

NORTHERN TERRITORY FISHERIES  
JOINT AUTHORITY

REPORT FOR PERIOD

1 July 2002  
to  
30 June 2003

Commonwealth of Australia

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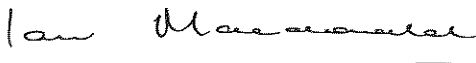
*FISHERIES MANAGEMENT ACT 1991  
(COMMONWEALTH)*

*FISHERIES ACT 1988  
(NORTHERN TERRITORY)*

*NORTHERN TERRITORY FISHERIES JOINT AUTHORITY*

*REPORT OF THE NORTHERN TERRITORY FISHERIES JOINT AUTHORITY*

*FOR THE PERIOD: 1 JULY 2002 TO 30 JUNE 2003*



Senator the Hon Ian Macdonald  
Minister for Fisheries, Forestry and Conservation  
Parliament House  
CANBERRA



The Hon Konstantine Vatskalis MLA  
Minister for Primary Industry and Fisheries  
Parliament House  
DARWIN



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## Introduction

This is the sixteenth annual report of the Northern Territory Fisheries Joint Authority (NTFJA). This report details the functions and activities undertaken during the period from 1 July 2002 to 30 June 2003.

The Northern Territory Fisheries Joint Authority assumed management responsibility for the following fisheries in all waters adjacent to the Northern Territory (NT):

- Demersal fishery;
- Finfish trawl fishery;
- Timor Reef fishery; and,
- Shark fishery

## Enabling Legislation

The NTFJA was established in February 1983, under the then Commonwealth legislation (*Commonwealth Fisheries Act 1952*) to provide for the Commonwealth and the Northern Territory to jointly manage declared fisheries and fisheries resources in waters adjacent to the Northern Territory. With the passage of the *Offshore Settlement Agreement* of 1987, management of the NT pearl oyster fishery passed to the NTFJA.

On 3 February 1995, the NTFJA, subject to the provisions of the *Commonwealth Fisheries Management Act 1991* (FMA) and the *Northern Territory Fisheries Act 1988*, assumed responsibility, in waters adjacent to the Northern Territory, for the demersal, Timor Reef, Shark and Finfish trawl fisheries. At that time, management of pearl oysters passed to the Northern Territory. Day to day administration of these fisheries is provided by the Fisheries Group of the Northern Territory Department of Business, Industry and Resource Development (DBIRD).

The NTFJA was established under "The Arrangement between the Commonwealth of Australia and the Northern Territory", published in the Australian Government

Gazette of 1 February 1995 and the Northern Territory Gazette of 1 February 1995 (No. S7, 1 February 1995). A copy of this Arrangement is provided at Annex A.

## 2. Members of the Joint Authority

The members of the NTFJA during the reporting period were:

Senator the Hon Ian Macdonald  
Minister for Fisheries, Forestry and Conservation  
(1 July 2002 to 30 June 2003) and,

The Hon Paul Henderson  
Minister for Primary Industry and Fisheries  
(1 July 2002 to 17 Oct 2002)

The Hon Dr Chris Burns  
Minister for Primary Industry and Fisheries  
(18 Oct 2002 to 30 June 2003)

Deputies for the NTFJA during the reporting period were:

For the Commonwealth Minister –

Mr Frank Meere  
Managing Director  
AFMA  
(1 July 2002 to 30 June 2003)

Mr Glenn Hurry  
General Manager, Fisheries and Aquaculture  
Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF)  
(1 July 2002 to 30 June 2003)

For the Northern Territory Minister -

Mr Richard Sellers  
Director of Fisheries  
DBIRD  
(1 July 2002 to 30 June 2003)

Secretariat services to the NTFJA are provided by the Northern Territory Department of Business, Industry and Resource Development (DBIRD).

### 3. Functions and Powers of the Northern Territory Fisheries Joint Authority

Section 62 of the Commonwealth *Fisheries Management Act 1991* together with Section 66 of the Northern Territory *Fisheries Act 1988* provides for the function of the NTFJA, viz:

*"keeping constantly under consideration the condition of the fishery, formulating policies and plans for the good management of the fishery, and for the purposes of the management of the fishery exercising the powers conferred on it by the Northern Territory Fisheries Act and co-operating and consulting with the other authorities including other Joint Authorities within the meaning of the Commonwealth Act, in matters of common concern."*

The Commonwealth Act also provides that in undertaking these functions, the Joint Authority must pursue the objectives of –

- (a) *implementing cost-effective fisheries management; and,*
- (b) *ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle, in particular the need to have regard to the impact of fishing activities on non-target species and the marine environment; and,*
- (c) *maximising economic efficiency in the exploitation of fisheries resources; and,*
- (d) *ensuring accountability of the fishing industry and to the community generally in its management of fisheries resources.*

The NT *Fisheries Act 1988* also provides the following objectives for the NTFJA.

- (a) *ensuring, through proper conservation, preservation and fisheries arrangement measures, that the living resources of the waters to which the Act applies are not*

*endangered or over-exploited; and,*

- (b) *achieving the optimal utilisation and equitable distribution of those resources.*

Management of the recreational component of NTFJA fisheries resides with the DBIRD.

### 4. Meetings of the Northern Territory Fisheries Joint Authority

Meetings of the NTFJA are convened on an "as needs" basis, with DBIRD coordinating the "day to day" management under the NT *Fisheries Act 1988*, on behalf of the NTFJA. A meeting of the NTFJA was convened on 18 September 2002.

DBIRD representatives participated in the annual Northern Australian Fisheries Management Workshop (NAFMW), which was convened in August 2002. The NAFMW is convened annually to consider fisheries management, research and compliance issues in seeking to ensure collaborative and complementary actions in managing fisheries resources throughout northern Australia. The NAFMW is convened under formal Memorandum of Understandings for cooperative management of fish stocks. The issues considered at the NAFMW have been extended to incorporate collaborative and complementary management of fish species generally, with recent participation by adjacent international jurisdictions.

### 5. Advisory Committees

The administrative arrangements implemented in association with the OCS arrangements envisaged that existing fishery advisory forums would be utilised, wherever possible.

The NT *Fisheries Act 1988* provides for stakeholder involvement in the formulation of management arrangements and advising the Executive Director of Fisheries on operational arrangements through the appointment of Fishery Management Advisory Committees (FMACs).

FMACs, appointed for NTFJA fisheries, did not meet throughout the reporting period. Fisheries Management Advisory Committee meetings are convened on an "as needs" basis.

A Northern Territory representative has been afforded membership to the Queensland Gulf of Carpentaria (GoC) Fisheries Management Advisory Committee covering all fisheries (other than the Northern Prawn Fishery) in Queensland's component of the GoC. This appointment assists in ensuring the consideration of complementary management arrangements and the implications of dual Queensland/Northern Territory licenced vessels operating in the GoC.

## 6. Condition of the Fisheries

### Offshore demersal fisheries

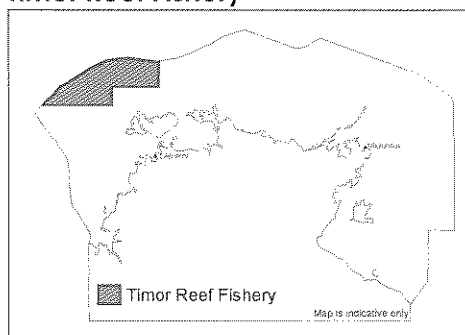
Separate management regimes have been implemented for the Timor Reef, Demersal, Finfish Trawl and Shark fisheries. These arrangements seek to set commercial participation levels at relative low levels in satisfying legislative objectives of ensuring the sustainability of our fisheries resources.

To assist in this regard, DBIRD has implemented data collection procedures for the collation of catch and effort information from commercial participants, which is supplemented by onboard monitoring by research staff. This time series data, including information collected over the last two decades, is the principal source of data for stock assessments undertaken for Joint Authority fisheries.

The Fisheries Group, of DBIRD, has received export approval for the Timor Reef Fishery when assessed against the Commonwealth guidelines for sustainable fisheries to enable ongoing exports of landings for the Timor Reef fishery beyond December 2003. It is the Fisheries Group's intention to seek similar certification, pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), for the demersal, finfish trawl and shark fisheries, amongst others. Reports for the demersal and Finfish Trawl fisheries are

currently being assessed by the Department of the Environment and Heritage for export approval beyond December 2003.

### Timor Reef Fishery



The key fish species landed by commercial operators in the Timor Reef fishery are goldband snapper (*Pristipomoides* spp.), red snappers (*Lutjanus malabaricus* & *L. erythropterus*) and cods (*Epinephelus* spp.). Commercial operators are using traps and baited lines catch these main species. A separate licence is required to operate within the confines of the Timor Reef fishery. There are currently 12 licensees in the fishery, a reduction from 22 licences in 1993. A ceiling of 45 fish traps for each licence was agreed to in 2002.

### Profile of the fishery - Commercial Sector

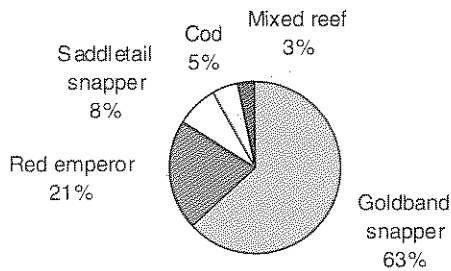
#### Fishing method

Commercial operators are authorised to use baited traps and vertical lines, including handlines and droplines. Although some operators used traps during the early development phase of the Timor Reef fishery, most chose to use vertical lines during the late 1980s and early 1990s. However, during 1999 and 2000 there was an industry wide change to trap fishing, and during 2002 only one operator was using droplines, with the remainder having changed to traps.

