

APPLICATION TO THE AUSTRALIAN GOVERNMENT DEPARTMENT OF ENVIRONMENT AND HERITAGE ON THE WESTERN AUSTRALIAN TEMPERATE SHARK FISHERIES

(covering The West Coast Demersal Gillnet and Demersal
Longline [interim] Managed Fishery and the Joint Authority
Southern Demersal Gillnet and Demersal Longline Managed
Fishery)

For Consideration Under Parts 13 and 13A of the
*Environment Protection and Biodiversity
Conservation Act 1999*

NOVEMBER 2005



Department of Fisheries
Government of Western Australia



DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
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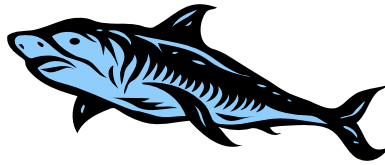
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EXECUTIVE SUMMARY

The Joint Authority Southern Demersal Gillnet and Longline Managed Fishery and the West Coast Demersal Gillnet and Longline Interim Managed Fishery are together known as the “temperate shark fisheries”. The two fisheries abut each other at 33° S latitude on the west coast, with the West Coast fishery lying between 26° S and 33° S on the west coast, while the Joint Authority southern fishery occupies the area on the west and south coasts between 33° S and 129° E longitude.

There are 57 licences in the Joint Authority southern fishery and 26 licences in the west coast fishery taking a number of shark and scalefish (teleost) species primarily for the “fish and chip” market. The target shark species are whiskery, gummy and juvenile dusky sharks, although school sharks are taken in the eastern area of the Joint Authority fishery and sandbar sharks are taken at the western end of the Joint Authority fishery and in the west coast fishery. The fin component of the two fisheries is small, primarily because the main target species are small and have small fins. However, in recent years there has been a degree of targeting of larger sharks (particularly larger dusky and sandbar sharks and other large carcharhinids) because of their associated fin value. This increase in take, as well as increases in the take of these species in other fisheries, has led to serious sustainability concerns for dusky and sandbar sharks and large carcharhinids generally. The scalefish species taken vary across the range of the fisheries with dhufish, pink snapper, samson fish and sweetlip emperor dominating the scalefish catch of the west coast fishery, while queen snapper and blue groper dominate that of the Joint Authority southern fishery.

The management arrangements for the two fisheries have recently undergone a significant review, initiated by concerns with the state of sandbar and dusky shark stocks and by a desire to increase the rate of recovery of the whiskery shark stock. In recent months the Minister for Fisheries has approved a number of major management changes for these fisheries that should resolve the sustainability issues for those species for which there is concern (dusky and sandbar sharks) and promote an increased recovery rate for whiskery sharks. The approved changes (see below) include some changes in areas outside the temperate shark fisheries. However, because some of the shark species (particularly dusky and sandbar sharks) occur widely along the coast or move into the temperate fisheries from areas outside these fisheries, these changes are relevant to the temperate shark fisheries. Approved changes (and their current status) include:

- Closure to targeted shark fishing between North West Cape and Broome (implemented)
- Closure to fishing in the west coast fishery and the western part of the Joint Authority southern fishery from the 16 August to 15 October (approved)

- Maximum size limits for dusky sharks (approved)
- Controls on the configuration of longline used in the demersal gillnet and longline fisheries, including a prohibition of the use of wire trace, hook size controls, materials used and branch line length controls (approved)
- Prohibition of the use of longlines outside the demersal gillnet and longline fisheries (approved)
- Prohibition of the use of wire trace in any fishery (except the mackerel fishery and the tropical shark fishery) (approved)
- Prohibition of the use of hooks on demersal gillnets or other static gear associated with demersal gillnet fishing (approved)
- Commercially protected fish status for sharks and rays (except in the demersal gillnet and longline fisheries and some other exceptions), but with no exceptions for sawfish of the genus *Pristis* (approved)
- Tightening of the anti-filleting regulations to cover both sharks and rays (approved)
- Significant increases in the penalty provisions for taking commercially protected sharks and rays or contravention of the anti-filleting regulations (approved)
- Effort controls to bring the fisheries back to 2001/2002 effort levels and conversion of the time unit for effort measurement from months to days (approved)
- Implementation of VMS to measure time consumption and time/area closures (approved)

The one issue not yet finalised is the conversion value for months to days. This measure is expected to be determined and approved in the next two months. Implementation of these approved measures is proposed over the next six months and prior to the commencement of the fishery year for the temperate shark fisheries.

1. INTRODUCTION

There are four fisheries in Western Australia that target sharks (Figure 1). These fisheries are often generically described as the Western Australian Shark Fisheries. They are:

1. The Western Australia North Coast Shark Fishery (WANCSF);
2. The Joint Authority Northern Shark Fishery (JANSF);
3. The Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGDLF); and
4. The West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WCDGDLF).

The WANCSF and the JANSF are collectively known as the northern shark fisheries or, as in this report, the tropical shark fisheries. Similarly, while managed by gear type rather than species, the JASDGDLF and the WADGDLF are known as the temperate shark fisheries. This report covers the tropical shark fisheries. While this report primarily covers the tropical shark fisheries, as some unit stocks are shared between the tropical and temperate Western Australian Shark Fisheries, reference is also made to the latter.

The operations of the JASDGDLF is governed a management plan while the WCDGDLF is currently managed under an interim management plan. There has been ongoing consideration to moving the WCDGDLF to a full management plan for some years but this was delayed pending the outcome of the recent review of the management of the State's shark fisheries. It is currently proposed, that as part of introducing the management changes recently agreed by the Minister for Fisheries, the WCDGDLF will move from interim to fully managed status. Copies of the existing management plan and interim management plan can be found on the Department's web site at:
<http://www.fish.wa.gov.au/docs/pub/LegislationHow/gateway.php?0006>

As these fisheries have recently undergone a significant review and the resulting management changes are still in the process of implementation or determination. This is an interim report that covers:

- a. the background on the historical operations of the fisheries;
- b. the current status of management arrangements;
- c. the outcome of the recent sandbar shark stock assessment; and
- d. the changes that have been or are to be implemented in the two tropical shark fisheries.

This application is made under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) with the aim of receiving certification to continue exports from the fishery. This is required to provide the Department of Fisheries Western Australia (DFWA) with sufficient time to:

- review the ecological risk assessment completed in 2002 in light of the new research findings, catch and effort data and management changes, so that a more comprehensive report can be compiled which includes all updated risk assessments; and
- implement and determine the outcome of the proposed management changes recently approved by the Minister for Fisheries.

These fisheries have historically focussed on the supply of shark flesh for human consumption mainly for the Western Australian market with much of the product going to ‘fish and chips’ retailers in local towns, regional centres and metropolitan Perth. However, in response to high fin prices, in recent years the export of fins to Asian markets has also become an important component of these fisheries.

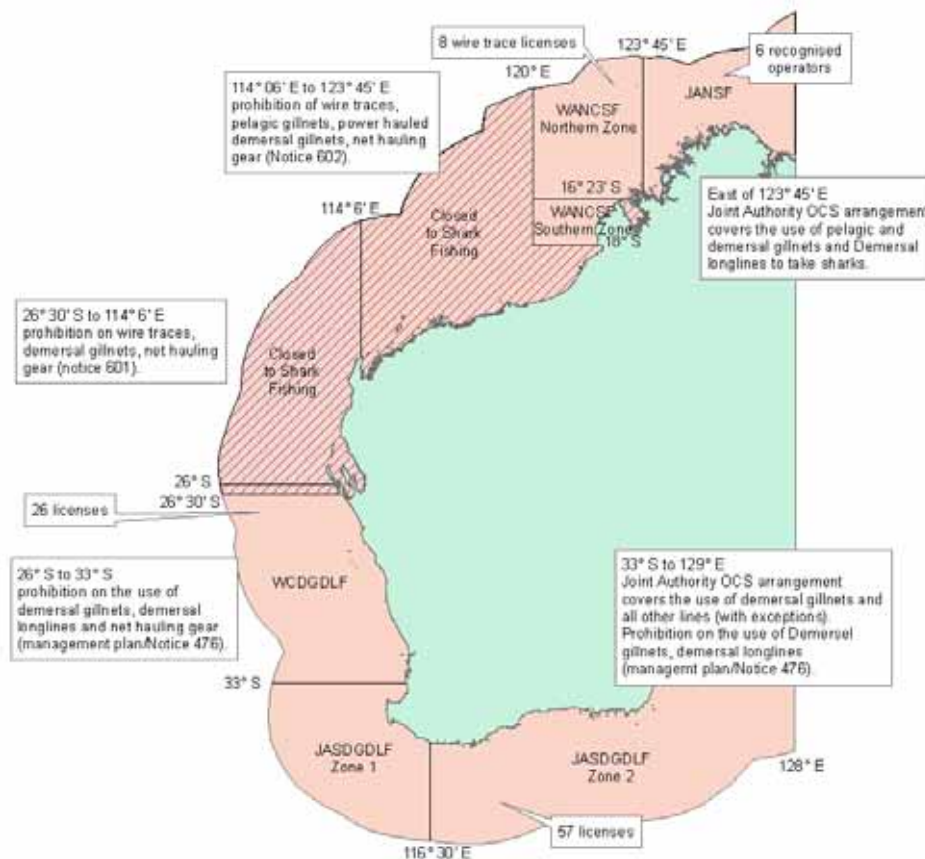


Figure 1 Western Australian Shark and Demersal Gillnet and Demersal Longline Fisheries.

