

## **Northern Shark Fisheries Status Report**

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### **FISHERY DESCRIPTION**

The ‘northern shark fisheries’ comprise the State-managed WA North Coast Shark Fishery (WANCSF) in the Pilbara and western Kimberley, and the Joint Authority Northern Shark Fishery (JANSF) in the eastern Kimberley. These fisheries primarily operate shark longlining vessels with power-hauled gear to target a variety of species including ‘blacktip’, sandbar and lemon sharks. As the principal methods and some target species are common to the JANSF and WANCSF, these data have been combined and the two regions are considered as a single fishery for assessment purposes.

A significant bycatch of shark is also taken by vessels not specifically licensed for shark fishing.

#### **Governing legislation/fishing authority**

Fisheries Notice no. 476 (Section 43 order)

Fisheries Notice no. 602 (Section 43 order)

Fisheries Notice no. 601 (Section 43 order)

Offshore Constitutional Settlement 1995

Condition 127 on a Fishing Boat Licence

#### **Consultation process**

WA Demersal Net and Hook Fisheries Management Advisory Committee

Department–industry meeting

#### **Boundaries**

The WANCSF extends from longitude 114°06' E (North West Cape) to 123°45' E (Koolan Island), and the JANSF from longitude 123°45' E to the WA/NT border.

## **Management arrangements**

The northern shark fisheries are input-controlled, with limited numbers of operators and a variety of gear and spatial restrictions.

The Western Australian-controlled sector of the northern shark fishery is managed by orders under section 43 of the *Fish Resources Management Act 1994*. Those permitted to fish in the WANCSF with shark gear do so under a fishing boat licence condition and are permitted to use longlines and droplines with metal traces and powered hauling gear.

The commercial take of shark in Western Australian waters east of 123°45' E longitude is controlled by a joint authority arrangement between the Commonwealth and the State of Western Australia gazetted in February 1995. In this arrangement, the State is given control of the JANSF on behalf of the WA Fisheries Joint Authority (WAFJA), whose members include the State and Commonwealth Ministers for Fisheries. Permitted fishing methods are longlines and gillnets, though gillnet fishing is not permitted within 12 nautical miles of the coast.

There are 14 licences in the northern shark fisheries, 8 allowing access to the WANCSF and 6 to the JANSF. Of these, 11 (2 more than in 2001/02) were active during 2002/03, however not all fished full-time and there is therefore considerable scope for mobilisation of latent effort within this sector. New management arrangements for the WANCSF and JANSF are currently being discussed, as it has become apparent that existing regulations in the JANSF are inadequate to prevent increased shark fishing effort on the north coast. Until formal stock assessment of key northern shark species has been completed, any further increases in fishing effort in this fishery are considered to be highly undesirable.

Despite regulations passed in October 2000 which prohibit fishing vessels landing only the fins from sharks, there is concern over reports that some operators have been illegally finning part of their catch and dumping the low-value carcasses at sea.

## **Research summary**

Research to monitor the status of northern shark stocks has been undertaken as an extension of the south and west coast shark research project. A three-year research project funded by the FRDC, due for completion by late 2004, is focusing on the sandbar (thickskin) shark component of the fishery and will provide an improved understanding of these fisheries and of northern shark stocks generally. Age-specific exploitation rates and biological data from this sandbar shark research have been incorporated into a preliminary demographic analysis,

to determine the likely response of the stock to current levels of exploitation. A further research project which began in 1999, funded by the Department of Environment and Heritage and FRDC to examine the sustainability of Australia's tropical sharks and rays, will also help to improve our understanding of the impacts of various fishing sectors which exploit elasmobranchs across the northern half of Australia. This project involves shark researchers from the Department of Fisheries, CSIRO, and the Northern Territory and Queensland fisheries agencies. Phase 2 is scheduled for completion in June 2005.