#### Catch

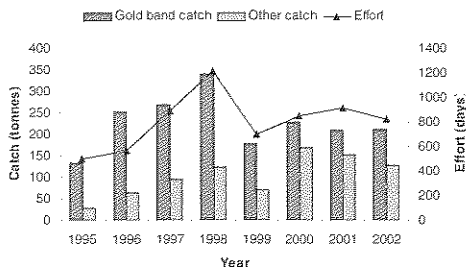
The principal target species of the Timor Reef fishery is goldband snapper, which comprises the three species *Pristipomoides multidens*, *P. typus* and *P. filamentosus*.





**Figure 1.** Composition of the catch from the commercial Timor Reef fishery, 2002

Together these species comprise 63% of the total catch with *P. multidentatus* being the most common of the three *Pristipomoides* species. Other key species in this fishery are red snappers (*Lutjanus malabaricus*, *L. erythropterus*), red emperor (*L. sebae*) and cods (Family Serranidae). Byproduct and bycatch species are minimal contributing less than 5% of total catch.



**Figure 2.** Catch and effort for the commercial Timor Reef fishery, 1995 to 2002

Total catch from the Timor Reef fishery during 2002 was 340 tonnes, while the goldband catch component was 213 tonnes. Both total and goldband catches have remained relatively constant over the past three years.

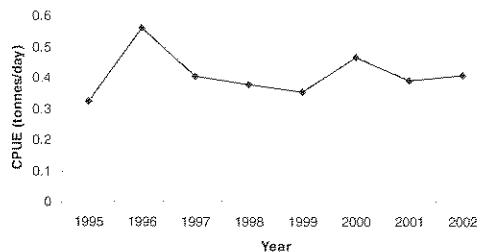
### Effort

Over the past three years fishing effort (boat days) has been relatively constant (Figure 2). During 2002, nine operators fished for 829 boatdays (Figure 2).

The number of licences has been reduced from 22 in 1995 to 12 in 2002, by a two for one for one licence reduction program.

### Catch rates

Catch per boat day increased in 2000 with the introduction of traps. There has been little change in cpue between 2001 and 2002 (figure 3).



**Figure 3.** Catch rates for the commercial Timor Reef fishery, 1995 to 2002

### Marketing

Due to the lack of consumer familiarity with tropical snapper and emperors during the early developmental phase of the fishery, initial catches were processed and sold as frozen fillets on southern domestic markets. Trial shipments of whole fresh "gilled and gutted" goldband snapper were well received. Studies on tropical snappers indicated a shelf life of up to 20 days after capture. This led to a marketing breakthrough for these species.

Currently, almost all snappers landed within the line and trap fisheries are sold as "fresh on ice" whole fish (including gills and stomach), with very small amounts sold as fillets. As the Darwin market is small, most product is forwarded to interstate markets, principally Brisbane and Sydney. Increasingly, operators are developing marketing arrangements outside the traditional central marketing systems, with a local representative of a major seafood wholesaler continuing to coordinate consignments to East Coast markets. At least one operator independently markets catch from his two vessels.

### Non-retained Species

For the Timor Reef fishery, the reported and observed level of bycatch (non-retained species) is very low, being less than 1% of total caught. The demersal tropical species landed in the fishery are well received throughout existing marketing channels, with operators reporting that all species can be sold.

Non-retained species include Chinaman fish (*Symphorus nematophorus*), red sea bass (*Lutjanus bohar*), big eye trevally (*Caranx sexfasciatus*), and starry triggerfish (*Abalistes stellatus*).

Bycatch in this fishery is well below the 10% trigger value.

### **Eco-system Impact**

The management arrangements for the fishery allow operators to use passive fishing gear, that being vertical lines and traps. Interaction with the habitat is limited to the effects of traps and vertical line weights on the substrate and the effect of anchors. Anchoring is usually limited to overnight stand down of fishing activity.

No interaction between the fishing gear and protected species has been observed. Such interactions are not expected with a deep-water trap fishery.

The impact of "ghost fishing", ie. the continued fishing of lost traps, is not considered to be significant in terms of either its impact or occurrence. Underwater video observation of traps during commercial fishing operations throughout northern Australia has shown the entry and exit of fish from the traps used in the fishery.

A prohibition on fish trawling within the area of the Timor Reef fishery was declared in the late 1980s. Such a declaration sought to provide greater protection of the then emerging fishery from the impacts of demersal fish trawling. The Commonwealth Government managed Northern Prawn Fishery allows prawn trawlers to operate year round in offshore waters throughout northern Australia. Prawn and scampi (deep-water shellfish) trawling activity is generally limited to water greater than 200 m deep in areas immediately north of current demersal fishing grounds.

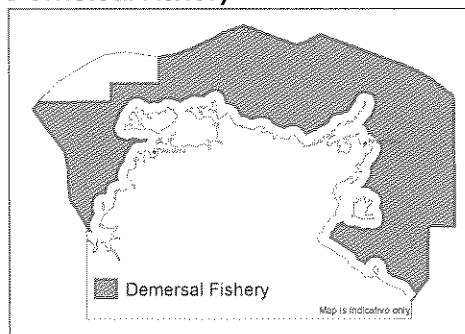
### **Social Impact**

This fishery directly employs over 20 people as crew on boats and numerous people in other support industries, eg. transport, boat repairs etc.

### **Economic Impact**

At the point of first sale in 2002, the commercial Timor Reef fishery was valued at \$2.3 million. The goldband snapper component was \$1.6 million (2001 - \$1.1 million) and \$0.32 million for saddletail snapper (2001 - \$0.27 million).

### **Demersal Fishery**



(Figure 1.) Fishing area available to the demersal fishery.

The demersal fishery is a multi-species dropline and trap fishery operating in waters 15 nautical miles from shore to the outer limit of the Australian Fishing Zone (AFZ). It is managed under the NT Fisheries Act 1988.

The demersal fishery targets goldband snapper (*Pristipomoides multidens*), but also catches significant quantities of red snappers (*Lutjanus malabaricus*, *L. erythropterus*), red emperor (*Lutjanus sebae*) and cods (Family Serranidae). The catch is kept on ice and the majority transported as whole fish to Sydney and Brisbane markets.

Red snappers and red emperors are also taken by the recreational sector, however these are from inshore areas.

Until recently, the demersal fishery has been considered marginally viable. This was due primarily to the lack of unloading and storage facilities, distances from transport networks in ports remote to Darwin, and the lack of fishing methods able to target widely spread congregations of the high value species (Ramm et al. 1997 and Mounsey et al. 1998).

However, a change in fishing practices in 1999 led to a rapid increase in catches in this fishery. By using traps, which do not require the targeting

of snapper congregations, catch rates over areas previously considered to be unproductive for dropline fishing have become profitable. Fishing effort has been dispersed away from localised reef areas and onto bottom types such as mud and sand.

## Profile of the fishery - Commercial Sector

### Area

The demersal fishery operates in waters from 15 nautical miles from the shore to the outer limit of AFZ, excluding the area of the Timor Reef fishery (Figure 1).

Within the demersal fishery, only a relatively small area (less than 5%) is currently fished due to the added cost of exploring grounds and fishing further away from the Port of Darwin.

### Fishing method

Although some operators during the early development of the fishery used traps, most fishers in the past have used drop lines to target goldband snapper. With improved catch rates and profitability, trapping is now the preferred method of fishing.

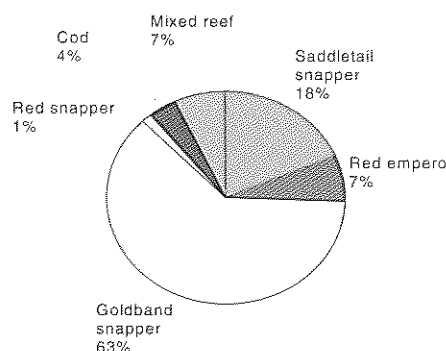
A drop line or vertical long line consists of a weighted main line, the lower section of which has a number of branch lines, each with 30-40 hooks. Hooks, generally baited with squid, are set within 25 m of the seabed for three to 15 minutes. The fishery developed using lines buoyed and set free of the vessel and later retrieved and hauled aboard by a mechanised winch. Most drop line vessels now use hydraulic or electric reels.

Most operators now use traps in preference to baited lines. They are constructed of steel mesh. Fish enter the trap through a single funnel. A clip door, situated opposite the funnel entrance, allows the easy removal of captured fish and provides access to the bait box for re-baiting.

### Catch

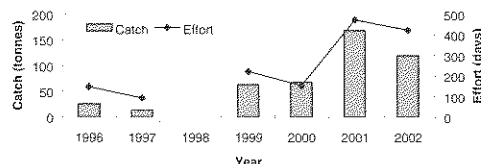
The majority of fishers target goldband snappers, which make up 63% of the total annual catch. Other major target groups are the red snappers (*Lutjanus malabaricus* and *L. erythropterus*-19% of annual catch), red emperor (*Lutjanus. Sebae*-7%) and cod (Family Serranidae-4%). The

remainder of the catch is byproduct (7%) and bycatch species (less than 1%).



**Figure 2.** Catch composition of the commercial demersal fishery in 2002

While catches have increased during the past four years (Figure 3), prior to 2001 the majority of operators fished less than 10 days per year in this fishery. From 2000 onwards, traps predominantly took the catch. The total catch from the demersal fishery during 2002 was 120 tonnes.



**Figure 3.** Catch and effort for the commercial demersal fishery, 1996 to 2002 (Due to confidentiality constraints 1998 data cannot be published)

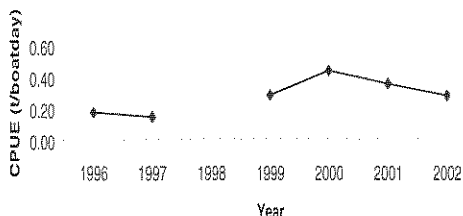
### Effort

Effort in the demersal fishery doubled from 2000 to 2001 as operators in the Timor Reef fishery began utilising their demersal licences and exploring areas adjacent to the Timor Reef fishery (Figure 3). Only 10 of the 60 licences were active during 2002. Effort has reduced slightly from 475 boatdays in 2001 to 417 boatdays in 2002.

