nm to AFZ	25	60	10	Nil	N	Limited entry
	Timor box	N	line, trap	Offshore Timor Sea	25	12	10	Nil	N	Limited entry
	Spanish Mackerel	N	Troll line	0-AFZ	25	19	13	Nil	N	Limited entry
	Fish Trawl	N	Trawl	Offshore Arafura	25	1	1	Nil	N	Limited entry
	Restricted bait	B	100 or 300m 65 mm mesh	HW to 3 nm	25	220	49	No limit	N	Limited entry

Jurisdiction	Fishery	Type *	Gear Type	Area	Vessel Length	No's Permit	Active Permit	Possession Limit	VMS	Others
AFMA	NPF	N	Trawl	Cape York to Londonderry	NA	97	N	nil	Y	Limited entry, Observers Reductions in place
	NWST	B	Trawl	Eastern Kimberley	NA	20 permit	6	nil	Y	Access by permit
	WDWTF	B	Trawl	Pilbara to Kimberley	NA	21 permit	6	nil	Y	Access by permit
	SWTB	B	Longline, purse seine	N of 20^{o}S, 12nm to-AFZ	NA	124 permit	N	20 sharks	Y	Limited entry, Observers Combining with STBF

Jurisdiction	Fishery	Type	Gear Type	Area	Vessel Length	No's Permit	Active Permit	Possession Limit	VMS	Others
WA	WANCSF	T	Longline, Dropline	114° 06‟ to 123° 45‟	N/S	8	8	No limit	Y	
	JASNF	T	Longline, Gillnet	East 123° 45‟	N/S	6	6	No limit	Y	
	Open Wet line	B	Line	114° E to NT	N/S	N/S	N/S	No limit	N/S	Open to FBL outside managed areas (76%) of shark
	Open Mackerel	B	Line	114° to NT	N/S	78	26	No limit	N/S	2 regions
	NDSFMF	B	Line, Trap	East of 120° E	N/S	11	5	No limit	N/S	in, offshore and research zones
	KGBMF	B	Gillnet	HW to 3nm. 19°S to 129° W	N/S	7	7	No limit	N	
	80M BGMF	B	Gillnet	East 120° to 123° 45‟	N/S	2	2	No limit	N	
	BPMF	B	Trawl	123° 45‟ to 126° 58‟	N/S	5	N/S	No limit	N	Closures, BRD
	KPMF	B	Trawl	N/S	N/S	135	30	No limit	N	
	WCDSCIMF	B	N/S	N/S	N/S	N/S	N/S	No limit	N/S	

	PFTMF	B	Trap	114° 9‟ to 120° E. 30-200m	N/S	2	2	No limit	N/S	
	PFTIMF	B	Trawl	114° 9‟ to 120° E. 50-200m	N/S	11	4	No limit	N/S	Zoned transferable effort VMS. (20%) of shark
	OBPMF	B	Trawl	Onslow to 116° 45‟	N/S	29	15	No limit	N/S	Seasonal closures. BRD to be installed
	NBPMF	B	Trawl	116° 45‟ to 120° E. to-200m	N/S	14	11	No limit	N/S	Seasonal closures. BRD to be installed

26. APPENDIX V: MANAGEMENT PROGRAM

Aim: to meet the strategic goals for the Northern Shark Fisheries through a system of consistent, clear, cooperative and inclusive management arrangements across northern Australia

SUBPROGRAM	AIM	OUTPUT	Op Plan Actions	Op Plan Priority	Comp Plan Rec#	Comp Plan Time
CATCH CONTROLS	*Catch controls are in place so that impacts from fisheries that take shark do not lead to over exploitation of target or non target species or have unsustainable trophic, or social impacts and assist in the recovery of overfished stocks*	Specific management controls are in place for all fisheries that catch shark, including where discarded	3, 6, 11, 25	1A, 2, 1A, 3	12, RA	NTS, NTS
		Appropriate fishing mortality limits identified	3	1A		
		In multi-species fisheries, the shark catch, by species, is adequately controlled	3, 4	1A, 3	12, RA	NTS, NTS
		Prohibitions on the finning of all live shark	5, 36	1A, 2	12	NTS
		Arrangements allow for rehabilitation strategy and criteria for rehabilitation	2, 13, 14	1A, 1C, 1C		
		Assessment of the appropriateness of using non fishery specific controls (such as DEH provisions) to manage shark catch				
		Methods and processes developed to control the catch taken by both legal and illegal foreign fishing			12, RA	NTS, NTS
BYCATCH CONTROLS	*Ensure that adequate controls are in place to minimise species taken as incidental catch, with emphasis on reducing all bycatch, especially PET species*	Satisfactory management arrangements developed to control incidental catch in target, byproduct and no take fisheries that interact with northern sharks	2, 3, 11, 25	1A, 1A, 1C, 3	12, RA	NTS, NTS
		Bycatch limits determined and implemented for each fishery that interacts with northern shark	3, 17	1A, 1C	12, RA	NTS, NTS
		Controls in place to reduce volumes and minimise negative impacts on discards	2, 3, 6, 17, 37, 38	1A, 1A, 2, 1C, 1A, 1A		
		Fisheries that take shark incidentally are DEH or ESD assessed as to their ecological impacts	1, 2, 31	1A, 1A, 3		
		An assessment of the implications of „nil" or restricted possession limits on the rate and volume of dumping of shark	3, 4, 25	1A, 3, 3	RA	NTS

		An assessment of the value of using economic means (such as levies or tradable rights) to address discarding and byproduct levels		2008		
		Development of protocols for „move on" provisions if catches of PET species exceeds agreed limits	2, 37, 38	1A, 1A, 1A		
		Development of a bycatch action plan for northern sharks	3	1A		
		Specific codes for the handling, releasing and reporting of *Glyphis sp*. and sawfish are developed in line with any approved recovery plans	2, 37, 38	1.A, 1A, 1A		
		Procedures are in place so that interactions with PET and bycatch species are identified and reported accurately	17, 25, 37, 38	1C, 3, 1A, 1A	11, RA	2006, NTS
		Reference points, trigger catch limits, decision rules where consistent with individual fishery arrangements	10, 13, 14, 18, 42	1B, 1C, 1C, 1C, 1C		
EFFORT CONTROLS	*Effort controls are in place so that the impacts of fisheries that take shark do not lead to over exploitation or unacceptable levels of interactions with target or non target species and assist in the recovery of overfished stocks*	Levels of effort dedicated towards shark fishing, target or incidental, in northern waters are identified and capped where appropriate	6	2		
		Permitted effort levels in northern fisheries are set to manage catch rates	6, 11	2, 1C		
		Controls to ensure that management arrangements do not encourage a shift from other fisheries or jurisdictions into northern shark fisheries, particularly in cases where catch controls are not present	6, 11, 42	2, 1C, 1B		
		Policies are developed to ensure that participation rates in target and non target fisheries do not exceed agreed sustainable levels	3	1A		
		Methods and processes to control the effort of both legal and illegal foreign fishing			12, RA	NTS, NTS
GEAR CONTROLS	*In conjunction with other management arrangements, controls are in place so that gear types used in fisheries that take shark do not lead to over exploitation of target and non target species*	Management arrangements specify acceptable gear types and methods of operation	6, 11, 42	2, 1C, 1B	12, RA	NTS, NTS
		A lost and found net reporting system	25	3		

	or detrimentally affect the environment or ecosystem in general and assist in the recovery of overfished stocks					
CLOSURES	*Spatial and temporal controls are in place to protect specified agreed important areas from those that take shark*	A process to identify the need for closures and types of closures as well as assessing their quantitative and qualitative values to link in with the NOO (National Oceans Office) Northern Marine Plan and MPAs	8, 12	1A, 1B		
		Agreed areas of critical shark or other habitat are protected by the use of range of measures, including spatial or temporal closures	2, 12	1A, 1B	12	NTS
		The benefits of using VMS to manage closures are investigated			8, 9, 12	2005, 2005, NTS
		The implications to the Australian industry and the sustainability of the resource of putting in place significant offshore closures	12	1B		
SOCIO - ECONOMIC	*Management arrangement take cognizance of social and economic impacts on those involved in, or reliant on, the fishery with a view to maximising economic returns and minimising negative social outcomes*	Consistent fin to bodyweight ratios are determined across all jurisdictions	5	1A	12	NTS
		Management arrangements encourage the full utilisation of harvested product	5	1A		
		Alternate management arrangements to the existing restricted processing, or nil possession limits, are investigated with a view to minimising economic loss	3	1A		
		Opportunities for sale of meat are maximised by vessels and processors being AQIS registered for export	29	1A		
		The value of the fleet, industry and flow on effects are built into management consideration				
		An assessment of social implications at individual and community level are investigated as part of any new arrangements and built into management consideration				
CONSULTATION	*Coordinated consultation processes*	The legislative framework in all jurisdictions enshrines the role of open and inclusive consultation				

	across all northern jurisdictions are undertaken in a consistent and complementary way involving key stakeholders	Consultative frameworks in all jurisdictions move towards a common forum	9, 42	1C, 1B		
		Policy decisions made on long term future of shark fishing takes into account economic, social as well as sustainability factors	9	1C		
		Development of a specific consultative frameworks for dealing with International jurisdictions that abut the AFZ	43	1B		
JURISDICTION CONTROL	*Jurisdictional controls are such that complementary, consistent and cooperative arrangements are in place for all northern shark fisheries*	An assessment of the impacts of multi jurisdictional access entitlements in northern shark fisheries	6, 11, 42	2, 1C, 1B		
		A review of the existing OCS arrangements to develop a system that sees complementary consistent and cooperative arrangements in place for all northern shark fishery jurisdictions	1, 6, 11, 42	1A, 2, 1C, 1B	6, 11, 12	2005, 2006, NTS
		An assessment of the implications of changing, or centralising, jurisdictional responsibilities for small or distant shark fisheries	6, 42	2, 1B		
		A method to ensure that State/Territory and Commonwealth fisheries do not negatively impact on each other, or shark stocks	6, 11, 42	2, 1C, 1B		
		A risk assessment of the implications of the amalgamation of the WTBF and STBF, especially in respect to discards of shark, unless the implications are considered to be adequately management under the WTBF Management Plan	3, 17, 25, 42	1A, 1C, 3, 42		
		Triggers are set so that when desired outcomes are reached for any qualitative, quantitative, recovery or rehabilitation programs are reached, agreed actions occur. Potentially, limit reference point and target reference points developed by fishery/species with predetermined actions if these are reached/triggered.	2, 3, 10, 13, 14, 35	1A, 1A, 1C, 1C, 1C, 2		
		A clear and documented understanding of the International treaties that Australia, East Timor, Papua New Guinea and Indonesia are signatories to and an assessment of their status in respect to current fishing activity and responsibilities	43	1B		
		Threats to Australia‟s sovereignty arising from illegal fishing activity are understood and measures are in place	43	1B	2, RA	NTS, NTS

		to protect Australia‟s sovereignty				
		An assessment of the possibility of developing a regional agreement between Australia, East Timor, Papua New Guinea and Indonesia to develop a multi jurisdictional operational plan	43	1B		
GOVERNANCE	*Governance through formal and informal arrangements and structures encourages a collaborative approach to management and the minimisation of impacts from fishing activity across agencies, non government sectors and the general public*	A review of the existing minimum vessel number reporting arrangements and an assessment of the negative impacts this may have on the open reporting of fishery activities	23	2		
		Confirmation of the status and methods available to deal with varying management regimes in each jurisdiction, including mutual recognition and transshipping	6, 42	2, 1B	12, RA	NTS, NTS
		Northern shark fishery jurisdictions identify areas of legislative commonality	6, 11, 42	2, 1C, 1B	12	NTS
		Development of process to move towards common legislative requirements for all northern shark fisheries	6, 11, 42	2, 1C, 1B	12	NTS
		Investigation of the legislative and operational constraints to the implementation of one body (NAFM) to oversee northern shark management	6, 11, 42	2, 1C, 1B		
		An assessment of the impacts of restricting shark fin as an export commodity	5, 26	1A, 1B		
		Development of a common framework that assesses the risks and benefits of proposed management arrangements including economic, social, sustainability and ecosystem outcomes	31	3		
		All fisheries that target shark are DEH or formally assessed as to their ecological impacts	1, 2, 31	1A, 1A3		
		Development of complementary and consistent, cooperative management arrangements for northern shark through a regional MOP (management operational plan)	1, 6, 11, 42	1A, 2, 1C, 1B	12	NTS
		Protocols to assess marine and other pest and disease risks taking cognizance of changing illegal foreign fishing patterns				
		A process to have streamlined, consistent and complementary ecological assessment programs in place between Commonwealth and State/Territory waters and Foreign States	1, 2	1A, 1A		

27. APPENDIX VI: RESEARCH PROGRAM

Aim: to meet the strategic goals for the Northern Shark Fisheries through a system of consistent and cooperative research programs across northern Australia which report to stakeholders in a timely manner.

