

pilchards in Western Australia's traditional east-coast bait markets. This is viewed by some industry members as the biggest current threat to the south coast purse seine industry.

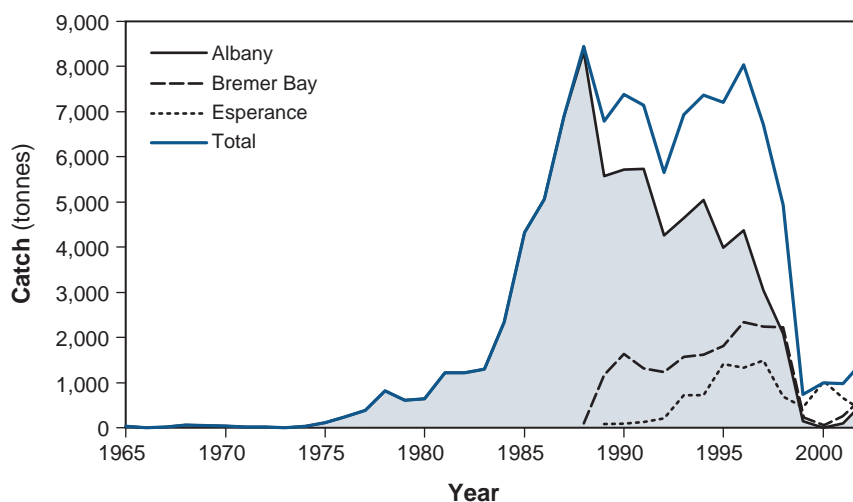
Environmental factors such as variations in the Leeuwin Current flow are likely to be affecting both the distribution and the biology of the species, and will be assessed further as more years of data become available. The possibility that global warming may be causing longer-term changes, on a time scale unrelated to the normal inter-annual environmental variations, cannot be discounted.

SOUTH COAST PURSE SEINE TABLE I

Processing details (t) from Albany, Bremer Bay and Esperance for 2001/02.

PRODUCT	ALBANY	BREMER BAY	ESPERANCE	TOTAL SOUTH COAST
Trays	229.3	367.9	355.1	952.3 (81.4%)
IQF	48.7	116.7	29.8	195.2 (16.7%)
Pet food/ Other	0.2	5.8	15.8	21.8 (1.9%)
Total	278.2	490.4	400.7	1,169.3

South Coast Purse Seine Annual Catch



SOUTH COAST PURSE SEINE FIGURE I

Annual catches of pilchards along the south coast, by fishing zone.

Demersal Gillnet and Demersal Longline Fisheries

Management Summary

The take of finfish, including shark, by demersal gillnet and demersal longline is controlled on the south coast and the west coast (south of Shark Bay) through two similar management plans. Both fisheries are managed using effort controls in the form of limited entry and an individually transferable effort system that regulates both time and gear use into tradeable units of entitlement. One unit permits the use of one net of a particular length, or a demersal longline with a particular number of hooks, for one month.

Management has historically been focused on ensuring the sustainable exploitation of three main species, whiskery shark (*Furgaleus macki*), dusky whaler shark (*Carcharhinus obscurus*) and gummy shark (*Mustelus antarcticus*). On the

west coast, the sandbar or thickskin shark (*Carcharhinus plumbeus*) is also emerging as an important commercial species.

Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGDLF): The joint authority arrangement for the JASDGDLF covers the take of sharks, rays and bony fish by 'demersal gillnets and all other lines' (demersal longlines) from 33° S latitude to the WA/SA border and out to the limit of the Australian Fishing Zone.

West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WCDGDLF): Extensive research carried out on the commercially important shark species off the Western Australian coast indicates that this fishery shares a series of unit stocks with the JASDGDLF. Because of the commonality of these key stocks, the WCDGDLF is reported under the south coast bioregion. The biomass targets for the three major species in the south coast fishery also apply to the west coast fishery.

SOUTH COAST BIOREGION

The west coast fishery extends from 33° S latitude to 26° S latitude and out to the limit of the Australian Fishing Zone. An order prohibiting the use of longlines and droplines with metal traces, demersal gillnets and powered hauling devices applies to Western Australian waters between 26°30' S latitude (Steep Point) and 114°06' E longitude (North West Cape), and has been in place since April 1993. The primary purpose of the order is to protect breeding stocks of dusky whalers.