This status report is prepared based on CAES data supplied by industry and a knowledge of tropical shark stocks obtained from preliminary research data and the scientific literature. CAES data from the northern shark fisheries are available from 1994/95, although the accuracy of early records is uncertain. Since July 2000, catch identification and reporting in the northern fisheries has been validated by at-sea observation of catches and the accuracy of returns is now considered to be good.

In addition to ongoing monitoring of catch and effort data from the longline fishery, collection of the following data should be considered as a high priority in the short to medium term:

- Improved shark catch data, with emphasis on correct species identification and accurate reporting of shark catch from other commercial, recreational and charter fishing sectors.
- Size/age composition of the longline fisheries' catch.
- Fishery-independent monitoring (employing commercial fishing techniques), which has the potential to mitigate many of the problems associated with the use of fishery-dependent CPUE data.

Other issues with lower priority include the stock assessment of 'blacktip' species in the northern shark fisheries and research into the biology and ecology of high conservation-value species, especially sawfish (family Pristidae) and grey nurse sharks (*Carcharias taurus*).

## RETAINED SPECIES

**Commercial production (season 2002/03): Northern shark fisheries 490 tonnes**

**'Other' fisheries 194 tonnes**

### Landings

The catch of shark in the state's two northern shark fisheries has risen dramatically in recent years (Northern Shark Figure 1) and is now higher than the catch from the West Coast Demersal Gillnet and Demersal Longline Fishery. This increase appears to have slowed significantly over the last year. In 2002/03, the total shark catch increased to 490.1 t, its highest level since records began but only 7.4% higher than in 2001/02 (456 t).

'Blacktip' species remained the primary component of the fisheries' catch at 178 t (Northern Shark Table 1). The generic 'blacktip' category refers to a suite of carcharhinid species that have black markings on one or more of their fins. In northern WA, the 'blacktip' catch is known to consist mainly of the Australian blacktip whaler (*Carcharhinus tilstoni*), the common blacktip whaler (*C. limbatus*) and the spot-tail shark (*C. sorrah*).

The catch of sandbar shark (*Carcharhinus plumbeus*) increased by 21.4% to 87.7 t, with most of the rest of the catch comprising 56.9 t of lemon sharks (*Negaprion acutidens*), 44.7 t of hammerhead species (family Sphyrnidae), 42.6 t of tiger sharks (*Galeocerdo cuvier*) and 32.4 t of pigeye sharks (*Carcharhinus amboinensis*).

The northern shark fisheries' scalefish catch increased by 136.1% in 2002/03 but still remained small at 8.2 t, accounting for less than 2% of total fishery landings. This comprised 7 t of grey mackerel (*Scomberomorus semifasciatus*) and 1.2 t of 'other' scalefish.

In addition to the catch by the two dedicated fisheries, sharks are also caught by other commercial operators. During 2002/03, vessels licensed in other managed fisheries operating in the area between North West Cape and the WA/NT border reported catches of sharks and rays totalling 78 t. A further wetline/longline catch of 116 t of sharks and rays was taken by vessels without access to managed fisheries. The combined 'external' catch of 194 t is 14% higher than last year and is greater than one third of the landings from the dedicated shark fisheries, making the total catch of sharks in this region 684 t.

### Fishing effort/access level

Because longlining is the primary fishing method in the northern shark fisheries, effort is standardised in terms of hook days. The standardised effort measure is the number of longline or dropline hooks multiplied by the number of fishing days. Comparative longline and gillnet catch and effort data were used to convert gillnet effort into the equivalent longline effort.

In 2002/03, the total fishing effort was 422,670 hook days expended by 11 vessels, which represents a decrease of 4% from the previous year (Northern Shark Figure 2). Given the continued high value of shark fins and the increasingly full-time operation of vessels, effort in this fishery is likely to rise further in coming years.

### Catch rate

In 2002/03 there was a 4.3% decrease in effort and an 11% increase in catch rate for all species combined. Although the reports of discarding carcasses at sea are difficult to confirm, they nevertheless give cause for concern regarding the validity of the reported catch and hence could bias estimated catch rates.