SUBPROGRAM	AIM	OUTPUT	Op Plan Actions	Op Plan Priority	Comp Plan Rec#	Comp Plan Time
BIOLOGICAL DATA	*Biological data is collected in a consistent way across all jurisdictions and is of an adequate standard to assist in making informed decisions on the status of shark stocks, bycatch and PET species, ecosystem impacts and introduced pests*	Sufficient knowledge of life history parameters of shark species involved in northern shark fisheries to assist in management decisions	2, 10, 15, 22, 34	1A, 1C, 2, 1C, 3		
		A process to collect the necessary data to measure biodiversity and ecological impacts from fisheries that interact with shark, including removal of apex predator and trophic cascades	2, 10, 15, 21, 22, 25, 31, 34, 37, 38	1A, 1A, 1C, 1B, 1C, 2, 1C, 3, 3, 1A, 1A		
		The distribution of key and important shark species is understood, including identification of migration paths and areas of aggregation.	2, 10, 12, 15, 22, 34	1A, 1C, 1B, 2, 1C, 3		
		Rapid assessment of mortality parameters of key shark species	10,13, 14, 22	1C, 1C,1C, 1C		
		Identification of the boundaries ,range, stock size and biological productivity of any straddling shark stocks	2, 10, 12, 22, 34	1A, 1C, 1B, 1C, 3		
		Areas of critical shark habitat identified	2, 10, 21, 22	1A, 1C, 1B, 1C		
		Data to assist in determining if population variations are natural or impacts	34	3		
		Relevant historical foreign fishing observer and research data is incorporated into parameters and estimates	10, 15, 21	1C, 2, 1A		
		Foreign fishing impacts incorporated into any ESD based assessment on northern sharks	2, 10, 22	1A, 1C, 1C		
		Ongoing impacts of ghost fishing are monitored and methods developed to ameliorate the effects	25	3		
CATCH DATA	*Catch data is collected in a consistent manner*	Consistent logbook catch data is collected from all fisheries that take or interact with shark at a scale suitable	2, 3, 11, 15, 19, 21, 22,	1A, 1A, 1A, 1C, 2, 1A,		

	across all jurisdictions and is of an adequate level to assist in making informed decisions on the status of shark stocks, level of removals and impacts on bycatch and PET species	for assessments, including: – key species – spatial and temporal catch data – overexploited and PET species	23, 25, 37, 38, 43	1C, 1A, 1A, 3, 1A, 1A, 1B,		
		Catch data sets are standardised and validated	21, 23, 24	1A, 2, 2		
		Species identification guides based on various product forms are available for those that take or monitor shark. Use of DNA identification.	18, 37, 38	1A, 1A, 1A		
		A process to confirm species, volumes and fate of any discarded species taken as incidental catch in northern shark fisheries	2, 3, 4, 17, 25,37, 38	1A, 1A, 3, 1A, 3, 1A, 1A		
		Status of high conservation sharks species in State and Territory waters	2, 13, 14, 37	1A, 1C, 1C, 1A		
		The level of sawfish take in all fisheries and management options to minimise overall impacts	2, 3, 13, 14, 17, 37, 43	1A, 1A, 1C, 1C, 1C, 1B, 1A		
		Data on PET and bycatch species taken by non target and foreign fisheries is collected and an assessment of impacts undertaken	2, 13, 14, 17, 25	1A, 1C, 1C, 1C, 3		
		Methods to determine current legal and illegal catches of shark in northern waters by foreign fleets which may impact on Australian fisheries	15, 22, 43	2, 1C, 1B		
		Methods to determine historical foreign catch of shark in northern waters which may have impacted on Australian fisheries	15, 43	2, 1B		
EFFORT DATA	*Effort data is collected in a consistent manner across all jurisdictions and is of an adequate quality to assist in making informed decisions on the status of shark stocks and level of fishing effort*	Consistent logbook effort data is collected from all those that take or interact with shark at a scale suitable for assessments, including spatial and temporal data	11, 19, 21, 22, 23, 37, 43	1C, 1A, 1A, 1C, 2, 1A, 1B		
		Logbook effort data sets are standardised and validated	19, 21, 23, 24	1A, 1A, 1A, 2		
		Processes are in place to identify changes in fishing practices and reason for them, especially transfers between gear types, areas and jurisdictions	32	3		
		An assessment of the impacts on the resource as a consequences of increasing effort	22, 34	1C, 3		
		Methods to determine historical foreign fishing effort expended in the taking of shark in northern waters which	15, 43	2, 1B		

		may have impacted on Australian fisheries				
		Methods to determine current legal and illegal effort expended by foreign fleets in the taking of shark in northern waters which may impact on Australian shark stocks	15, 22, 43	2, 1C, 1B		
SOCIO-ECONOMIC	*Socio-economic data is collected in a consistent manner across all jurisdictions and is of adequate quality to make informed decisions on the socio-economic status of the fishery and those involved in the fishery*	Socio-economic analysis on the northern shark fishery and the impacts of any social or economic drivers				
		Socio-economic scenario models are developed to assess outcomes from any proposed management arrangements that may impact on existing shark fishing activity in northern Australian waters				
		The potential market for shark protein is investigated to find uses and markets for product not currently fully utilized, to maximise economic return to industry and minimise negative perceptions	5, 29 to be discussed with Industry	1A, 1A		
		Extent of waste in the fishery is documented and methods are developed to maximise utilisation and provided to Industry with the rate of take up assessed	5, 25, 29 to be discussed with Industry	1A, 3, 1A		
		An assessment of using economic incentives to manage foreign fishing activity in northern Australian waters				
		An assessment of the impacts on fishing activity and behaviour arising from any change in Indonesian fuel subsidies and rising fuel costs				
ANALYSIS	*Analysis and assessments are undertaken in a consistent and timely manner in all jurisdictions and are of a standard so that informed decisions on the status of shark stocks can be made*	Rapid risk assessment methodologies developed	10, 13, 14, 22, 27	1C, 1C, 1C, 1C, 1A		
		Reliable stock assessment for key species	10, 22	1C, 1C		
		Assessment of the effectiveness of using key primary shark species in multi species fisheries to assess the status of the fishery				
		Population dynamic assessments of shark stocks	10, 22, 34	1C, 1C, 3		
		Risk assessments of most vulnerable species including PET species	2, 10, 13, 14, 17 22, 35	1A, 1C, 1C, 1C, 1C, 1C, 2		

		Standardised and validated data sets from all jurisdictions available for assessments	15, 21, 23, 24	2, 1A, 2, 2		
		Available observer data is evaluated and the need for further programs evaluated	21	1A		
		The incorporation of domestic and foreign catch, effort, and socio-economic data into all analysis	22	1C		
		Rapid risk assessments of trophic impacts of shark fishery	10, 27, 31	1C, 1A, 3		
REPORTING	*The outcomes of all data collection programs and subsequent analysis are reported to Government, stakeholders and the general public in a timely manner so that informed judgments on issues arising in the shark fishery operating in northern Australia can be made*	System and processes that allows for the secure sharing of necessary data and reports between jurisdictions	15, 23, 24	2, 2, 2		
		Existing unpublished data is identified and where possible analysed and published, or made available for 3rd party analysis	23, 24	2, 2		
		Agreed timetable for the publication, or reporting, of all data collection programs and subsequent analysis to agencies, stakeholders and the general public	24, 27	2, 1A		
		Process to reduce lag time between data collection programs, analysis and reporting	22, 24	1C, 1C, 2		
		Streamlined processes to foster greater research and Industry cooperation in reporting	10, 15	1C, 2		
		A report on the impacts of the removal of apex predators from the ecosystem and trophic cascades implications prepared in line with DEH and ESD requirements	1, 31	1A, 3		
GOVERNANCE	*Governance through formal and informal arrangements and structures encourages a collaborative approach to research across agencies, non government sectors and the general public*	Data collection processes and methods are standardised across all jurisdictions	10, 11, 15, 21, 22	1C, 1C, 2, 1C, 1A		
		Investigate the use of NAFM to oversee and coordinate research priorities across borders	13, 15	1C, 2		
		The inclusion of a Shark Sub-Program into FRDC	39	1A		
		The development of complementary, consistent and cooperative research arrangements for northern shark through a ROP (Research Operational Plan)	21, 22, 39	1A, 1C, 1A		
		The development of a coordinated Observer program and protocols to maximise the value of observer data	21, 22	1A, 1C		

28. APPENDIX VII: COMPLIANCE PROGRAM

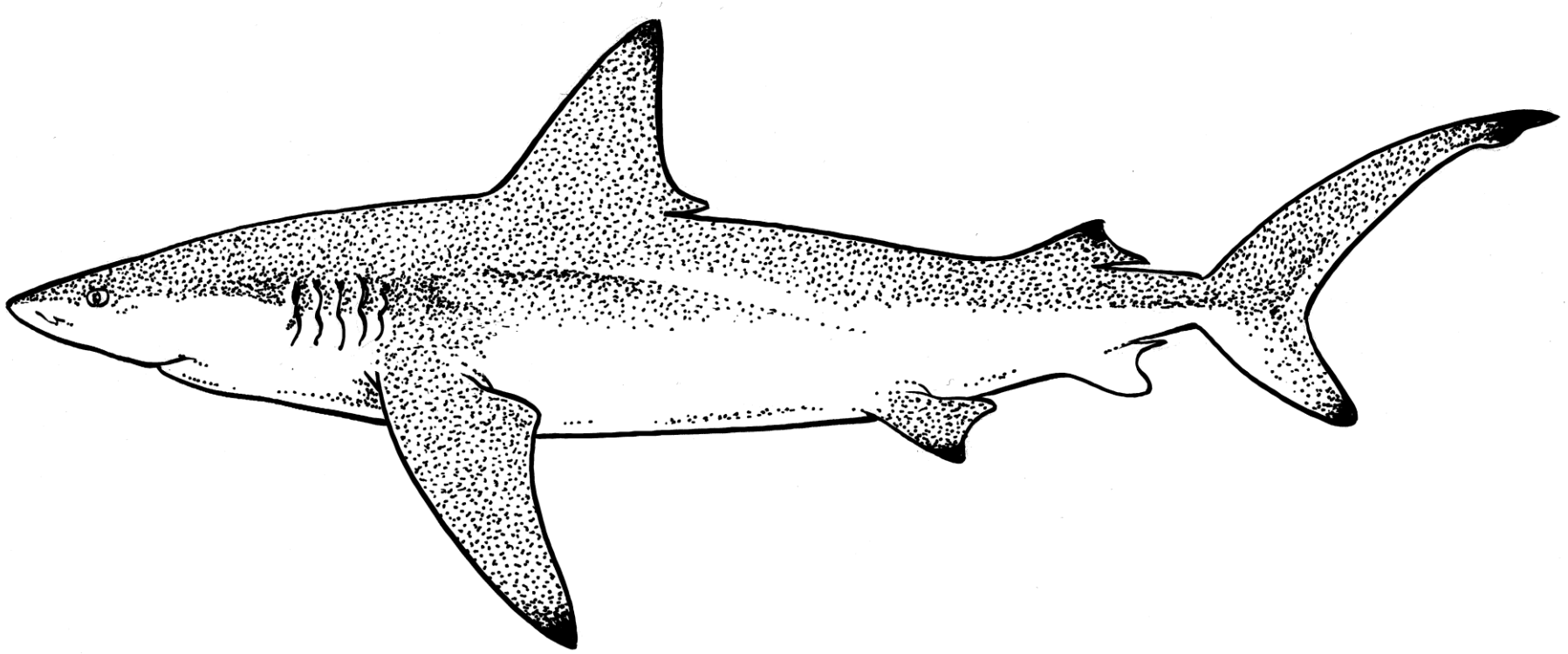
Aim: to meet the strategic goals for the Northern Shark Fisheries through a system of adequately resources consistent, and cooperative compliance programs and arrangements across northern Australia

SUBPROGRAM	AIM	OUTPUT	Op Plan Actions	Op Plan Priority	Comp Plan Rec#	Comp Plan Time
ENFORCEMENT	*Enforcement arrangements and capacity are adequate to meet management objectives in respect to compliance*	A review of enforcement arrangements to assess if existing capacity and resources can effectively and efficiently undertake the enforcement controls currently in place			7	2005
		An assessment of the impacts and compliance requirements arising from any new management controls being proposed, including nil and prescribed possession limits	3, 4, 5	1A, 3, 1A	15	NTS
		A coordinated enforcement approach across all jurisdictions in northern Australia that interact with sharks, both domestic and foreign			1, 2, 3, 5, 6, 14	NTS, 2005, 2005, 2005, 2005, 2005
		An assessment of innovative methods, including the use of VMS, to undertake compliance activities in remote location and DNA testing on product	18	1A	8, 11	2005, 2006
		The effectiveness of using administrative seizures as a deterrent to illegal foreign fishing			15	NTS
		A coordinated approach and information sharing arrangements between agencies responsible for border security, illegal fishing, quarantine and pest incursions			1, 2, 8	NTS, NTS, 2005
		A risk assessment on the impacts of changing foreign fishing patterns and the more regular incursions into near coast Australian waters			15	NTS
		A compliance plan to deal with increasing illegal foreign fishing activity in northern Australia			15	NTS
		Negotiations with Indonesia, East Timor and Papua New Guinea to assess the process necessary to develop a coordinated regional fishery compliance plan for waters				

		adjacent to the AFZ				
SELF COMPLIANCE	*Opportunities for Industry self compliance, where they meet compliance objective, are utilised*	An Industry code of practice for northern shark fisheries	36	2		
		Industry and Government develop means or measures to ensure compliance with the code of practice	36	2		
		Industry, Government and other stakeholders develop processes to engage in discussion to resolve issues of common concern in a timely manner				
		A coordinated, comprehensive and adequately resourced observer program to collect a range of data, including interactions with PET species and the fate of any discarded species	2, 17, 21, 22, 25	1A, 1C, 1A, 1C, 3	11, 12, 15	2006, NTS, NTS
		A process to ensure all protected species interactions are reported by Industry and observers in all jurisdictions to DEH	2, 21, 25, 37, 38	1A, 1A, 3, 1A, 1A	12, 15	NTS, NTS
EXTENSION / COMMUNICATION	*A program is in place to ensure that key information on the status of the fishery and impacts on the shark resource and other key species is available for Industry, Government, key stakeholders and the general public in a timely manner*	An assessment of the issues of public concerns regarding the shark fishery			10, 11	2006, 2006
		A communication program to inform stakeholders and the general public on the status of the northern shark fishery, reports of inappropriate activity and to respond to negative public perceptions	37	1A	10, 11	2006, 2006
		Procedures and extensions services in place to ensure that PET or unwanted species are released alive if possible	2, 17	1A, 1C	10, 11	2006, 2006
		Identification and extension to industry of technical and operational adjustments that can minimise or eliminate bycatch	2, 17	1A, 1C	10, 11	2006, 2006
		A process that ensures that information obtained from observer reports, research and other key findings are made available to Industry, Government, key stakeholders and the general public in a timely manner	21, 22	1A, 1C	10, 11	2006, 2006
JURISDICTION	*Jurisdictional controls are developed in such a way that complementary, consistent and cooperative compliance*	A review of the existing complex multi-jurisdictional legislation that affects shark fishing in northern Australia, highlighting compliance similarities and variances			12, 14	NTS, NTS
		An assessment of the value of amending legislation to develop a system that sees complementary, consistent and cooperative compliance programs in place for all			12, 14	NTS, NTS