### Catch rates

Catch per boat day increased significantly in the demersal fishery with the introduction of traps in 1999 (Figure 4). The increase in catch rate is because traps are more efficient than drop lines

in catching fish that are dispersed on the grounds. In 2002 the catch rate was 0.29 t/boatday.



**Figure 4.** CPUE for the commercial demersal fishery, 1996 to 2002

(Due to confidentiality constraints, 1998 data cannot be published)

Prior to 2001, the majority of the catch was taken only by a couple of operators. Therefore care should be taken in interpreting small shifts in CPUE trends as this may reflect operator efficiency rather than a change in fish abundance.

### Marketing

Currently all tropical snappers landed within the line and trap fisheries are sold “fresh on ice” as whole fish, with only a small amount sold as fillets. The small local Darwin market means most product is forwarded to interstate markets, principally Brisbane and Sydney. Increasingly, operators are developing marketing arrangements outside the wholesale central interstate marketing systems.

### Recreational Sector

Recreational fishers catch some of the same species, particularly red snappers and red emperor, from inshore waters. However, the overall impact on the offshore commercial fishery, is considered negligible.

### Fishing Tour Operator Sector

Very few FTOs are active in the demersal fishery and as with recreational fishers, catch of the same species is taken in inshore waters and therefore is not considered to impact on the commercial fishery.

### Non-retained Species

The reported and observed level of bycatch (non-retained species) in the demersal fishery is very low, being less than 1% of the total catch. The demersal species caught in the fishery are well

received through existing marketing channels and operators report that all species can be sold.

Non-retained species include Chinaman fish (*Symphorus nematophorus*), red sea bass (*Lutjanus bohar*), big eye trevally (*Caranx sexfasciatus*), and starry triggerfish (*Abalistes stellatus*).

The 2002 bycatch level of less than 1% is well below the 10% trigger value required for a review of management arrangements for the protection of bycatch species.

### Eco-system Impact

The management arrangements for the fishery allow operators to use passive vertical lines and traps. The effect of setting and hauling traps on substrate and bottom fauna is unknown. Anchoring is usually limited to overnight stand down of fishing activity.

No interaction between the fishing gear and protected species has been observed. Such interactions are not expected with a deep-water trap fishery.

The impact of “ghost fishing”, i.e. the continued fishing of lost traps, is not considered to be significant in terms of its either impact or occurrence. Underwater video observation of traps during commercial fishing operations throughout northern Australia has shown the entry and exit of fish from the traps used in the fishery.

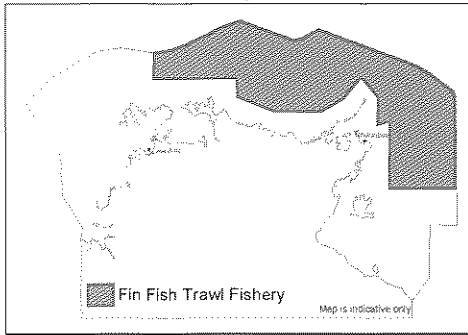
### Social Impact

The commercial fishery directly employs less than 20 people as crew on boats and numerous people other Industries, e.g. transport, boat repairs etc. However recreational fishing targets some of these demersal species and forms an important component in the lifestyles and culture of a large proportion of people residing in the Northern Territory.

### Economic Impact

At the point of first sale in 2002, the commercial demersal fishery was valued at \$0.8 million. The goldband snapper component was \$0.5 million and \$0.1 for saddletail snapper.

## Finfish Trawl Fishery



**Figure 1.** Fishing area available to the commercial finfish trawl fishery

The trawl fishery was intensively fished by Thai and Taiwanese pair trawlers during the 1970s. Foreign fleets continued fishing, under licence agreements, following the ratification of the AFZ in November 1979. Taiwanese pair trawlers (1979-1990), Thai- Australian stern trawlers (1985-90) and Chinese pair trawlers (1989) operated in the AFZ waters adjacent to the NT. Overall catches peaked at approximately 10,000 tonnes from the Arafura Sea in 1983.

Currently the finfish trawl fishery comprises of a single finfish trawl operator fishing in offshore waters east of Darwin and includes the northern region of the Gulf of Carpentaria. Fishing operations are conducted using a semi pelagic demersal trawl thereby limiting any damage to the seabed. The fishery is co-managed under the *Northern Territory Fisheries Act 1988*.

The principal species landed are the red snappers (*Lutjanus malabaricus* and *L. erythropterus*). Around 90% of the landed catch is exported, mainly to Asia.

## Profile of the fishery - Commercial Sector

### Area

The finfish trawl fisher operates in waters east of Darwin to the outer limit of the AFZ, excluding the area of the Timor Reef fishery (Figure 1).

Within this overall area, only a relatively small portion is currently fished due to the single operator targeting the higher yield red snapper

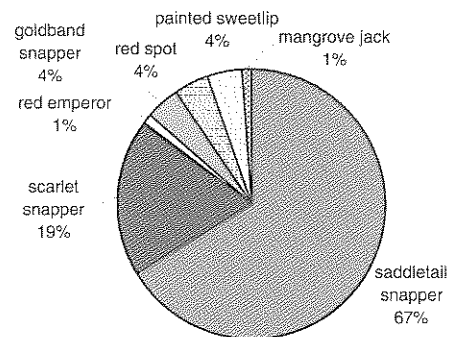
fishing grounds. Although legally able, the finfish trawl operator does not presently fish the same grounds as the demersal fishery licensees.

### Fishing method

This fishery has been limited to a single trawl operator. Fishing operations are conducted using a semi pelagic demersal trawl. This trawl net was developed cooperatively by industry and the Fisheries Group to minimise habitat disturbance whilst ensuring commercial catch rates were maintained. The quality of the retained catch was also improved by the reduction in the number of sponges and other unwanted species associated with the operations of traditional demersal trawls.

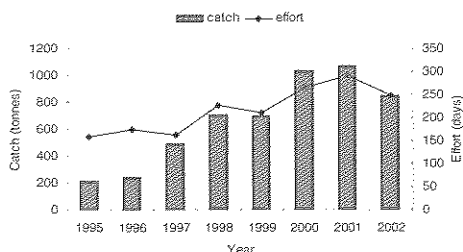
### Catch

Saddletail snapper (*Lutjanus malabaricus*) and scarlet snapper (*Lutjanus erythropterus*) are the target species of the finfish trawl fishery, comprising 86% of the total catch (Figure 2). Other significant species are sweet lip, red spot emperor, and goldband snapper.



**Figure 2.** Catch composition for the commercial finfish trawl fishery, 2002

Since 1995, catches have increased steadily, peaking in 2001 (Figure 3). The catch for 2002 was 850 tonnes. As there is only one operator in this fishery, care must be taken in interpreting catch trends as they may reflect business decisions rather than fishery trends.



**Figure 3.** Catch and effort for the finfish trawl fishery, 1995 to 2002

### Effort

Effort has increased from 158 boatdays in 1995 to 292 boatdays in 2001, falling slightly to 247 in 2002 (Figure 3). However as there is only one operator, care should be used in interpreting any trends in this fishery based on effort, as there are many reasons for any changes in fishing effort.

### Catch rates

Since 1997 the CPUE has shown little change, ranging from 3.0 to 3.9 t/boatday (Figure 4).



**Figure 4.** CPUE for the finfish trawl fishery, 1995 to 2002

### Marketing

Around 90% of trawl caught snappers are sold frozen to export markets, mainly in Asia. Fish are unloaded into refrigerated shipping containers at Gove and shipped to Darwin by barge for export. The product is then transported to Perth by road. A small amount of the product is retained for the local market.

### Recreational Sector

Recreational fishers take some of these demersal species, particularly red snappers and red emperor from inshore waters, however their impact on the offshore commercial fishery is considered negligible.

### Fishing Tour Operator Sector

The majority of FTO activity is in inshore waters where some of the same species are taken.

### Non-retained Species

For the commercial finfish trawl fishery, only 17% of the total catch are discarded. High proportions of the discarded species (by weight) are sharks and rays, which are returned to the water alive.

### Eco-system Impact

The Fisheries Group has encouraged fishing practices that cause minimal eco-system impact. The development, in conjunction with industry, of a semi-pelagic demersal trawl net that minimises seabed disturbance and reduces the amount of bycatch was important in reducing the environmental impact of this fishery.

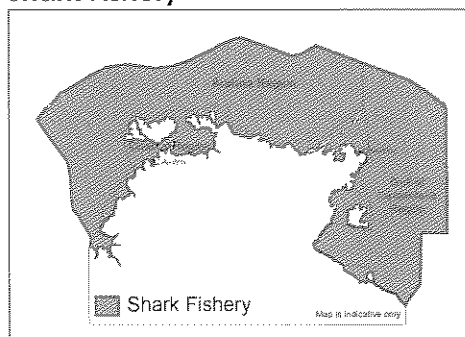
### Social Impact

This fishery directly employs less than 10 people; however there are benefits for other industries, eg. transport, boat repairs etc. Recreational fishers also target some of these species (within coastal waters) and recreational fishing forms an important component of the lifestyles and culture of a large proportion of people residing in the Northern Territory.

### Economic Impact

The value of the fishery is confidential (information for less than five active operators cannot be released without consent).

### Shark Fishery



Target species for the commercial shark fishery are the blacktip sharks (*Carcharinus tilstoni* and *C. sorrah*) and grey mackerel (*Scomberomorus semifasciatus*) with a variety of other sharks and pelagic finfish landed. A conservative approach has been adopted in managing the northern shark fishery given the well documented biological characteristics of sharks, particularly, slow growth rates, late age of sexual maturity,

low level of natural mortality and low fecundity (few offspring).