**Recreational component:**

**Not assessed**

## STOCK ASSESSMENT

**Assessment complete:**

**Preliminary**

As the demographic model developed for *C. plumbeus* operates independently of catch data, the possible under-reporting of catches will not have affected the assessment of the key target stock. However, if significant under-reporting is occurring, it not only undermines the reliability of the fishery's CPUE trends in recent years but also raises management issues over the sustainability of the catches of secondary stocks, particularly of the more *k*-selected species (i.e. those with slow growth and low fecundity) such as pigeye and lemon sharks.

Some of the uncertainties regarding the biological parameters used in the demographic model have been resolved as results from the FRDC-funded research project have become available. In particular, the reproductive periodicity has been determined as biennial (i.e. female sharks give birth every second year), not triennial as previously speculated, and the natal sex ratio as not significantly different from 1:1. However, until age at maturity and the age structure of

the catch become available (results expected later this year), the demographic analysis used should continue to be regarded as preliminary.

Based on data to June 2002, results from the demographic model indicated that at current levels of exploitation, the rate of population growth ( $r$ ) was positive and the stock would continue to replace itself. The model was run according to several different schedules of exploitation. Even under the most pessimistic scenario (that exploitation rates are underestimated by 35%), the model suggested that levels of exploitation at that time were sustainable, although the rate of population growth under those circumstances was low ( $r = 0.006 \text{ yr}^{-1}$ ). However, the possibility of under-reporting of catch and the relatively fast changes in the fleet dynamics in recent years suggest that the model results as of June 2002 should be used with caution, and any increases in effort minimised prior to a full reassessment of the data.

<b>Exploitation status:</b>	<b>Under-exploited</b>
<b>Breeding stock levels:</b>	<b>Adequate</b>

## **NON-RETAINED SPECIES**

<b>Bycatch species impact:</b>	<b>Low</b>
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The fisheries have some scalefish catch which is generally retained for sale. There is some discarded bycatch of unsaleable species of sharks, stingrays and scalefish which the ESD risk assessment process has rated as a low to negligible risk.

<b>Protected species interaction:</b>	<b>Low</b>
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The northern shark fisheries have been rated as having a generally low risk of interacting with protected species.

*Sharks and rays:* Because these fisheries generally operate some distance offshore, they pose a negligible risk to the spartooth shark (*Glyphis* sp. A) and the freshwater sawfish (*Pristis microdon*), which have primarily inshore, estuarine and riverine distributions. The white shark (*Carcharodon carcharias*) and the grey nurse shark (*Carcharias taurus*) rarely

occur north of North West Cape and the whale shark (*Rhincodon typus*) is extremely unlikely to be caught by longline or dropline gear.

*Turtles:* No turtle captures have either been observed or reliably reported in the northern shark fisheries and as the amount of gear used is small relative to the fisheries' operational area, the risk of interaction is low.

*Billfish:* The limited billfish bycatch in the northern shark fisheries is insufficient to impact breeding stocks.

*Cetaceans:* Given that pelagic gillnets are to be phased out following the introduction of the new management plan for the JANSF, the risk of interaction with cetaceans will be negligible.

## **ECOSYSTEM EFFECTS**

### **Food chain effects:**

**Negligible**

Given the relatively small amount of total catch taken by this fishery, which is spread across a large number of species, each of which has a wide diet, the fishery is likely to be currently having only a negligible impact on trophic interactions within this region. If the recent increases in take of a variety of larger species continues, this view may need to be reconsidered.

### **Habitat effects**

**Negligible**

The principal types of fishing gear (dropline and longline) are set so that they are only in intermittent contact with the seabed, and their physical impact on the seabed is minimal.

## **SOCIAL EFFECTS**

Estimated employment in the northern shark fleet during 2002/03 was approximately 30 fishers.