2. BACKGROUND & HISTORICAL OPERATIONS

2.1 HISTORY

Commercial shark fishing began in Western Australia (WA) in 1941 with a single boat setting demersal longlines in the Leschenault Inlet, primarily targeting gummy sharks, *Mustelus antarcticus* (Whitely, 1943). During the late 1940s and early 1950s

the shark fishery expanded to other ports including Albany, Fremantle and Geraldton and despite remaining a largely part time occupation for most fishers, shark fishing effort increased steadily as more operators entered the fishery. The shark fishery gradually moved further offshore throughout the 1960s and demersally set multifilament gillnets began to replace longlines as the preferred method for catching sharks. Catches rose steadily until the early 1970s, when public concern over the level of mercury in shark flesh contributed to a dramatic decrease in demand resulting in sharp declines of catches (Heald, 1987; Simpfendorfer and Donohue, 1998).

Following research carried out by the Fisheries Department of WA, the WA Health Department introduced regulations in 1974 prohibiting the sale of shark flesh with mercury concentrations in excess of 0.5 parts per million (Hancock and Edmonds, 1977) and consumer confidence gradually returned. As the markets for shark flesh began to recover and the introduction of new management regulations restricted vessels' access to other fisheries with the shark fisheries remaining open access, effort in both the temperate shark fisheries began to rise rapidly.

Throughout the 1980s, shark fishing became an increasingly full time occupation and operators began using larger and faster vessels equipped with satellite navigation systems and colour sounders, which enabled them to operate further offshore and in areas that had previously been out of range. In addition, new fishing gear technology, such as monofilament gillnets and powered net-reels, significantly increased the amount of net that fishers were able to operate. By this time, monofilament gillnet had become the most commonly used method with longlines only being used by a handful of small operators.

The increased fishing effort, together with declining catch rates, prompted the introduction of the first management plan for a Western Australian target shark fishery in 1988. Under an agreement between the State and Commonwealth governments the area between 33° S (Cape Bouvard) and the South Australian border (Figure 1) was declared a limited entry fishery. The JASDGDLF was split into 4 zones:

- **Zone 1:** between 33° S and Chatham Island (116° 30' E) (22 licences as at 30 June 2005);
- **Zone 2:** from Chatham Island (116° 30' E) to the W.A./S.A. border (129° E) (31 licences as at 30 June 2005);
- **Zone 3:** 33° S to 116° 55'24 E (1 licence as at 30 June 2005); and
- **Zone 4:** 116° E to 129° E (0 licences as at 30 June 2005).

Entry to this fishery was restricted to fishers who could demonstrate a historical use of the stock, and effort in the newly managed fishery was limited by the allocation of time/gear units of entitlement.

Zones 3 and 4 are no longer particularly relevant as there is only one active licence in these zones. In any event, these zones initially existed only to provide for zone 1 and zone 2 licensees who had a history of limited access to the adjacent area of the other zone (e.g. Zone 3 exists to cater for a Zone 1 licensee who had access through historical fishing to a small adjacent area of Zone 2).

The use of mechanically powered hauling gear outside the recognised shark and purse seine fisheries north of 33° S was effectively prohibited in July 1989 by a notice under the Fisheries Act 1905, limiting gillnets and longline access to the west coast. An interim management plan was introduced in 1997 for the WCDGDLIMF, giving the fishery similar management arrangements to the JASDGDLF. Implementation of the full management plan was initially delayed by legal challenges to the proposed unit allocation (now resolved) and subsequently by the 2004-2005 major review of the management of the State's shark fisheries.

In the late 1990's a series of phased effort reductions designed to aid the recovery of whiskery and gummy sharks (reducing unit values progressively over five years) were imposed on the temperate shark fisheries. While benefiting the recovery of these stocks and limiting the total potential fishing effort capacity, in the longer term the fishery responded by activating latent effort.

In 2003 with a five-fold increase in demersal longline fishing in the WCDGDLF over the previous year and evidence of declining dusky shark stocks and increased targeting of large dusky sharks by a wide range of commercial fishers (inside and outside the State's recognised shark fisheries), the Department focussed attention on reviewing the management arrangements for these fisheries. The release of the report *Stock assessment of the sandbar shark, Carcharhinus plumbeus, in Western Australia - Shark Section Research Advice Number 16* in April 2004 provided further impetus for rethinking the way the fisheries were being managed, how fishing effort could be more effectively controlled and how key target species could be managed more sustainably (Appendix 6.1).

To allow for completion of the recent review of the management of the temperate shark fisheries, the expiry date for the interim plan was amended to 31 May 2006. Additionally, under this plan, the fishery is managed using effort controls in the form of time/gear units, with each unit allowing a net length of 540 metres or 180 longline hooks. There were 26 licences in the WCDGDLF in 2002/03.

2.2 DESCRIPTION OF GEAR

The majority of vessels in the WA demersal gillnet and demersal longline fleet use demersally set monofilament gillnets to catch a wide variety of sharks and scalefish (teleosts). While JASDGDLF and WCDGDLF (demersal gillnet and demersal longline fisheries) endorsements also permit the use of demersal longlines, these are generally only used by a few small and mainly part-time operators. A small number of larger vessels have also often experimented with longline gear, to assess the advantages and disadvantages of this method and in recent years some vessels particularly in the northern part of the WCDGDLF, have used longlines to target larger sharks for their fins. There was also increasing interest over the past year from licensees interested in moving to longlines. The Department has recently addressed concerns with the potential for fishermen to use longlines to target large sharks for fins by gaining the Minister's approval to introduce special new restrictions for longline gear that should make this gear much less effective for targeting large sharks.

2.2.1 Demersal Gillnets

Nets are constructed of nylon monofilament with a diameter of between 35mm and 70mm (line 35-line 70). The mesh is hung between a negatively buoyant 'ground line', which sinks the net to the seabed and a positively buoyant 'head line', which floats the net vertically off the bottom (Figure 2). As fish do not easily 'gill' in taut mesh, the net is attached to the head and ground lines using a hanging ratio of 1.5 to 2 metres of net for every metre of line to ensure some slack. Permitted mesh sizes are restricted to a minimum of 162.5 mm on the south coast or 175 mm on the west coast and nets may not exceed 20 meshes in depth (or 263cm with a 178 mm mesh). Additional ballast is usually attached to each end of the net and often intermittently along its length to prevent dragging. Floats are attached at each end to assist with relocation and recovery. It is common practice for intermediate surface float lines to be attached to nets to reduce the amount of net that is susceptible to two or more double 'bite-offs' (where both the head line and ground line are severed between the float lines) and the fragments of net would otherwise be very difficult to retrieve.

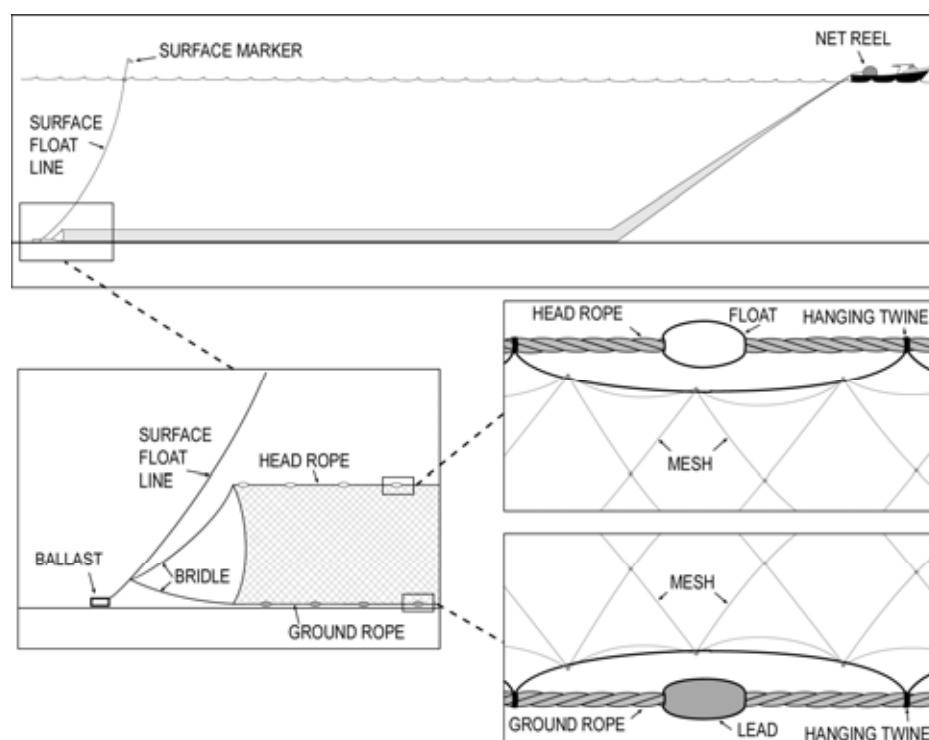


Figure 2 Typical demersal gillnet configuration.

Fishers generally set between 1 and 4 nets at any one time, depending on their unit allocation, vessel size, area of operation and expected catch rates, *etc.* Nets are typically between 1000m and 2500m long and may be set in close proximity to each other or separated by distances of several kilometres. Most vessels deploy their gear overnight (the mean observed 'soak time' for nets in these fisheries is 17 hours) but some deploy and recover their gear several times each day.

The fisheries are unitised with a unit being equal to 270 metres of demersal gillnet or 90 longline hooks the JASDGLF and 540 metres of demersal gillnet or 180 longline hooks in the WCDGLF. These units are tradeable in the open market and licensees

can accumulate units to increase the size or number of nets or longlines used. Nonetheless, in the JASDGLF a maximum net length of 8,240 metres and a maximum of 2,800 hooks applies. Similarly, in the WCDGLF a minimum of 5 units and a maximum of 132 units per licence applies and the maximum net length used in practice in this fishery is also around 8,000 metres in length.

2.2.3 Demersal Longline

Demersal longlines (see Figure 3) are currently only used by a handful of vessels in these fisheries. Longlines consist of a mainline (rope or monofilament), which is weighted in such a way that it lies roughly parallel to the seabed. Baited hooks are attached to the mainline via 'snoods', which, for the purpose of catching sharks, are most likely to have a length of wire at the hook end to prevent the shark from biting through. Demersal longlines may consist of any number of hooks, but without automatic baiting machines (which are not used in these fisheries), it is unlikely that more than 1500 hooks could be set at a time.

