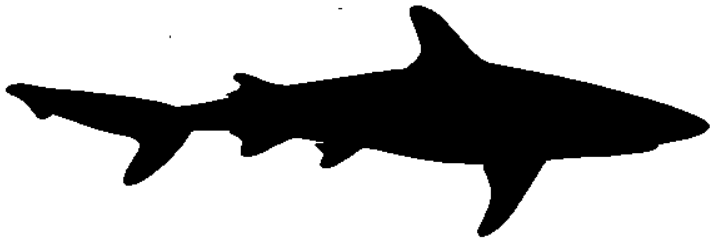
FISHERIES INFORMATION PAPER

OVERVIEW OF ISSUES IN MANAGING THE NORTHERN TERRITORY SHARK CATCH



Fishery Report No. 57

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1 INTRODUCTION

Whilst management arrangements are well advanced for the dedicated shark fishery, landings of shark in fisheries directed at other species is in general, unregulated. Prices paid for shark fins and flesh have risen considerably in recent times, with non-target fishers either increasing their landings of sharks or retaining sharks previously discarded, or both. Incidental landings in non-target fisheries are low. However, there is potential for non-target fishers to increase their overall share of the shark catch. Targeted fishing for sharks just for their fins (and discarding their bodies) is considered wasteful and contrary to the good management of the fishery and may risk their sustainability. Similarly, commercial and recreational fishers, together with the wider community deplore the removal of fins from live sharks.

Limits on commercial catch of sharks will be imposed because:

- there has been considerable increases in world landings;
- there is evidence of a decline in shark resources in many parts of the world;
- their life history (they have a long life, breed infrequently, produce few offspring and mature late in life) makes sharks vulnerable to over exploitation; and
- prices for fins and saleable flesh are rising.

Such limitations must be equitable, recognise that sharks are an incidental and unavoidable landing in a range of commercial fishing operations targeting other species, ensure that non-target fishers do not increase their share of shark landings, and must be easy to enforce. Not to place limits will erode the efforts of the dedicated shark fishery in reducing licence numbers and ultimately place our shark resources at risk. Moreover, the Northern Territory will be unable to meet a range of national and international conventions for the sustainable management of our shark stocks.

For the purpose of discussions, shark catch includes targeted catch (target), non-direct (non-targeted, incidental), bycatch (discarded non-targeted catch), byproduct (retained non-targeted catch), commercial, recreational and subsistence and other activities in which sharks are harvested.

There is a need to improve the quality of the shark data collected, with the Fisheries Division working with the Northern Territory Shark Fishermen's Association to help improve species identification of the commercial catch. Improved resolution of shark catches, including discards, in other commercial fisheries will also be necessary.

The term "shark" generally encompasses all species of sharks, skates, rays and chimaeras (Class Chondrichthyes). Commercial fisheries land what may be termed "true sharks" as both a targeted fishery (Northern Territory Shark Fishery) and as an incidental catch of all other commercial fisheries.

The key issues to be considered by the Northern Territory include:

- imposing equitable shark catch limits for individual commercial fishing operations targeting other species;
- establishing controls to guard against targeted shark fishing for fins;
- outlawing the inhumane practice of finning live sharks; and,
- improving the resolution of the shark data collected.

2 THE RESOURCE

2.1 Species Composition and Distribution of Shark Catches

The black-tip shark (*Carcharhinus tilstoni* and *C.sorrah*) is the key target shark species retained in the NT. Catches have fluctuated between 315 and 759 tonnes over the last five years (Table 1).

Table 1. NT landed shark from the target shark fishery (kg, whole weight)

Reported Common name	1994–95	1995–96	1996–97	1997–98	1998–99
Tilstoni shark (black tip)					113,631
Black tipped shark	305,659	700,381	571,867	431,904	97,285
Hammerhead shark	27,759	26,396	3,909	23,105	43,981
Sorrah shark (black tip)	371	2,586			42,645
Milk shark	3,425	2,343	1,914	3,229	9,546
Whaler shark				486	3,711
Saw shark	1,907	1,886	800	1,100	3,091
Shark-general	79,117	25,447	64,403	21,355	710
Shovel nose shark		29	29		69
Total shark	418,239	759,068	642,922	481,179	314,669