	arrangements are in place for all northern shark fisheries	northern shark fisheries				
		Inconsistencies in the legislation and compliance practices are identified and how compliance officers will administer these variances under mutual recognition			12, 14	NTS, NTS
		Regional compliance is coordinated across borders under an agreed plan that seeks to utilise all available resources to meet compliance and legislative objectives			1, 2, 3, 4, 12	2005, 2005, 2005, 2005, NTS
		The development of regional compliance arrangement between Australia, East Timor, Papua New Guineas and Indonesia to improve enforcement of illegal fishing activity				
		Challenges to Australia‟s sovereignty arising from illegal fishing activity by East Timor, Papua New Guineas, Indonesia or other foreign states are addressed			15	NTS
GOVERNANCE	*Governance through formal and informal arrangements and structures encourages a collaborative approach to compliance across agencies, non government sectors and the general public*	Development of complementary, consistent, cooperative compliance arrangements for northern shark through a COP (Compliance Operational Plan)	42	1B	1, 3, 4, 5, 6, 7, 12	2005, 2005, 2005, 2005, 2005, 2005, NTS
		An investigation into the legislative and operational constraints to the formation of a single body to oversee northern shark compliance			1, 3, 4, 5, 6, 7	2005, 2005, 2005, 2005, 2005, 2005
		A compliance risk assessment			15	NTS
		A consistent methods to deal with seized product				
		Shark fin included on the National Docketing System	5	1A	12	NTS
		A process that investigates and reports on anecdotal information of negative interactions in the fishery				
		System and processes that allows for the secure sharing of necessary data and reports between jurisdictions	23	2	6, 8, 13	2005, 2005, 2006
		Northern Fisheries Compliance Group and Operational Command Group formed			3, 4, 5	2005, 2005, 2005
		Service level compliance agreements between jurisdictions			1, 2	2005, 2005

29. APPENDIX VIII: OPERATIONAL PLAN FOR THE SUSTAINABLE USE OF NORTHERN AUSTRALIAN SHARK RESOURCES



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INTRODUCTION

There is worldwide 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.

The low productivity of shark stocks dictates that a precautionary approach to this group of fishes must be taken. As a consequence, the Food and Agriculture Organisation of the United Nations have developed an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks).

The IPOA-Sharks suggests that member countries should develop voluntarily, a National Plan of Action for Sharks (NPOA-Sharks) if their vessels conduct target fisheries for shark or their vessels regularly catch sharks in non-target fisheries.

Accordingly, a NPOA-Sharks has been developed for Australia to ensure that special conservation and management needs of sharks are not overlooked in managing the impacts of all resource users on the marine environment.

The NPOA-Sharks provides nationally endorsed advice and guidance as to how the conservation and management of sharks can be integrated into management arrangements for target and non-target fisheries by the jurisdictions responsible for those fisheries.

The Operational Plan for the Sustainable Use of Northern Australian Shark Resources (the Operational Plan) has been developed by Commonwealth, Northern Territory, Western Australia and Queensland in response to the NPOA-Sharks.

The aim of the Operational Plan is to ensure that management arrangements for target and non-target fisheries in northern Australia are integrated on a local regional and State levels

The Operational Plan presents the Actions and Priorities of the NPOA-Sharks and provides Responses to these Actions from a northern Australian perspective. The priority assigned to each Action is the same in each plan, as is the interpretation of the Priorities.

Like the NPOA-Sharks, the Operational Plan is a living document and subject to regular review. The Responses outlined in the Operational Plan are subject to funding.

Operational Plan for the Sustainable Use of Northern Australian Shark Resources

	Action	Priority	Responsible/ Interested Agency1	Response	Link to NPOA
THEME 1 REVIEW EXISTING CONSERVATION AND MANAGEMENT MEASURES					
1.	Assess current management arrangements for sharks against the objectives of this Plan and the issues that this Plan seeks to address; in particular, assess whether these arrangements are consistent with ecological sustainability of sharks and a precautionary approach, and are enforceable; and Address any deficiencies within 12 months of that assessment. **(Issue 7)**	1A	**All fisheries agencies** DEH State/NT conservation agencies	A single operational plan to be formulated for northern Australian shark fisheries for Western Australia. Northern Territory, Queensland and the Commonwealth. Assessment of shark fisheries to be undertaken in preparing submissions seeking export certification under the EPBC Act. Any deficiencies, and appropriate timelines, to be identified in the ecological assessment under the EPBC ACT	1,4 1 1,3
2.	Assess current management arrangements for listed threatened shark species against the requirements of recovery plans for those species; and Address any deficiencies within 12 months of that assessment. **(Issue 7)**	1A	**All fisheries agencies** DEH State/NT conservation agencies	Assist in the development of recovery plans, as required under the EPBC for critically endangered species via DEH National Shark Working Group. Consider management need of Glyphis spp. and sawfish through the DEH Shark Working Group. Promote biological investigation of life cycle characteristics and habitat requirements for these species.	1,2,3,5 1,3 3
3.	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; and • address any deficiencies identified in these assessments; Encourage the adoption of effective shark bycatch reduction measures. **(Issues 7, 14)**	1A	**All fisheries agencies** Commercial fishers Recreational fishers	Implement appropriate bycatch/byproduct limits for all commercial and recreational fisheries. Encourage investigation and adoption of alternative harvest methods to reduce shark bycatch in non-target fisheries. Review the appropriateness of shark bycatch/byproduct measures by December 2006 Develop a single bycatch action plan for northern Australian shark fisheries by December 2006	1,2,3,4 1,3,5 1,2,3 1,2,4,5

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

THEME 1 CONT.

	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
4.	Initiate an assessment of the impact of current shark bycatch reduction measures in order to detect any unintentional increases in bycatch of any species, particularly threatened species; and Assess the impact of bycatch reduction measures for other species on shark bycatch. **(Issue 15)**	3	**All fisheries agencies** Commercial fishers	Review the impact of current shark bycatch limits by December 2006	1,2,3,4
5.	Assess whether finning bans, requiring fins to be landed either attached to or accompanied by trunks, are being implemented effectively and are achieving their objectives; and Identify any deficiencies and address these. **(Issues 1,7, 10)**	1A	**AFMA** All relevant fisheries agencies Commercial fishers	Assess effectiveness of current finning legislation in terms of compliance and trends to processing target species, byproduct and bycatch subsequent to the introduction of such legislation. Undertake annual reviews for shark finning legislation.	1,2,4,5 1,2,4,5
6.	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 deficiencies. **(Issue 7)**	2	**DAFF** All fisheries agencies Commercial fishers	Review of OCS arrangements for northern Australia to commence in April 2004. Assess management of target shark species and bycatch species. ACIAR project for shark fisheries of Indonesia (potential for internationally shared stocks)	1,4,5 1,3 1,3,4,7
7.	Initiate an assessment of the ecological impacts of shark control programs for bather protection (including drum lines and nets) and review the need for these programs weighing up the ecological impacts against the level of risk to bathers. **(Issue 14)**	2	Fisheries &relevant agencies in Qld/NSW Conservation groups	Not applicable to northern Australia/Gulf of Carpentaria	
8.	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 Charter fishers Game fishers	Review of key recreational controls (possession limits) Investigate the use of closures as an alternative/additional measure of controlling the recreational, charter and game fishing take of shark species.	1,3,4,5 1,3,4,5
9.	Assess the impact of existing management measures for sharks on Indigenous fishing.	1C	**All fisheries agencies** Indigenous fishers	Consider the findings of the National Recreational and Indigenous fishing survey to identify the level of shark catch as a	1,3,4,5

	(Issue 11)			prerequisite to assess the impact of existing management measures on indigenous subsistence. Create improved opportunities for indigenous involvement in fisheries management planning processes, viz. Fisheries (GoC Inshore Finfish) Management Plan 1999 (Qld), NT review of aboriginal consultative arrangements, WA consultative process established under the Aboriginal Fishing Strategy.	1,4,5

THEME 2: IMPROVE MANAGEMENT AND CONSERVATION MEASURES					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
10.	Ensure that management arrangements for target shark species include precautionary management triggers and pre-determined management processes, including timeframes, should these triggers be reached. **(Issue 7)**	1C	**All fisheries agencies**	Northern Shark Research Program to apply rapid risk assessment process for shark species. Encourage focused research that will provide necessary biological information that can be used to review the status of target shark species. Each jurisdiction to develop management triggers, responses and prescribed response time.	1,3 1,3 1-5
11.	Ensure that, where a species is taken in two or more fisheries within a jurisdiction or in two or more jurisdictions: (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 multi-jurisdictional 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 and consistent with an ESD approach. **(Issues 5, 7)**	1C	**All fisheries agencies** Commercial fishers	*Standardised catch and effort logbook to be implemented for dedicated shark fisheries throughout northern Australia by July 2006.* Commence a review MOU and Joint Statements to ensure continuation of complementary management of shared stocks. Review to be undertaken in association with OCS. *Continuation of complementary management of sharks, including the linking of fishery licences for the GoC.* NAFM to canvass complementary management of shark fisheries	1,2,3,5, 6. 1,6,7 1,4,5 1,3,5,6
12.	*(a) Initiate action to identify habitat critical to the survival of shark species and where identified as necessary take action to*	1B	**DEH** **All fisheries agencies** State/NT conservation	Review Northern Australian Shark Research project findings as available.	1-3,5,6 1,6,7

	protect, and minimise threats, to these habitats; and (b) Within the relevant statutory timeframes protect, and minimise threats to, habitats critical to the survival of species listed under Commonwealth/State/NT legislation. MACs to identify research priorities, including identification of habitat critical to the survival of shark species. **(Issue 16, 18)**		agencies Conservation NGOs Commercial fishers Indigenous fishers Recreational fishers Game fishers Divers	Develop international MOU if critical life cycle habitat for a particular species is found to be beyond Australian waters. Promote research to identify critical habitats Investigate use of spatial closures to protect identified critical habitats.	1,3,6 3

THEME 2: CONT.					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
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** DEH State/NT conservation agencies Commercial fishers Conservation NGOs Scientific agencies	Northern Australian shark project seeks to assess methodologies for the rapid assessment of the status of sharks and rays. Rehabilitation strategies for any identified species of concern will be 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. Develop criteria (with industry) that can be used to establish the need for rehabilitation. Ensure management arrangements allow for the implementation of rehabilitation strategies. Encourage complementary research to improve the quality of risk *assessments* and assessments of resource status.	1,3,5 1-3,5,6 1,5,6 1,3,5,6
14.	Within 12 months of a risk assessment finding of "high risk" for a shark species initiate management and research (monitoring) actions to minimise risk including the introduction of precautionary management triggers and pre-determined managed processes, including timeframes, should these triggers be reached. **(Issue 6)**	1C	**All fisheries agencies** **DEH** Commercial fishers Indigenous fishers Recreational fishers Game fishers Scientific agencies	Northern Australian shark project seeks to assess methodologies for the rapid assessment of the status of sharks and rays. Rehabilitation strategies for any identified e species of concern will be 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. Evaluate management strategies and information requirements to minimize risk. Encourage complementary research to improve the quality of risk assessments and precautionary management triggers.	1,3,5,6 1,3,6 1,3,6
15.	Identify areas of uncertainty in current stock assessments for target shark species in target shark fisheries and ensure that research efforts for these species are focused on reducing this uncertainty, or where stock assessments do not exist, give priority to undertaking them.	2	**All relevant fisheries agencies**	The Northern Australian sharks and rays: the sustainability of target and by-catch fisheries seeks to identify and address areas of uncertainty in current stock assessment. Evaluate management strategies and information requirements to	1,3,6

	(Issue 5)			reduce uncertainty. Develop research priorities for Nth Australian fisheries through the NAFM Workshop.	1,3,5 1-5,7
16.	Implement processes to ensure that the scientific research potential of sharks caught in shark control programs is maximised. **(Issue 7)**		**NSW and Qld fisheries agencies Scientific agencies**	Not applicable to Northern Australia/Gulf of Carpentaria.	Na
17.	Initiate action to 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": (a) in fisheries taking species currently identified by risk assessments or other processes as being at "high risk" methods should be introduced by 2003; and (b) 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 funders Commercial fishers	Identify level of bycatch/byproduct under the Nth Australian Shark and Rays Research Project- Phase II.	1,3
18.	Investigate the potential for DNA identification kits for use in identifying shark species. **(Issue 1)**	1A	**DEH** AQIS/Customs All fisheries agencies Scientific agencies	Endorse DEH and Customs developing DNA identification for shark s and shark products (import, domestic and export).	1-7