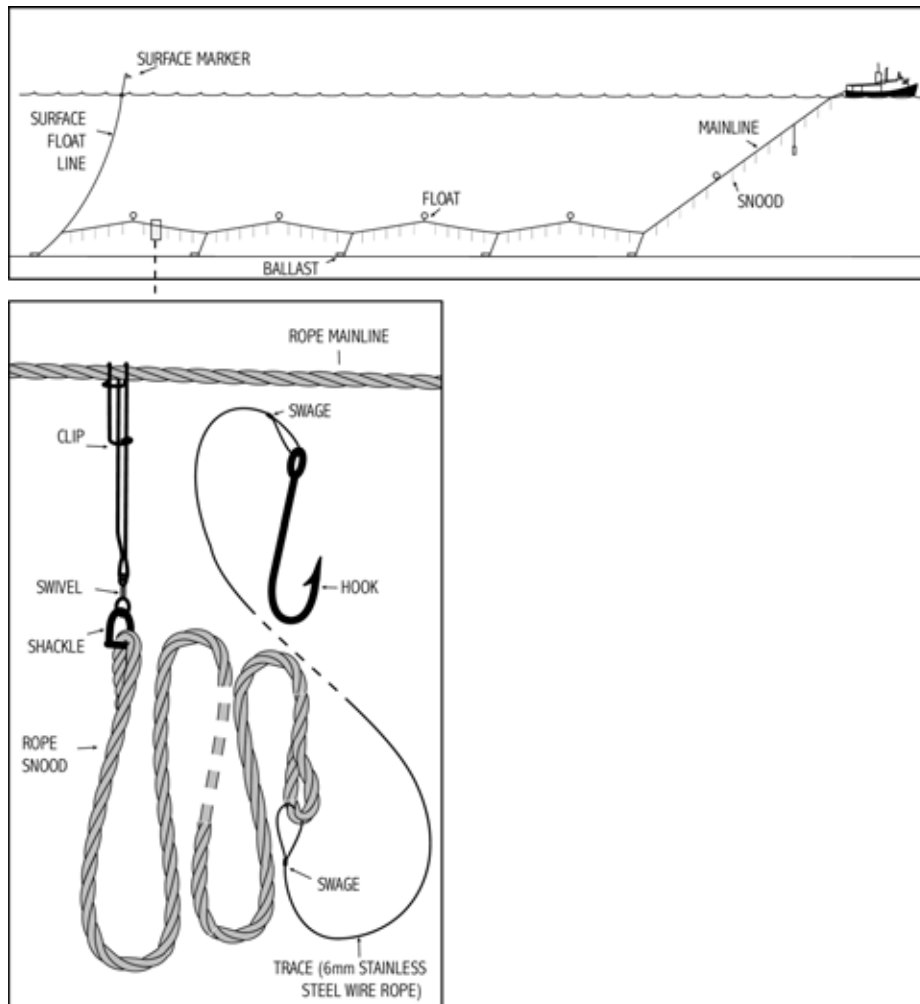


Figure 3 Typical demersal longline configuration.

2.3 CATCH HISTORY

Details of 2003-2004 catch data and other historical stock assessment and background on these fisheries as reported in the DFWA *State of the Fisheries Report 2003- 2004* is in Appendix 6.2. Further supporting data are in the *Status Report for the Southern and West Coast Demersal Gillnet and Demersal Longline Fisheries and Northern Shark Fisheries No 12 September 2005* in Appendix 6.3.

Demersal gillnet and demersal longline shark landings on the south and west coasts increased steadily through the 1970s and early 1980s until the JASDGLF management plan capped the number shark units in 1988 (Figure 4). The total shark catch peaked in 1987/88 at 2128.0 tonnes, of which 437.3 tonnes was from Zone 1, 959.3 tonnes from zone 2 and 731.5 tonnes from the west coast (north of 33° S). Regionally, catches peaked at 646.3 tonnes in Zone 1 in 1985/86, 1126.7 tonnes in Zone 2 in 1991/92 and 743.1 tonnes in the west coast fishery in 1988/89.

Since formal management of the south coast fishery in 1998, catches have fallen by 253.5 tonnes (26.4%) in Zone 2 and risen by 44.7 tonnes (14.2%) in Zone 1. West coast catches have fallen by 91.1 tonnes (22.0%) since the interim plan for the WCDGLF was introduced in 1997. Mean annual catches over the 10 years up to the 2000/01 reporting period were 313.4 tonnes in Zone 1, 684.4 tonnes in Zone 2 and 390.1 tonnes on the west coast.

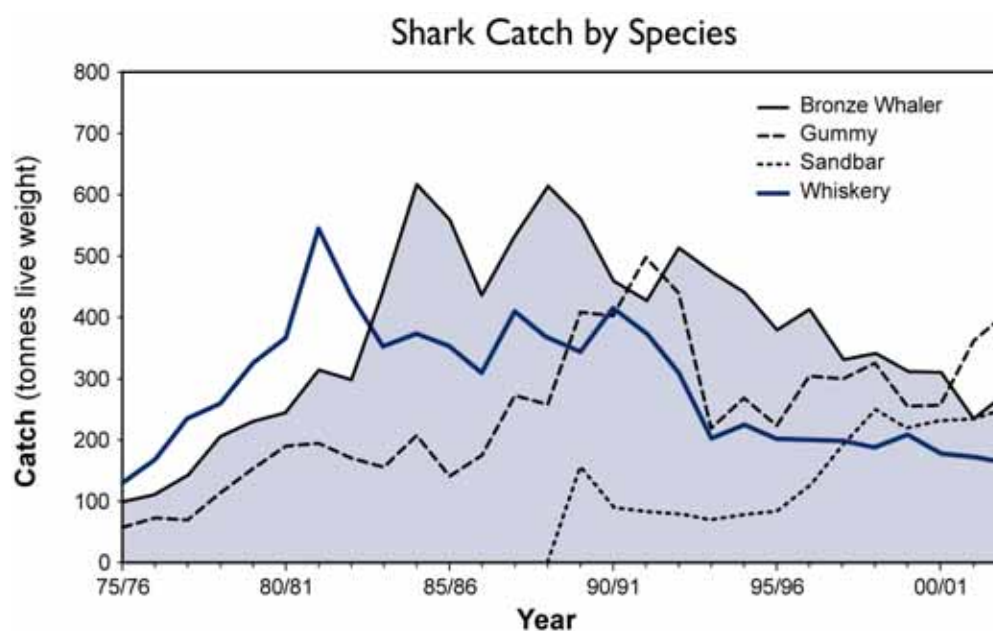


Figure 4 Demersal Gillnet and Longline - Annual catches of target shark species in the demersal gillnet and longline fisheries (JASDGLF and WCDGLF) for the period 1975/76 to 2002/03.

3. TARGET SPECIES

3.1 FISHING EFFORT

Appendix 6.3 *Status Report for the Southern and West Coast Demersal Gillnet and Demersal Longline Fisheries and Northern Shark Fisheries - No 12. September 2005* (McAuley 2005) is a detailed report covering the stock assessment for the key target species in the State's four shark fisheries for the 2003/2004 year.

Fishing effort increased by 34% and 9% in Zones 1 and 2 of the JASDGDLF, respectively, and by 43% in the WCDGDLF between 2002/03 and 2003/04. The temperate demersal gillnet and longline fisheries' total shark¹ catch was 1,441 tonnes, 194 tonnes (16%) higher than in 2002/03. Total shark catches increased in 2003/04 by 8% in Zone 1, 10% in Zone 2 and 31% in the WCDGDLF. Dusky shark catches increased by 12% and 7% in Zones 1 and 2 of the JASDGDLF, respectively, and by 64% in the WCDGDLF and by 17.7% in the northern shark fisheries. The substantial increase in the WCDGDLF dusky shark catch, which followed a 55% increase in 2002/03, was a consequence of the nearly five-fold (465%) increase in demersal longline fishing effort.

While there was no change in the whiskery shark catch in Zone 1, despite the increased level of effort, there was an overall increase of 14% in the temperate fishery's whiskery shark catch as a result of 21% and 31% increases in landings from Zone 2 and the WCDGDLF, respectively. The fishery's total gummy shark catch increased for the fourth year in a row to 465 tonnes in 2003/04. The largest increase of 38 tonnes was in Zone 2, where 84% of the fishery's total gummy shark catch originated. However, the largest percentage increase of 108% (34 tonnes) occurred in Zone 1, where there was a noticeable increase in the amount of effort in the region. Sandbar shark catches increased by 34% in the WCDGDLF, decreased by a similar amount (35%) in the JASDGDLF and increased by 138% in the northern shark fisheries, resulting in a combined catch of 413 tonnes, which was 60% higher than in 2002/03.

Formal stock assessment of sandbar sharks, which was completed in April 2005, indicated that the combined levels of catch in all the shark fisheries in 2001/02, 2002/03 and 2003/04 were unsustainable.

Scalefish catches increased by 46% in Zone 1, 34% in Zone 2 and 18% in the WCDGDLF, resulting in a 31% overall increase from the temperate demersal gillnet and longline fisheries.