Management arrangements established under the OCS provide for the day to day operations of the shark fishery. Current arrangements recognise the historical management zones however, the number of commercial participants has been reduced considerably.

Considerable cooperative research efforts are under way with adjacent jurisdictions, with the Northern Territory actively contributing to the formulation and implementation of a National Plan of Action for Sharks.

Sharks are also taken as by-product in a range of fisheries targeting other species.

### Profile of the fishery - Commercial Sector

#### Area

Operators are generally authorised to fish in a number of managed zones, with spatial restrictions placed on the use of certain gear. The three management zones are the coastal, Arafura and Gulf of Carpentaria zones.

The majority of the fishing is undertaken within the coastal zone (within 12 nm of coast or baseline) and immediate offshore in the Gulf of Carpentaria. Little fishing was undertaken in the offshore component of the fishery during 2002.

#### Fishing method

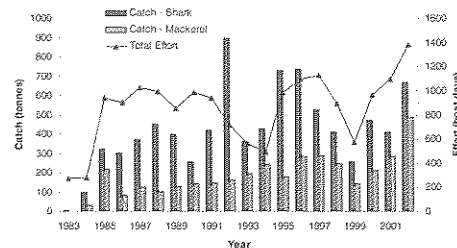
Operators may use either longlines or pelagic nets, but bottom set gillnets are prohibited. Most shark fishing is undertaken by pelagic gill net. Nets are generally 1000 to 2500 m in length with a mesh size of 150 mm to 250 mm. Most nets are constructed of monofilament nylon with a drop of 50 to 100 meshes, are weighted and have a buoyed headline.

In 2002, one operator commenced longline fishing for sharks.

#### Catch

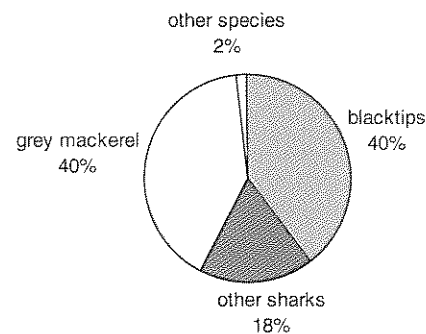
The total catch of all species for the fishery in 2002 was 1167 tonnes, with a total catch of sharks of 670 tonnes (Figure 1). Generally, since 1983, the catch of sharks has been highly

variable, fluctuating between 100 and 900 tonnes.



**Figure 1.** Catch and effort for the commercial shark fishery, 1983 to 2002

The catch of blacktip sharks was 465 tonnes, or 40% of the total catch (Figure 2). The catch of grey mackerel was 479 tonnes (40%) and was much more important than other shark species, which only comprised 18% (205 t) of the catch. The remainder of the catch (less than 2%) was mostly other pelagics such as tuna.



**Figure 2.** Compositions of the commercial shark fishery catch 2002

Since 1998 there has been a large increase in the catch of sharks other than black tips from 49 tonnes to 205 tonnes in 2002. Of significance is the increasing catch of mackerels (primarily grey mackerel) to the point where that catch exceeds the shark catch observed in most previous years.

Sharks are also landed as an incidental catch in a range of commercial fisheries targeting other species. Landings from these fisheries have fluctuated between 32 and 64 tonnes since 1994.

Generally, shark fins have been sourced from the dedicated shark fishery, both from sharks processed for their flesh and from incidental landings of larger sharks. Fins are also taken as

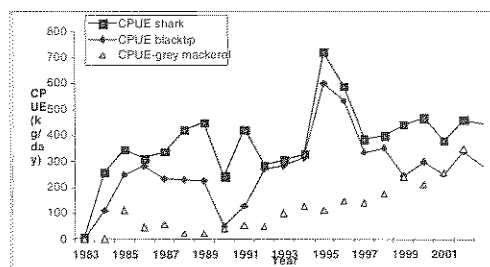
a by-product for commercial fishers targeting other species.

### **Effort**

Effort in the shark fishery has shown considerable variability, ranging from 275 boat days in 1983 to a high of 1386 boat days in 2002 (Figure 1). Much of that variability can be attributed to movements of operators into and out of the fishery. Effective effort, incorporating actual lengths of net deployed (measured in 100 m net days) has increased consistently since 1995, largely reflecting increased net lengths. (Figure 3).

The Catch rate for shark (Figure 3) has shown a substantial decline to around one third of the 1995 level, but has shown a slight improvement from the low of 1999.

The catch rate for mackerels has not shown such a marked trend, with 2002 being similar to 1995. As for shark the mackerel CPUE has shown a slight rise in since a low in 1999.



**Figure 3.** CPUE for the commercial shark fishery, 1983 to 2002

### **Marketing**

Grey mackerel is marketed as fillet, trunks and whole fish on domestic markets. Increasing prices for shark fins will encourage the retention of sharks previously discarded or increase landings for both flesh and/or fins.

### **Recreational Sector**

#### **Area**

The significant areas for shark catches are the Darwin Harbour area, McArthur River area and the Cobourg Peninsula

#### **Fishing method**

Most sharks are taken during reef fishing and general fishing (fishing with no specific target).

These types of fishing generally use lines with bait.

### **Catch**

Sharks are not specifically targeted by recreational fishers, but are caught during other targeted fishing. In 1995, over 80,000 individuals were caught, but only 18% were retained, giving a harvest of 15,000. Reef fishing and non-target fishing accounted for 74% and 18% of the total shark catch respectively. The proportion of shark harvested depends on the type of fishing. During non-target fishing 34% of sharks caught are harvested, whilst reef fishers only harvest 12%. In 2000, 8,000 individual sharks were harvested.

### **Fishing Tour Operator Sector**

#### **Area**

Sharks are not specifically targeted by FTOs, but are landed during other targeted fishing

#### **Catch**

In 2002, 5406 sharks were caught of which approximately 4427 or 82% was released. The species of sharks caught and harvested was not recorded

The number of sharks caught by FTO clients has approximately doubled since 1995 when just under 3,000 sharks were caught, however the proportion of sharks harvested has declined. In 1995, 60% of sharks captured were harvested, this figure decreased rapidly to only 10% in 1997 and has remained relatively consistent around 20% since 2000.

The proportion of captured sharks, which are harvested by FTO clients, is generally higher than the general recreational fisher community.

### **Indigenous Sector**

#### **Area**

Most fishing occurs in the close vicinity of communities and outstations, in inland or near coastal waters.

#### **Catch**

Sharks and rays were one of the more important groups of fish caught by indigenous people in northern NT. In 2000, over 12,000 sharks and rays were harvested, comprising just over 3% of



the total finfish harvest. The species of sharks and rays caught and harvested were not identified.

### ***Non-retained Species***

Sharks are generally seen as a non-targeted or incidental catch for the recreational sector. A low proportion of the sharks caught is harvested, although this does depend on the type of fishing and the fishing location. Besides various mackerel species, the majority of other species caught by the recreational sector during targeted game fishing, are trevally and queenfish. Most of these fish are retained, with a harvest rate of over 83%. Other minor species caught also have a high retention rate of 78%.

### ***Eco-system Impact***

The ecosystem impact of harvesting sharks and grey mackerel has not been determined. Little is known about the stock structure of the principal species harvested, particularly the extent to which Indonesia, Western Australia, Queensland and the Northern Territory share their fishery resources. Australian States and the Northern Territory are cooperatively managing shark stocks, with the NT and Qld agreeing to link shark fishing concessions for the Gulf of Carpentaria to limit any increase in fishing capacity. The Northern Australian Shark Research Project (Phase 2) seeks to obtain comprehensive data on the species composition (target and bycatch) in those fisheries in northern Australia which take sharks, including other fisheries as well as those for which sharks are the primary target. Staff on this project undertook two observer cruises during 2002 on shark fishery vessels.

Controls on fishing gear have been introduced to minimise any physical impact on the seabed, other than anchoring. A prohibition on the use of bottom set gill nets was introduced following interactions with turtles.

### ***Social Impact***

There are a total of 19 licences in the fishery. Most vessels employ a skipper and two or three crew members.

### ***Economic Impact***

At the point of first sale in 2002, the commercial shark fishery was valued at \$6.9 million. The

black tip shark component was valued at \$1.6 million (2001 - \$1.5 million), \$2.7 million for other sharks (2001 - \$0.7 million) and \$2.5 million for grey mackerel (2001 - \$1.4 million).

## **7. Management Arrangements**

### **Timor Reef Fishery**

#### ***Management***

Management objectives for the Timor Reef fishery are achieved by maintaining target incidental and non-retained catch levels within acceptable ranges. Should landings of goldband snapper rise above sustainable yield estimates, a review of the management arrangements will commence. Similarly, a significant decline in catch rates would prompt a review of the management measures for this fishery.

Existing arrangements also seek to ensure the sustainability of byproduct species taken in the Timor Reef fishery. Acceptable catch ranges for by-product are not more than 10% of the weight of aggregate landings in the fishery. Monitoring is achieved through analysis of commercial logbook reports.

Controls on the construction and use of fish traps and vertical lines minimise the effects on ecosystem components. Should significant interaction with components be identified, the appointed advisory group will make recommendations regarding appropriate remedial action. No such interactions were identified throughout the reporting period.

#### ***History***

A joint venture feasibility study between an Australian and Japanese company was undertaken in the early 1980s to investigate the potential for a domestic dropline fishery. Landings from the trial were around 1500 tonnes per annum. It was not until 1987 that commercial droplining by domestic operators commenced. Jurisdictional arrangements were changed in 1998, at which time management responsibility for line fishing and trapping in waters adjacent to the NT passed to the Northern Territory Government.