## **ECONOMIC EFFECTS**

### **Estimated annual value (to fishers) for year 2002/03**

**\$1.4 million**

The combined value of the catch from the two managed sectors was approximately \$1.4 million (including the estimated value of shark fins). As fishers do separately identify the weight of fins on their catch returns, fin weight was calculated at an average of 3% of sharks'

whole weight and value was estimated using a price of \$45/kg. During the 2002/03 season, shark fins maintained their value of between \$25 and \$120/kg, depending on fin size and species. Categories of shark which do not have saleable fins were excluded from fin valuation.

## **FISHERY GOVERNANCE**

### **Acceptable catch range:**

### **Sandbar sharks < 117 tonnes**

Owing to the large number of elasmobranch species caught in these fisheries, it is not feasible to formally assess each species. Because the effects of fishing are likely to be detectable in the primary target catch first, the catch of sandbar sharks is considered as a suitable indicator for monitoring the catch of secondary species.

The maximum acceptable annual sandbar shark catch in the northern shark fisheries of approximately 117 tonnes was derived from the mean reported catches from 2000/01 and 2001/02 (which the model results suggest are sustainable) plus an allowance of 50%.

### **New management initiatives (2003/04)**

In response to the International Plan of Action for the Conservation and Protection of Sharks, released in 1999 by the Food and Agricultural Organisation of the United Nations due to concern over the increase in shark catches and the consequences for shark populations, a National Plan of Action has been developed to address those issues specific to Australian shark species and fisheries.

The Department has conducted a review of shark fishing operations in the JANSF and a management proposal was circulated for stakeholder comment in early 2003. The Joint Authority has since approved the drafting of legislation based on the proposal and arrangements will be implemented by way of a gear prohibition order pursuant to Section 43 of the *Fish Resources Management Act 1994*. It is intended that the gear prohibition apply to the use of demersal gillnets, pelagic gillnets, demersal longlines and net hauling devices in Western Australian waters east of 123° 45' E longitude. Recognised JANSF operators will be permitted to use either demersal longlines or pelagic gillnets, although the Department is considering phasing out pelagic gillnets in the future. Input controls such as hook limit and restrictions on lengths of pelagic gillnet will also be introduced. The take of mackerel by

JANSF operators will be prohibited unless operators hold a licence to operate in the proposed mackerel fishery. The Section 43 order is considered to be an interim management arrangement, and will give the Joint Authority an opportunity to consider the longer-term management of the JANSF.

The northern shark fisheries have now formed a Northern Shark Industry Association (NSIA) so as to streamline a move towards developing a formal management plan. The NSIA has suggested that effort reductions are required for their industry and the Department will be working with this association to determine what the appropriate effort levels should be. Concern was raised during the year that sharks in the northern fishery were not being fully utilised. As such, the Minister has requested that the northern shark fisheries indicate that they are making full and appropriate use of their shark catch. The ability to demonstrate full and appropriate usage will influence whether or not the fishery becomes formally managed.