3.2 STOCK STATUS

The status of the key target stocks are summarised in the stock assessment report (Appendix 6.3) are as follows:

- a) the breeding stock of **dusky sharks** is overexploited and recruitment of neonate dusky sharks has decreased in recent years.
- b) the total catch of **dusky sharks** by the JASDGDLF and WCDGDLF exceeded this species' trigger limit by 45%.
- c) increased use of demersal longlines, particularly in the WCDGDLF, has caused a rapid escalation in catches of **dusky sharks** . Due to the less size-selective nature of hooks and the areas in which longlines have been fished, a high proportion of this longline catch is thought to have been comprised of older juveniles, sub-adult and adult sharks.
- d) increased targeting of large **dusky shark** using setlines and longlines may also have been contributing to reported gillnet catches over recent years, which might have caused an overly optimistic trend in gillnet catch rates;
- e) continuing mortality of larger **dusky sharks** from capture by 'wetline' fishing by commercial operators outside the recognised shark fisheries and other external sources, including entanglement in plastic packing straps, is likely to be further depleting the breeding stock .
- f) current levels of **sandbar shark** catches are unsustainable and the breeding stock has been depleted.
- g) the total catch of **whiskery sharks** by the JASDGDLF and WCDGDLF exceeded this species' trigger limit by 25%.
- h) total **whiskery shark** biomass was estimated to be stabilising at 5% below the target biomass level.
- i) the biomass of mature female **whiskery sharks** has been increasing marginally for three consecutive years.
- j) activation of latent effort in the temperate gillnet fisheries has reduced the probability of achieving the **whiskery shark** biomass target by 2010.
- k) the total catch of **whiskery shark** by the JASDGDLF and WCDGDLF exceeded this species' trigger limit by 8%.
- l) the increasing trend in **gummy shark** Catch Per Unit Effort (CPUE) over the last eight years suggests that adult biomass has increased, however this trend could be confounded with increased targeting of this stock.
- m) the total catch of **gummy shark** by the JASDGDLF and WCDGDLF exceeded this species' trigger limit by 33%.

3.3 DUSKY WHALER (*CARCHARHINUS OBSCURUS*)

The dusky shark, *Carcharhinus obscurus*, is a large 'whaler' shark, which is common in warm temperate and tropical seas around the world. *Carcharhinus obscurus* inhabits continental shelf and adjacent oceanic waters where it is found on the surface and close to the bottom to depths of at least 400m (Compagno, 1984; Last and Stevens, 1994). This species occurs throughout all Western Australian waters, but

appears to be uncommon in the north-east and south-east of the State. Despite this, tagging of neonates and small juveniles indicates some movement of younger age classes into South Australia (Simpfendorfer *et al.*, 1996).

Dusky shark, *Carcharhinus obscurus*, is the primary component of the catch in the Western Australian demersal gillnet and demersal longline fisheries (JASDGLDF and WCDGLDF). Dusky sharks are also caught in the WA northern shark fisheries (see ESD report for Western Australian tropical shark fisheries) and are taken by other commercial fishers operating under State jurisdiction. *C. obscurus* is a known bycatch species in the Commonwealth-managed Southern and Western Tuna and Billfish Fishery and is also subject to a range of hidden mortality and “revenge killing” of sharks by recreational and commercial fishers who believe them to be damaging other more valuable target catch, biting off scalefish catch or posing a risk to safety. Hidden mortality includes misreporting and under reporting of catch due to misidentification, discarding and attempts to circumvent anti-finning and bycatch regulations.

Reproduction is viviparous, with pupping occurring during late summer and autumn in the south-west of WA, between Geraldton and Bremer Bay (Simpfendorfer *et al.*, 1996; Simpfendorfer *et al.*, 1999) with the highest abundance of new-born sharks occurring in the area between Lancelin and Albany. Young are born at between 70cm and 100cm Total Length (TL) and grow extremely slowly at approximately 10cm yr⁻¹ for the first 5 years and more slowly after that (Simpfendorfer, 2000; Simpfendorfer *et al.*, 2002). This is an extremely long-lived species which may take up to 23 years to reach maturity and which probably lives in excess of 40 years (Natanson *et al.*, 1995, Natanson and Kohler, 1996; Simpfendorfer *et al.*, 2002). Reproductive information is scarce but the limited available data suggest that reproduction is either biennial (Compagno, 1984; Sminkey and Musick, 1996) or triennial (Simpfendorfer, 1999) and litter sizes number between 3 and 14.

The young apparently remain in south-western waters for a number of years, probably spending more time in deeper coastal waters as they grow, before beginning a gradual northerly migration. Larger sharks are most abundant but apparently dispersed in north-western waters between the Abrolhos Islands and NW Cape with smaller numbers present throughout the Pilbara and Kimberley regions of the north coast.

Since the demographic analysis was completed in the mid-1990s, ongoing monitoring of the dusky shark stock has largely involved examination of catch rate data from the target fisheries. However, because the relative contribution of neonates to the fisheries’ catch appears to have declined and catches of older juveniles have increased since exploitation rates were measured in the mid-1990s, analysis of CPUE data for this species has become complicated.

The increased demand for fins in the world market has encouraged more fishers to target large dusky sharks for their fins. In addition to operators in the temperate shark fisheries adapting their fishing practices to target larger sharks and particularly large dusky sharks, many other commercial fishers were using multi-hooked set lines to target large dusky sharks. All holders of Western Australian fishing boat licence are able to use set lines and normal wetlines to fish and are therefore able to target large sharks in this way.

Further complicating the ongoing assessment of the status of this stock has been the increased targeting of large dusky sharks by 'wetline' hook methods for the value of their fins, both within and outside the managed shark fisheries. Not only has the reported wetline catch of dusky shark (recorded as 'bronze whaler') outside the target fisheries doubled since the mid-1990s but it is believed that a significant proportion of demersal gillnet vessels' reported gillnet catch consisted of larger sharks using large hooks on lines set concurrently with gillnet gear. This artificial inflation of the gillnet catch seriously biases the gillnet fishery's historical catch rate data, and provides an overly optimistic trend in the CPUE for recent years. The apparent decline in catch rates of neonates throughout south-western Australia strongly suggests that the size of the breeding population has been depleted and recruitment has declined.

There is thus a strong possibility that there are fewer adult females pupping over a smaller geographic range. Department of Fisheries research data show that there is a continuing bycatch of adult dusky sharks in other fisheries and mortality from entanglement in plastic packing straps. Thus the collective mortality of dusky sharks beyond that generated by the managed shark fisheries remains a major cause for concern.

The concerns with the sustainability of dusky shark stocks was a prime factor in reviewing the management of the temperate shark fisheries. It was also a consideration, but not the major driver, supporting the extensive closure introduced in August 2005 for the southern part of the WANCSF.

3.4 GUMMY SHARK (*MUSTELUS ANTARCTICUS*)

The gummy shark, *Mustelus antarcticus*, is a medium sized shark, which is probably endemic to Australian waters (Compagno, 1984), where it is found around the southern half of the continent, from NSW to Geraldton in WA. This species is most common in near-shore waters, even entering shallow bays and estuaries, and offshore to depths of about 80m (Last and Stevens, 1994). *Mustelus antarcticus* belongs to the hound shark family (Triakidae), which contains several other commercially important species. Two smaller forms of gummy shark are also caught in WA (*Mustelus* sp. A and sp. B, Last and Stevens, 1994) but these are generally found in deeper water and further north than *M. antarcticus*. *Mustelus antarcticus*, is the primary component of the catch in Zone 2 of the JASDGLF and the Commonwealth managed Southern Shark Fishery (SSF).

While genetically homogenous across Southern Australia (Garner and Ward, 1998), tagging indicates that there is only limited movement across the WA-South Australia border and the WA population has been considered a unit stock for stock assessment purposes. This species demonstrates distinct sexual segregation, with a strongly male-dominated catch in southeastern WA and western SA and an increasingly female-biased catch further to the east and west (Lenanton *et al.*, 1990; Walker, pers. comm.; McAuley and Simpfendorfer, 2003).

Mustelus antarcticus is a relatively productive species of elasmobranch. Reproduction is ovoviviparous and probably occurs every 2 years. Pupping occurs during spring and

summer (Lenanton *et al.*, 1990) and young are born at between 30 cm and 35 cm TL. Males reach about 140 cm TL and females 175 cm TL. Both sexes mature relatively early (Moulton *et al.*, 1992), with males reaching reproductive age at approximately 4 years (80 cm TL) and females at 5 years (85 cm TL). Litter sizes range between 1 and 31 and increase exponentially with maternal length. Maximum age is thought to be 13 years for males and 16 years for females. The diet consists mostly of cephalopods.

Much of the WA catch of *Mustelus antarcticus* is sold in Victorian markets, as it commands higher prices than in WA. If catches of the school shark, *Galeorhinus galeus*, the other major source of shark meat in eastern states markets, continue to decline, there is likely to be an increased demand and consequently increase in prices for gummy sharks. This situation might lead to increased exploitation of gummy sharks, not only in WA but also throughout the SSF. Additionally, a number of SSF operators also own Managed Fishery Licences (MFLs) for the JASDGDLF. Declining catches of school sharks in the SSF may also encourage these operators to move into WA, especially if quota for school and gummy sharks are reduced.

Unlike many other commercially exploited shark species in WA, due to their small, relatively low value fins, gummy sharks are not especially prone to being targeted in response to the increased demand for fins in international markets.

3.5 WHISKERY SHARK (*FURGALEUS MACKI*)

The whisky shark, *Furgaleus macki*, belongs to the family Triakidae (hound sharks), which contains several other commercially important species, and is endemic to coastal waters of southern Australia. It is known from Victoria and Tasmania in the east, through South Australia, to North West Cape in WA (Last and Stevens, 1994). Whisky sharks occur throughout the range of the demersal gillnet and demersal longline fisheries, although the highest catch rates are reported from the SW of the State (in waters between Mandurah and Albany). They are known to occur in waters from 3 m to 200 m depth, with the highest catch rates between 50 and 90 m (McAuley, unpublished data).

Size at birth has been estimated at between 22 cm and 27 cm TL, with the maximum size of adults given as 160 cm TL. Growth rates for both sexes are rapid until approximately 3-4 years, after which, with the onset of maturity, growth slows and there is little increase in length after 4 years in males and 6 years in females. Males mature at about 121 cm TL and females at 126 cm TL, corresponding to ages of 4.5 years and 6.5 years, respectively (Simpfendorfer *et al.*, 2000).