In responding to concerns that excess fishing capacity may lead to the over-exploitation of

goldband snapper stocks, a moratorium on the issue of further entitlements for what is now known as the Timor Reef fishery was announced in December 1991. Only those fishers active in the fishery or licence holders able to demonstrate a commitment to entering the fishery retained access.

Separate management measures were implemented for the Timor Reef fishery in 1993 when it was annexed from the demersal fishery. Overall fishing capacity within the boundary of the Timor Reef fishery was reduced from a potential 60 to 22 licences. Limits on the number of operators were implemented in responding to concerns that fishers displaced from interstate fishing restructuring programs may lead to over exploitation of goldband snapper stocks.

A further revision of the jurisdictional arrangements occurred in 1995. The Northern Territory Fisheries Joint Authority (NTFJA) provided for the Commonwealth and the Northern Territory to jointly manage the fishery given the likelihood of shared resources with adjacent national and international jurisdictions.

#### ***Current issues***

Reported catch levels for target species, incidental (byproduct) and non-retained catch throughout 2002 were within acceptable levels.

The NT shares goldband stocks across the Sahul Banks with Indonesia and East Timor. Sustainability of these resources depends upon responsible management by all parties. The Northern Australian Fisheries Management workshop, which now includes Indonesia and East Timor, provides an ideal forum to discuss this issue.

#### ***Future plans***

A review of the levels of permitted gear (handlines and droplines) will be undertaken throughout 2003.

Goldband snapper are also landed outside the boundary of the Timor Reef fishery, but are likely to be part of the same stock. Management triggers recognise this, with the management arrangements under constant review.

#### ***Consultation, Communication and Education***

Regular consultation occurs between the Fisheries Division, the NT Timor Reef Fishermen's Association and the NTSC. In addition to this, Fisheries staff regularly visits the wharf to speak informally with fisheries.

#### ***Demersal Fishery***

##### ***Management***

Management arrangements for the demersal fishery seek to maintain catches of goldband snapper and red snappers by all sectors within acceptable ranges. Red snappers are also a target species of the finfish trawl fishery. Should landings of goldband snapper from the Timor and Arafura Seas rise above sustainable yield estimates, a review of the management arrangements will commence. Similarly, a significant decline in catch rates would prompt a review of the management measures for this fishery.

##### ***History***

With the passage of the revised jurisdictional arrangements contained in the Offshore Constitutional Settlement (OCS) of 1988, provisions were made for the Commonwealth and the Northern Territory to jointly manage the fishery given the likelihood of shared resources with adjacent national and international jurisdictions.

In 1993, the area of the Timor Reef fishery was annexed from the demersal fishery and the inshore boundary was altered to separate the demersal fishery from the inshore coastal line fishery. All operators who had previously held a fishing entitlement to this area were issued a demersal licence if they did not already hold such an entitlement.

A further revision of the jurisdictional arrangements occurred in 1995. The Fisheries Group undertakes day to day management of the Timor Reef, on behalf of the NTFJA.

Agreement was reached on placing a ceiling of 45 fish traps for the Timor Reef fishery in 2002. A similar limit has been agreed for the demersal fishery as a precautionary measure and to provide clarity on the amount of fishing gear used under each licence

### ***Current issues***

Encouraging further development of this under-utilised fishery and encouraging operators to undertake fishing throughout the entire fishery area continue to be the key objectives for industry and government.

### ***Future plans***

A review of the levels of permitted gear (hand and drop lines) will be undertaken during 2003. While a limit on trap numbers has been agreed, the need for similar controls for vertical lines will be canvassed. Only one or two vessels are currently using vertical lines.

### ***Consultation, Communication and Education***

Regular consultation occurs between the Fisheries Division, the NT Demersal Fishermen's Association and the NTSC. In addition to this Fisheries staff make regular visits to the wharf to speak informally with fisheries.

The Division also puts out publications in the form of Fisheries reports, newsletters etc. to inform and educate stakeholders.

## **Finfish Trawl Fishery**

### ***Management***

Management of the finfish trawl fishery seeks to ensure the ecological sustainability of target and by-product species. The objectives aim to ensure that overall landings of target species are maintained within agreed levels.

The acceptable catch range for red snappers, the principal target species, is 500 to 2,500 tonnes. Landings remained within this range throughout 2002.

Incidental (by-product) and non-retained (discarded) catch are monitored during on board observer trips conducted by fisheries officers. Any significant increase in by-product will prompt a review of the fishery.

### ***History***

With the passage of the revised jurisdictional arrangements contained in the Offshore Constitutional Settlement (OCS) of 1995, management of the trawl, shark and line fishing and trapping in waters adjacent to the NT passed

to the Northern Territory Fisheries Joint Authority (NTFJA).

The NTFJA provided for the Commonwealth and the Northern Territory to jointly manage the fishery given the likelihood of shared resources with adjacent national and international jurisdictions. The Fisheries Group on behalf of the NTFJA undertakes the day-to-day management of the fishery.

### ***Current issues***

The fishery is currently undergoing an ecological sustainability assessment to comply with the Commonwealth EPBC Act.

### ***Future plans***

The Fisheries Group will continue to monitor the fishery to ensure catches are maintained within agreed ranges.

### ***Compliance***

The PFMEU undertakes enforcement. The unit has 17 officers who are responsible for providing compliance and education on all fisheries managed by the Northern Territory.

This fishery has no current compliance issues.

### ***Consultation, Communication and Education***

Joint industry/government forums are used to consult with the single finfish trawler

## **Shark Fishery**

### ***Management***

Management of the NT's shark fisheries was simplified with the passage of an Offshore Constitutional Agreement between the Northern Territory, Queensland, Western Australia and the Commonwealth. At that time, management of the State/Northern Territory and Commonwealth components of the fishery passed to three separate Joint Authorities. Complementary management is achieved under State/Territory law. This means that a single body manages the Northern Territory shark fisheries.

Management of the shark fishery seeks to maintain shark catches within appropriate ranges. This is achieved by reducing fishing capacity through a "three for one" licence reduction program. This licence reduction

program requires new entrants to acquire and transfer three restricted shark fishery licences to the Territory for the issuance of an unrestricted shark fishery licence. Overall capacity has been reduced from 38 licences to 19 licences in 2002.

Catch restrictions apply to Spanish mackerel. This by-product limit seeks to link landings of Spanish mackerel to grey mackerel catches. Such a measure was agreed to address concerns by other sectors about pelagic net fishers targeting Spanish mackerel.

A review of the incidental capture of sharks, including finning, in other fisheries targeting non-shark species concluded in 2002. A limit on the incidental catch of shark was agreed for the barramundi and coastal line fishery in 2002. A prohibition on the possession of sharks and shark product was also agreed for the Timor Reef, demersal, finfish trawl and Spanish mackerel fishery. Agreement was reached with the barramundi and coastal line fishery on the level incidental catch of sharks, in 2002.

Agreement has also been reached with Queensland about the complementary management of what is likely to be shared fishery resources in the Gulf of Carpentaria. The former Commonwealth entitlement issues prior to 1995 permitted a single vessel in the fishery under fishery licence. With jurisdiction passing to two separate Joint Management Agencies, Queensland and the Northern Territory agreed to "link" shark fishery licences to ensure that the overall number of vessels in the fishery did not increase.

### ***History***

A large commercial shark fishery commenced throughout northern Australia in the early 1970s. At that time, a Taiwanese gill net fleet targeted a range of pelagic shark and fish species, with foreign fishing vessels working within 12 nautical miles (approximately 22 km) of the coast prior to 1978. 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 fleet's 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 continued access for 30 gill netters to land up to 7,000 tonnes of shark from northern Australian waters. Further restrictions were introduced in 1986 due to declining catch rates and concerns about the incidental capture of dolphins. These restrictions limited the length of gill nets to not more than 2.5 km, thereby rendering foreign gillnetting uneconomic. Despite the permitted use of baited longlines, foreign fishing operations in northern Australian waters ceased in late 1986.

Direct involvement by domestic fishers in coastal waters occurred in the early 1980s. At that time, the Northern Territory actively encouraged the development of the inshore component of the fishery. Landings remained low with catches ranging from 100 to 500 tonnes, with shark fillets sold on established food markets throughout southern Australia.

### ***Current issues***

The Northern Territory seeks the finalisation and implementation of a National Plan of Action for Sharks (NPOA) and the development of a regional agreement on the management of shared shark resources with Indonesia and East Timor. The Northern Territory is promoting the concept of an "operation plan" for northern Australian shark fisheries to achieve the outcomes of the NPOA.

The Northern Australian shark research project will assist in improving our understanding of the sustainability of tropical sharks. This research seeks to provide the necessary information for the rapid assessment of the vulnerability of sharks.

The need for a desktop assessment of grey mackerel was agreed at a joint industry/government workshop.

### ***Future plans***

The incidental landings of sharks in fisheries targeting other species are subject to annual review. A review is underway to reduce the practice of finning sharks and not utilising the carcass in all fisheries.

The shark fishery is to undergo ecological assessment under the Commonwealth

Government's EPBC Act for export certification in 2003.

#### **Consultation, Communication and Education**

Workshops are convened annually to provide a forum for industry, management and researchers to canvass all issues of interest to the shark fishery

## **8. Fisheries Monitoring, Research, Surveillance and Enforcement**

### **Timor Reef Fishery**

#### **Monitoring**

This fishery is monitored primarily through daily logbooks, through which operators provide detailed catch and effort information, as well as data on spatial distribution of the fishery.

Due to resource constraints only one onboard monitoring trip was conducted during 2002. While onboard, observers document vessel and gear information, location and depth fished, fishing practices, catch composition, and where possible, measure all landed species.