The hammerhead shark may include three species, scalloped hammerhead (*Spyhrna lewini*), winghead shark (*Eusphyra blochii*) and great hammerhead (*S. mokarran*). Other species of shark that have been reported in this fishery include graceful shark (*C. amblyrhynchoides*), grey reef shark (*C. amblyrhynchos*), pigeye shark (*C. amboinensis*), spinner shark (*C. brevipinna*), whitecheek shark *(C. dussumieri*), creek whaler (*C. fitzroyensis*), hardnose shark (*Carcharhinus macloti*), Australian sharpnose shark (*Rhizoprionodon taylori*) and tiger shark (*Galeocerdo cuvier)* (Anon. 1990).

The common name “saw shark” (Table 1) usually refers to the family Pristiophoridae, which has not been recorded from waters across the top of Australia. In this instance saw shark refers to Pristidae, coastal and estuarine species that occur in Australian tropical waters (Last and Stevens 1994). ‘Shovel nose shark’ which was a very small component of the catch may refer to either, or both, shovel nose rays (Rhinobatidae) and sharkfin guitarfishes (Rhynchobatidae) both of which occur in Australia’s northern waters (Last and Stevens 1994). The former does not have fins of commercial value while the latter has the highly valuable ‘white’ shark fin.

Reported effort in the target shark fishery is inconsistent and is considered to be relatively low (Table 2). It is apparent that since 1995–96 the catch in relation to the number of boat days fished has declined.

Table 2. Effort of target shark fishers in the Northern Territory

Year	No. Licences	Effort – Boat days	Catch per boat day (kg/boat day)
1994–95	16	721	580
1995–96	22	1,190	638
1996–97	16	1,304	493
1997–98	14	1,327	362
1998–99	13	987	319

Sharks are also landed as an incidental catch in a range of commercial fisheries. Landings of shark from these fisheries have fluctuated over the last five years between 39 and 64 tonnes (Table 3). Most of the landings were reported under “shark-general” because of identification problems. Black tipped shark was the next most dominant category of shark landed annually. The species composition of “shark-general” is unknown at this time.

Table 3. NT landed shark bycatch (kg, whole weight)

Reported common name	1994–95	1995–96	1996–97	1997–98	1998–99
Black tipped shark	13,428	8,305	7,695	7,294	2,758
Hammerhead shark	5,578	448	925	1,010	355
Saw shark	4,944	985	1,604	139	230
Shark-general	36,279	37,385	28,979	56,002	36,072
Milk shark		4			
Java shark		4,000			
Total	60,230	51,126	39,203	64,445	39,415

Where there are less than five licence holders declaring catches of shark within a licence “category” within any year, the licence type for the capture is combined with others and appears under the “combined” category. These licences may include coastal developmental, coastal net, bait net, Spanish mackerel, barramundi, demersal (nil catch limit), mud crab, aquarium fish display and northern finfish trawl fisheries. The majority of landings were recorded under 'combined' licences (Table 4).

Table 4. Landed shark bycatch by licence type (kg, whole weight)

Licence type	1994–95	1995–96	1996–97	1997–98	1998–99
Coastal line	4,583	4,721	2,960	2,170	1,641
Restricted bait	13,200	13,356	17,085	16,839	17,546
Combined	42,447	33,049	19,159	45,436	20,228
Total	60,230	51,126	39,203	64,445	39,415

Table 5. Number of licensees that declared catches of shark

Licence type	1995–96	1996–97	1997–98	1998–99
Coastal line	13	10	8	8
Restricted Bait Net	25	24	23	21
Barramundi	10	12	9	7
Coastal net	8	7	5	6
Developmental coastal net	1	2	2	1
Finfish trawl	1	1	1	1
Spanish mackerel	1			
Demersal	1	1		
Bait net			1	
Aquarium fish display	1	6		
Total licences	61	63	49	44

The number of non-target shark licensees that take shark has declined in the last two years (Table 5). The Restricted Bait Entitlement had the largest number of licensees landing shark (which was also the fishery that recorded the highest quantity of shark bycatch (Table 4)) followed by coastal line and barramundi fisheries. The holder of a Restricted Bait Entitlement may catch bait for his/her own fishing operation but may not sell any of the catch, such as shark flesh or fins. Most commercial fishing licensees, other than coastal line fishers hold such entitlements.