The maximum age of male whisky sharks in WA was found to be 10.5 years and 11.5 years for females. Reproduction is ovoviparous and probably biennial with mating occurring between August and September (Simpfendorfer and Unsworth, 1998). Females probably store spermatozoa for a number of months before fertilisation and a 7-8 month gestation. Parturition occurs between August and October, with litter sizes varying between 4 and 28 (mean of 19). Like other species of hound sharks, litter sizes are proportional to maternal length. Despite extensive use of experimental small-mesh gillnets, no small juveniles have been collected. This suggests that either deep water, or un-fishable areas, such as heavy coastal reefs, may

function as nursery areas. Further research will be required to clearly identify the nursery areas.

For stock assessment purposes whiskery sharks are considered as a unit stock within WA, however there is some tagging evidence of mixing between Western Australian and South Australian stocks. The diet of *F. macki* consists almost exclusively of cephalopods.

3.6 SANDBAR SHARK (*CARCHARHINUS PLUMBEUS*)

The sandbar shark, *Carcharhinus plumbeus* (Nardo, 1827), is a medium sized grey – brown carcharhinid shark, which occurs in tropical and temperate coastal waters in most of the world's oceans (Springer, 1960; Compagno, 1884). In Australia the species is known to occur off the coast of Queensland, Northern Territory and WA (Last and Stevens, 1994) and possibly in South Australian waters. In WA, *C. plumbeus* is mainly found between the Kimberley in the north and Albany on the south coast. The stock is segregated by size, with juveniles apparently preferring deeper continental shelf waters (>100m) south of Shark Bay but moving into shallower waters (50m-100m) between summer and early winter. Adults are most commonly found in depths greater than 40m between the Eighty Mile Beach in the Pilbara and the Abrolhos Islands. Adults can also be found in deeper water (>100m) south of the Abrolhos Islands during summer and autumn. Throughout their range, sandbar sharks are most commonly found on, or just above, the seabed and occasionally at the surface. In WA, this species is commonly known as the ‘thickskin’ shark due to their dense covering of dermal denticles.

Although well studied in the northwestern Atlantic, less is known about the biology of *C. plumbeus* in Australian waters but it is known to have life history attributes similar to the most *K*-selected carcharhinid species. Reproduction is viviparous, with pupping thought to occur between North West Cape and Albany during summer and autumn (McAuley, unpublished data). Locally, size at birth is between 40 cm and 50 cm TL, although reported to be up to 75 cm TL elsewhere (Compagno, 1984). Maximum size is given as between 245 cm TL and 300 cm TL (Last and Stevens, 1994; Compagno, 1984) but is likely to be slightly less in WA. In US waters, this species has been reported as taking between 15 & 30 years to reach sexual maturity (Casey and Natanson, 1992; Sminkey and Musick, 1995) and to live for up to 50 years. *C. plumbeus* has a typically long gestation period (9-12 months) and produces an average of six offspring in each litter (Springer, 1960).

Sandbar sharks, *Carcharhinus plumbeus*, are the primary component of the catch in the WCDGDLF and in the developing WANCSF. *C. plumbeus* is a known bycatch species in several State and Commonwealth-managed fisheries, including the State’s ‘wetline’ sector and the Southern and western Tuna and Billfish Fishery. Concerns about the status of sandbar shark stocks (see Appendix 2 - *Stock assessment of the sandbar shark, Carcharhinus plumbeus, in Western Australia - Shark Section Research Advice Number 16* (McAuley 2005) were a major factor driving management changes in the WCDGDLF and the WANCSF and the primary reason for closing a large part of the WANCSF (see Figure 1).

3.7 SECONDARY SPECIES

3.7.1 Other Sharks and Rays

In the context of the demersal gillnet and demersal longline fisheries, ‘other sharks and rays’, describes the portion of the fisheries’ elasmobranch catch that is not covered by individual performance reports (i.e. all species other than, *Carcharhinus obscurus*, *C. plumbeus*, *Furgaleus macki* and *Mustelus antarcticus*). These fisheries catch a relatively large number of ‘secondary’ species, which are retained for sale and which fishers consider to be an integral component of their shark catch. As with the ‘target’ species, distributions of these ‘other’ shark and ray species are not uniform throughout the fisheries, meaning that each species might only be a significant component of the catch for a particular region within the management area.

Due to the large number of elasmobranch species caught in these fisheries, it is currently impossible to formally assess every one. As it is most probable that the effects of over-exploitation will be detectable within the target stocks first and as relatively robust assessment techniques are available for these species, their status is used as a proxy for assessment of the group referred to as ‘other sharks and rays’. Additionally, the catch and catch rates of ‘other sharks and rays’ species will be reviewed annually and monitored for signs of changes in their abundance.

Biological synopses of the main species comprising ‘other sharks and rays’, as identified from research data collected between 1993 and 2004 in the demersal gillnet and demersal longline fisheries are given below.

Biological Synopses

The smooth hammerhead, *Sphyrna zygaena* is a medium to large species, which is widespread in temperate waters (and some tropical regions) in both hemispheres, including southern Australia. It is a coastal-pelagic and semi-oceanic shark that often occurs in large schools (usually when juvenile) from the surface to depths of at least 120m (Compagno, 1984; Last and Stevens, 1994; McAuley, unpublished data). *S. zygaena* is viviparous, producing litters of 20-50 young between January and March in Australia, after a gestation period of 10-11 months (Stevens, 1984). Young are born at 50 to 60cm TL and attain about 350cm TL. Males mature at about 250cm TL and females at about 265 TL. The diet of *S. zygaena* consists mainly of bony fishes and to a lesser extent, elasmobranchs, cephalopods and crustaceans.

The school shark, *Galeorhinus galeus*, is a member of the hound shark family (Triakidae), which also includes the commercially important gummy shark, *Mustelus antarcticus*, and whiskery shark, *Furgaleus macki*. This medium sized shark is widespread throughout temperate latitudes and throughout southern Australia and New Zealand. In WA, the distribution of *G. galeus* is restricted to the south coast and it only occurs in significant numbers in the southeastern most region of the State. It is a primarily demersal species on or adjacent to the continental shelf, is highly

migratory throughout its range and often occurs in discrete single-sex schools. Reproduction is ovoviviparous, with females producing 15-43 pups in the summer months off south-eastern Australia. Pupping is not thought to occur in WA. Males mature at 8 years and females at between 10-12 years (Olsen, 1954). Tagging studies indicate that this species is extremely long-lived, with one individual recaptured after 41 years at liberty, indicating that *G. galeus* may live to over 55 years of age.

Wobbegongs (family Orectolobidae) are small to large bottom dwelling sharks, commonly found in Australian continental waters from the intertidal zone to at least 200m in depth (Compagno, 1984; Chidlow, unpublished data). They are found in warm-temperate to tropical waters of the western Pacific, including Australia, Indonesia, Papua New Guinea and north to China and Japan. There are seven recognised species of orectolobids in three genera (Compagno, 1984; Hutchins and Swainston, 1986; Last and Stevens, 1994). Six of these species are found in Australia. Each of these six species has a particular geographical range, with some overlap occurring between species.

Four recognised species, *Orectolobus ornatus*, *Orectolobus* sp. A (Last and Stevens, 1994), *O. maculatus* and *Sutorectus tentaculatus*, are caught in the demersal gillnet and demersal longline fisheries, although all catches are recorded by commercial fishers as 'wobbegong'. By number, *Orectolobus* sp. A are the most common species encountered by commercial fishers followed by *O. ornatus*, *S. tentaculatus* and *O. maculatus* (Chidlow, unpublished MSc thesis).

Reproduction is ovoviviparous with large litters of around 20, or more, young. Male and female orectolobids mature at similar sizes. *Orectolobus* sp. males mature at 112 cm TL and females at 110 cm TL and can reach a maximum length of 200 cm TL. *Orectolobus ornatus* males mature at 181 cm and females at 184 cm and can reach 290 cm TL. *Orectolobus maculatus* may mature at around 60cm TL and reach around 300 cm TL in length. *Sutorectus tentaculatus* may mature at around 65cm TL and can reach 92cm TL. Orectolobids appear to have a seasonal reproductive cycle. In Western Australia, mating in *Orectolobus* sp. occurs in winter and sperm is possibly stored for four to six months. Female *Orectolobus* sp. A breed every two to three years and produce between 18 and 29 young. Male *Orectolobus* sp. A appear to mate each year. The gestation period is 9 to 11 months with parturition occurring between July and September. Neonate *Orectolobus* sp. A are born at sizes ranging from 22 cm to 26 cm (Chidlow, unpublished MSc thesis) and grow rapidly from birth until reaching maturity at a relatively large size. Age at maturity and maximum size have not been determined, as vertebral band formation is indistinct. Size at birth for *O. ornatus*, *O. maculatus* and *S. tentaculatus* is also around 20 cm. Orectolobids are considered opportunistically selective feeders that prefer a diet of teleost and octopi.

The demersal gillnet and demersal longline fisheries generally only land larger wobbegongs as the 'recovery' of saleable flesh from these species is low and smaller sharks are therefore considered uneconomical to process. The reported wobbegong catch is therefore comprised of mainly *O. ornatus*, *O. maculatus* and only the largest *Orectolobus* sp. A. Even the largest *S. tentaculatus* are too small to be retained by most operators.

The spinner shark (also known as longnose grey or ‘blacktip’), *Carcharhinus brevipinna*, is a large, slender species of ‘whaler’ shark, which is characterised by its long snout and the distinct black fin-tips in larger animals. It is common in warm-temperate and tropical waters over continental and insular shelves, nearshore to at least 75m depth. The spinner shark is a schooling species, which tagging studies indicate is highly migratory. In WA it moves south in warmer water months to Cape Leeuwin and even further east in stronger Leeuwin current years. *C. brevipinna* is viviparous, with litter sizes varying from 3 to 15. They have a gestation period of 12 to 15 months, with young born in mid to late summer. In WA, juvenile spinner sharks have been observed between the Pilbara and Perth. Size at maturity varies considerably between regions but in eastern Australia, males reach maturity at about 195 cm TL and females at about 210 cm TL. Both sexes grow to about 260 cm TL. The diet of *C. brevipinna* consists mainly of small scale-fish, including many pelagic species, and cephalopods.