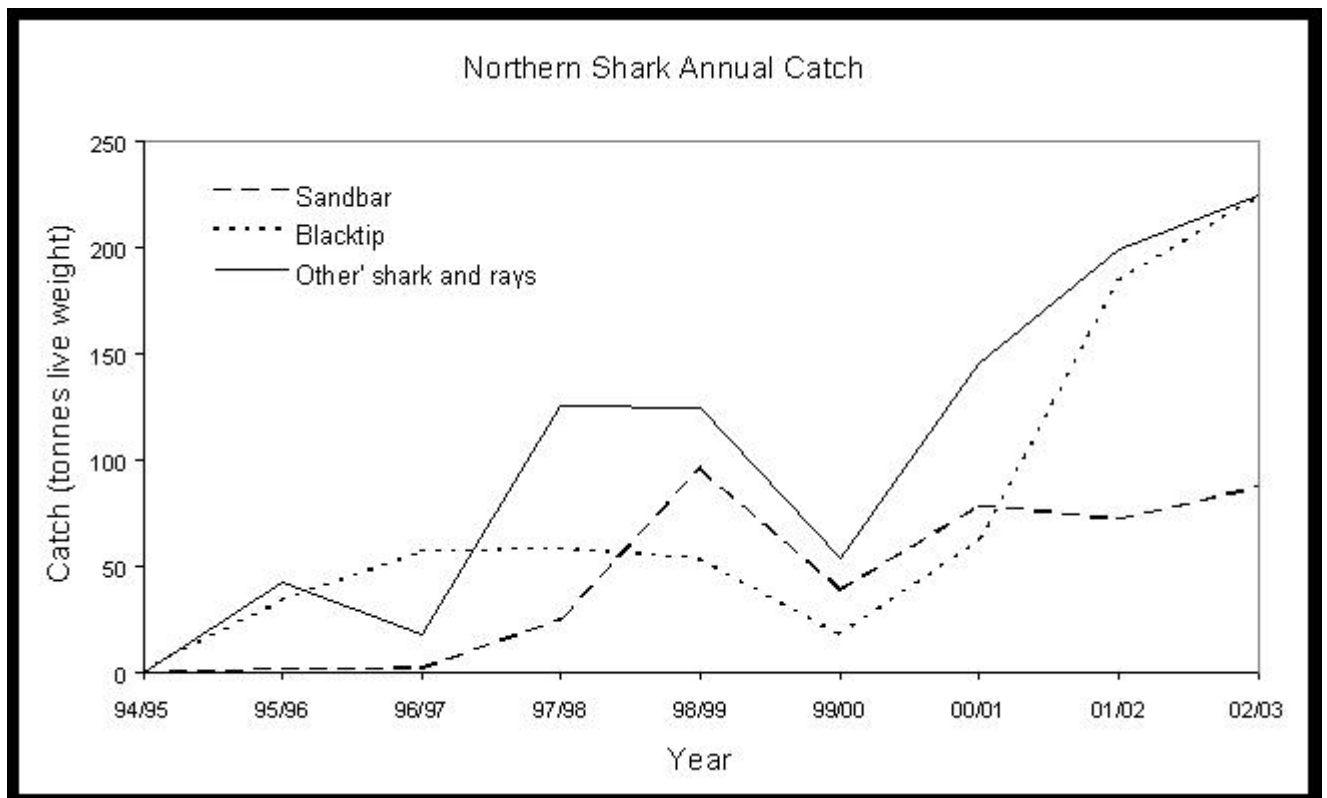
## **EXTERNAL FACTORS**

A significant quantity of sharks are caught in the State's northern bioregion as by-product by vessels licensed to fish for other target species. This factor, in addition to the multi-species nature of the tropical shark fisheries, will make formal stock assessment of the minor species caught in these fisheries particularly difficult.