Barramundi fishers have not targeted shark in the past as barramundi stocks are plentiful and there is no incentive to target sharks. However, due to the nature of the fishing operation, sharks are frequently taken as an incidental catch. There are currently 26 barramundi licences in use, but less than half of these fishers recorded shark landings: 10 in 1995-96 to 7 in 1998-99. Separate shark fishery licences were issued to barramundi fishers in recognition of past landings of sharks, especially during the closed barramundi season. Many barramundi fishers have since transferred these licences to operators seeking to enter the shark fishery.

The coastal net fishery commenced as a haul or seine net fishery in which a school of fish was encircled, or alternatively, hauled in an area in which mullet and blue salmon occur. Nets may now be set with a single anchor. Nets may only be hauled by hand, with the catch generally landed live.

Sharks are also taken as an incidental catch in the development coastal net, finfish trawl and the coastal line fisheries. In the coastal line fishery, sharks are generally landed as an incidental catch of line fishing, and may be used as bait or processed for the market. Coastal line fishers generally sell their catch, fresh on ice, to local and southern markets.

Few shark landings have been reported from the Spanish mackerel fishery and mud crab fishery due to the nature of the fishing gear employed. A nil shark by-catch limit has been imposed for the offshore demersal and Timor Reef line and trap fishery.

2.2 Evolution of Catch

A complete overview of the development of the shark fishery is provided in Appendix A.

Direct involvement in the shark fishery by domestic fishers began in the early 1980s. Landings remained low with catches ranging from 100 to 500 tonnes until the early 1990s, with shark fillets marketed on the established food markets throughout southern Australian States.

Sharks are also taken as an incidental catch of coastal line, bait and inshore netting operations, with reported landings ranging from 39 tonnes to 60 tonnes over recent years (Table 4). Prawn trawlers and longline fishing operations for tuna have recorded incidental shark landings. Nil or zero bycatch limits have been imposed for the Northern Prawn Fishery. Shark bycatch limits have been implemented for the tuna fisheries to land sharks as trunks (with fins attached).

2.3 Markets

The shark fishery targets black-tipped sharks (*Carcharhinus tilstoni* and *C.sorrah*) for the food market.

Due to operational constraints associated with working in such a remote region (a coastline in excess of 6,500 km with only one port, Darwin, with all seasons access) operators must process and freeze their catch at sea. Some trunked (head, tail and viscera removed) sharks are sold fresh on ice to southern city markets. Black-tip shark is marketed as trunk, fillet and fin to southern capital city markets. Prices range from $3.50 to $5.00 for black-tipped shark fillets, and have improved in recent times. Anecdotal evidence suggests that lower landings in other Australian shark fisheries have resulted in increased prices for tropical sharks. In the past, some larger shark trunks have been exported, as they cannot be sold domestically due to mercury concentrations that exceed Australian food standards.

Small amounts of shark meat have also been sold on local markets by coastal line and coastal net fishers.

Prices received for shark fins rose considerably throughout the later part of the 1990's. A review of available details shows that shark fins have been sourced from the dedicated shark fishery, both from sharks processed for their flesh and from incidental landings of larger sharks, and as a "by-product" of commercial fishers targeting other species. Increasing world prices for shark fins will encourage the retention of sharks previously discarded, or increase landings, for both flesh and/or fins. With the exception of the Demersal and Timor Reef fisheries, there is no limit or restriction on the amount of shark that may be harvested within other commercial fisheries.

3 MANAGEMENT OBJECTIVES

3.1 Shark Finning in Other Australian States

A decision by the NSW government to require fishers to land sharks as a carcass or trunk (with their fins attached) sought to provide a greater level of protection to great white and grey nurse sharks following their listing as a vulnerable/threatened species. Fishers must retain sharks in a whole condition to aid in their identification to ensure compliance with the ban on landing vulnerable/threatened species.

In Victoria, regulations requiring shark fishers to land sharks as trunks were imposed over 15 years ago due to marketing/health issues associated with offering larger sharks for sale. The Australian standard for maximum mercury levels in shark flesh is a policy that is applicable Australia wide for the sale of all shark products.