Rays (order Batoidea) are a primarily demersal marine group of cartilaginous fish that share many of their life-history characteristics with sharks. Due to taxonomic uncertainties and problems with species identification it is unclear how many species of rays are caught in the demersal gillnet and demersal longline fisheries. At least 6 families of rays are represented in unpublished Department of Fisheries research data from these fisheries, although from observations by Departmental staff, only 5-8 species are ever retained (western shovelnose ray, *Aptychotrema vincentiana*, southern fiddler ray, *Trygonorrhina fasciata*, white-spotted guitarfish, *Rhynchobatus djiddensis*, southern eagle ray, *Myliobatis australis*, and sawfishes of the family Pristidae). Apart from the skates, which are oviparous, embryonic rays are nourished via a placenta-like connection with the uterine wall and are born live. Their diet consists mainly of benthic invertebrates, although sawfishes, in particular, have been observed feeding on fish.

3.7.2 Scalefish

Scalefish composes a significant and economically important part of the catch in the temperate shark fisheries (Table 1 and 2).

Species	Catch (tonnes live weight; % of landings in each zone in parentheses)		
	Zone 1	Zone 2	Total
Queen snapper	10 (11%)	30 (34%)	40 (31%)
Blue Groper	12 (13%)	22 (25%)	34 (26%)
Pink snapper	2 (2%)	8 (9%)	10 (8%)
Salmon	9 (10%)	0 (0%)	9 (7%)
Dhufish	6 (6%)	2 (2%)	7 (6%)
Samson fish	2 (2%)	4 (5%)	6 (5%)
Leather jacket	1 (1%)	4 (5%)	5 (4%)
Boarfish	0 (0%)	3 (4%)	4 (3%)
Mulloway	0 (0%)	3 (3%)	3 (2%)
Other fish	51 (54%)	12 (13%)	11 (8%)

Table 1 Species composition of the 2003/2004 JASDGLF scalefish catch

Species	Catch (tonnes live weight; % of landings in parentheses)
Sandbar (thickskin)	182 (38%)
Bronze whaler	137 (28%)
Whiskery	34 (7%)
Shovelnose/fiddler rays	29 (6%)
Blacktip	25 (5%)
Wobbegong	23 (5%)
Hammerhead	17 (4%)
Gummy	9 (2%)
Tiger	4 (1%)
Other sharks	21 (4%)

Table 2 Species composition of the 2003/2004 WCDGDLF shark catch

WCDGDLF scalefish landings increased by 16 tonnes (18%) during 2003/04, accounting for 18% of the fishery's total catch (Figure 7). Dhufish, *Glaucosoma hebraicum*, remained the largest component of the fishery's scalefish catch (20 tonnes), followed by sweetlips, family Haemulidae (17 tonnes); pink snapper, *Pagrus auratus*, (13 tonnes) and samsonfish, *Seriola hippos*, (12 tonnes)

Whilst the JASDGDLF fishery is a primary source of exploitation of queen snapper, blue groper and boarfish, the quantities landed are considered small relative to the likely size of their stocks. The Department nonetheless will continue to monitor the levels of their catch but more specific management is not thought to be necessary at present.

Although catches of several other scalefish species, including dhufish, pink snapper, samson fish, mulloway and baldchin groper, are important in the demersal gillnet and longline catch, they only contribute small proportions to total WA catches of these species. The JASDGDLF and WCDGDLF were responsible for significant proportions of the total State-managed catches of unidentified scalefish, sweeps, footballers and morwongs.

Generally, outside of specific managed fisheries, the commercial scalefish fishery in Western Australia has lacked sophisticated management and is an open access fishery with all licensed fishing boats able to line fish. However, the Department is now moving to introduce formal management into the scalefish fishery and this is likely to bring additional focus onto the take of scalefish in all the temperate shark fisheries. The Department has also indicated to the industry that it is concerned that these fisheries may respond to approved effort controls and management changes to conserve at risk shark stocks by increased targeting of scalefish and if this happens the Department will move to constrain catches to historical levels.

4 BYCATCH AND POTENTIAL INTERACTIONS WITH PROTECTED SPECIES

4.1 WHITE SHARK (*CARCHARODON CARCHARIAS*)

White sharks were rarely reported in monthly catch and effort returns prior to the species being protected but all WA catches were reported by demersal gillnet or demersal longline fishers. There have been no reports of white shark captures in any commercial fishery since their protection.

Between July 1994 and June 1999, Department of Fisheries staff observed an average of 1 white shark capture per year in the demersal gillnet and demersal longline fisheries. Overall research observer coverage during this period was 7% of reported commercial fishing effort but coverage varied regionally between 2% in south-eastern JASDGDLF and northern WCDGDLF regions, to 20% in Zone 1 of the JASDGDLF (McAuley and Simpfendorfer, 2003). The observed mean calculated weight of white sharks caught by these fisheries was 150kg, however this value was based on only 2 measured specimens. A quantitative assessment is not possible with this limited data, however anecdotal information from demersal gillnet fishers, suggests that incidental capture rates have remained low.

There might be some additional unreported captures of great whites in other sectors for which data are not available. In particular, the past use of ‘pot hooks’ (now prohibited) and pelagic longlines in the Commonwealth managed Southern and Western Tuna and Billfish fishery are believed to have been responsible for some captures and the it is considered the continuing trade in white shark jaws and teeth might be encouraging continuing illegal take of the species.

4.2 GREY NURSE SHARK (*CARCHARIAS TAURUS*)

Numbers of *Carcharias taurus* in inshore waters of NSW and Queensland declined dramatically throughout the 1960s and 1970s due to the combined effects of targeted ‘trophy’ spear-fishing, incidental capture by commercial and recreational fishing and protective beach shark netting. Unlike NSW and Queensland, grey nurse sharks have never been subjected to targeted fishing in WA. Rather, the only significant source of mortality on the west coast has been from incidental capture by the demersal gillnet fishery for which high quality, independently verified, catch and catch rate data are available from 1989/90 until the species listing under the *Environmental Protection and Biodiversity Conservation* (EPBC) Act in December 1997.

These data, along with limited tagging data indicate that, over the period for which records are available:

1. *C. taurus* abundance was high in WA waters,
2. the WA *C. taurus* population was stable, and
3. fishing mortality was and remains low.

Further, because fishing effort in the temperate demersal gillnet and demersal longline fisheries has declined significantly (by 80%) from its peak of 787,000 km gillnet hours in 1987/88, catches are most likely to be far lower than they were during the past 20 years. The relatively healthy state of the Western Australian population was recognised at the recent IUCN Oceania Red List workshop where it was agreed that the species should be assessed as 'near-threatened' on the West Coast.

There are a number of reasons why the species is thought to be relatively abundant off the west coast, compared to the east coast:

- a) they were never trophy-hunted as they were in NSW and Queensland;
- b) there is no protective beach meshing programme in WA;
- c) sharks on the west coast are thought to constitute a genetically separate stock to those on the east coast;
- d) aggregation sites apparently do not occur within the functional area of the WA demersal gillnet fishery; and
- e) there are large areas of known grey nurse shark habitat outside the demersal gillnet and demersal longline fishery's operational range which are thought to offer significant refuge, specifically the closed area between Steep Point and NW Cape and in deeper coastal waters (>100m), where demersal gillnet vessels do not operate.

Research to confirm these views, including genetic comparisons between eastern and western sharks, archival tracking (McAuley, 2004) to determine movement patterns and habitat usage in WA, and collection of data to identify potential aggregation sites (Chidlow *et al.*, 2005) has been undertaken or is currently still underway.

The mean annual catch of *Carcharias taurus* between 1989/90 and 1996/97 (the last year for which a full 12 months data is available) was 743 kg in the JASDGDLF and 3635 kg in the WCDGDLF. Based on a mean observed live weight of 72 kg, these catches equate to an average of 74 sharks caught each year prior to the species listing under the EPBC Act . This level of catch is indicative of there being a large grey nurse population, in the years immediately after the peak in demersal gillnet fishing effort, particularly on the west coast, where the majority of the catch was recorded. Apart from a spike in WCDGDLF landings in 1992/93, catches were remarkably stable over this period.

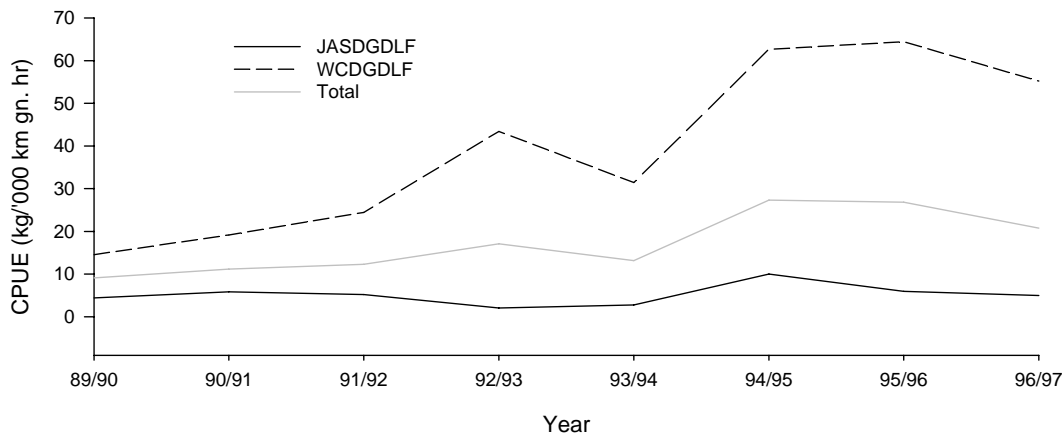


Figure 5 Demersal gillnet and demersal longline grey nurse shark catch rates prior to species listing under ESPA in December 1997.