**NORTHERN SHARK TABLE 1**

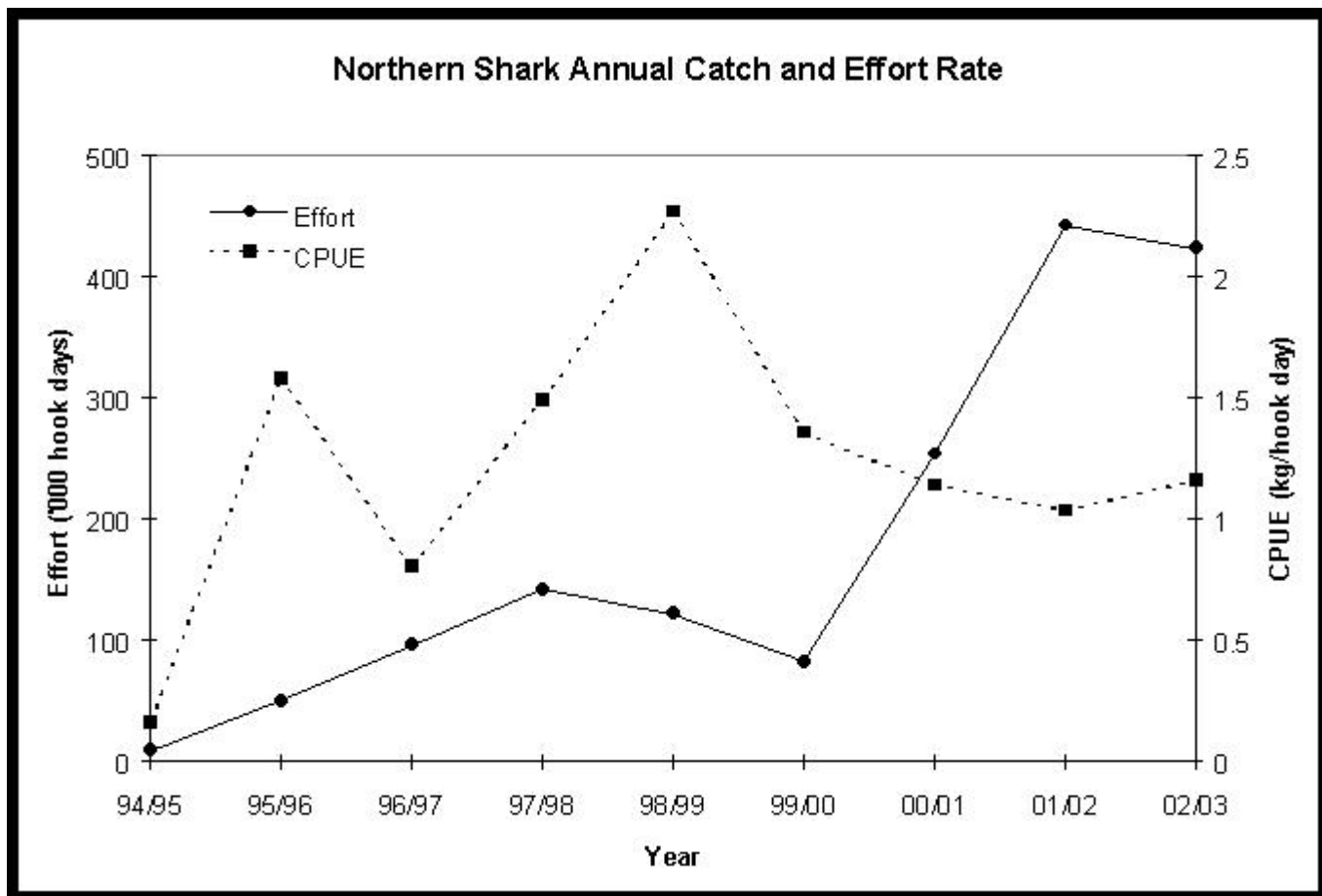
Elasmobranch catch species composition for the northern shark fisheries (WANCSF and JANSF) from 2000/01 to 2002/03.

Species	Catch (tonnes)		
	2000/01	2001/02	2002/03
Blacktip shark <i>Carcharhinus spp.</i>	47	185	178
Sandbar (thickskin) shark <i>Carcharhinus plumbeus</i>	79	72	88
Lemon shark <i>Negaprion acutidens</i>	15	26	57
Hammerhead shark Sphyrnidae	23	43	45
Tiger shark <i>Galeocerdo cuvier</i>	34	37	43
Pigeye shark <i>Carcharhinus amboinensis</i>	29	25	32
Shovelnose/fiddler rays Rhinobatidae, Rhynchobatidae	3	11	11
Grey reef shark <i>Carcharhinus amblyrhynchos</i>	7	6	7
'Bronze whaler' shark <i>Carcharhinus obscurus</i>	9	6	7
Spot-tail shark <i>Carcharhinus sorrah</i>	-	-	3
Other sharks/rays	26	45	19
<b>TOTAL</b>	<b>272</b>	<b>456</b>	<b>490</b>



**NORTHERN SHARK FIGURE 1**

Annual landings for the northern shark fisheries (WANCSF and JANSF) for the period 1994/95 to 2002/03.



**NORTHERN SHARK FIGURE 2.**

Annual effort and catch rates of all sharks and rays for the northern shark fisheries (WANCSF and JANSF) for the period 1994/95 to 2002/03.