Furthermore, processing of sharks at sea is only permitted in the dedicated shark fisheries in WA. All other commercial fishers must land their incidental catch of sharks as trunks, with fins attached.

3.2 International Plan of Action for the Conservation and Management of Sharks

In accordance with the requirements of the agreed International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks 1999), Australia has commenced a review of the status of its shark fisheries as a precursor for assessing the need for a National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks). IPOA-Sharks suggests that member countries, such as Australia, should adopt an NPOA-Sharks if their vessels regularly capture sharks as a targeted or incidental catch.

Implementation of an NPOA-Sharks requires the preparation of a Shark Assessment Report (SAR). This report is to be updated regularly to advise on the status of shark stocks as assessments are made and to identify gaps in our understanding of our shark resources. The NPOA report will require the collection and ongoing analysis of compatible data at an appropriate resolution leading to improved species identification and eventually, abundance indices (Shark Advisory Group, 2000).

The NPOA does not distinguish between targeted and incidental catch; rather, it places obligations on the States/Northern Territory and the Commonwealth to demonstrate that our shark resources are adequately managed. The Northern Territory must demonstrate that adequate management arrangements have been implemented for both the managed shark fishery and sharks landed as an incidental catch, including discards.

3.3 Commonwealth Laws Requiring Environmental Impact Assessments

Under the *Commonwealth Environmental Protection and Biodiversity Conservation Act* (EPBC) all Commonwealth-managed fisheries are subject to strategic assessment, as are those fisheries managed by the States and the Northern Territory, which impact on protected species.

Furthermore, the *EPBC Act* requires that all Commonwealth fisheries must be formally assessed on their environmental impact while State/NT fisheries might trigger the need for Commonwealth environmental assessment.

The *Wildlife Protection (Regulations of Exports and Imports) Act* will require all fisheries to undertake an environment assessment by 2003 if any part of their catch is exported. The process for such assessments is yet to be agreed, however, is likely to require a greater level of assessment than currently provided.

Such assessment will require the Northern Territory to demonstrate that adequate controls are in place for sharks landed in the targeted fishery and incidental catches in other fisheries. Assessment will be required for all Joint Authority fisheries (Timor Reef, Demersal, Fish trawl and sharks), those fisheries that export any part of their catch and any fisheries which interact with threatened or rare species. This means that these management arrangements must cover these species irrespective of the fishery in which they are landed.

3.4 Bycatch Action Plan

A National Policy on Fisheries Bycatch was adopted by the Ministerial Committee on Fisheries Forestry and Agriculture (all State/Territory and Commonwealth Fisheries Ministers) in seeking to coordinate actions nationally to address the incidental capture of species in fishing operations. Such an agreement provides for all resource management agencies, in partnership with stakeholders, to address the issue of incidental landings, including sharks.

3.5 Special Management Actions

Special management may be necessary for those species that have poor conservation status and those that are naturally rare. In Australia there are six species of sharks that have been given greater protection: white or great white shark, grey nurse shark, *Glyphis* spp, freshwater sawfish, whale shark and sand tiger shark (Shark Advisory Committee, 2000).

The *Commonwealth Environmental Protection and Biodiversity Conservation Act* requires that recovery plans for protected species must be implemented, within a five year timetable for those species which are listed as vulnerable.

4 MANAGEMENT POLICIES AND THE POLICY SETTING PROCESS

4.1 Identification and Evaluation of Policies

The shark fishery is managed under the *Northern Territory Fisheries Act 1988.*

Entry to the shark fishery is limited to those operators who, in the past, have satisfied commercial catch criteria in demonstrating a reliance on the fishery. A commercial fishery licensing reduction program commenced in 1995 to both reduce capacity available in the fishery with the aim of ensuring sustainability and to afford an adequate level of profitability for the remaining operators.

Pre-existing access concessions were recognised with the passage of an Offshore Constitutional Settlement (OCS) in 1995. At that time, existing fishers were issued a “restricted licence” for the zone or zones in which they were authorised to operate. The three management zones, previously implemented under a Commonwealth implemented development plan, were continued.

There is a ban on the landing of sharks in Northern Territory’s offshore line and trap fisheries for tropical snappers.