THEME 3: IMPROVE DATA COLLECTION AND HANDLING					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
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 D of this Plan. **(Issue 2**)	1A	**DAFF** All fisheries agencies ASIC	Standardise logbooks for collection of commercial shark catch and effort information for data capability for management, research and compliance purposes.	1-4,7
20.	Assess the findings (with respect to sharks) of the 2000 National Recreational and Indigenous Fishing Survey (to: • identify gaps in existing monitoring and data collection programs for recreational, charter and Indigenous fishing; • determine the nature (focus) 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; and • where necessary introduce appropriate and effective supplementary or alternative data collection mechanisms to ensure adequate information on recreational, charter and Indigenous fishing is collected for management purposes **(Issues 2, 8, 11)**	2	**DAFF** State/NT fisheries agencies Indigenous fishers Recreational fishers Game fishers	Review findings of the National Recreational Fishing Survey. Future surveys of recreational fishers to be determined on a national/jurisdictional basis, rather than specifically for sharks. Ensure that requirements at State/Territory level are met by either the NRFS or by research within jurisdictions.	1,4 1,4 1,3,4
21.	Ensure that where possible processes for the validation of shark catch data from commercial fisheries and charter operations, using observer, monitoring, fishery-independent research programs or other appropriate methods have been initiated.	1A	**All fisheries agencies** Commercial fishers Indigenous fishers Recreational fishers Game fishers Shark control programs	Northern Australian Shark Research Project (Phase 1) identified catch species composition and utility of on-board observers as a data collection/validation tool. Northern Australian Shark and Research Project (Phase II) validated shark catch and shark bycatch data. Establish and fund long term monitoring programs for northern	1,3 1,3

	(Issue 2)			sharks.	1,3,5
22.	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)**	1C	**All fisheries agencies**	Northern Australia Shark Research Project to produce and provide rapid risk assessments for sharks. Review risk assessment as new life history and fishery information becomes available.	3 1,4,5,7
23.	Develop protocols whereby data can be shared between relevant agencies, yet remain secure through appropriate confidentiality agreements that protect commercially sensitive information and intellectual property rights. **(Issue 2)**	2	**All fisheries agencies** DAFF Commercial fishers Indigenous fishers	Protocols (Joint Statements) to be developed for Northern Australia	4-6

THEME 3: CONT.					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
24.	Ensure data are well managed in databases 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 summarisation. **(Issue 2)**	2	**All fisheries agencies**	Internal validations developed for Northern Australia shark fisheries given standardised reporting of catch and effort. Seek funds to develop a central database on sharks for efficient data storage, extraction, exchange and summarization, and seek external funds (eg FRDC) to develop human capital for ongoing management of the database resource. Seek agreed protocols for summarising catch and effort	1,3,4,5 1,3 1,3,4,6
25.	Ensure, where feasible, that appropriate data is collected on quantifiable aspects of cryptic fishing mortality as an input to stock assessments and risk assessments; and Evaluate the sub-lethal effects of game fishing, the scientific benefits of targeted/permitted tag and release activities and, where possible, the extent of cryptic fishing mortality arising from recreational and game fishing. ***(Issue 2, 9)***	3	**All fisheries agencies** CSIRO DEH State/NT conservation agencies Rec./game fishers Research funders	Incidence of incidental mortality to be included in commercial fishery observer data collection programmes (eg., net fall-out and companion baiting) Conduct an assessment to identify if incidental fishing mortality is an issue in recreational, charter and/or game fishing.	1,3,7 1,3
26.	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 Identify deficiencies and address these.	1B	**DAFF** Conservation NGOs AQIS/Customs Australian Bureau of Statistics	Consider outcomes of DAFF"s review, particularly any deficiencies identified	2,5-7

	(Issue 3)		Importers/Exporters Commercial fishers		

THEME 4: TARGETED RESEARCH AND DEVELOPMENT					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
27.	Evaluate the methodologies for risk assessment and adopt a single national risk assessment framework (see Appendix E), 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 funders DEH State/NT conservation agencies	Northern Australian Sharks and Rays Project – Phase 2 – using currently available methodologies for rapid risk assessment.	3,5
28	Based on the methodology developed under Action 27 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 funders EA State/NT conservation agencies	Relies on initiative 27 Undertake risk assessment once methodology has been developed, recognising that assessment methodologies are dynamic and will be improved with better data.	1,3
29.	Initiate an assessment of opportunities for increasing utilisation/value adding of shark products from currently harvested species and encourage commercial fisheries to evaluate these opportunities subject to the long-term ecologically sustainable harvest of shark species. **(Issue 3)**	1A	**Commercial fishers** Seafood Services Australia ASIC Scientific agencies Research funders All fisheries agencies	Commercial industry to consider.	1,3
30.	Initiate research to determine the impact on the biology and behaviour of sharks of electromagnetic fields including personal shark protection devices. **(Issue 18)**	2	**DEH** DISR All fisheries agencies Research funders Tourism operators	Promote research into such devices.	1,3
31.	Initiate an evaluation of the methodology, and where possible apply the methodology, to assess the impact of shark management and conservation measures on ecosystem structure and function. **(Issue 15)**	3	**DAFF** **DEH** All fisheries agencies Research funders GBRMPA	Desktop study of ecosystem assessments to be undertaken using agreed methodology.	1,3
32.	Produce an information paper on Indigenous shark fishing highlighting the traditional, cultural and spiritual	1A	**DAFF** **ATSIC** Indigenous	DAFF to coordinate the preparation of the information paper.	1,3,5

	significance of sharks to Indigenous people so as to better accommodate these issues in the development of management arrangements. **(Issue 11)**		fishers/researchers Research funders All fisheries agencies	Ensure information paper includes indigenous knowledge of shark species and possible declines in abundance of at risk species (eg. Sawfish). Jurisdictions to contribute information as appropriate.	
33.	Identify gaps in knowledge about Indigenous shark fishing and, where the need is identified, develop research proposals to address these gaps. **(Issue 11)**	1C	**All fisheries agencies** **ATSIC** Indigenous fishers Scientific agencies Research funders	Review findings of the National Recreational and Indigenous Fishing Survey Identify information needs on indigenous shark fishing	1,3

THEME 4: CONT.

	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
34.	Aim to initiate development of appropriate methods for modeling the population dynamics of chondrichthyans in the ecosystem and develop a basis for distinguishing between natural variation and trends (impacts) in the system so as to assist in understanding population status, rates of recovery, population structure and distribution. **(Issue 5, 6 15)**	3	**All fisheries agencies** DEH Scientific agencies Research funders	Evaluate findings of the Northern Australian Shark and Ray Research Project –Phase II and other recent international research. Review monitoring/assessment procedures for data poor fisheries that are appropriate for tropical shark.	1,3
35.	*Develop a quantitative framework to assess the recovery of listed threatened species.* **(Issue 13)**	2	**DEH** Scientific agencies Research funders All fisheries agencies State/NT conservation agencies	To be developed in association with the formulation of recovery plans for any listed threatened species.	1,2,5
36.	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. This review could include: (a) the chase of the shark common in game fishing; (b) the issue of finning of live sharks; (c) the issue of towing live sharks back to shore; and (d) the keeping of live shark in aquaria either for display or for restaurant use. **(Issue 10)**	2	**DEH** **HSI** Scientific agencies Commercial fishers Recreational fishers Game fishers Australian Seafood Services	Review of shark handling practices, where appropriate, to be undertaken within agreed timeframes. Industry to develop Codes of Conduct.	1,2,5

THEME 5: UNDERTAKE EDUCATION AND AWARENESS RAISING					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
37.	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, current threats and status, the cumulative impact of shark bycatch, the need to return sharks to the sea and to maximise their chances of survival and of safe swimming and safe diving guidelines; (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 based on the outcomes of relevant research as they become available; (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; and (f) Encourage recreational, game fishing and tourist sectors to address specific issues relevant to those sectors. **(Issues 1, 8,9)**	1A	**DAFF** **DEH** **All fisheries agencies** Conservation groups Commercial fishers Indigenous fishers Indigenous researchers Recreational fishers Game fishers GBRMPA Tourism operators, eg cage divers, scuba operators	Undertake audit of existing education strategies with a view to : (a) Identify existing education strategies and evaluation of its intended outcomes (objectives) and success (effectiveness) – in association with initiative 38. (b) Include in instructions to fishers (logbooks, industry newsletters) (c) consider on receipt of catch and effort information from National Recreational and Indigenous fishing survey (d) see (b) above (e) annual fishermen"s workshop and identification guide (f) Address, where applicable. Ensure wide dissemination of Final Report for FRDC Sharks 2 project plus other publications that the project generates. Investigate the development of a national website for information dissemination for sharks.	1,5,6
38.	(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;	1A	**All fisheries agencies** Scientific agencies Commercial fishers Indigenous fishers Recreational fishers Game fishers	(a) See initiative 37 (b) Implemented, where appropriate (c) Complementary approach implemented for northern Australia (d) See initiative 37 (e) Refer initiative 37	1,3,6,7

	(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; and (e) Develop measures to monitor the effectiveness of the guides. **(Issue 1)**			Ensure supply of suitable guides as required.	

THEME 6: IMPROVE COORDINATION AND CONSULTATION					
	Action	Priority	Responsible/ Interested Agency	Response	Link to NPOA
39.	Within 6 months of this plan being adopted: (a) establish a national 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 that responds to the research needs identified in the NPOA. **(Issue 4)**	1A	**DAFF** **FRDC** **Scientific agencies** **Indigenous researchers** All fisheries agencies Commercial fishers Indigenous fishers Recreational fishers Game fishers	Encourage and contribute (in kind) to DAFF submission seeking the establishment of an FRDC subprogram.	3,6
40.	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	Review findings of the National Recreational and Indigenous fishing survey to identify level and regions of take. Consider whether existing consultative arrangements are appropriate given these results.	1,6
41.	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	See initiative 40.	1,3
42.	Actively promote the implementation of the IPOA-Sharks and improved regional management of shark stocks, particularly shared 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)**	1B	**DAFF** **AFMA** **DEH** Conservation NGOs	Encourage cooperative management of northern Australian shark stocks achieved through MOU and Joint Statements agreed between Western Australia, Northern Territory, Queensland and the Commonwealth.	1-7
43.	Initiate discussions with countries in the region eg. Indonesia, Papua New Guinea, East Timor, New Zealand, in relation to complementary and collaborative	1B	**DAFF** DEH AFMA	Encourage and contribute (in kind) to DAFF & ACIAR initiatives for shared stocks of sharks throughout northern Australia and eastern Indonesia to:	1,3,7

	management of straddling shark stocks. These discussions should include: the identification and implementation of collaborative measures to enhance the capacity of these countries to collect, analyse and share data on straddling shark stocks and to encourage and assist with the development of national plans of action. **(Issue 7)**			Identify species and landings (current ACIAR shark project). DAFF to approach relevant international jurisdictions (East Timor, Indonesia) to develop a central straddling shark stocks database for the efficient data storage, extraction, exchange and summarization, and seek external funds (eg ACIAR) to develop human capital for ongoing management of the database resource.	
44	Each jurisdiction to report annually on the implementation of the operational plan.	1A	**All fisheries agencies**	Tabulated report to be produced by the NAFC Secretariat for NAFM consideration and subsequent referral to NAFC.	6

30. APPENDIX IX: FINAL REPORT OF THE NORTHERN AUSTRALIAN FISHERIES COMPLIANCE WORKING GROUP

Final Report of the Northern Australian Fisheries Compliance Working Group

NORTHERN AUSTRALIAN SHARK

STRATEGIC AND OPERATIONAL COMPLIANCE PLAN

2005 - 2010

Commonwealth (AFMA)
Northern Territory (NTPOL M&FS / DBIRD FD)
Queensland (DPI&F)
Western Australia (DOF)

Compiled by Paul Fitzpatrick DOF/WA

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30.2. PART 1 BACKGROUND, ROLE OF COMPLIANCE AND OVERVIEW OF THE NORTHERN SHARK FISHERY

1.1 Background

At the Northern Australian Fisheries Management Forum (NAFM), in September 2004, the Chief Executives of the Commonwealth, Northern Territory, Queensland and Western Australia fisheries agencies (jurisdictions) formed the Northern Australian Fisheries Committee (NAFC), to adopt a coordinated response to Northern fisheries issues. Due to current pressures on stocks and fishing practices, Shark was adopted as a priority fishery.

As an outcome of the Compliance Workshop component of NAFM, the NAFC requested that

> 'a compliance risk assessment workshop for northern shark be conducted in Darwin by the end of November 2004. The workshop was to include an analysis of jurisdictional powers, the application of VMS and the development of a compliance delivery plan".

In late November 2004 senior compliance professionals from the NAFM agencies (Appendix 1) met in Darwin to examine jurisdictional powers, assess the implementation of VMS, undertake a risk assessment and produce a strategic and operational compliance plan for Northern Australia, with a particular focus on shark. The group surpassed expectations and were a credit to their home agencies in their willingness to form a strong unified 'team' approach in the northern sector.

The Northern Australian Fisheries Compliance Working Group (CWG) undertook a risk analysis based approach to identify gaps and agency exposure and provide solutions through a series of recommendations. The risk-based approach identified and prioritised all the risks within the fishery and has application for other northern fisheries crossing jurisdictional boundaries. Risk was assessed in terms of offence opportunity, sustainable practice, humane practice, gap analysis, political and community perception. Recommendations have then been progressively developed over a six- month period to provide NAFC with a framework for decision-making and resource allocation. This work has not been previously undertaken to provide this type of framework.

The CWG focused on solutions that would provide a model for shark and other northern fisheries. This approach would then have a practical application in the first two-year operational plan that would utilise existing resources and assets in a cost effective and coordinated approach. Due to the change environment across agencies, ongoing discussion and review has occurred to ensure outcomes are relevant to revised strategic directions.

The context of the paper is consistent with the NAFM's agreed priority, the National Plan of Action for Sharks, the National Fisheries Compliance Committee strategy to address shark and the NAFC consultant report "Northern Australian Fishery Management Strategy" (Fishwell Consulting), being concurrently developed.

In the view of the CWG the currently available compliance data did not accurately reflect potential non-compliance and may in part reflect issues related to remoteness, priority, resource allocation, at-sea capacity, management constraints and the capacity to monitor and investigate remote fishing and porting across jurisdictions.