4.3 TURTLES

It is considered highly likely that these fisheries will occasionally interact with green and/or loggerhead turtles due to the overlap of the species ranges with the northern extent of the WCDGLF. One turtle capture was recorded in research data collected between July 1994 and June 1995. Observer coverage was 6% of commercial fishing effort on the west coast north of 33°S. No turtle captures were observed in the JASDGLF. The more active WCDGLF fishers have indicated they may each catch, on average, one turtle every 2 to 3 year.

4.4 BILLFISH

Billfish are commercially protected under the FRMA. There is no reported catch of billfish in these fisheries and the gear used (primarily demersal gillnet) is considered to be highly unlikely to catch billfish. There is no recorded catch of billfish by these fisheries in 9 years of observer coverage and the fisheries operates inshore of billfish species' pelagic ranges.

4.5 CETACEANS

Cetaceans are protected under the EPBC Act and the *Wildlife Conservation Act, 1950* (WCA). Between July 1994 and June 1999, the Department of Fisheries staff observed 8 dolphin captures in the demersal gillnet and demersal longline fisheries. The more active demersal gillnet fishers each anecdotally report catching an average of only one dolphin each every several years. The substantial reduction in demersal gillnet and demersal longline effort since it's peak in 1980s is thought to have significantly reduced the number of cetaceans captured by this sector.

Proposed management changes will encourage greater use of gillnets and it is recognised that it is likely that this may increase the risk of dolphins being captured. As part of the planned observer program the Department will monitor the nature and level of fisher's interactions with dolphins and other protected species. Fishers will also be required to report to DFWA on their fishing returns all captures and other significant interactions with protected species.

4.6 PINNIPEDS

All species of seals and sea lions of the Family Otariidae are protected under the EPBC Act and WCA. Between July 1994 and June 1999, Department of Fisheries staff observed the captures of one Australian fur seal and one Australian sea lion in the demersal gillnet and demersal longline fisheries. Demersal gillnet fishers actively avoid areas surrounding seal colonies as, not only do they find the capture of these species highly unpleasant, but seals, sea lions and the large predatory sharks that they may attract can cause extensive damage to their nets. Areas closed to fishing in existing and proposed marine parks are also frequently sited in the vicinity of seal and sea lion colonies further reducing the opportunity for accidental capture or interaction.

Because of the risk of interaction between fishers and seals and sea lions and in response to Commonwealth Action Plan for Seals, (refer to the DEH publication at <http://www.deh.gov.au/coasts/publications/pubs/ausseals.pdf>), the Western Australian Fishing Industry Council under the Australian Seafood Industry SeaNet program is developing a code of conduct for permit holders and licensees to reduce adverse interactions (including those that may result in injury or mortalities) with seals and sea lions.

4.7 SEABIRDS

Because of the minimal use of longlines it is considered these fisheries have only a minimal impact on seabirds. Even when longlines are used, they are set demersally and sink very quickly due to the amount of ballast that is necessary to secure them to the seabed in high-energy inshore environment and in the event of a large shark being caught. Furthermore, fishers who have used demersal longlines in the past reported a negligible catch of seabirds and Department staff undertaking work in the fishery have only recorded occasional interactions (e.g. individual seabirds attracted by the light and flying into the rigging, masts, on deck fishing gear and superstructure of fishing boats at night).

5. APPROVED NEW MANAGEMENT ARRANGEMENTS

The Minister for Fisheries recently approved a number of significant changes to the management of the temperate shark fisheries primarily aimed at:

- a. ensuring the sustainability of at risk stocks of dusky and sandbar sharks; and
- b. providing a more effective management regime that will ensure that the level of fishing effort exercised in the fishery can be effectively managed.

Many of the changes approved by the Minister have come about following the discussion process stimulated by the release of Fisheries Management Paper 180 *Future Management Arrangements for Western Australia's Temperate Shark Fisheries* which was released in August 2005 (see DFWA website under "Publications" for a copy of this document).

Fisheries Management Paper 180 focussed on concerns with sustainability of dusky sharks and the need to reduce the level of fishing effort to 2001/02 levels. The

subsequent release of the publication *Stock assessment of the sandbar shark, Carcharhinus plumbeus, in Western Australia - Shark Section Research Advice Number 16* (Appendix 6.1) in April 2005 raised concerns about the status of sandbar stocks and provided further support for the case to undertake a major overhaul of these fisheries and the WANCSF (which also targeted sandbar sharks).

Development of a package of measures to deal with all the issues, including for fisheries outside the demersal gillnet and longline fisheries which also take shark, has been a major undertaking. It has also involved conjunctive management measures to be implemented between the tropical and temperate shark fisheries because stocks of both of the main species of concern (dusky and sandbar sharks) span the area of activity of these fisheries.

In order to make the package of management measures more comprehensible they are broken down into changes being implemented in the temperate shark fisheries, changes being implemented in the tropical shark fisheries which have relevance to the temperate fisheries and changes to deal with shark catches generally both in other state jurisdiction fisheries as well as in the demersal gillnet and longline fisheries. A summary of the management measures being implemented within the shark fisheries is outlined in Appendix 6.4.

5.1 CHANGES SPECIFIC TO THE TEMPERATE SHARK FISHERIES

Measures to be implemented in the temperate shark fisheries are:

- a. A closure to demersal gillnet and demersal longline fishery activity in the West Coast fishery and the Joint Authority southern fishery west of Albany between 16 August and 15 October;
- b. Effort reductions to bring the fisheries back to 2001/02 effort levels
- c. Conversion of the monthly unit to days;
- d. Implementation of VMS to control temporal and spatial closures and to measure the consumption of days fished;
- e. Prohibition of the use of hooks on demersal gillnets or other static gear associated with demersal gillnet fishing; and
- f. Controls on the configuration of longlines used in the demersal gillnet and longline fisheries, including a prohibition of the use of wire trace, hook size controls, materials used and snood lengths.

One measure sought but not yet approved by the Minister is a measure to provide the Executive Director with the capacity to implement “real-time” controls on annual fishery effort levels, fishing areas and times and gear usage. These controls are considered necessary to ensure that there is no lag in responding to any effort creep or other factors which may affect sustainability. In conjunction with incorporating these powers in the management plan there was to be a Ministerial Policy Guideline related to the way in which the Executive Director exercised those powers.

One other as yet unresolved issue is determining the appropriate conversion of months to days to ensure that the outcome delivered is an effort level equal to the 2001/02 effort level. The Department is currently engaged in discussions with industry on this matter.

Explanation of the measures:

Two month closure in the West Coast fishery and the Joint Authority fishery west of Albany

The purpose of this closure is to give a “kick start” to the process of re-building the whiskery shark stock by providing protection for whiskery sharks during their pupping season in the main areas of whiskery shark abundance.

Effort reductions back to 2001/02 effort levels

Designed to increase re-building of all shark stocks by bringing effort levels back to a long-term sustainable level.

Conversion of monthly units to days

To provide for a more explicit and less “elastic” unit of effort. Part of the effort creep which has occurred in the demersal gillnet and longline fisheries has come about through increasing the number of days fished per month. Stating the effort entitlement as the number of days which may be fished prevents further fishery effort creep through increasing the number of days fished per month.

Implementation of VMS

VMS is the only technology which can be rationally employed to measure consumption of the days fished entitlement. It is also crucial to managing any spatial closures as well as the two month temporal closure.

Prohibition of the use of hooks on demersal gillnets or other static gear associated with gillnet fishing

Some gillnet operators have been rigging gillnets and other static gear (e.g. float lines) with hooks to take large sharks. The legality or otherwise of this practice has been “grey” because it could be seen as dropline fishing, which is a valid “open access” wetline fishery method under the operator’s fishing boat licence. This change will clarify the issue and make the practice illegal for shark fishers. (Note: Other fishing boat licence operators in the open access wetline fishery [and, it is proposed, in the future wetline managed fishery] can still use droplines, but will not be permitted to take shark).

Controls on the configurations of longlines

These controls are designed to limit the capacity of longlines to take large sharks, while keeping the gear method as a valid method in the fishery. The new configuration controls:

- a. limit the material used in traces and snoods to unsheathed monofilament nylon or monofilament fluorocarbon with a maximum width at any point of 1.8 millimetres;
- b. prohibit the use of metal in the material used for the mainline (with the exception of using metal in flags, swivels, sinkers, floats and connectors);
- c. prohibit the use of branch lines (requiring use of a single mainline);

- d. restrict the material used in the hooks (with the exception of the barb) to having a maximum width at any point of 3 millimetres;
- e. allow a maximum of two ferrules/swages/barrel locks/sleeves per snood;
- f. allow a maximum ferrule/swage/barrel lock/sleeve length of 25 millimetres;
- g. allow a maximum trace or snood length of 600 millimetres measured from the mainline to the eye of the hook (the length to include the full length of the swivel, snap fastener or other device that attaches the trace to the mainline);
- h. allow a maximum of one hook and one line per snood;
- i. allow the swivel, snap fastener or other device that attaches the trace to the mainline to be no longer than 150 millimetres; and
- j. limit the maximum external dimension (length or width) of a hook to 80 millimetres (i.e. the maximum dimension of any hook will be 80 millimetres and this will typically be the external measurement between the top of the eye and the bottom of the bend of the hook).

There is one possible risk and one possible benefit in this new approach to longline use. The possible risk is that it may increase the capacity of demersal longlines to take scalefish and/or, because of the reduction in the catch of large sharks, operators will seek to increase their catch of scalefish to compensate for the reduction in earnings from shark. Industry have been warned that this aspect will be under close scrutiny. The possible benefit is that, if the modified configuration proves useful for the take of small sharks (and does not increase scalefish catch) it may open up an avenue to move the fishery away from demersal gillnets, which have more potential to interact with protected species.