A number of special interest areas have been declared throughout Northern Territory waters, in which fishing activity is restricted. While not specifically declared to provide protection for sharks, fishing restrictions apply which limit the capture of sharks.

4.2 Policies Adopted

Complementary management arrangements have been agreed between the Northern Territory and Queensland for the shark fishery within the central Gulf of Carpentaria (GoC) region. Prior to the passage of the OCS of 1995, the Commonwealth Government managed the shark fishery in offshore waters throughout northern Australia. At that time, a single fishing concession was issued for the GoC Zone, covering waters adjacent to the both the Northern Territory and Queensland. With the passage of management responsibility from the Commonwealth to the Northern Territory and Queensland Fishery Joint Authorities, agreement was reached on the need for a complementary and compatible approach to manage what are likely to be shared stocks.

Policies have been agreed to effectively "link" shark fishing concessions issued by Northern Territory and Queensland agencies for the central GoC region to prohibit any increase in the number of fishing vessels. Details on the management and policies of the main commercial fisheries in the NT are provided in Appendix B.

4.2.1 Resource Access

Management of the shark fishery places limits on the overall number of commercial licensees together with restrictions on the construction and type of fishing gear.

A licence reduction program requires existing licensees to transfer three restricted shark fishery licences to the Territory for the issuance of an unrestricted shark fishery licence. New entrants must acquire and surrender three "restricted" shark fishery licences for the issuance of an "unrestricted" fishery licence. Alternatively, any new entrant may acquire an "unrestricted" licence, that is, a pre-existing licence issued on the surrender of three (restricted) licences.

Timor and Demersal fishers may not land or possess sharks.

4.2.2 Gear Restrictions

Commercial shark operators may use a maximum of 2,500 m of pelagic gillnet constructed of twine not less than 0.9 mm in diameter with a mesh size between 150 mm and 250 mm. Pelagic longline may be used in all regions (restrictions apply to the Coastal zone) of the shark fishery, or demersal longline in the Arafura or GoC region, provided the total length of all lines used does not exceed 20 nm at any time. A ban on the use of bottom set nets has been enacted to protect charismatic megafauna.

Gear restrictions for fishing operation targeting other species and landing of sharks as an incidental catch are described in Appendix B.

4.2.3 Vessel Regulations

The holder of a shark fishery licence may operate a vessel under that licence if that vessel operated in the fishery prior to 1995 or if he or she has the written approval of the Joint Authority to use the vessel. An interim moratorium on the introduction of vessels larger than 25 m has been implemented.

4.2.4 Biological Regulations

To ensure the biological integrity of our shark fishery resources the management arrangements will primarily include effort controls and a commercial fishery licence reduction program.

4.2.5 Species 'Special Management'

There is currently no evidence (either anecdotal or otherwise) to suggest that vulnerable or threatened species are landed within the Northern Territory shark fishery or fisheries targeting other species. White Shark (*Carcharodon carcharias*) have a cosmopolitan distribution but do not occur in tropical waters, including those adjacent to the Northern Territory. Similarly, the

Fisheries Division has no record of grey nurse (*Carcharias taurus*) sharks occurring in waters adjacent to the Northern Territory.

5 THE MANAGEMENT PLANNING PROCESS

5.1 Fishery Statistics

Catch and effort details are collected from commercial fishers operating under a Northern Territory fishery concession. For the shark fishery, fishing effort and catch (type and species) is recorded for each fishing session, on a daily basis. Licensees provide logbooks together with a separate report on sales of fisheries products.

Difficulties in the identification of some species of sharks are reflected in the reporting with a range of species recorded as “sharks-general” within commercial fisheries targeting other species. The level of shark discards is mostly unrecorded.

Seafood marketers are generally required to record and report on all purchases of seafood products.

Independent observers employed by NTDPIF have accompanied shark fishers and reported on commercial fishing activity in the past.

Catch and effort details are collected from all commercial fisheries and fishing tour operators, including incidental landings of sharks. A comprehensive survey of recreational fishers was undertaken in 1995, with a further survey of recreational and indigenous fishers currently under way.

The *Northern Territory Fisheries Act* of 1988 provides for the confidentiality of fishers reports, including logbooks and marketing returns. Generally, logbook returns provided by fishers are amalgamated to ensure the confidentiality of details reported by individual fishers. This means that the logbook information provided by five or more fishers is combined for reports released publicly.