In summary the Compliance Plan will addresses strategic and operational issues to provide a framework for the five-year period from July 2005 to June 2010. The case for cooperative models and incremental standardisation of management applied to the compliance management of shark fisheries will be transportable across a range of fisheries. The five-year Compliance Plan will provide a framework for continuous review, which can be adapted to respond to change.

On this basis Part 1 details the strategic and contextual background to a cooperative joint approach to fisheries compliance in the north of Australia. Part 2 provides the assessed compliance risks and framework for planning and executing joint operations. Part 3 provides the first two-year operational plan to commence operations and will be dependent on financial allocation to achieve goals.

1.2 Importance of the Role of Fisheries Compliance Management

The integral value of compliance (and enforcement) programs in the management of fisheries and the maintenance of sustainable fish stocks, cannot be understated. The capacity to implement the outcomes of research findings and management requirements relies on professional regulatory compliance.

The key factors contributing to successful compliance are:

- Risk based approach
- Education
- Proactive deterrence
- Surveillance
- Response
- Investigation & Prosecution
- Analysis and reporting

Compliance is undertaken by uniformed officers who provide inspection, audit, surveillance, industry and community access to services, education, licensing, marine safety, investigation and prosecution functions. In undertaking this broad range of compliance actions they ensure regulatory management objectives are accepted, upheld and maintained. Officers undertake these actions in direct interface with the industry and community, providing both a land and sea based presence. This presence enables catch, effort, processing and consignment standards and targets are met.

Where a robust compliance program is not maintained sustainability risks increase exponentially through unregulated fishing. The reality of stock collapses witnessed across the world is a result of unregulated fishing or where there is no capacity or will to enforce outcomes. The collapse of fish stocks has devastating social, environmental and political impacts. At it's most extreme, this competition for food resources has seen Naval confrontation in a dangerous game of brinkmanship between nations. It is proposed that effective deterrence as the cornerstone of any sustainable natural resource management decision-making must focus on preserving live fish stocks, rather than applying sanctions post fish-catch mortality. This is particularly the case with shark where international restrictions and stock reductions drive a frontier 'finning' gold rush mentality that has serious impacts on stock levels, due to the capacity to harvest and waste hundreds of tonnes of shark flesh.

Fortunately the majority of domestic fishers participate in the development and observance of strict management requirements and support strong compliance. Their support is based on protection of their livelihood, concern for the marine environment and industry equity. However

a significant risk occurs to the integrity of regulatory management when illegal behaviour is rewarded paradoxically by increased profit that outweighs risk in terms of a low risk of detection and insignificant sanction mechanisms.

It is also of note that if a declaration is sought under the Environmental Protection and Biodiversity Conservation Act from the Minister of Environment and Heritage to approve a northern shark fishery as a Wildlife Trade Operation, the Minister will most likely insist on appropriate tools to monitor and validate compliance. The implication of not being able to demonstrate compliance integrity is that no export declaration will be given or the declaration may be revoked.

1.3 The Case For A Cooperative Approach

Northern Australia has vast oceans and land areas over which limited compliance resources need to be deployed effectively to achieve maximum outcomes. There are approx 1.5 million square kilometres between the western intercept of the Australian Fishing Zone with 20° east longitude and the western boundary of the Protected Zone Joint Authority in the Torres Straits. The reality of compliance management in remote northern Australian fisheries is that Shark and other fish are vulnerable to over-exploitation. The risk of detecting illegal activity is lower due to the vast areas, low density, lack of at-sea presence and the limited number of fisheries compliance professionals. High prices for shark fin (averaging between $80 and $150 kilo beach price, dependent on grade) driven by strong demand have increased the pressure on shark stocks so the case to share and coordinate resources across Northern Australia has been established. Although initially the cooperative approach will maintain a priority focus on shark, other fisheries issues of joint concern will be considered, to maximise efficiency in multi-tasking.

Preliminary analysis is showing that compliance and knowledge gaps occur in the following areas:

- Amount of illegal foreign catch
- Impact of illegal foreign catch on domestic fisheries catch
- Illegal catch hidden through remote porting / crossing jurisdictions
- Live finning
- High grading
- Threat to domestic fisher and officer security
- Location of vessels at sea
- Investment of organised crime in fishing
- Unlicensed catch
- Gear compliance

These gaps need to be examined in the context of their threat to sustainability and humane practice. To achieve improved coordination the following key compliance actions are required;

- Cross-authorization
- Vessel Monitoring Systems
- National docketing
- Joint operations
- Information sharing
- Complimentary legislation

On this basis an agreed level of joint-servicing is essential to complement existing jurisdictional compliance. In 2005 the identified critical resource gap and therefore area of high risk is the

capacity to deliver at-sea compliance. The level of resource currently attributed to shark compliance may have been insufficient to gain a true picture of non-compliance levels. Currently officers can undertake desktop audit, point of landing inspections, consignment tracking, and distribution. But the capacity to validate practice and provide point of capture deterrence is severely limited. The high cost of sea compliance determines that any commitment must be limited, targeted and maximise efficiency.

This must be considered in the context of the absence of at-sea compliance and the opportunity for illegal behaviour and community perception of this approach. Therefore planning in the initial two-year period will focus on coordinated land and sea operations that will capitalise on pooled resources and effective utilisation of assets. The approach will be minimalist and approach the issue by a series of short sharp at-sea compliance operations in areas of joint interest.

With the increased global and national focus on shark, northern fishery agencies are likely to be judged by their capacity to respond cooperatively to address the issue of finning and overfishing.

1.4 Northern Shark Fisheries in Brief

Seasonally from April to November, 42 (NT13, QLD 9 and WA 20) domestic fishing vessels target shark using demersal gillnet or longlines. Each fisher that targets shark uses gear that makes it difficult to be selective in terms of particular species caught. However management of mesh and hook sizes and area of fishing helps fishers to be more selective.

Most vessels home port at Broome, Darwin, Gove, Karumba, Wyndham and along the east coast of Queensland. Of these vessels some remote port (i.e. fish in WA, port in Darwin). There are other vessels however that also catch shark as a secondary target species, as by-product. An example is the Kimberley Gillnet and Barramundi Fishery, where shark are taken incidentally.

While many fisheries currently have the opportunity to catch shark under open access arrangements the main fisheries in northern waters are listed below. Due to the catch levels some fisheries that take shark as a secondary target species are also listed:

- Australian Fishing Zone MoU Box;
- Northern Territory Joint Authority Shark;
- Queensland Joint Authority Shark;
- Queensland Shark Fishery;
- Western Australia Joint Authority Shark,
- WA North Coast Shark
- WA Kimberley Gillnet and Barramundi Fishery.

(NB The Offshore Constitutional Settlement agreement between the Commonwealth and States applies to the listed shark Joint Authority Fisheries.)

These fisheries occur in an area that covers approximately 50% of Australia's territorial and state waters (including the east coast of Queensland) or an area of approximately 3.5 million square nautical miles of ocean. The critical operational area for the CWG excluded the east coast of Queensland reducing the total compliance area to 3.0 million square nautical miles of ocean. Of note within this area is the containment of the MoU box and impact of illegal fishing incursions on domestic fisheries.

1.5 Australian Fishing Zone (AFZ) MoU Box:

This is an area northwest of Broome, where under a 1974 Memorandum of Understanding (MoU) with Indonesia, Australia agreed to not apply its fisheries laws against traditional Indonesian fishers because of their historical use of the area. Regulation of fishing in the MoU Box focuses on whether fishing activity is "traditional", which in practice is determined by whether a sailing (traditional) or motorized (non-traditional) vessel is used. As the MoU Box excludes application of Australia's fisheries legislation to traditional fishers, fisheries management mechanisms cannot be applied against those fishers inside the MoU Box. The Indonesian Government has publicly stated the importance it places on continued access for traditional Indonesia fisheries to the MoU Box. Withdrawing from the MoU or acting unilaterally to abrogate it would be controversial in Indonesia and could adversely affect our broader interests in maritime cooperation. Traditional fishers are therefore not currently restricted by management arrangements of a similar and restrictive nature, as is the case for the domestic industry.

1.6 MAIN COMMERCIAL SHARK SPECIES TARGETED IN NORTHERN WATERS

The key shark species taken in the northern shark fisheries are:

- Blacktip shark: *Carcharhinus tilstoni, Carcharhinus limbatus, Carcharhinus sorrah*
- Graceful shark: *Carcharhinus amblyrhynchoides*
- Gray reef shark: *Carcharhinus amblyrhynchos*
- Hammerhead shark: family *Sphyrnidae*
- Hardnose shark: *Carcharhinus macloti*
- Lemon Shark: *Negarprion acutidens*
- Milk shark: *Rhizoprionodon acutus*
- Pig eye shark: *Carharhinus amboinensis*
- Tiger shark: *Galeocerdo cuvier*
- Sandbar shark *Carharhinus plumbus*

1.7 Summary of Part 1

In summary there are several key factors to consider ;

- That the NAFC / NAFM and officers are committed to working cooperatively across northern Australian fisheries
- That compliance (enforcement) has a vital role to play in implementing the outcomes of research findings reflected in management approaches.
- That there is a robust case for joint cooperation in compliance operations
- That alignment in legislation and management of species will improve industry understanding of requirements and improve cross jurisdictional compliance
- That gaps in the delivery of at-sea compliance need to be addressed to provide a professional and effective approach to managing shark stocks.

- That the impacts of illegal foreign catch needs to be estimated and effectively managed through intervention and development of offshore compliance programs.

- That the community acceptance of the „no action" option in relation to „finning" practices is unlikely to be positive.

On the basis of this discussion Part 2 of the Compliance Plan sequentially addresses the long term strategic and shorter term operational needs to adopt an action response to proactively manage these issues.

PART 2

STRATEGIC AND OPERATIONAL COMPLIANCE RISK ASSESSEMENT AND EVALUATION

Utilising prior experience and issues identified through NAFM workshops as a background; a new approach to document a clear strategic framework that would result in a schedule of actions was undertaken. The approach of the CWG was four tiered to:

1. **Identify the strategic context to facilitating a joint approach**

2. **Identify management and legislative improvements**

3. **Undertake a risk assessment**

4. **Apply the risk assessment to a response solution**

A brief discussion of issues raised and solutions proposed to establish a consolidated approach to shark fishing in the northern fisheries is provided consistent with these four identified approaches. In effect preliminary endorsement of continuing actions will be required to effectively proceed.

2.1 Identify the strategic context to facilitating a joint approach

2.1.1 High-level Support and Endorsement

If annual targeted operations that focus on both domestic and foreign illegal fishing are to proceed, then high level support and endorsement is required. To achieve this will require a development of a Service Level Agreement (SLA) to be developed between NAFM agencies to undertake joint operational compliance.

At times the operations would be bilateral, multilateral or include Federal government agencies to provide an overall coordinated response. As domestic and illegal fishing areas overlap this makes good sense in terms of vessel use.

On this basis if alignment between domestic and illegal foreign fishing were to be targeted concurrently, then senior level endorsement from Customs and Defence would be required. Whilst competing Federal tasking priorities may take precedence, forward planning should ensure a pre-agreed level of support. This would also require the development of a SLA to provide a clear commitment.

The development of a SLA can be progressed by the CWG Coordinator with assistance from the NAFC Project Officer already employed on a joint basis and hosted at AFMA.

- **Recommendation 1: NAFM Compliance SLA**
  That NAFC endorse joint agreed compliance operations and the development of a Service Level Agreement.

- **Recommendation 2: Australian Customs Service / Defence SLA**

That NAFC negotiate a Service Level Agreement for joint operations with Australian Customs Service and Department of Defence.

2.1.2 Compliance planning and review

To progress and achieve joint servicing the compliance group needs a structured working group formation. To achieve this an ongoing CWG, linked to the NAFM annual meeting, would be required. The linkage to the NAFM meeting was seen as the optimal time to review the year's outcomes, link to research / management outcomes, conduct refined risk assessment, and identify forward target potential. This general group would be compliance management focussed and determine general priorities. Terms of reference would be developed and presented to NAFC if this recommendation is endorsed. This group would be coordinated on rotation by member agencies.

Due to the additional responsibilities, time and resource demand for the Coordinator, the CWG suggests that additional remuneration be paid to the Coordinator (as rotated through agencies) in recognition of the additional demand required. These costs should be met rotationally by each home agency. The group has nominated Paul Fitzpatrick (Regional Manager North / Dept of Fisheries W.A.) to undertake the Coordinator role on the first two-year cycle to establish, develop and progress the changes.

- **Recommendation 3: Establish Compliance Working Group**
  That the Northern Australia Fisheries Committee (NAFC) endorse the establishment of a Northern Australian Fisheries Compliance Working Group (NAFCWG).

- **Recommendation 4: Coordinator of the NACWG**
  That NAFC endorse the appointment and remuneration of a rotational Coordinator for the NAFCWG to establish and progress agreed changes.

2.1.3 Operational Command

The need for a restricted Operational Command Group (OCG) that progresses two-year operational plans was strongly supported. Without this approach prior history has shown that an *ad hoc* approach develops that does not deliver tangible outcomes. For reasons of security and management of sensitive information this group would not include the broader membership of the CWG. The OCG would be facilitated and led by the CWG Coordinator. Membership would represent each jurisdiction and include;

- Coordinator CWG (Facilitator)
- Zone Manager
- Operation Manager
- Intelligence Analyst/Manager
- Customs and Defence representatives as required.

This operationally focussed group would plan specific joint operations and supervise their execution. The OCG's role would also incorporate bilateral operations and desktop audit. Senior agency staff with compliance experience, understanding of intelligence analysis, capacity to commit resources and determine tasking priorities would therefore be required as OCG members. Reporting of milestones would be presented via the Coordinator to the broader CWG / NAFM meeting.

To progress 2005 operations this group would need to be formed and meet during July early August 2005. The preferred central location for all agencies to meet is Darwin. Separate costs to meet travel expenses could be met by home agencies and on this basis are not separately identified. Due to reduced demand on the Northern Territory staff to travel it is anticipated that they will meet venue and catering costs.