#### **Stock assessment methods and reliability**

The current stock assessment model used to assess the goldband snapper stocks in the Timor Reef fishery was developed in 1996 and reviewed in 2000. A suite of models, surplus production model, delay difference model and stock synthesis models, were examined (Ramm 1997).

The modelling approach combines the best available information (provided by logbooks, length frequency data, age at length data, reproduction and growth information and Coastwatch observations on Indonesian fishing effort) to estimate the biomass and the sustainable harvest level of the fishery.

A key outcome for the Timor Reef fishery was a recommended harvest level of 10-15% per year of the stock and a biomass estimate for goldband snapper between 3,000 and 20,000 tonnes (Ramm 1997). The biomass estimate depended on the interpretation of catch rates, age and survey details. However a biomass estimate of

9000 tonnes was determined to be a more realistic figure for modelling and management purposes.

The rapid change over of gear from droplines to traps has resulted in a discontinuous data series, causing problems for stock assessment.

The snapper stocks in the Timor Sea are shared with Indonesia. Information collected during a five year collaborative Indonesia-Australia project (ACIAR funded FIS /97/165) has shown that the majority of fishing for both countries occurs on the Sahul banks.

Unfortunately, catch records for Indonesia are poor which makes stock assessment uncertain.

Genetic analysis using mitochondrial DNA has shown that goldband snapper (*Pristipomoides multidens*) is the same stock in both the Timor and Arafura Seas, but there are a number of separate stocks throughout Indonesia.

Otolith microchemistry indicates that adult goldband snapper are relatively sedentary and there is unlikely to be substantial movement between Western Australia and the Northern Territory and therefore these stocks can be managed separately.

#### **Current status**

In the Timor Sea, Indonesian long line and Australian trap and dropline vessels target goldband snappers. These methods target fish above the size of maturity, which means that the majority of fish landed in these fisheries have bred prior to capture. Harvest levels in the Australian sector of the Timor Sea are below current reference points.

#### **Future Assessment Needs**

Future assessment needs to concentrate on the degree of movement of snappers between Australia and Indonesia, the identification of red snapper juvenile habitats and obtaining more accurate growth parameters from the capture of juvenile goldband snapper.

#### **Research**

#### **Summary to date**

The FRDC funded project 1996/131; "Stock structure of *Pristipomoides multidens* resources across northern Australia" used mitochondrial

DNA analysis to determine the structure of *P. multidentis* stocks in Western Australia, the NT and southern Indonesian waters. Results from this study indicate those *P. multidentis* in Indonesian and Australian waters are separate stocks. Multiple stocks appear also likely within Indonesian waters. While there appears to be genetic similarity between the Australian sectors of Timor and Arafura Seas, there is evidence to suggest a restriction of gene flow along the northern and western Australian coastline, with a genetic disjunction in the Kimberley area (Ovenden et al. 2001).

A subsequent FRDC funded project (98/154) investigated the stock structure of *P. multidentis* across northern Australia and southern Indonesia by analysing oxygen and carbon isotope ratios in otoliths obtained from the same samples. This study showed location-specific signatures and indicated that fish from all sites sampled within Australia (Exmouth, Rankin Bank, Broome, Vulcan Shoals, Timor Sea, and Arafura Sea), Indonesia and Papua New Guinea were different (Newman et al. 2000).

The research implies that there is unlikely to be substantial movement of *P. multidentis* between these distinct adult assemblages. The stable isotope signatures were persistent through time at the different locations, indicating separate stocks (Newman et al. 2000). The results suggest that there are separate stocks of goldband snapper between Indonesia and Australia and in particular the Arafura Sea for the purposes of the fisheries management.

A joint project between the Fisheries Group, CSIRO and Indonesia (funded by ACIAR) is currently examining the degree of sharing of goldband and red snapper stocks between Indonesia and Australia. The project is also examining the biology, life history and sustainability of these species and consequently what management arrangements are required.

### ***Incorporation into management***

The recent research findings have confirmed the validity of present management arrangements for this fishery.

### ***Current Research***

Current research is focused on developing new methods through GIS spatial analysis tools to investigate trends in catch and effort in this fishery.

There is also continued refinement of population parameters and stock assessment for this fishery.

The DBIRD undertakes a range of tasks on behalf of the NTFJA. Specifically, the DBIRD has established, and continues to maintain, catch and effort information from commercial fishers operating in NTFJA fisheries. It is from such information, together with available research data, that the condition of the fishery is kept under constant consideration.

The DBIRD is collaborating with CSIRO and Agriculture, Fisheries and Forestry- Australia in an Australian Centre for International Agricultural Research (ACIAR) assisted project to examine the "Biology, stock assessment and management of shared snapper fisheries in northern Australia and eastern Indonesia".

This four-year project, which commenced in 1999, seeks to examine the population dynamics, stock structure and biology of goldband and red snappers relevant to the management of stocks shared between Australia and Indonesia. It also aims to identify and explore ways of developing complementary fisheries management strategies that will result in the long-term sustainability of these snapper fisheries.

Socio-economic research, undertaken as part of this study, seeks to consider the potential impact of future management arrangements and gather data on the importance of these fishes in southeast Indonesia. As an outcome, the project is to provide the details necessary for complementary conservation, management and utilisation of shared stocks.

Two Fisheries Research and Development Corporation (FRDC) projects examining the stock structure of goldband snapper using mitochondrial DNA and Otolith microchemistry were completed in 1999. This was a collaborative project between the Northern Territory's Fisheries Division, Fisheries

Department of Western Australia and Queensland Department of Primary Industry.

For the study adult goldband snapper (*Pristipomoides multidentis*) samples were collected from 6 locations in Australia; Exmouth, Pilbara, Broome, Kimberley, Timor and the Arafura Sea. These sites correspond to areas of major fishing activity. Opportunistic samples were obtained from Kupang and West Irian Jaya (Indonesia) and Madang (PNG). Findings from this study suggest that there are significant genetic structures between:

- Indonesian and Australian sites
- Indonesian sites
- Australian sites and a Kimberley site

This subdivision may be explained by sedentary nature of all life stages, including planktonic eggs, and larvae, and implies localised recruitment. A separate study using Otolith microchemistry techniques on same samples has found that the adults are sedentary.

### **Compliance**

The Marine and Fisheries Enforcement Unit of the Northern Territory Police, Fire and Emergency Services undertake 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 and as an adjunct to compliance activities for other fisheries.

There are no current compliance issues in this fishery.

### **Demersal Fishery**

#### **Monitoring**

This fishery is monitored primarily through logbooks, which provide valuable catch and effort information, as well as data on the spatial distribution of the fishery. Operators are required to fill out daily logbooks, which are submitted to the Division on a monthly basis.

The majority of effort in the demersal fishery in 2002 was adjacent to the Timor Reef fishery. The

fisheries also use the same fishing practices. Therefore observer data from the Timor Reef fishery has been used as an indicator for operations in the demersal fishery in 2002.

#### **Stock assessment methods and reliability**

Trawl surveys of the Timor and Arafura Seas undertaken in 1990 and 92, and in the Gulf of Carpentaria in 1990 and 1991, provided the most recent independent data suitable for the assessment of ground fish stocks in NT waters.

Catch and effort data provided by foreign and domestic fleets were used for the production of surplus production models (Ramm 1994). The trawl surveys provided information, which could be used with biological data to produce yield per recruit models, which were considered to be more reliable (Ramm 1993).

The most recent estimate for goldband snapper in the Arafura Sea is from Ramm (1994). A yield per recruit model using survey and biological data was used for the assessment. The method provides an estimated annual sustainable yield of 100-400 tonnes for the Arafura Sea (excluding Gulf of Carpentaria).

However various assumptions were made with regard to the model parameters including using growth parameters for *Lutjanus malabaricus* from the NW Shelf and the assumption that goldband snapper were evenly distributed between trawlable and untrawlable grounds.

On the basis of these assumptions, Ramm (1997), considered the sustainable yield estimate for goldband snapper to be unreliable and that these values were an underestimation of potential yields.

In 2000 the red snapper stock assessment yield estimates for the Arafura Sea (excluding the Gulf of Carpentaria) was updated. These assessments were mainly based upon simple stock reduction analysis (SRA). Using SRA, an unfished stock estimate of 50,000 tonnes was derived, which together with optimum harvest rates and growth rates derived from biological research gives an estimated sustainable yield of 1,500-2,500 t/yr for red snappers (Ramm1997).

While the potential productivity of the demersal fishery has been determined for the red snappers, (*Lutjanus malabaricus* and *L. erythropterus*), goldband snapper estimates can only be refined when more fishers become active in the fishery and associated logbook data becomes available.

### **Current status**

Most recent stock assessments of tropical snappers in relation to sustainable harvest levels indicate that current catch levels in the Australian sector of the Arafura Sea are below triggers for a review of management arrangements. Combined catches of red snapper in the Demersal and Finfish trawl fisheries in 2002 were 574 tonnes (Table 1).

Current triggers for a review of management arrangements for red snappers in the Australian sector of the Arafura Sea is 2500 tonnes (Table 1).

### **Future Assessment Needs**

Future assessment needs to concentrate on the degree of movement of snappers between Australia and Indonesia, the identification of red snapper juvenile habitats and obtaining more accurate growth parameters from the capture of juvenile snapper.

## **Research**

### **Summary to date**

Recent research has concentrated on both goldband and red snappers.

The FRDC funded project 1996/131; "Stock structure of *Pristipomoides multidens* resources across northern Australia " used mitochondrial DNA (mtDNA) analysis to determine the structure of *P. multidens* stocks in WA and NT and southern Indonesian waters. Results from this study indicate those *P. multidens* in Indonesian and Australian waters are separate stocks. Multiple stocks appear also likely within Indonesian waters. While there appears to be genetic similarity between samples from the Australian sectors of Timor and Arafura Seas, there is evidence to suggest a restriction of gene flow along the northern and western Australian coastline, with a genetic disjunction in the Kimberley area (Ovenden *et al* 2002).