5.2 Stock Assessment

Evaluation of yield estimates for tropical sharks was the subject of the 1992 Joint Australian-Indonesian Workshop on the Arafura Sea Fisheries and a follow-up Workshop in 1994. Yield estimates proved inconclusive due to inconsistencies in data collection methods.

The joint NTDPIF-CSIRO Pelagic Fish Stock Assessment Program estimated that, in waters adjacent to the Northern Territory, the maximum sustainable yield (MSY) for *C. tilstoni* and *C. sorrah* is 3,400 tonnes annually. This estimated yield consists of 1,900 tonnes in the Arafura and Gulf of Carpentaria zones and 1,500 tonnes in the NT zone.

CSIRO tagging studies suggest that *C. tilstoni* and *C. sorrah* form a single large stock throughout northern Australia. However, movement rates both longshore and offshore are relatively restricted, indicating slow exchange rates (1-10 percent/year) between the northern Australia/Arafura area where most Taiwanese gillnetting took place, versus the Gulf of Carpentaria and Bonaparte Gulf where foreign fishing was either low or totally excluded.

The ratio of catch to fishing effort is referred to as Catch per Unit of Effort (CPUE). The statistics corrected for shark targeting (square root variation in CPUE with stock size) suggest that the Taiwanese fishery of the 1970s and 80s reduced the northern Australia/Arafura component of the stock by about 60-70 percent. Analysis suggests that the GoC stock may not have declined by more than 30 percent due to closures imposed by the Commonwealth when the northern Australia/Arafura stocks were being depleted, probably “hyperdepleted” by the Taiwanese fleet.

Combining potential yields over the heavily fished Arafura Sea and Gulf of Carpentaria stock components gives a combined potential yield estimate for Western Australia, the Northern

Territory, and Queensland of at least 2,000 tonnes per year. An optimum annual exploitation rate of the vulnerable component of the stock on the gillnet is 6-7 percent per year. This suggests that while there may be a large population of sharks, only a small amount can be sustainably harvested each year. The optimum annual exploitation rate is determined from annual mortality, growth, selectivity, and pup production rate data; what we are mainly uncertain about is how large a stock this rate should be applied to in calculations of the total annual catch.

Age-structure modelling indicates that the overall stock (northern Australia/Arafura plus GoC components) should have been increasing since the mid-1980s when Taiwanese catches were greatly reduced, at a rate of between 5 percent and 10 percent per year in spite of more recent domestic catches. However, CPUE data from the NT gillnet fishery does not show such a rise in catch levels.

To reproduce this pattern while still estimating stock sizes in 1985 large enough to account for the Taiwanese catches and impact on relative abundance, we have to assume that there has been a continuing unreported removal of around 1,500 tonnes/year from the northern Australian stock component (as compared with an average reported catch of only 300 tonnes/year by all domestic fisheries combined). This may be due to foreign fishing in the Arafura region, perhaps combined with unreported catches.

It is also possible that declines in domestic CPUE have been due to slow depletion of an inshore, resident component of the overall stock, without there being a major impact of recent fishing on the stock as a whole (that is, overall stock may be recovering, but inshore density is being reduced by domestic fishing in spite of overall increase).

The tagging work undertaken by CSIRO is not totally inconsistent with this hypothesis, when data is corrected for bias in apparent movement patterns due to higher offshore fishing efforts during the period when the study was conducted. However, if there is a distinctive inshore stock component being fished by Northern Territory and Queensland fishers, this stock component has a much lower sustainable yield than we would estimate for the stock as a whole based on the offshore Taiwanese removals.

For this assessment we have had to rely almost entirely on highly suspect CPUE statistics from Taiwanese fishers, the validity of which is questionable for stock management purposes. It is not known whether the observed fishing strategy and changes in catch rates are linked to the availability of sharks or the targets of other pelagic fish in other regions. There are various reasons to suspect that the observed CPUE trends are not proportional to changes in the actual stock size.

5.2.1 Biological Advice Review Process

In 1974, the then Forestry, Fisheries and Land Conservation Branch, Commonwealth Department of the Northern Territory, engaged Professor P. Copes to assess the state of the Northern Territory fisheries and recommend directions for the future development and management. His recommendations shaped the directions of the fishing industry over the next two decades (Copes 1975).