- **Recommendation 5: Operational Command**
  That the NAFC endorse the establishment and funding of an Operational Command Group (OCG) that meets in Darwin to implement operational planning, oversee operations and review post-operational outcomes.

2.2 Identify management and legislative improvements

2.2.1 State / Territory Cross Jurisdictional Authorisation

The issue of cross-jurisdictional authorisation of officers to undertake joint operations and access information is being progressed. Preliminary analysis of cross-jurisdictional authorities and powers was provided to the workshop (Appendix 2). Generally powers are consistent and the primary authorities required are bilateral between WA / NT and QLD / NT. In the first instance it was viewed that WA / QLD cross authorisation would be of minimal benefit. This can be reviewed and progressed at a later time if required. The legal complexity of acting under state authority in another jurisdiction is complex and will require ongoing work and alignment of regulatory requirements. This is a long-term project.

Concerns from the NT Police command regarding the use of the Northern Territory Police Marine and Fisheries Section Officers (MFSO) in other states was expressed. The basis for the concern is that the NT Police have Occupational Safety and Health requirements to carry firearms and this would apply when working across state jurisdictions. This can be resolved by officers utilising firearm safe storage facilities in other jurisdiction police stations and aboard the patrol vessels. The firearms can then be utilised as appropriate for vessel boarding.

However in any operation home jurisdiction officers would always be present and this will reduce issues of legal authority and risk. The legal capacity to access information would require authorised access via formal agreement contained in the SLA and by officer appointment across jurisdictions. The issue of cross authorisation is being progressed and should not preclude current year operations being completed. Correspondence to the Chief Executives seeking approval for authorisations will be undertaken by July 2005.

- **Recommendation 6: Cross Jurisdictional Authorisation**
  That cross authorisations continue to be progressed and the Coordinator briefs NAFC re progress as appropriate, in July 2005.

2.2.2 AFMA Authorisations

All officers in the Northern Territory and most Queensland Officers hold AFMA authorizations. Some officers in the Northern region of WA also hold AFMA authorizations. It is seen as a useful step that all suitable Fisheries Officers in the WA Northern region likely to be involved in joint operations gain this authorization. This will be largely completed by completion of Commonwealth Fraud Training (Certificate Four). Significant levels of recognition of Prior Learning can be achieved by staff due to their current levels of investigative qualification and experience such as modified Detective Training of officers in W.A.

- **Recommendation 7: AFMA Authorisations**
  That AFMA provide an induction, training and authorisation for Western Australian Northern Region Fisheries and Marine Officers by December 2005 and additional officers in N.T. & Queensland as required.

2.2.3 Vessel Monitoring Systems

The CWG sees implementation of Vessel Monitoring Systems into all shark fisheries operating across Northern Australia as a management priority. VMS will greatly improve zone compliance and reporting of catch for vessels crossing jurisdictional borders. Queensland Joint Authority vessels operating in the Gulf already have VMS monitoring. Proposed Management Plan amendments to NT and WA vessels to require installation of Automatic Location Communicators (ALC) will bring the full northern domestic fleet online. Management plan amendments would require all vessels to leave their ALC on at all times whilst at sea, this will cover cross jurisdictional tracking.

It was recommended that Western Australia become the single VMS monitoring point for Northern Shark vessels. This would require the development of a formal agreement to share information across jurisdictions. Existing infrastructure for VMS in WA could be configured to receive all data at little cost. As Queensland has their own Pacific region VMS agreements they would continue to monitor their own systems with no additional cost required once the management amendments were in place. The capacity to monitor the whole fleet has advantages for compliance reporting and management.

As the NT is considering VMS requirements on their vessels in Shark and later other vessels this issue was reviewed. It would appear that the most cost effective solution for the NT government would be to enter into a VMS service agreement with WA. This bilateral arrangement would reduce the need for NT to establish monitoring units, contract for satellite land earth station access, training and ongoing service contracts. It is estimated that this could save approximately $20k establishment costs. The flow on saving would be to contract WA fisheries for 0.20 FTE to provide monitoring and alarm notification by email. This would be a more cost effective option than NT providing training and sufficient FTE allocation to attract a suitable VMS operator. It would also allow much more rapid implementation of VMS into the fishery.

If these options are to be pursued some project time may be required to establish changes and set up systems, but this should be minimal and could be worked up in a detailed project brief for NT consideration. This would specify contractual terms for service delivery costs. To provide some illustration of provisional costing to implement and monitor VMS in NT & WA would be approximately:

Northern Territory	$15-20k VMS monitoring unit, secure room renovation and licensing $ FTE costs / training costs $ Ongoing contract and equipment replacement costs
WA monitoring (NT cost)	$14k per annum 0.2FTE equivalent if monitoring is required. (This would remove NT need to establish parallel units and offset initial project costs pending establishment)
NT/WA (Industry cost)	$ 4k per vessel for ALC installation $ 2k for vessel computer if required
Polling (Industry cost)	$ 100 per vessel per annum for 4 times per day polling (may be greater if frequency of polling increased)

NB To undertake trilateral VMS information sharing /viewing additional joint polling additional equipment may not be required, but some system reconfiguration may be required. The cost for this should be marginal. The primary need is industry / government agreement and resultant management changes to reflect this new requirement.

- **Recommendation 8: Sharing VMS Information**
  The Coordinator provide a WA project brief that details the cost and implementation steps required to implement VMS monitoring for NT and combined tracking access for WA, NT and QLD vessels through information exchange, to the NAFC, by September 2005.

- **Recommendation 9: Management Plan Amendments - VMS**
  That the respective Fisheries Managers progress amendments to implement VMS within management arrangements of northern shark fisheries. An update of progress to be provided to the project Officer AFMA for collation and presentation to NAFC by September 2005.

2.2.4 Promoting cooperation and improving industry education

There is an opportunity to develop a media education program for fishers and the community that could promote the combined approach to Shark compliance. The media strategy could incorporate the development of posters, website links and pamphlets that would promote the joint response, and information for the public and industry. Industry pamphlets would include compliance and general useful information related to reporting numbers and what to do if encountering foreign fishing vessels, best fishing practice and shark biology. Existing *Free-call* numbers across jurisdictions for offence reporting would be utilised, removing any need for additional cost.

It was suggested that the Queensland DPI Media Unit be engaged to undertake this task as Queensland and Northern Territory already have some common high quality media products. The cost to produce posters and pamphlets and associated artwork would be in the vicinity of $10,000.

It was envisaged that this could be undertaken as a finite short-term project. The value of a document that showed the five partner organizations logos would reinforce a strong unified approach message.

The issue of media coverage of joint operations would be developed in a separate media planning brief to maximise operational exposure and would be developed by the Coordinator and the OCG for consideration of the NAFC endorsement prior to implementation. This would ensure political risk is managed for all agencies.

- **Recommendation 10: Media publications brief**
  That the NAFC endorse a 'Northern Shark' publications brief by Queensland Media Unit to develop and cost an information brochure and poster for northern shark (approximate cost <$10,000) to be presented to NAFC by late August 2006.

2.2.5 Catch Identification and Observer Program

The development and utilisation of DNA and other identification testing strategies being developed by scientists to identify take of endangered and vulnerable species was strongly endorsed by the CWG. The use of these tools in the field would enhance identification

particularly where trunks and fins have been separated and frozen at sea. The development of simple easy to use tools will be of benefit to track illegal take of protected species. Scientist-lead education and tools development for compliance staff and industry is strongly supported.

The CWG also supported inclusion of a scientific officer to assist / train operational compliance staff as required, to provide specialist identification of species. Observer program are expensive and produce results when the observer (as is the case for a compliance officer) is present. However detection risk for plan and regulatory offences would require basic compliance familiarisation training for scientific observers so they view their tasking in perspective of management and compliance requirements.

The risk of underreporting of catch reinforces the need for attention to accurate catch reporting as an ongoing priority. Whilst observer programs are effective whilst observers are present and are a useful tool, observers catch records need to reflect a daily catch /set catch recording. This requirement can then be verified by inspection will greatly enhance compliance inspection capability. Pursuant to the NAFM research groups focus on log books, a uniform approach to log books that do provide capacity for immediate catch verification and do not rely on monthly returns is suggested. Returns should be readily accessible by compliance staff for compliance audit analysis and this should be viewed as regulatory priority for information sharing. The CWG does not hold the view that this would decrease reliability of fisher reporting.

- **Recommendation 11: Catch Identification and Scientific Observer Program**
  That NAFC note a request by the CWG for the NAFM Research Working Group to:

  1. *Develop shark fin identification tools to determine the species origin of a shark fin, possible identifiers being DNA or dermal denticles.*

  2. *Develop a shark identification education program and an observer program to assist compliance and education.(CPO see 2.2.7)*

2.2.6 Regulatory Change Priorities

The priority regulatory changes identified by the group, included

1. VMS requirement in all management plans, that includes requirement to keep VMS activated at all times at sea and to facilitate cross-jurisdictional tracking.
2. Greater consistency in compliance specifications for more uniform management.
3. National docketing requirements /implementation to improve tracking of fish.
4. Development of joint access arrangements to permit intelligence sharing.
5. Amendments to WAJANSF plan to incorporate offence provisions of WA F.R.M.A.
6. Develop a robust catch reporting and observer development program.

- **Recommendation 12: Regulatory Change Priorities**
  That NAFC note the need to assign management priority to regulatory changes to include VMS in all plans, provide greater management consistency, implement the national docketing of shark, develop catch reporting and observer programs and amend WAJANSF to include offence provision in plan (currently progressed).

- **Recommendation 13: Intelligence sharing**

  That the Coordinator facilitate jurisdictional Intelligence Managers to determine and document impediments to /and changes required to remove barriers to intelligence sharing. A brief to be provided to NAFC by Coordinator by November 2006.

2.2.7 Compliance Project Officer

An extensive range of coordination and project development will be required to progress changes and produce outcomes. To effectively progress changes a joint funded Compliance Project Officer (CPO) would be sought (1 FTE). This position could proceed to attract external project funding to workshop and develop industry and officer compliance and education priorities. The CPO would work with the Coordinator to progress agreed priorities and coordinate cross jurisdiction input.

- **Recommendation 14: Compliance Project Officer**
  That NAFC endorse that the Coordinator progress a business case for joint funding of a dedicated compliance project officer to progress the compliance change agenda.

2.3 Undertake a risk assessment

The CWG undertook a risk-based assessment that examined the key compliance risks in the fishing process, which would provide opportunity to offend. Each risk was then discussed, reviewed, evaluated for consequence and likelihood, threat to triple bottom-line sustainability, equity, community perception and political impact. The analysis was based on experience and currently available information. The highest priority risks requiring immediate intervention were then examined and applied to an operational strategy.

It is also acknowledged by the CWG that improved intelligence access and analysis would refine the assessment process. Ongoing assessment will produce increasingly sophisticated identification of key threats and non-compliant fishers to be targeted in operations. The CWG considered that improvements in trans-national analysis attained in Shark, would also produce an improved model for other northern fisheries. The results of the analysis are presented below and signify a high level of consensus in the CWG. The highest priority risk for shark stock compliance was identified as the absence of an at-sea presence in the Northern Territory waters.

Key identified compliance risks in priority order

<u>High risk requiring immediate intervention</u>

1. Unlicensed commercial fishing in a fully allocated fishery (domestic)
2. Illegal foreign fishing
3. Remote port trans-shipping
4. High grading / selective retention
5. Non reporting of protected species interaction

<u>Medium High risk requiring intervention</u>

6. Fishing outside authorized zone (closed waters offences)
7. Non reporting of commercial shark species / failure to complete and lodge log books and returns
8. Gear offences

(NB Lower risks were excluded from discussion in this paper but will be scrutinised at an operational response level such as point of landing, consignment, desktop and at-sea.)

2.4 Apply the risk assessment to a response solution

The CWG used the outcomes of the risk assessment to identify operations as the priority for the two-year period from July 2005 to June 2007. The operations would be supported by an intelligence and data analysis of potential targets (within current constraints), but would not rely on this factor alone. The value of an at-sea response operational response in zones where this was not current common practice will also provide significant deterrence.

Based on NAFC endorsement, an Operational Command Group (OCG) would be established to coordinate joint tasking operations and surveillance across northern Australia. The OCG would progress operations for the first two years by coordinated planning and risk-assessed approach to deployment of resources. Preliminary discussions have identified target locations in each of the agency zones of responsibility.

The following joint operational zones were proposed:

1. Australian Territorial Zone (EEZ/MOU waters)

2. Western Zone (WA waters north of Broome)

3. Central Zone (NT waters)

4. Eastern Zone (QLD waters in the Gulf of Carpentaria and offshore)

To progress the next stage of OCG operational planning Queensland and Western Australian staff would convene in Darwin, with the NT Police MFSO. The cost of travel per agency would be approximately $3000 for three staff to attend. The staff attending from each jurisdiction should include the Zone Manager, Operations Manager and Intelligence Analyst / Manager). This will allow the OCG to be specific in its determination of operations. It is anticipated that the Northern Territory would provide venue and catering, as they are not incurring travel costs. Thereafter operational planning and review would be conducted online / by teleconference.

Whilst the primary focus will be shark fishers, opportunities to check other fisheries shark by-product / marine safety would be explored as a secondary outcome. Operations would be planned to complement existing agency compliance strategies and land-based approaches, in the jurisdiction of the funding agency/s. This multifaceted approach is important as it maximises cost benefit for government investment.

2.4.1 Refining the risk-based approach

Further analysis and refined risk based assessment will be undertaken by the OCG to improve specific target identification to develop operational plans, prior to conducting operations. The approach would be two phased:

- Firstly to refine risk assessment and operational planning for forthcoming joint operations

- Secondly to risk assess shark byproduct fisheries and plan a concerted approach to ensure compliance levels across all byproduct fisheries.