The west coast fishery is currently managed under an interim management plan, which is due to expire on 31 May 2004. The Minister for Fisheries has recently authorised the Department to undertake consultation on a new management plan for the fishery, which is intended to be in place by the expiry of the interim plan.

Following the conclusion in 2000/01 of the five-year gear reduction strategy in the JASDGDLF, the Department is currently reassessing the status of the three key target species and will initiate a management response on the basis of these results. In addition, the Department is currently considering ways to address key shark management issues including the removal of latent effort, limiting increases in fishing efficiency to cap effort at its current level, and reducing fishing mortality on sharks in other fisheries. Growing international and national concern about the need to conserve sharks means that there will be continuing pressures to implement further measures to restrict shark catches and bolster breeding stocks.

The ability of fishers outside the managed shark fisheries to take sharks by other methods continues to be a matter of concern. The *Fish Resources Management Regulations 1995* were amended in November 2002 to prohibit both commercial and recreational fishermen from attaching hooks to rock lobster pots, pot lines, mooring lines and anchor ropes. This prohibition was implemented to reduce the catch of large sharks, particularly dusky whalers, which are targeted for their fins.

The WA Demersal Net and Hook Fisheries Management Advisory Committee met on 8 and 21 August 2002 specifically to discuss the National Plan of Action for the Conservation and Management of Sharks, which was adopted by State, Territory and Commonwealth representatives on the Shark Assessment Group in late 2002.

A draft application has been submitted for both the WCDGDLF and the JASDGDLF as part of Environment Australia's ecological sustainability reporting process under the *Environment Protection and Biodiversity Conservation Act 1999*. A final application is being developed which will be submitted to EA in 2004.

Governing Legislation/Fishing Authority

South Coast

Joint Authority Southern Demersal Gillnet and Demersal Longline Management Plan 1992

Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery Licence

West Coast

West Coast Demersal Gillnet and Demersal Longline (Interim) Management Plan 1997

West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery Permit

Fisheries Notice no. 601 (Section 43 order)

Consultation Process

WA Demersal Net and Hook Fisheries Management Advisory Committee

Department–industry meetings (as required)

Research Summary

A major FRDC-funded study of the shark fishery on the south and west coasts of Western Australia, undertaken over the period 1993/94 to 1998/99, provided a detailed basis for managing the fishery. The extensive information from these studies was incorporated in two FRDC final reports, and the data sets incorporated into the Department of Fisheries' research data records. A further three-year FRDC-funded project commenced in July 2000 focusing on the sandbar (thickskin) shark component of the fishery.

Research monitoring of the fishery involves analysis of CAES data and biological sampling of commercial catches. During 2002/03, a major revision of the catch and effort database for these fisheries was undertaken using improved validation protocols, and reported to the WA Demersal Net and Hook Fisheries Management Advisory Committee.

These research data are used to provide the following status report on the fishery.

Demersal Gillnet and Demersal Longline Fisheries Status Report

Prepared by R. McAuley and D. Gaughan

FISHERY DESCRIPTION

Boundaries and access

Joint Authority Southern Demersal Gillnet and Demersal Longline Fishery: The JASDGDLF was declared a limited entry fishery in 1988, managed under a Joint Authority with the Commonwealth Government. It covers the waters from latitude 33° S to the WA/SA border. For the purposes of management, the fishery is composed of two zones. Zone 1 extends from latitude 33° S around the coast as far as longitude 116°30' E, and Zone 2 from 116°30' E to the WA/SA border (129° E).

The fishery is currently managed using effort controls in the form of time/gear units. One unit allows a fisher to use one 'net' for one month. This management strategy was introduced in 1992 and net length has been modified to reduce effort in a series of stages through to 2000/01 (see *State of the Fisheries Report 2000/2001*). All JASDGDLF units now permit the use of either 270 m of demersal gillnet (15 or 20 mesh-drop) or 90 demersal longline hooks for one month. In the 2001/02 season there were 57 JASDGDLF licences.

West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery: An interim management plan for the demersal gillnet and demersal longline fishery between latitude 33° S and a line drawn north of North West Cape (114°06' E) was introduced in 1997/98. However, shark fishing has been prohibited between Steep Point (26°30' S) and North West Cape since 1993. Under the interim plan, the fishery is managed using effort controls in the form of time/gear units, with each unit allowing a net length of 540 m. Implementation of the full management plan is currently awaiting the outcomes of legal challenges to the proposed unit allocation. Access to the WCDGDLF during 2001/02 was limited to 26 licences.