A subsequent FRDC funded project (98/154) investigated the stock structure of *P. multidens* across northern Australia and southern Indonesia by analysing oxygen and carbon isotope ratios in otoliths obtained from the same samples. This study showed location-specific signatures and indicated that fish from all sites sampled within Australia (Exmouth, Rankin Bank, Broome, Vulcan Shoals, Timor Sea, and Arafura Sea), Indonesia and Papua New Guinea were different (Newman *et al.* 2000).

The research implies that there is unlikely to be substantial movement of *P. multidens* between these distinct adult assemblages. The results suggest that for the purposes of fisheries management, there are separate stocks of goldband snapper between Indonesia and Australia and in particular the Arafura Sea.  
Incorporation into management

The recent research findings have confirmed the validity of present management arrangements for this fishery.

### **Current Research**

Current research is focused on developing new methods through GIS spatial analysis tools to investigate trends in catch and effort in this fishery.

A joint project between NT Fisheries Division, CSIRO and Indonesia, funded by ACIAR, is examining the degree of sharing of goldband and red snapper stocks between Indonesia and Australia. Information on the biology, life history and sustainability of these stocks is required. Consequently, suitable management arrangement will be identified.

There is also continued refinement of population parameters and stock assessment for this fishery.

### **Compliance**

The PFMEU undertake enforcement. The unit has 17 officers who are responsible for providing compliance and education on all fisheries managed by the Northern Territory.

This fishery has no current compliance issues.



## **Finfish Trawl Fishery**

### ***Monitoring***

Due to resource constraints only one monitoring trip was conducted during 2002. While onboard, observers document vessel and gear information, location and depth fished, fishing practices, catch composition, and measure landed species.

### ***Stock assessment methods and reliability***

Trawl surveys of the Timor and Arafura Seas undertaken in 1990 and 1992, and in the Gulf of Carpentaria in 1990 and 1991, provided the most recent independent data suitable for the assessment of ground fish stocks in NT waters.

Catch and effort data provided by foreign and domestic fleets were used for the production of surplus production models (Ramm 1994). The trawl surveys provided information, which could be used with biological data to produce yield per recruit models, which were considered to be more reliable (Ramm 1993).

In 2000 the red snapper stock assessment yield estimates for the Arafura Sea (excluding the Gulf of Carpentaria) was updated. These assessments were mainly based upon simple stock reduction analysis (SRA). Using SRA, an unfished stock estimate of 50,000 tonnes was derived, which together with optimum harvest rates and growth rates derived from biological research gives an estimated sustainable yield of 1,500-2,500 t/yr for red snappers (Ramm1997).

The demersal and finfish trawl fisheries both harvest demersal finfish resources from the Arafura Sea and Gulf of Carpentaria, potentially from the same stock. The combined catch of red snappers from both fisheries for the Arafura Sea is 574 tonnes for 2002, which is well below the 2,500 tonnes trigger for these fisheries.

The most recent estimate for goldband snapper in the Arafura Sea is 100 – 400 tonnes (Ramm 1994). However, this estimate is considered unreliable due to methods applied to determine the estimate. Participants at the 1994 workshop considered that these values were likely to underestimate potential yields.

### ***Stock assessment reliability***

The snapper stocks in both the Arafura and Timor Seas are shared with Indonesia. Information collected during a collaborative Indonesia-Australian project (ACIAR funded FIS /97/165) has shown that the majority of fishing for both countries occurs on the Sahul banks. Unfortunately catch records for Indonesia are poor and there is a significant level of unlicensed, illegal fishing in Indonesian waters. Also of concern is the fact that Indonesian trawlers use very small mesh, catching snappers well below size at first maturity. All of these factors combine to make stock assessment uncertain. It is also possible that Australian fishery, with only one trawler, may be acting as a donor to the Indonesian fishery.

### ***Current Exploitation Status***

Due to the high level of Indonesian trawl fishing in the Arafura Sea adjacent to the AFZ, there are serious concerns about the sustainability of snapper stocks in the Arafura Sea. Harvest levels in the Australian sector of the Arafura Sea are below current reference points.

### ***Future Assessment Needs***

Future assessment needs to concentrate on the degree of movement of red snappers between Australia and Indonesia to resolve whether Australia is acting as a donor of red snappers to Indonesia. Identification of juvenile habitats is also important.

### ***Compliance***

The PFMEU undertakes enforcement. The unit has 17 officers who are responsible for providing compliance and education on all fisheries managed by the Northern Territory. This fishery has no current compliance issues.

## **Shark Fishery**

### ***Monitoring***

Two observer cruises on commercial shark boats were undertaken during 2002. Species composition of both harvest and bycatch (retained and non-retained) was recorded. Licensees are also required to complete catch and effort logbooks.

### **Stock assessment methods and reliability**

The joint NTDPF-CSIRO Pelagic Fish Stock Assessment Program conducted in the mid 1980s estimated that in waters adjacent to the Northern Territory, the maximum sustainable yield for the black tip sharks, *Carcharinus tilstoni* and *C. sorrah*, is 3,400 tonnes annually. This consisted of 1,900 tonnes in the Arafura and Gulf of Carpentaria (GoC) zones and 1,500 tonnes in the NT zone.

CSIRO tagging studies indicated that the blacktip sharks form a single large stock throughout northern Australia. Movement rates both along-shore and offshore are relatively restricted between the northern Australia Arafura Sea and the GoC and Bonaparte Gulf.

A more recent assessment suggests a potential yield estimate for WA, the NT and Queensland of at least 2,000 tonnes per year, with an optimum annual exploitation rate of 6 to 7% per year on the gill net vulnerable component of the stock.

Age-structure modelling indicates that the overall stock should have been increasing, at a rate of between 5% and 10% per year since the mid 1980s, when Taiwanese catches were greatly reduced. However, CPUE data from the NT gill net fishery indicates a substantial decline in relative abundance since the mid 1980s (catches per boat have been increasing slowly, but catches per length of net set have decreased by around 50% since 1985). This may be for a number of reasons, including the unaccounted removal of around 1,500 tonnes per year from the northern Australian stock component. This may be due to foreign fishing in the Arafura Sea, combined with unreported domestic catches.

The slow depletion of an inshore, resident component of the overall stock, without a major impact of recent fishing on the stock as a whole (ie. overall stock may be recovering, but the inshore density is reduced by domestic fishing in spite of overall increase)

The unreliability of the assessment techniques that are based almost entirely on CPUE statistics from both the Taiwanese and domestic gill net fisheries. There are a number of reasons to suspect that neither of these fisheries has provided CPUE trends proportional to changes in

the actual stock size. There is little prospect that future information from logbook programs will be more useful in providing a good index of abundance based on CPUE.

Given the statements above the reliability for stock assessment for the shark fishery must be considered to be low.

### **Current Exploitation Status**

Exploitation by the FTO and recreational sectors is considered to be quite low. The level of exploitation by the commercial is below most estimates of sustainable yield. However, given the high degree of uncertainty in those estimates and indications of a decline in CPUE since the mid-1990s, conservative management precludes any increase in exploitation. The fishery is considered to be fully exploited.

### **Future Assessment Needs**

A key recommendation from previous assessments has been to establish a cooperative program with fishers to provide a "fishery independent" index of stock trend based on standardised, regular fishing at a set of consistent test locations along the Top End and into the Gulf of Carpentaria.

Further, there should be a concerted effort to obtain black-tip catch statistics from the foreign fisheries currently operating in the Arafura Sea, north of the AFZ. Constraints on resources have meant that these recommendations are yet to be implemented.

A collaborative tagging program involving catch and release (by line) of a small number of sharks by commercial operators to provide estimates of harvest rate is being developed.

Given the significance of the grey mackerel catch in this fishery, there is a need for further information on this species. Information will be required on stock structure, movements and age structure of the population. Collaborative projects to undertake this research will be developed during 2003-04.

## **Research**

### **Summary to date**

In the mid 1980s, the NT Shark fishery was the subject of a major joint NT/CSIRO Pelagic Fish Stock Assessment Program. This research program undertook extensive gillnetting around the NT coastline and tagged sharks. Occasional tag recoveries are still occurring. Outcomes from that research were discussed above. Research since that time has been limited to monitoring of trends in the commercial fishery data and stock assessment modelling using all available data.

### **Incorporation into management**

Results of research have allowed informed and conservative management regimes to be implemented for the shark fishery.

### **Current Research**

Current research is primarily focussed to fishery observations as part of the Northern Australian Shark Research Project (Phase 2), in collaboration with CSIRO. Development of a collaborative tagging program with commercial fishers is also under way.

### **Compliance**

Enforcement is undertaken by the PFMEU. The unit has 17 officers who are responsible for providing compliance and education on all fisheries managed by the Northern Territory. There are no current compliance issues in this fishery.

## **9. Financial Arrangements**

The Northern Territory Government has previously determined to provide financial resources for the management of NTFJA fisheries.

The Northern Territory received \$74,704 in licence fees for Joint Authority fisheries (Shark \$15,428; demersal, \$48,720; finfish \$1,624; Timor Reef \$10,556) in 02-03.

This revenue was paid into the Northern Territory Fishing Industry Research and Development Fund. Complete details on revenue and expenditure may be found in the Annual Report of the Northern Territory Department of Business, Industry and Resource Development.