The current lack of VMS use in Western Australia and the Northern Territory make vessel tracking more difficult and will need alternate strategies to locate vessel positions, such as Coastwatch tasking and intelligence gathering. Implementation of VMS was discussed at section 2.2.3 and should be progressed as quickly as possible.

The OCG would utilize available information intelligence and offence concealment strategies in any operation to target known or suspected offenders. Current offence detection rates as a performance indicator are not reliable at present as the extent of black market and at sea offences is not clearly known.

Inherent risk in terms of inadvertent industry 'tip off' will require that operational details remain restricted, with standby briefings delivered immediately prior to commencement of operations to minimize leakage and security breaches.

2.4.2 Operational aims and planning

The OCG will deliver a series of operations based on a series of two-year plans in which:

- The first aim will be maximum apprehension.
- The secondary aim will be to conduct maximum visibility deterrent / education operations.
- The third aim will be operations that target areas where foreign illegal and domestic fisheries overlap. This will optimize collaborative tasking with AFMA and their federal partner agencies.
- The fourth aim will be to conduct marine safety and other fisheries compliance checks especially those with a shark catch exemption checks would be conducted on these remote operators concurrent to license / management plans compliance inspection.

2.4.3 Stages of OCG joint operational planning and execution

The stages that the OCG would consider and develop for each operation would include:

- Determine resource allocation level
- Assessment of intelligence and information to target specific licences
- Planning operational details and logistics
- Implementation of operation
- Evaluation of outcomes and intelligence

The detailed planning would be conducted on an annual basis and respond to change priorities.

2.4.4 Combined Operations Budget Requirements

Based on risk assessment outcomes and gap analysis the highest area of compliance risk requiring commitment of funds is sea patrols. Presently no dedicated time in the north Kimberley, Northern Territory or Gulf is provided for shark or other shark by-product fisheries compliance. Currently WA services Pearling, Commercial Trap and Trawl and Marine Park compliance in the

Kimberley, while Queensland services the Northern Prawn Fishery in the Gulf of Carpentaria. Due to the proximity to state borders adjacent to the Northern Territory when these fisheries are patrolled, it is considered to be the optimal period to consider joint tasking or contract.

Both Queensland and Western Australia require an additional five days for their respective patrol vessels to achieve servicing of their own fisheries in the northern Kimberley and Gulf areas. This allocation has not been seen as a priority previously due to the smaller number of shark vessels. However in the case of WA, approximately 18 licensed commercial fishing vessels homeport into Darwin. Therefore fishing in WA, porting outside of WA and therefore not being inspected by W.A. FMOs The other vessels of interest from a state fisheries and marine safety perspective are charter and recreational vessels.

In the longer term a fisheries and marine safety patrol vessel based in Darwin was seen to be of high priority. This would need to be considered in context of a cost benefit analysis by NT government, given the proposed cooperative model opportunities. In the short to medium term access to experienced Fisheries and Marine Patrol crew and Patrol Vessels Walcott (WA) and New Investigator (QLD) was seen to be both cost effective and of high value. Based on the working groups risk and gap analysis the use of vessels to conduct at-sea operations was seen to be of prime importance during the 2005-2007 period pending implementation of VMS.

The normal charge out rate (as cost adjusted) for these vessels is approximately:

- 1 sea day PV Walcott (WA) $4500 (Fully accrued/includes crew travel)

- 1 sea day PV New Investigator (QLD) $4800
  QLD Staff travel cost dependant on circumstance (i.e. crew changeover)

On this basis the following funding is required per jurisdiction for sea time as per draft operational plans provided in Part 3, Shark Compliance Operational Compliance Plan July 2005 - July 2010.

Australian Territorial Zone (EEZ/MOU waters)

AFMA	5-10 days	$22,500-48,000	Western MOU/ Timor Box/ Wessel Islands

Central Zone (NT waters to EEZ)

NT	5 days	$22,500 - $24,000	Dependent on vessel to work in Timor Box Area or Wessel Islands.

Eastern Zone (Western QLD waters to EEZ)

QLD	5 days	$24,000	Concurrent to NPF contract servicing

Western Zone (WA waters north of Broome to EEZ)

W.A.	5 days	$22,500	WA / NT border areas (includes 2 days NT in recompense of Darwin inspections by MEU

2.4.5 Cost reduction strategies

There are also potential cost offsets and absorption from normal operating costs that the NAFC could consider to reduce overall cost and minimise the need for any new allocations:

1. OCG operational planning costs (travel & accommodation) can be met by home agencies through normal operational costs, but identified as a discrete cost. As Darwin will provide a central focus and based on reduced travel demand for NT officers, NT would provide venue and catering costs.

2. WA and QLD could reallocate existing vessel patrol time to meet/offset their contribution costs.

3. Through NAFC agreement (to facilitate this special project only) that vessel costs for NT and AFMA are provided at a reduced rate to be determined bilaterally.

4. NT costs are shared between NT fisheries and NT Police or as they negotiate.

On this basis a decision needs to be made on funding commitment as follows

- **Recommendation 15: Combined Operations Resources**
  That the NAFC four jurisdictions agree to allocate the following recurrent funds for sea patrol from July 2005 – June 2006 (four financial year allocations)

AFMA	*$22,500- 48,000*
NT	*$22,500-24,000*
QLD	*$24,000*
WA	*$22,500*

  to provide at-sea domestic and joint operational compliance;
  Or as negotiated pursuant to cost reduction strategies detailed above.

2.5 Conclusion

The Northern Australian Shark Strategic and Operational Compliance Plan 2005-2010 is submitted for NAFC consideration and provides the considered work of the CWG. The participants of the CWG (Attachment 1) workshop embraced the opportunity to build a new model of cooperation, with a common vision of achieving practical, cost effective and common sense solutions.

The potential to develop the identified changes and will require ongoing commitment and high-level support. There is a significant opportunity if these recommendations are accepted to provide a new model for cooperation and deliver practical outcomes to respond effectively. The models provided are carefully considered to be transportable across all fisheries that catch shark.

At this preliminary and developmental stage the large array of change requirements have been reviewed to produce a more effective compliance system. It is evident that current capacity and attention to shark in the northern sector has been historically at a lower level than is now required. The CWG has not sought large increases in staffing or large allocations of sea patrol time although current resources are limited and stretched. In fact the approach has been to use current resources better to target priorities that if completed will have significant detection/deterrent impact. In essence the level of offence detection may be more aligned to resource levels as opposed to a simpler interpretation that voluntary compliance levels are high. Do we really know what is going on out there? This is the challenge for the CWG to progress.

The annual NAFM meeting for compliance needs to continue to be risk based and outcomes focussed. On this basis the CWG should be undertaking risk assessments across all fisheries that catch shark, as a focus in September 2005. The risk assessment should also identify opportunities for industry education and engagement.

Better coordination and a relatively minor additional allocation of joint operation resources would provide significant dividends in addressing fisheries compliance in the northern Australia. Paradoxically the remoteness that has been the protection of the northern waters in the past, has now made it a lucrative target. It is anticipated that increased pressure and restrictions in southern fisheries will see a shift to northern waters. When this potential shift in effort is considered in the context of unquantified catch from illegal foreign fishing now that MOU areas are depleted, it presents a significant issue that needs to be addressed. Increasing shark take internationally will continue to make Australia's northern waters a last frontier for the fin supply to the Chinese markets.

The future of better communication and cooperation across the northern sector should aim for a vision of seamless service and regulatory consistency to be established over the next five-year period. However the bottom line is that without resource allocation commitment from NAFC progress while be slow and not keep pace with change requirements and expectations.

A summary of recommendations (Attachment 3) and a matrix of agency cost proposals are provided (Attachment 4), for NAFC consideration and direction.

31. APPENDIX X: STRATEGIC RESEARCH PLAN FOR NORTHERN SHARK

Strategic Research Plan for Northern Sharks

Dan Gaughan (Chairman, NAFM 2004 Shark Workshop)

BACKGROUND

A Workshop on issues of shark sustainability for northern Australia was held as part of the NAFM meeting at Darwin in September 2004.

The goal of having a strong focus on shark at NAFM 2004 was to develop consistency within the management approach across northern Australia. With this goal in mind the Workshop reviewed (1) the impediments to consistency in management, (2) the fishery data issues that needed to be addressed, and then developed (3) a list of research priorities.

The research priorities developed in the Workshop were presented to NAFM. It was decided that these research priorities should be developed into a Strategic Research Plan for northern Australian shark. This is a draft of that plan. Contributions by Northern Territory and Queensland are provided in Appendix 1. While this draft plan largely reflects the outcomes from the NAFM 2004 Shark Workshop, note that it has yet to be viewed by other Workshop participants and does not fully encompass the plans from NT and WA. Nonetheless, as Chairman of that workshop I believe this draft accurately reflects the priority research needs for northern Australian sharks as highlighted at NAFM 2004.

(1) The legislative and data impediments for implementing equivalent regulations were identified as follows.

(i) No resources to sort it out (see ii and iii below). [*NAFC aims to address this through scoping paper.*]
(ii) Multiple jurisdictions (e.g. regional authorities)
(iii) Lack of uniform laws
(iv) Lack of common trigger/reference points.
(v) No uniform use of relative risk assessments.
(vi) Lack of structured communication between jurisdictions (compliance)
(vii) Variable ability to implement use of VMS supported.
(viii) No agreement to implement consistent (i.e. low/none) bycatch limits across all non-target fisheries.

(2) Fishery data issues/needs were identified as follows:

(i) Need for standard logbooks (compulsory returns) and comparable observer data. (Both research and compliance data

need to be considered. Compliance data and its robustness/statistical analysis fall within the research domain).

(ii) Standard protocols have been developed for collecting catch and biological data by onboard observers.

(iii) Standard protocols for logbooks.

(iv) Compatible databases (review by Julie Lloyd, DBIRD).

(v) Data collection from non-target fisheries. Standard protocols need to be broadly available to non-collaborators and other fisheries (e.g. bycatch).

(vi) Data sharing (commercial catch data) issues need to be addressed:
-mechanism for sharing
-confidentiality issues.

(3) Current Research Priorities

The Current research priorities (Table 1) developed in the workshop were presented to NAFM. NAFM endorsed further collaborative research on northern Australian shark, to be led by Dr Steve Blaber (CMR, Cleveland). This further work, known at this stage as *FRDC proposal for Phase 3*, would follow on from previous collaborative projects known as *Phase 1* and *Phase 2*. However, note that while the participants in the workshop on shark issues had identified the list below, the intended focus for a *Phase 3* FRDC project on northern shark project had not been decided on at the time of the NAFM meeting. [NOTE: The *FRDC proposal for Phase 3* has been discussed at a different forum focussing on shark research, with participants from state and federal agencies. As such, development of *Phase 3* within that other forum may not align with the NAFM research priorities.].

NAFM also noted the need for the black-tip shark assessment model to be revised, and following this also supported the development of a northern fisheries stock assessment group, which would meet annually (pre-NAFM) and then report outcomes to NAFC. This need is therefore included in the list of research priorities.

Table 1. Research priorities for northern Australian shark.

(i)	Co-ordinated monitoring program/protocols; e.g. improve onboard data collection, logbook validation.
(ii)	Identifying critical habitat for highly vulnerable species. Investigate use of spatial closures.
(iii)	Update assessment of black-tip complex.
(iv)	Use risk (e.g. highly k-selected species) and fishery (important proportion of catch) criteria to select indicator species for which to undertake biological/exploitation research (e.g. gear

	selectivity, tagging - exploitation rates, biology, reproductive parameters) AND to develop management triggers/reference points.
(v)	Human capital development to achieve database/catch return compatibility.
(vi)	Foreign and Illegal. Collate data on foreign fishing activity (e.g. compliance records). See what is available/collected. Initiate measures to collect required data.
(vii)	Use of DNA to aid -determination of species composition; -location of origin. Need to identify which species (world-wide) have been DNA finger-printed. (CSIRO)

PREVIOUS AND CURRENT WORK

Since 1999 there have been five large "shark" projects relevant to NAFM (Table 2), noting that in two cases projects have consisted of two distinct Phases. There have also been several smaller studies on highly vulnerable species such as sawfish and *Glyphis* spp.. Note that the details for these smaller projects are incomplete and that a Strategic Plan will need to provide a full list of projects and their outcomes.

Table 2. Previous and current projects relevant to northern shark.