Main fishing method

Demersal gillnet.

RETAINED SPECIES

Commercial production (season 2001/02):

All sharks 1,152 tonnes
Key species 766 tonnes

Landings

Historical catches have been revised this year according to improved catch and effort data validation procedures and will therefore not necessarily match those reported previously.

The total shark catch of 1,152 t from these fisheries in 2001/02 comprised 842 t from the JASDGDLF and 310 t from the WCDGDLF, made up as follows:

JASDGDLF:

Dusky whaler*	176 t
Gummy shark*	343 t
Whiskery shark*	141 t
Sandbar shark**	30 t
Other shark	152 t
Total shark	842 t

WCDGDLF:

Sandbar shark**	130 t
Dusky whaler*	60 t
Whiskery shark*	30 t
Gummy shark*	15 t
Other shark	75 t
Total shark	310 t

* Original key target species subject to stock assessment.

** Sandbar (known locally as thickskin) shark was not previously reported separately, but is emerging as an important commercial species on the west coast and is the subject of a research project commenced in July 2000.

In addition to these shark landings, approximately 10–20% of the overall demersal gillnet and longline catch is now composed of finfish species which are retained for sale. In 2001/02, scalefish landings totalled 160 t in the JASDGDLF and 87 t in the WCDGDLF. For a detailed breakdown of catch species composition in the two south coast zones and the west coast fishery, see Demersal Gillnet and Longline Tables 1 and 2. The historical annual catches of the key target shark species are shown in Demersal Gillnet and Longline Figure 1 (for sandbar shark, also see Northern Shark Figure 1).

Apart from the two dedicated fisheries, sharks are also caught by other user groups and these catches are reported here because of their importance to an understanding of the true exploitation rates. During 2001/02, vessels licensed in other managed fisheries operating in the same overall area (i.e. between North West Cape and the South Australian border) reported catches of shark and ray totalling 11 t. An additional 166 t catch of shark and ray was taken by wetline vessels without access to managed fisheries.

Fishing effort

Historical effort levels have been revised this year according to improved catch and effort data validation procedures. The revised data indicate that effort had previously been over-estimated for these fisheries, particularly in the years leading up to the implementation of the JASDGDLF management plan in 1988.

JASDGDLF: 151,232 kilometre gillnet hours
(Zone 1: 36,658; Zone 2: 114,574)

WCDGDLF: 52,981 kilometre gillnet hours

Effort is expressed as standardised kilometre gillnet hours and takes into account the small amount of longline effort still employed in the fisheries (Demersal Gillnet and Longline Figure 2). Effort in the JASDGDLF decreased by 6% in 2001/02, while that in the WCDGDLF decreased by 1%. The numbers of vessels fishing in each fishery in 2001/02 increased by one from the previous year, to 30 in the JASDGDLF and 14 in the WCDGDLF.

Catch rate

See 'Stock assessment' below.

Recreational component:

< 5%

The estimated recreational catch between Augusta and Kalbarri, from a Department of Fisheries recreational trailer-boat survey conducted in 1996/97 (Sumner and Williamson 1999), was 3,700 sharks, with a further 3,500 released. This total catch included wobbegong species, of which 1,000 were kept. Assuming that the species caught recreationally are similar to those taken by the commercial fishery, at an average weight of 5 kg per shark, then the west coast recreational take of sharks at the time of the survey would have been about 15–20 t, or approximately 4% of the west coast commercial shark catch in that year.

Stock assessment completed:

Yes (key species)

Stock assessment is carried out for the three main shark species caught by the fishery and the results presented to the MAC. A summary of the results is as follows.

Whiskery shark: Total whiskery shark landings decreased by approximately 3% in 2001/02 to 171 t, which was again at the lower limit of the acceptable catch range. There was an overall 5% increase in the whiskery shark catch in the JASDGDLF, despite the marginal decrease in effort. However, this analysis masks the contrast between zones, where there was an 11% decrease in Zone 1 but a 28% increase in

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Zone 2. The WCDGDLF catch of whiskery shark decreased by 26%, despite a stable level of effort. Since the substantial declines in the overall catch rates of whiskery sharks during the late 1970s and early 1980s, catch rates now appear to have stabilised, albeit at a reduced level. This was again the case in 2001/02 when, despite the marked decline experienced in the WCDGDLF, there was a 2% increase in overall catch rate. The high catch rate in Zone 2 is probably a result of an increased level of effort targeted at gummy sharks, which have a similar ecological distribution to the whiskery shark, in the western portion of this region.