Note: Data sourced from NT Fishery Status Reports 2002

# Management Arrangements and Landings for NTFJA Fisheries

Fishery	No. of Restricted Licences	No. of Unrestricted Licences	Management Regime	Sustainable Yield Estimates	Landings (2002/2003)
Shark	9	10	<p>Effort Controls</p> <p>Restriction of the total number of licences issued</p> <p>2500 m of net mesh size 150 mm to 250 mm</p> <p>Longline to 20 nautical miles</p> <p>3:1 licence reduction program</p>	2000 tonnes for northern Australia	<p>Black Tipped shark 465 t</p> <p>Other shark 205 t</p> <p>Grey mackerel 479 t</p> <p>Spanish mackerel 9 t</p> <p>Other 9 t</p>
Demersal	Not Applicable	60	<p>Effort Controls</p> <p>Limit on licences issues</p> <p>Vertical Lines with a maximum of 5 hooks</p> <p>Droplines with 6-40 hooks</p> <p>Maximum of 45 traps per licence</p> <p>Restrictions on the possession of sharks and mackerels</p>	<p>Red Snapper – Arafura Sea 1500t (Ramm 1997b)</p> <p>Timor Sea 600-2500t (Ramm 1994)</p> <p>Gulf of Carpentaria 2880-9015t (Anon 1994).</p>	<p>Reef fish 12 t</p> <p>Goldband snapper 74 t</p> <p>Red Snappers 24 t</p> <p>Red Emperor 9 t</p>
Timor Reef	2	10	<p>Effort Controls</p> <p>Limit on licences issues</p> <p>Vertical Lines with a maximum of 5 hooks</p> <p>Droplines with 6-40 hooks</p> <p>Maximum of 45 traps per licence</p> <p>Transferability on amalgamation of two restricted licences</p> <p>Must hold a Demersal Licence</p> <p>Restrictions on the possession of sharks and mackerels</p>	<p>Gold Band Snapper – Arafura Sea 100-400t (Ramm 1994)</p> <p>Timor Sea 100t (Ramm 1994)</p> <p>Gulf of Carpentaria: No estimate currently available</p>	<p>Goldband Snapper 213 t</p> <p>Red Snappers 73 t</p> <p>Red Emperor 30 t</p> <p>Other Reef Fish 44 t</p>
Fish Trawl	Not Applicable	1	<p>Effort Controls</p> <p>Restrictions on the use of fishing gear</p>	1500 t for Arafura Sea. GoC to be determined	Confidentiality considerations preclude publication of catch data

Please note that the details outlined provide a general summary of the management arrangements only and should not be relied upon as a complete description of all legislative requirements. The Northern Territory *Fisheries Act* and Regulations provide precise information about legislative arrangements implemented for the fisheries nominated.

## **Annex A: Excerpt of the Northern Territory Government Gazette of February 1995**

### **ARRANGEMENT BETWEEN THE COMMONWEALTH AND THE NORTHERN TERRITORY IN RELATION TO THE NORTHERN SHARK FISHERY**

An ARRANGEMENT entered into between the Commonwealth of Australia (the Commonwealth) of the one part and the Northern Territory (the Territory) of the other part.

#### **WHEREAS-**

- (a) paragraph 4(i)(a) of the Acts Interpretation Act 1901 of the Commonwealth provides that where an Act is enacted on or after the date of commencement of this section that it is not to come into operation immediately upon its enactment, is expressed to confer power, inter alia, to make an instrument of a legislative or administrative character, then, unless the contrary intention applies, the power may be exercised, and anything may be done for the purpose of enabling the exercise of the power, before the Act concerned comes into operation as if it had come into operation;
- (b) subsection 2(2) of the Fisheries Management Act 1991 of the Commonwealth (the Management Act) provides that Part 5 of the Management Act, which provides for co-operation with the States and Northern Territory in the management of fisheries, commences upon the repeal or the ceasing to have effect (as the case may be) of Part IVA of the Fisheries Act 1952 of the Commonwealth;
- (c) by subsection 7(3) of the Fisheries Legislation (Consequential Provisions) Act 1991 of the Commonwealth (the Consequential Provisions Act) as amended by section 24 of the Primary Industries and Energy Legislation Amendment Act 1993 Part IVA of the Fisheries Act 1952, unless sooner repealed, ceases to have effect at the end of the period of 3 years beginning 3 February 1992, the day on which section 7 of the Consequential Provisions Act commenced;
- (d) paragraph 7(4)(a) of the Consequential Provisions Act provides that upon the commencement of Part 5 of the Act, the Northern Territory Fisheries Joint Authority, established by subsection 12D(i) of the Fisheries Act 1952, continues in existence as if it had been established under Part 5 of the Management Act;
- (e) arrangements were entered into under section 12H(4) of the Fisheries Act 1952 between the Commonwealth and the Territory in relation to the:
  - (i) Pelagic Fishery, published in the Commonwealth of Australia Gazette No 8109 on 14 April 1988;

- (ii) Pelagic Fishery except with pelagic gillnets in waters within 12 nautical miles seaward of the baseline or by trolling, published in the Commonwealth of Australia Gazette No 8109 on 14 April 1988;
- (f) paragraph 7(4)(b) of the Consequential Provisions Act provides that upon the commencement of Part 5 of the Act, any arrangement made with a State or Territory under subsection 2H(i) or (4) of the Fisheries Act 1952 that was in force immediately before that commencement continues in force as if it had been made under Part 5 of the Management Act;
- (g) the Arrangements referred to in paragraph (e) of this Arrangement were made under Division 3 of Part FVA of the Fisheries Act 1952;
- (h) subsection 75(1) of the Management Act provides that an Arrangement under Division 3 of Part 5 of the Management Act may be terminated by instrument approved by the Governor-General and the Governor or Governors of the State or States concerned;
- (i) section 59 of the Management Act provides:
  - (i) that Part 5 of the Management Act Has effect as if the Northern Territory was a State
  - (ii) that a reference in that Part to the Governor of a State shall be read, in relation to the Northern Territory, as a reference to the Administrator of the Territory;
- (j) subsection 33 (3) of the Acts Interpretation Act 1901 provides inter alia that where an Act confers a power to make any instrument, the power shall, unless the contrary intention appears, be construed as including a power exercisable in the like manner and subject to the like conditions (if any) to repeal any such instrument;
- (k) subsection 8(1) of the Interpretation Act 1978 of the Territory provides that where a provision of an Act is expressed to confer power, or to amend a provision of another Act in such a manner that the other Act, as amended, will confer power, to take any action, including power to make an appointment or to make an instrument of a legislative or administrative character then, before the first-mentioned provision or the second-mentioned provision as amended, as the case may be, comes into operation, that power may be exercised and anything may be done for the purposes of enabling the exercise of the power or of bringing the appointment or instrument into effect;
- (l) subsection 64(2) of the Fisheries Act 1988 of the Territory (the Territory Act) empowers the Territory to terminate an arrangement under Part 5 of the Management Act;

- (m) subsection 71(1) of the Management Act provides that the Commonwealth may make an arrangement with a State or States represented on a Joint Authority that the Joint Authority is to have the management of a particular fishery in waters relevant to that State or any of those States;
- (n) subsection 74(1) of the Management Act provides that an arrangement under, inter alia, section 71 is to be made by an instrument approved by the Governor-General and the Governor or Governors of the State or States concerned;
- (o) subsection 64(1) of the Territory Act as amended by section 37 of the Fisheries Amendment Act 1994 of the Territory empowers the Territory to make an arrangement under Part 5 of the Management Act;
- (p) both the Commonwealth and the Territory are desirous of exercising their powers to make a further Arrangement in relation to the fishery referred to in clause 2 of this Arrangement.

NOW THEREFORE, in pursuance of the Management Act and the Territory Act and of all the powers so enabling, it is mutually arranged as follows:

1. The Arrangements entered into between the Commonwealth and the Northern Territory as referred to in paragraph (e) of the recitals to this Arrangement are, pursuant to subsection 75 (i) of the Management Act and subsection 64(2) of the Territory Act, terminated.
2. The Commonwealth and the Territory hereby arrange that the fishery, being for any purpose other than recreation, in waters relevant to Northern Territory, being coastal waters and waters of the Australian fishing zone that lie within the area described in Schedule 2 to the Petroleum (Submerged Lands) Act 1967 under the heading "Area that includes the Adjacent Area in respect of the Northern Territory", for:
  - (a) all fish of the Class Chondrichthyes (cartilaginous fishes) using any fishing method;

but excluding fish to which this paragraph otherwise would apply taken in the exercise of a right conferred in relation to another fishery by a fishing concession granted by the Australian Fisheries Management Authority under the Management Act;

- (b) all fish of the Class Osteichthyes (bony fish) taken in the exercise of a right conferred by a licence or other authority granted by the Territory on behalf of the Northern Territory Fisheries Joint Authority for the fish to which paragraph (a) applies;

is to be managed by the Northern Territory Fisheries Joint Authority in accordance with the law of the Territory.

3. The Minister responsible for administering the Management Act and the Minister responsible for administering the Territory Act may agree in writing to the maximum quantity of other fish the subject of paragraph 2(b) that may be taken from time to time under a licence or other authority referred to in that paragraph and on matters of mutual interest in relation to the fishery.
4. This Arrangement shall, upon being executed on behalf of the Commonwealth and of the Territory and upon being approved by the Governor-General of the Commonwealth and the Administrator of the Northern Territory, take effect on 3 February 1995.
5. Without affecting the construction which this Arrangement would have if no provision of this Arrangement or part thereof is invalid, it is the intention of this Arrangement that if any provision of this Arrangement or part thereof is invalid, the remainder of that provision or part thereof was not included in this Arrangement even if the result is to extend the fishery by this Arrangement.

Dated 19th December, 1994

Signed for and on behalf of the  
Commonwealth of Australia by the  
Honourable DAVID PETER BEDDALL,  
Minister for Resources

In the presence of  
P. STEVEN

Signed for and on behalf of the  
Northern Territory by the  
Honourable DR CHRIS BURNS  
Minister for Primary Industries and Fisheries

In the presence of  
A.R.SPRIGG