Project	Primary Funder	Period	Agencies	Topic
1. The Sustainability of Northern Australian Sharks and Rays.	**EA**	**1999-2002**	**EA/CSIRO/FWA/NT DPI/QDPI/BRS**	**Biology and risk assessment (commercial perspective) for 148 species**
2. Northern Australian Sharks and Rays: the sustainability of target and bycatch species, Phase 1	**FRDC**	**2001-2002**	**CSIRO/FWA/NT DPI/QDPI**	**Catch composition, pilot observer program**
3. Northern Australian Sharks and Rays: the sustainability of target and bycatch species, Phase 2	**FRDC**	**2002-2005**	**CSIRO/FWA/NT DPI/QDPI**	**Catch composition, pilot observer program, protocols for longer term monitoring**
4, 5.Artisanal shark and ray fisheries in East Indonesia: their socio-economic and fishery characteristics and relationships to Australia resources	**ACIAR**	**2001-2003 (Phase 1)** **2004-2006**	**CSIRO/Murdoch Uni./**	**Potential for internationally shared stocks**

		(Phase 2)		
6. Biology and stock assessment of the sandbar shark *Carcharinus plumbeus*, in Western Australia.	**FRDC**	**2001-2004**	**FWA**	**Catch, effort, exploitation rate, biology, demographic analysis**
7. Australian Geographic Expedition to the Daly-Douglas River Research Station	**Australian Geographic**			**Acoustic tracking; genetic samples**
8. Conservation assessment of *Glyphis* sp. A (speartooth shark), *Glyphis* sp. C (northern river shark), *Pristis microdon* (freshwater sawfish) and *Pristis zijsron* green sawfish	**DEH**	**2004-2005**	**CSIRO/ NT DBIRD**	**Acoustic tracking**
9. Biology of sawfish in QLD (Masters Thesis)	**JCU**		**Stirling Peverell**	**Age validation, distribution and abundance. Journal manuscript accepted**

STRATEGIC RESEARCH PLAN

The research requirements fall into two broad categories:

- ***SUSTAINABLE HARVESTING (I.E. MANAGEMENT OF TARGET SPECIES)***
- Protection of Biodiversity (i.e. risk mitigation for highly vulnerable species)

SUSTAINABLE HARVESTING

The black-tip shark complex (*C. sorrah* and *C. tilstoni*) and the sandbar shark (*C. plumbeus*) (see Table 2, Project 6) have stock assessment models, which, when up-to-date, can be used as a basis for managing these species. The remaining shark species in northern Australia are unlikely to ever have formal stock assessments. In recognition of the negligible likelihood of ever developing quantitative assessments of a large number of species spread over a large geographic area, a qualitative risk assessment was undertaken for 148 species of shark (Table 2, Project 1). The project on relative risk assessments has shown that sharks can be classified as being at either high risk to exploitation (e.g. slow growing, low fecundity species) or at low risk (e.g. faster growing, relatively more fecund, shorter gestation period). This work successfully raised awareness of the issues for shark exploitation and identified gaps in data collection and knowledge of northern shark. However, a significant gap in the management of northern shark is that this relative risk assessment has had little tangible impact on how northern shark is managed, beyond highlighting the need to offer a higher level of protection for long lived, slow growing species (see Point 1(v) above).

Likewise, subsequent studies to determine the sustainability of shark have focussed on collecting data on catch composition, and developing catch monitoring protocols (Table 2, Projects 2 & 3), but again, preliminary results for these do not appear to be leading to a means of assessing whether or not exploitation of particular stocks is sustainable. For example, it is not clear how data on catch composition, even if independently verified by observers, will be used to manage the target or bycatch fisheries that catch shark.

These concerns are evident in the above sections (1). *The legislative and data impediments for implementing equivalent regulations* and (2) *Fishery data issues/needs*.

PROTECTION OF BIODIVERSITY

The highly vulnerable species are the elasmobranchs that occur in shallow inshore water, including estuarine/freshwater river systems (e.g. sawfish species, *Glyphis* spp., see Table 2, Projects 7-9). The species may be conservation

dependent, requiring special management considerations outside of the targetted shark fisheries.

RECOMMENDATION FOR PRIORITISING RESEARCH NEEDS

From the NAFM perspective, the most urgent issues for shared management of northern shark are

(1) shared management objectives
(2) shared performance indicators
(3) shared management-decision systems
(4) compatible data and databases.

The research needs identified at the NAFM 2004 workshop (from Table 1) have therefore been ranked as in Table 3. This ranking reflects that various research has already been undertaken or is underway. These include development of relative risk assessments and methods to monitor catches. The research needs ranked as 1 are highly complimentary and would build on the results of earlier and current work (Table 2, Projects 2 and 3). Co-ordinating databases is a major need that would require expert input if these top two research needs were to be successfully addressed. The 2nd ranking project also sits with these first two, but collection of further biological data could be done at a later date once the management objectives, performance indicators etc. had been developed and backed up by a consistent data collection/recording system.

Biodiversity conservation research, i.e. directed towards investigating habitat usage and use of spatial closures for highly vulnerable species, is of critical importance. However, a consistent data collection/recording system that covers all sectors would provide further indications as to where these species were most threatened. As such, the higher ranked projects would provide input that may assist the more focussed work on habitat usage. Some preliminary work on highly vulnerable species has been undertaken. An assessment of the finding for these projects may provide a basis for determining what research would best address the ongoing conservation issues. Finally, implementation of consistent use of the risk assessment could also provide the basis to afford these species some immediate protection if required.

The projects ranked 5 could also wait until a consistent data collection/recording system was in place.

Table 3. *Ranking of research needs.*

Rank	Research needs	Key outcome or Comment
1.	Human capital development to achieve database/catch return compatibility.	Develop standardized reporting systems for all sectors (to cover all aspects from landing to data extraction).

1.	Co-ordinated monitoring program/protocols; e.g. improve onboard data collection, logbook validation.	Develop standardized reporting systems for all sectors.
2.	Use risk (e.g. highly k-selected species) and fishery (important proportion of catch) criteria to select indicator species for which to undertake biological/exploitation research (e.g. gear selectivity, tagging - exploitation rates, biology, reproductive parameters) AND to develop management triggers/reference points.	Develop and implement consistent (a) use of relative risk assessment, (b) performance indicators (e.g. trigger points)
3.	Identifying critical habitat for highly vulnerable species. Investigate use of spatial closures.	Quantifying catch of these might be the basis for a PI. See Priority 1 projects. Some habitat-use pilot studies underway.
4.	Update assessment of black-tip complex.	Low risk, but dominant in catch. Stock assessment long overdue.
5.	Foreign and Illegal. Collate data on foreign fishing activity (e.g. compliance records). See what is available/collected. Initiate measures to collect required data.	Important, but consistent data collection and assessments within Australia are prerequisite to assessing foreign data requirements.
5.	Use of DNA to aid -determination of species composition; -location of origin. Need to identify which species (world-wide) have been DNA finger-printed. (CSIRO)	Important, but may not provide real-time information relevant to management. PIs, and management responses, will likely be based on fishery returns.

APPENDIX 1

DRAFT STRATEGIC PLAN FOR RESEARCH ON QUEENSLAND SHARK RESOURCES 2005-2015

NOTE: Annotations by Dan Gaughan.
Yellow= align with NAFM shark workshop outcomes
Aqua - comments

Theme 1: Research to improve management measures for shark resource sustainability

(i) **Establish appropriate management units (including stock structure definition, stock boundaries, and the spatial dynamics of the stocks) for target shark species in the Queensland Gulf of Carpentaria and East Coast target shark fisheries**

(ii) **Refine catch information (for target and bycatch shark species) from commercial fisheries through improved logbooks and catch species identification**

(iii) **Track changes over time in catch composition of the shark component of Queensland Gulf and East Coast fisheries in terms of seasonal occurrence and inter-annual variability, and the distribution and biological attributes of the species involved**

(iv) **Investigate alternative harvest methods to reduce shark bycatch in non-target fisheries, with priority to listed threatened and endangered species, and determine the socio-economic benefits and costs of change**

(v) **Develop Shark Bycatch Action Plans for Queensland fisheries which do not target shark**

(vi) **Assess the ecological impacts on East Coast coastal shark populations of the Queensland Shark Control Program for Bather Protection**

(vii) **Develop and set precautionary management triggers for black-tip shark species, including timeframes and pre-determined management processes and responses**

(viii) **Use risk and fishery criteria to determine suitable indicator shark species outside the black-tip species complex, for assessing exploitation dynamics and establishing management triggers**

(ix) **Develop and undertake monitoring programs for high risk shark species in target and non-target fisheries, to reduce the level of risk [see Theme 2]**

(x) **Assess the effectiveness of spatial closures sustaining populations of sedentary shark species and their socio-economic impacts (including the potential for effort shifting) [see Theme 2]**

(xi) **Identify key habitats for survival of shark species eg nursery/"pupping" areas, and investigate the use of spatial closures to protect the identified habitats**

(xii) **Investigate the potential for DNA identification kits for use in identifying shark species and the location of their origin**

Theme 2: Research to improve conservation measures for shark resources

(i) **Determine life cycle characteristics and habitat requirements for listed threatened and endangered shark species**

(ii) **Assess current fishery management arrangements for listed threatened and endangered species against requirements for those species**

(iii) **Develop recovery/rehabilitation plans for listed endangered species eg *Glyphis* spp; Pristidae especially *Pristis microdon***

(iv) **Identify key habitats for survival of listed threatened and endangered shark species, and investigate the use of spatial closures to protect the identified habitats**

Theme 3: Improving the quality of information for research purposes on the shark database for Queensland target and non-target fisheries

(i) **Develop and implement fishery-independent long term monitoring programs for shark resources in Queensland Gulf and East Coast waters [Development has been done in the FRDC Phase and Phase 2 projects]**

(ii) **Queensland and Northern Territory to develop a standardised approach for collection of shark catch and effort information in commercial, recreational and charter boat fisheries, for data compatibility for research purposes [As above, Development has been done in the FRDC Phase and Phase 2 projects]**

(iii) **Implement risk assessments for shark species taken in Queensland target and non-target fisheries [Risk assessments have been developed in the FRDC Phase and Phase 2 projects. The issue is one of consistency in implementation.]**

(iv) **Assess cryptic fishing mortality of shark species in target and non-target fisheries, for input to shark stock assessments and risk assessments**

(v) **Assess levels of cryptic fishing mortality of shark species in recreational and charter boat fisheries, and game fishing**

Theme 4: Research into the basic biology of sharks, their ecological roles, and the ecosystem impacts of shark harvesting

[Not discussed as priorities at NAFM]

(i) **Develop population dynamics models for sharks in the ecosystem, for determining population status, rates of recovery, population structure and distribution**

(ii) **Assess the impact of shark management and conservation measures on ecosystem structure and function**

(iii) **Establish the age structure of Queensland shark populations, and develop age-length keys for target and bycatch shark species**

(iv) **Develop a quantitative framework to assess the recovery of listed threatened and endangered shark species**

Theme 5: Research into shark product development and marketing

[Not discussed as priorities at NAFM]

(i) Collaborate with the Queensland commercial shark fisheries in identifying, evaluating and developing opportunities for increasing utilisation/value adding of shark products

(ii) Determine the impact on the biology and behaviour of sharks of electromagnetic fields, including personal shark protection devices

This draft strategic plan was prepared as a document for discussion by R Garrett and N Gribble, DPI&F Northern Fisheries Centre, Cairns on 19/11/2004.

31.1.

31.2. NORTHERN TERRITORY R&D SHARK PLAN

PLANNED OUTCOMES	SPECIFIC OUTPUTS	PROJECTS	PLANNED DURATION	MEASURES OF SUCCESS

PLANNED OUTCOMES	SPECIFIC OUTPUTS	PROJECTS	PLANNED DURATION	MEASURES OF SUCCESS
SUSTAINABLE HARVESTING	1. Fishery Management Plan 2. Environmental accreditation under the EPBC Act (export certification) 3. Contribute to the Operational Plan of Action for Northern Australian Shark Fisheries agreed with Qld and WA	Fishery Management Plan review to canvass • Outcome of Fisheries Assessment Report (FAR) for shark and grey mackerel including impacts of fishing by all sectors (including cryptic mortality) incorporated into management arrangement • Trigger points/performance indicates for sustainability of target species • Agreed by-catch/by-product catch shares for the commercial, recreational, FTO and indigenous sectors • Conditions of accreditation under the EPBC Act. Implementing the agreed outcomes of the national Plan of Action for Sharks Bycatch/byproduct limits for all commercial fisheries targeting other species		Fisheries management regime addresses issues appearing in the fisheries assessment report Trigger points incorporated into fishery management arrangements Operation plan implemented Management contribution to the Environmental accreditation under the EPBC Act provided within agreed timeframes. Bycatch/byproduct catch limits implemented for NT commercial fisheries that ensure overall landings remain within historical levels.

PLANNED OUTCOMES	SPECIFIC OUTPUTS	PROJECTS	PLANNED DURATION	MEASURES OF SUCCESS
PROTECTION OF BIODIVERSITY	Risk Assessment of impacts on by-catch/by-products	Assist in the collation of baseline information on-by catch undertaken by the Research Branch.		
OPTIMUM UTILISATION	Optimise the benefits that accrue to the NT through harvesting NT fisheries resources	Provision of options paper for allocation models for the consideration of the Aquatic Resource User Group Forum 1. C.O.P for commercial sector 2. Promote recreational fishing experience		Options paper on allocation models accepted by the Aquatic Users Resource Group

FIGURE 5a. STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE FOR THE SHARK FISHERY

WILD HARVEST	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE (Years)				
				N	E	Y	02	03	04	05	06
SHARKS AND GREY MACKEREL	SUSTAINABLE HARVESTING	Fishery assessment reports on the status of the fishery with reduced uncertainty of assessments and predictions. These reports contain sustainability indicators.	- Continue analysis and refinement of catch and effort information from fishers logs using when available information from fleets operating outside the AFZ [H] - Participate in the FRDC funded project '*Northern Australian sharks and rays: the sustainability of target and bycatch species, phase 2*' [H]. - Investigate feasibility of tagging to monitor harvest rates and to examine onshore/ offshore migration of blacktip sharks [M]. - Investigate a rapid assessment project for grey mackerel and develop and test of monitoring protocols [M]	X		X X X					
	PROTECTION OF BIODIVERSITY	Species and quantity of retained and incidental bycatch determined and any important effects that the fishery may be having on the species composition of elasmobranches and	- Participate in FRDC funded project '*Northern Australian sharks and rays: the sustainability of target and by-catch species, phase 2*' (see above). - Collection of bycatch data from commercial fishers.		X	X X					
	OPTIMUM UTILISATION	The economics and profitability of the commercial shark fishery assessed by the commercial industry, including assessment of current and potential market improvements.	- Assess the need of a food safety plan for the NT shark fishery. - Examine potential markets and utilisation of by-catch species.			X X					

STAKEHOLDER UTILISATION	
COMMERCIAL INDUSTRY	H
RECREATIONAL FISHING	L
TRADITIONAL USAGE	H

KEY:
H = HIGHLY IMPORTANT
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE
NIL = NO UTILISATION

Project Priority: H = High; M = Medium; L = Low

N = NT Funded; E = Externally funded; Y = Yet to