The stock assessment model shows that the biomass of whiskery shark declined from 1975 until recently, but has now stabilised, again at a low level. Biomass is currently between 29.6 and 33.9% of virgin biomass, and at current effort levels this biomass has a 41.9% chance of increasing.

Dusky whaler: At 236 t, the total catch of dusky whalers in 2001/02 was 21% less than that of the previous year. Dusky shark catches decreased by 26% and 21% respectively in Zones 1 and 2 of the JASDGLF, and by 14% in the WCDGDLF. Catch rates were calculated to have decreased by 14% in Zone 1, 18% in Zone 2 and 12% in the WCDGDLF. The declining catch rates throughout all of south-western Australia strongly suggest that the size of the breeding population has been depleted and recruitment has declined. There is therefore a strong possibility that there are fewer adult females pupping over a smaller geographic range. This view is supported by the most recent stock assessment of dusky sharks, which concluded that the demersal gillnet fisheries' catch of primarily neonate (first year) sharks was sustainable as long as mortality of sharks older than 6 years was less than 4%. Department of Fisheries research data show that there is a continuing bycatch of adult dusky sharks in other fisheries, as well as ongoing 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.

Gummy shark: The total catch of gummy sharks in 2001/02 was 358 t, 40% higher than in the previous year and at the upper end of the acceptable catch range. This appears to be in response to increased abundance of this species, as well as increased targeting of effort to take advantage of this increased abundance. The 47% increase in overall catch rate and the results of previous stock assessments indicate that the stock abundance is likely to be above the target level. However, given the imminent conclusion of the five-year management cycle, a new stock assessment should be conducted as soon as possible.

Exploitation status: **Gummy sharks fully exploited**
Dusky whaler and whiskery sharks over-exploited

Current effort levels in this multi-species fishery are considered to be fully exploiting the gummy shark stocks and causing some over-exploitation of the dusky whaler and whiskery shark stock.

Breeding stock levels:

Declining

Following concerns regarding the procedures used to validate catch and effort data used in stock assessment of the target shark species and questions regarding the reliability of the whiskery shark model, a review of these programs was undertaken in early 2003. The resulting stock assessment for whiskery sharks estimated that their current biomass is approximately 32% of its unexploited level and declining.

Recent catch rates of neonate dusky whaler sharks suggest that the breeding stock of this species is declining, possibly due to influences outside of the control of the fishery. Breeding stock of gummy sharks appears to be adequate.

NON-RETAINED SPECIES

Bycatch species impact:

Low

There is some discarded bycatch of unsaleable species of sharks, rays and scalefish. Following preliminary ESD assessment of these fisheries, all bycatch species impacts are considered to be low.

Protected species interaction:

Low–negligible

The fishery has limited ability to interact with protected species as a result of its area of operation and the gear types used.

Sharks and rays: The numbers of white sharks (*Carcharodon carcharias*) and grey nurse sharks (*Carcharias taurus*) caught are small (< 20/yr and < 80/yr respectively) and a high proportion of these are released alive. The likelihood of this fishery significantly impacting the viability of these stocks is remote.

Turtles: Captures are rare as the fisheries largely operate well south of the normal range of most Western Australian turtle species.

Cetaceans: Dolphin captures are rare and unlikely to cause an impact on the population.

Pinnipeds: Fishers largely avoid seal and sea lion colonies and the number caught is likely to be extremely low.

ECOSYSTEM EFFECTS

Food chain effects:

Not assessed

Habitat effects:

Negligible

The level of effort is such that the gear is deployed infrequently over approximately 40% of the fisheries' area and the physical impact of the gear on the bottom is minimal. Demersal gillnet and longline fishing are not permitted between Steep Point (26°30' S) and a line drawn north of North West Cape (114°06' E), or within 3 nautical miles of the Abrolhos Islands baselines.