5.2 CHANGES TO THE TROPICAL SHARK FISHERIES WITH RELEVANCE TO THE TEMPERATE SHARK FISHERIES WA

Explanation of the measure:

Closure of the waters of the NWCSF from NW Cape to Broome

Closure of the waters of the NWCSF from NW Cape to Broome (see Figure 6) has effectively created a huge sanctuary area for sharks, which now stretches from 26° 30'S to 18° S. However, while the waters between 26° 30'S and NW Cape (114° 06'E) have been closed to the use of shark fishing gear for many years, inclusion of the more northern areas now provides a high level of sanctuary for both dusky and sandbar sharks.

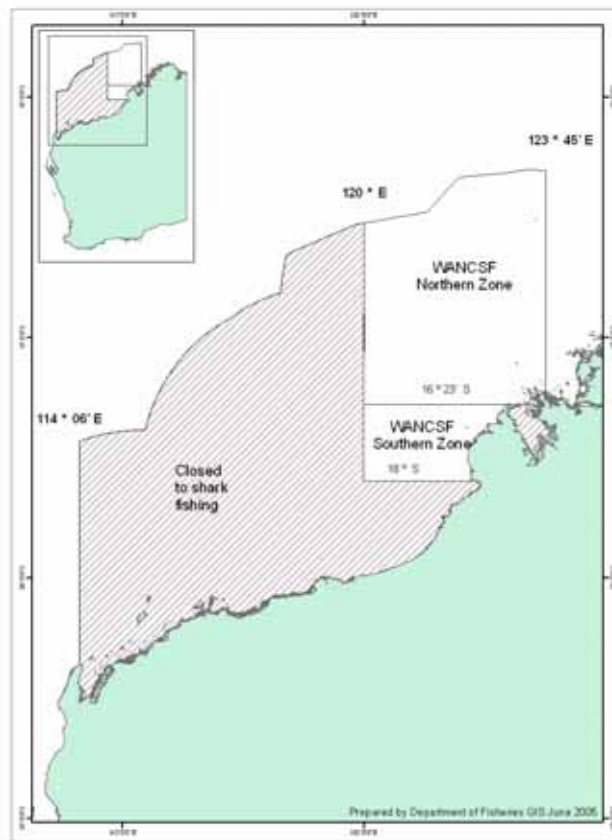


Figure 6 New Closure for the WA North Coast Shark Fishery.

5.3 CHANGES TARGETING ALL SHARKS STOCKS AND FISHERIES

Measures to be implemented which will operate broadly across all fisheries which take (or potentially take) sharks are set out below. Note that some measures (e.g. a size limit on dusky shark, tightening of anti-filleting regulations) notionally now only relate to the demersal gillnet and longline fisheries because other fisheries cannot take shark. However, they have been included in this list because they are part of a broad “armoury” of measures which support the commercially protected fish status of sharks and rays as well as being of effect within the demersal gillnet and longline fisheries.

- Commercially protected fish status for sharks and rays (except in the demersal gillnet and longline fisheries and some other exceptions), but with no exceptions for sawfish of the genus *Pristis*.
- Significant increases in the penalty provisions for taking commercially protected sharks and rays or contravention of the anti-filleting regulations.
- Prohibition of the use of longlines for fisheries under State jurisdiction (except in the demersal gillnet and longline fisheries).
- Prohibition of the use of wire trace in any fishery (except the mackerel fishery and the tropical shark fishery).

- A maximum size limit for dusky sharks.
- Tightening of the anti-filleting regulations.

Commercially protected fish status

Categorising sharks and rays as “commercially protected fish” means that they cannot be taken by commercial fishers with the exception of those operating in the demersal gillnet and longline fisheries and a number of other excepted fisheries. Recreational fishers will continue to be able to take a bag limit of two sharks, although this provision is under consideration by recreational fishery managers.

While sharks and rays generally will become commercially protected, great white and whale sharks will remain totally protected and the grey nurse shark will continue to be protected under the state’s *Wildlife Conservation Act 1950*. The exceptions to the commercially protected status for sharks and rays are set out below. Exceptions are:

- a. Commercial Fishing Licence holders who possess sharks and rays under the authority of an authorisation that provides for the use of demersal gillnet, demersal longline or pelagic gillnet;
- b. The Marine Aquarium Fish Managed Fishery (in accordance with the management plan);
- c. The Kimberley Gillnet and Barramundi Managed Fishery;
- d. any other fishery where the take of sharks and rays is specifically provided in a management plan (e.g. Northern Demersal Scalefish Managed Fishery); and
- e. persons who are permitted to possess sharks or rays in accordance with an authorisation as provided for under Commonwealth law.

Although not listed as exceptions, the Minister has also agreed, initially through a Section 7 exemption, to allow operators in the rock lobster fisheries to continue to take wobbegong sharks (only one per day) and agreed to exempt the Pilbara Fish Trawl Interim Managed Fishery, WANCSF and the 80 Mile Beach Gillnetters from the prohibition on the possession of sharks and rays under section 7 of the FRMA. These fisheries will be permitted to continue to take sharks and rays until shark and ray bycatch issues are resolved.

However, there will be no exceptions for the take of sawfish of the genus *Pristis*.

Increases in penalties

To underpin the commercial protection of sharks and rays, the prescribed values for sharks and rays (including sharks and rays not treated in accordance with the anti-finning regulations [Reg 16C]) will be as follows:

- fins: -\$120 per kg and \$24 per fin; and
- whole shark or trunk (or part other than fins) -\$8 per kg and \$120 per fish.

If a person is convicted of contravening regulation 16C (anti-finning regulation) or section 47 of the FRMA (Commercially Protected Fish), the mandatory penalty under section 222 of the FRMA will be ten times the values above, although the exact amount of the penalty will depend on the court’s decision on which matter (fins, trunks numbers or weight) to base the penalty. In line with the significant increase in

penalties a conviction to contravening regulation 16C will also attract a ‘black mark’ under section 224 of the FRMA. A conviction under section 47 already attracts a ‘black mark’ under section 224.

A Prohibition on the use of longlines in fisheries under State jurisdiction

This prohibition will support the commercially protected fish status for sharks and rays. Currently the definitions of longlines and droplines are not as “tight” as they could be and this change will close off a potential area of “greyness”.

A Prohibition on the use of wire traces

The use of wire trace will be prohibited in all WA commercial fisheries Statewide, including in the JASDGDLMF and the WCDGDLIMF, but with the exception of the Mackerel (Interim) Managed Fishery and the tropical shark fisheries. This prohibition will also support the commercially protected status of sharks, by preventing fishing mortality of sharks through capture on wire trace gear.

Maximum size limit for dusky sharks

Dusky sharks will be commercially protected and therefore commercial operators outside the target shark fisheries will not be permitted to possess dusky sharks. However, the target shark fisheries will be permitted to continue to take dusky sharks that have an interdorsal fin measurement of less than 70 cm (approximately equivalent to a 1.5m fork length), provided they are landed with the fins attached to the trunk, to underpin the compliance of the interdorsal fin measurement legislation.

This measure is primarily aimed at preventing operators in the two temperate shark fisheries targeting large dusky sharks. With increased demand for shark fins, licensees have had an incentive to move from targeting neonates (young sharks) for their flesh to larger sharks with more valuable fins. Some operators have done this by using droplines, moving from gillnets to longlines, attaching hooks to gillnet gear as well as just moving their fishing operations to areas where there is more likelihood of catching larger sharks.

Tightening of the existing “anti-finning” regulations:

While the Department’s existing “anti-finning” regulations (Regulation 16 C) are considered effective and require the trunk of sharks to be landed with any fins landed it has been recognised that they need to be widened to cover all sharks and rays. Given that some shark-like species are actually rays, this change will more effectively cover the field.

5.4 IMPLEMENTATION TIMETABLE

While the Department recognises it would be desirable to put all the approved changes in place immediately this is not possible due to

- a) the time and resources needed to draft and gazette legislation;
- b) the need to time certain changes with the start of the fishing season (1 July);
- c) the difficulty in dealing with existing time gear nominations and assuring some level of equity (i.e. so that licensees who nominated their gear units

- earlier and have already fished their full entitlement are not unfairly advantaged);
- d) the need to further develop in liaison with licensees the working arrangements for a “days fished” system of management;
 - e) the need to give licensees adequate notice of changes;
 - f) the need to give licensees time to acquire and fit VMS transponders’

The proposed timetable for implementation is as follows:

JANUARY 2006

- Wire trace prohibition
- Longline outside shark fisheries prohibition
- Definition of longlines
- New longline gear restrictions for shark fisheries
- Max size for dusky sharks
- Revise anti-filleting regulations
- Shark and sawfish definition in regs
- Commercial protection of sharks, sawfish and rays
- Increased values of sharks in schedule to regs. Anti-filleting prescribed offence and black mark. Sect. 222

JUNE 2006

- Effort reductions
- Pupping closure
- VMS
- Day based fishing
- MPG response for future reduction

6. APPENDICES

6.1 STOCK ASSESSMENT OF THE SANDBAR SHARK, *CARCHARHINUS PLUMBEUS*, IN WESTERN AUSTRALIA - SHARK SECTION RESEARCH ADVICE NUMBER 16

6.2 EXTRACTS FROM STATE OF THE FISHERIES REPORT 2003/2004

6.3 STATUS REPORT FOR THE SOUTHERN AND WEST COAST DEMERSAL GILLNET AND DEMERSAL LONGLINE FISHERIES AND NORTHERN SHARK FISHERIES NO 12 SEPTEMBER 2005

6.4 MATRIX

6.5 REFERENCES

6.6 ACRONYMS