With the Northern Territory attaining self-government in 1978, future directions were further reviewed with increased resources for the newly created Fisheries Division to implement these directions. Since that time there have been further reviews of individual fisheries, a number of reviews of the Division and its functions and directions, the 1992 Joint Australian-Indonesian Workshop on the Arafura Sea Fisheries, a follow-up Workshop in 1994 and a stock assessment workshop series partly funded by the Fisheries Research and Development Corporation (FRDC) (Buckworth 1993).

In 1993, FRDC funded the employment of a stock assessment expert to provide the latest stock assessment expertise to assist in refining stock assessments and fisheries management strategies. In the absence of a suitable candidate, it was decided not to continue with the recruitment for a stock assessment expert, but rather, seek funding for short-term consultancies, which addressed immediate issues in research and management within the Northern Territory.

Such a review was undertaken for the shark fisheries throughout Northern Australia in 1997. An assessment team, led by Dr Carl Walters of the University of British Columbia, conducted a workshop to review all available information gathered from shark fisheries throughout northern Australia. The teams consisted of Northern Territory, Queensland, Western Australia and Commonwealth scientists and managers. The review workshop commenced with a formal meeting attended by industry, managers and scientists to describe the fishery, management objectives, current research and data available. A separate “modelling workshop" was then convened to review recent analyses and management strategies, and provide a learning platform. The outcomes of the workshop were conveyed in an "open meeting" with industry, managers, scientists and other interested individuals.

6 FISHERY MANAGEMENT REGULATIONS

6.1 Regulations

The shark fishery is managed under the *Northern Territory Fisheries Act* 1988.

Fisheries Regulations place limits on the overall number of commercial licensees, together with restrictions on the construction and type of fishing apparatus used.

A licence reduction program requires existing licensees to transfer three restricted shark fishery licences to the Territory for the issuance of an unrestricted shark fishery licence. Fisheries Regulations provide that access to the fishery regions of an unrestricted fishery licence shall be those permitted under the surrendered licence. This is to say that new entrants can surrender three shark fishery licences from any fishing region or regions (Coastal, Arafura and/or Gulf of Carpentaria), for the issuance of an unrestricted licence to that zone or zone(s) only.

7 LAW AND ENFORCEMENT

7.1 Enforcement Issues

The Marine and Fisheries Enforcement Unit of the Northern Territory Police, Fire and Emergency Services undertakes surveillance and enforcement functions for NTFJA fisheries, as part of its ongoing tasks in fisheries matters.

Operationally, surveillance activities for NTFJA fisheries have been by way of in-port inspections of fishing gear to ensure compliance with effort controls, by-catch limits for Spanish mackerel and as an adjunct to compliance activities for other fisheries.

Compliance also seeks to ensure the prohibition on possessing sharks or shark products by participants in the offshore line and trap fisheries for tropical snappers.

Any catch limits must be easily enforced to ensure an adequate level of compliance.

8 MANAGEMENT SUCCESS

8.1 Profitability of the Fishery

Evaluation of the profitability in the fishery was undertaken throughout the mid to late 1980s in encouraging the development of the domestic shark fishery in coastal waters adjacent to the NT (Evaluation of the Sustainability of Longlining for Sharks in Northern Australian Waters, NT Fishery Report No. 15). This development strategy included “A preparatory Evaluation of the Development of a Shark Fishing Industry in Northern Territory Waters (NT Fishery Report No. 12 Vol. 1), Mercury in Sharks from Northern Territory Waters (NT Fishery Report No. 12 Vol. 2), Consumer Acceptability of Shark (NT Fishery Report No. 12 Vol. 3) and Exploratory Fishing Survey of Sharks and Other Pelagic Fish Resources Found in Northern Territory Inshore Waters (NT Fishery Report No. 12 Vol. 4).

8.2 Licence Reduction Program

In considering the available yield estimates for the Northern Territory shark fishery, general agreement was reached on reducing the overall number of access entitlements to ensure sustainability and economic viability. In 1995, significant amendments to the Northern Territory Fisheries Regulations were made to implement an industry sponsored commercial fishery licence reduction program. Following further regulatory refinement in 1998, the overall number of access authorisations for the Northern Territory shark fishery have been reduced from 39 to 23 licences.