SOCIAL EFFECTS

Estimated employment during 2001/02 in the JASDGLF was 50 skippers and crew, and in the WCDGDLF 20.

ECONOMIC EFFECTS

**Estimated annual value (to fishers) for year (2001/02):
\$5.5 million**

<i>JASDGDLF</i> :	\$3.2 million (shark and scalefish)
<i>JASDGDLF</i> :	\$850,000 (shark fins)*
<i>WCDGDLF</i> :	\$1.1 million (shark and scalefish)
<i>WCDGDLF</i> :	\$300,000 (shark fins) *

* As fishers do not specify the value of fins on their catch returns, fin values were calculated at an average of 3% of sharks' whole weight and value was conservatively estimated using a price of \$35/kg. Categories of shark which do not have saleable fins were excluded from fin valuation.

The value of the fisheries was similar to last year. A declining trend in shark catches in recent years has been offset by increases in the value of shark fins to between \$25 and \$120/kg, depending on fin size and species.

FISHERY GOVERNANCE

Acceptable catch range: Key species 725–975 tonnes

Acceptable catch ranges for the key species, based on 10-year averages, are as follows:

Whiskery shark	175–225 t
Dusky whaler	300–400 t
Gummy shark	250–350 t
Sandbar shark	< 250 t

Catches of whiskery and dusky sharks are now at or below the target levels which were set before the last phase of net length reductions in the southern fishery was introduced. Given these effort reductions are now complete, these ranges will be readjusted before next year's report.

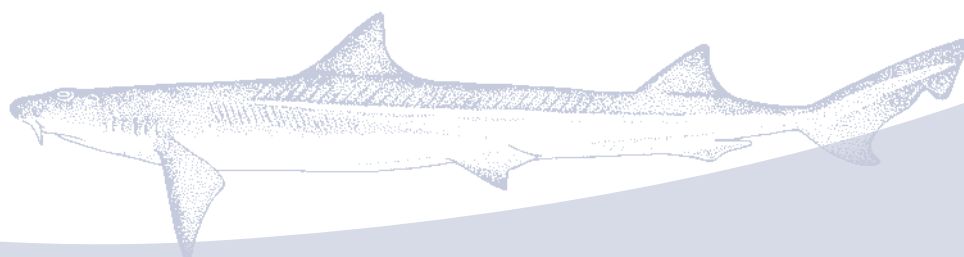
EXTERNAL FACTORS

Continued observed and anecdotal evidence suggests that significant numbers of large dusky whaler sharks have been taken over the previous 5–10 years by fishers operating outside the target fisheries. Unpublished catch data from Commonwealth-managed pelagic longline vessels and other WA-licensed vessels support this conclusion. There is thus an urgent need to quantify the take of breeding dusky whaler sharks by these sectors to determine to what extent this catch contributes to the apparent decline in dusky whaler breeding stocks.

DEMERSAL GILLNET AND LONGLINE TABLE I

Shark catch species composition for the demersal gillnet and demersal longline fisheries (*JASDGDLF* and *WCDGDLF*), 2001/02.

SPECIES		CATCH (tonnes)				
		<i>JASDGDLF</i>			<i>WCDGDLF</i>	STATE TOTAL
		Zone 1	Zone 2	Total		
Gummy	<i>Mustelus antarcticus</i>	19	324	343	15	358
Dusky	<i>Carcharhinus obscurus</i>	105	71	176	60	236
Whiskery	<i>Furgaleus macki</i>	74	67	141	30	171
Sandbar (thickskin)	<i>Carcharhinus plumbeus</i>	30	0	30	130	160
Hammerhead	Sphyrnidae	7	31	38	22	60
Wobbegong	Orectolobidae	11	7	18	21	39
Blacktip	<i>Carcharhinus</i> spp.	1	< 1	1	21	22
School	<i>Galeorhinus galeus</i>	0	15	15	0	15
Skates and rays		0	6	6	1	8
Copper	<i>Carcharhinus brachyurus</i>	0	1	1	5	6
Shovelnose rays	Rhinobatidae, Rhyncobatidae	0	0	0	5	5
Pencil	<i>Hypogaleus hyugaensis</i>	< 1	2	2	1	3
Other sharks		55	17	72	0	72



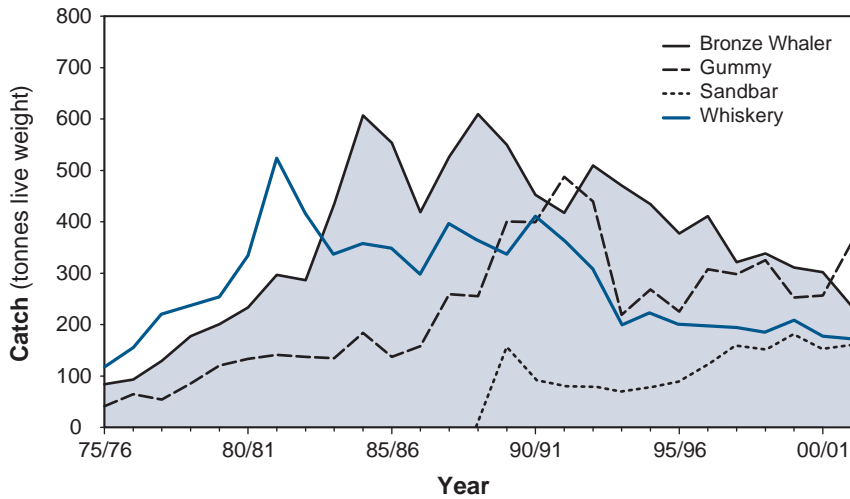
SOUTH COAST BIOREGION

DEMERSAL GILLNET AND LONGLINE TABLE 2

Scalesh fish catch species composition for the demersal gillnet and demersal longline fisheries (JASDGDLF and WCDGDLF), 2001/02.

SPECIES		CATCH (tonnes)				STATE TOTAL
		Zone 1	JASDGDLF Zone 2	Total	WCDGDLF	
Queen snapper	<i>Nemadactylus valenciennesi</i>	9	22	30	7	68
Blue groper	<i>Achoerodus gouldii</i>	9	11	20	4	44
Pink snapper	<i>Pagrus auratus</i>	2	7	8	14	31
Dhufish	<i>Glaucosoma hebraicum</i>	6	1	8	16	31
Samson fish	<i>Seriola hippos</i>	5	2	7	12	27
Salmon	<i>Arripis truttaceus</i>	6	0	6	<1	12
Redfish	<i>Centroberyx affinis</i>	<1	4	4	<1	9
Boarfish	Pentacerotidae	<1	3	3	<1	6
Leatherjacket	Monacanthidae	<1	3	3	<1	6
Other scalesh fish		44	13	57	33	147

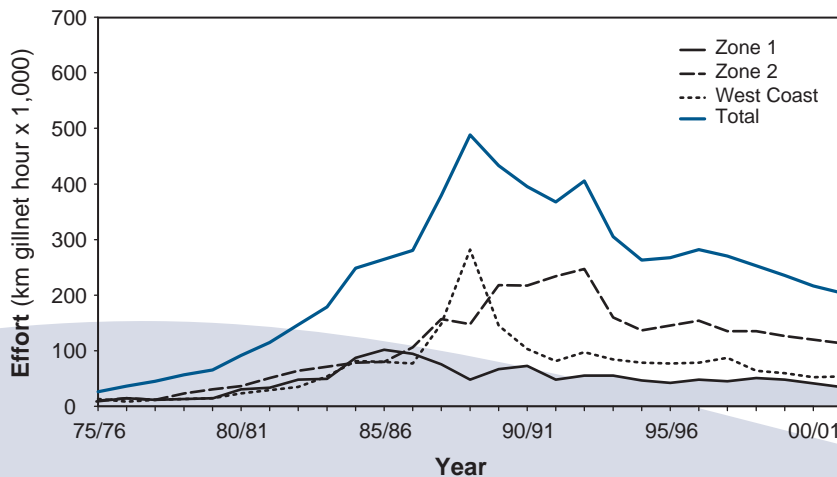
Shark Catch by Species



DEMERSAL GILLNET AND LONGLINE FIGURE 1

Annual catches of target shark species in the demersal gillnet and demersal longline fisheries (JASDGDLF and WCDGDLF) for the period 1975/76 to 2001/02.

Demersal Gillnet and Demersal Longline Effort



DEMERSAL GILLNET AND LONGLINE FIGURE 2

Effort in the demersal gillnet and demersal longline fisheries (JASDGDLF and WCDGDLF) for the period 1975/76 to 2001/02.