A licence reduction program has been imposed for the coastal line fishery and a number of coastal netting licences will be surrendered under a government funded “buy-back” scheme.

8.3 Issues of Equity and Efficiency

Sharks are also taken in the line, bait and inshore netting operations.

A prohibition on the landings and possession of sharks was introduced for the offshore line and trap fishery for tropical snappers in concert with the licence reduction program for the commercial shark fishery. Sharks are an incidental catch in the inshore bait net fishery and may be utilised as bait in some inshore line fisheries, with shark flesh and shark products marketed as a minor incidental catch of inshore netting operations, particularly for barramundi.

The Commonwealth managed Northern Prawn Fishery has imposed a voluntary ban on shark and sharks products, including fins. By-catch reduction devices have reduced shark landings in the NPF. Catch limits are in force for the Western Tuna Fishery with operators to land their catch as trunks.

Shark catch limits are required for all commercial fisheries, whether they are set at nil or zero (Demersal and Timor Reef), unlimited or at some other level. To do otherwise will erode the benefits of the licence reduction program implemented for the NT shark fishery and place the future sustainability of shark resources at risk.

8.4 Management Costs

The Northern Territory Government bears management, research and compliance costs of the Northern Territory shark fishery.

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APPENDIX A: History of the Development of the Northern Territory Shark Fishery

Shark resources throughout northern Australia were exploited commercially by a Taiwanese gill-net fleet from 1974 until about mid 1986. Prior to 1978, the Taiwanese fished to within 12 nautical miles (22 km) of the coast. Foreign fishing vessels were excluded from the Gulf of Carpentaria in 1979. With the declaration of the Australian Fishing Zone (AFZ) in 1979, the foreign fishing fleets exclusion zone adjacent to Arnhem Land and the Wessel Islands increased to between 40 and 50 nautical miles offshore.

A bilateral agreement between Australia and Taiwan permitted access for 30 gill netters to land up to 7,000 tonnes (processed weight) of shark throughout northern Australian waters after this time. Fishing operations continued until 1978 with minor changes to overall catch levels. Throughout this time, joint venture arrangements were encouraged in an attempt to seek greater involvement by Australian operators.

Further restrictions for foreign fishing vessels were introduced in 1986 in response to declining trends in shark catch rates and concerns about the incidental capture of dolphins. These restrictions introduced limits on the length of gillnets, with gillnets not to exceed 2,500 m in overall length. Such controls rendered the Taiwanese gillnetting uneconomical, and despite the permitted use of baited longlines, fishing operations in northern Australian waters ceased in late 1986.

Appendix B: Management Arrangements for NT Fisheries

Fishery	Fishery extent	Number of Lic.	Access to the fishery	Gear restrictions	Gear type	Mesh size (mm)	Net length (m)
NT Barramundi	shore to 3nm	26 (211 units)	Licence, limited entry	gillnet units, area andseasonal closures	gillnet	150	100m net units
NT Coastal Line	shore to 15nm	66	licence, limited entry	limits on gear, includinghooks and traps	line and trap		
NT Coastal Net	Regionalised - Darwin, Gove and Borroloola – shore to 3nm	14	licence, limited entry	net length, mesh size,area closures	gillnet/haul net	65	300
NT Fish Trawl	Offshore	1	Limited entry	net restrictions	semi demersal trawl	>110	
NT Shark Fishery	Regionalised - Coastal, Arafura and Gulf of Carpentaria	23	Licence limited entry with a 3 for 1 licence reduction program	Net and long line length	surface set gillnets	150 –250	2,500
NT Spanish Mackerel	NT, coast to outer AFZ		Limited entry 2 for 1 licence reduction program		troll line, floating handline, rod and line		
NT Mudcrab Bait Fishery	Shore to 3 nm offshore	49	Restrictions on the use of nets to harvest bait only		gillnet	<65	100
NT Recreational Fishery	Marine waters		Restrictions on the use of nets to harvest bait		Haul net	<65	40
NT Fishing Tour Operators	All waters		Restricted to recreational fishingApparatus		line, rod and reel		