

FISHERY SITUATION REPORT 9. TRAWL AND DANISH SEINE FISHERY

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## SOUTH EASTERN FISHERIES COMMITTEE

The South Eastern Fisheries Committee, a committee of the Standing Committee of the Australian Fisheries Council, was set up in 1969 as one of three regional management and research committees.

The South Eastern Fisheries Committee co-ordinates interstate fisheries management and research activities in waters adjacent to New South Wales, Victoria, Tasmania and South Australia. In addition to its co-ordinating role, it also provides a forum for discussion in fisheries science and management, and advises management authorities on problems referred to it by member organisations.

The Committee is comprised of representatives of the Commonwealth Department of Primary Industry, CSIRO Division of Fisheries Research, New South Wales, Victoria, Tasmania and South Australia.

A number of fisheries in the area are of such importance as to warrant special attention by a group of experts. These Research Groups constantly monitor the state of the fisheries and discuss current research.

### FISHERY SITUATION REPORTS

To assist the Committee in its management role, the Research Groups prepare and maintain situation reports for these fisheries for which they are responsible. The reports outline the present state of the fishery, its history and management. In addition, the current state of knowledge on the biology of the species and the population dynamics of the exploitable stocks is outlined.

This report was prepared under the auspices of the Demersal and Pelagic Fish Research Group.

To broaden public knowledge of the fisheries of south eastern Australia, these situation reports are published as a series by the Committee. *sc*

A. J. HARRISON  
Chairman  
South Eastern Fisheries Committee

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SOUTH EASTERN AUSTRALIA TRAWL AND DANISH SEINE FISHERYSummary

Annual catch (tonnes)	New South Wales 13,000 Victoria 4,000 Tasmania 800
Value to fishermen	Approximately \$14 million in 1979/80
Marketing method	Most sold as fresh fish locally or through the Sydney and Melbourne fish markets. Over half the gemfish landings are processed into frozen fillets; some redfish is sold for pet food.
Weight marketed domestically	All the catch, except school whiting which is mainly exported to Japan, is sold on the domestic market.
Number of vessels	About 180 vessels operate in the fishery, although many only part-time. Many NSW vessels also fish for prawns or tuna in season.
Number of men in fishery	About 400
Value of boats and gear	About \$30 million
Present status of fishery	Under-exploited

## Introduction

The paper "Demersal Trawling in Australia" (Anon. 1972) outlined the history of this fishery to 1968, and Rowling (1977, 1979) reviewed the NSW trawl fishery, describing recent changes to the fishery and discussing prospects and research.

Since 1970, several significant changes have occurred to the fishery. The most important is the exploitation of the upper continental slope grounds off central and southern NSW, western Victoria and north western Tasmania. As a result gemfish has become the most important trawl fish, and significant quantities of redfish, mirror dory, king dory, ocean perch, ling and blue grenadier are being landed from these grounds.

Until 1974, trawling for fish was confined to NSW, but since then trawl fisheries have become established on the continental shelf and slope off eastern Victoria, in northern Bass Strait and on the continental slope off western Victoria and south eastern South Australia.

Concurrent with the expansion of the trawling industry has been the decline in the number of Danish seiners. During the 1970's most of the seiners operating off southern NSW converted to otter trawling, so that by the end of the decade, only six were still working in NSW. The number operating off eastern Victoria also fell but landings of school whiting and tiger flathead are being maintained by about 15 seiners.

## Species and Distribution

The main commercially important fishes taken by trawl and Danish seine off NSW, Victoria and Tasmania are listed in Table 1 according to the depth range in which they are generally caught.

Off NSW the main stocks of trawl fish are found along the central and southern coasts; off the north coast only school whiting and flathead are landed in any quantity, usually as a by-product of prawn trawling operations in shallow water.

Between Cape Hawke (NSW central coast) and eastern Bass Strait the main species caught on the shelf are redfish, flathead, jackass morwong, john dory and snapper. Redfish is taken in large quantities both from the shelf and upper slope between 100 and 400m (50 and 200 fm); some tiger flathead and jackass morwong are also caught down to 360m (180 fm).

TABLE 1: Main commercial species by State and depth range.

Continental Shelf 0-200m (0-100fm)	Outer Shelf/Upper Slope 100-400m (50-200fm)	Continental Slope 200-600m (100-300fm)
New South Wales		
john dory sand flathead school whiting snapper red gurnard mulloway trevally jack mackerel calamary octopus	redfish tiger flathead jackass morwong latchet shark - angel - gummy - school Gould's squid cuttlefish	gemfish mirror dory king dory blue grenadier ocean perch ling ribbonfish blue-eye (trevalia)
Victoria		
(E): Eastern (C): Central (W): Western		
school whiting (E,C) tiger flathead (E) toothy flathead (C,W) sand flathead (C) common sawshark (E) octopus (E) angel shark (E) jack mackerel (E)	jackass morwong (E,W) gemfish (E) warehou (E) snoek (E) Gould's squid (E) southern sawshark (E) red gurnard (E) redfish (E)	blue grenadier (W) silver dory (W) king dory (W) ocean perch (W)
Tasmania		
tiger flathead school whiting jackass morwong latchet flounder	jackass morwong gemfish shark - gummy - school Gould's squid warehou spotted trevalia	blue grenadier gemfish ling king dory ocean perch spotted trevalia blue-eye (trevalia)

Gemfish are caught along the edge of the shelf off southern NSW during summer, but the bulk of the catch is taken in 300-500m (150-250 fm) during their winter spawning run along the southern and central NSW slope. Mirror dory and ribbonfish are also caught at these depths during the winter.

Ocean perch, ling and blue grenadier are caught mainly in the 400-600m (200-300 fm) depth range.

In Victorian waters, the fish faunas on similar substrates at similar depths differ markedly from east to west and these differences are reflected in the compositions of trawl and Danish seine catches. Off the far east coast the species composition, depth and seasonal distributions are similar to those off southern NSW. Gemfish (main season March-June), jackass morwong (July-March) and redfish (October-March) make up over 70% of the commercial catch.

Off Lakes Entrance the Danish seine fishery is based largely on school whiting which are caught from the shore to depths of 60m (30 fm) (March-September); tiger flathead are a major part of the Danish seine and trawl catches on the continental shelf (October-March). Jackass morwong, octopus, latchet, ocean perch, warehou, snoek and common sawshark are important trawl species on the outer continental shelf and upper slope (March-November) and gemfish are trawled at the edge of the continental shelf (October-January). Redfish are only incidental in trawl and Danish seine catches off Lakes Entrance.

School whiting, toothy and sand flathead, flounders, warehou, Gould's squid and southern bay lobsters are the main species taken by trawl and Danish seine on grounds 30-90m (15-45 fm) deep adjacent to Phillip Island, the west coast of Wilsons Promontory and the Otway Peninsula.

Blue grenadier, king and silver dories, gemfish and ling are the major species trawled on the outer continental shelf and the continental slope off western Victoria (November-May). Toothy flathead, jackass morwong, latchet and warehou are trawled at depths of 120-140m (60-70 fm) (July-October).

Tasmanian trawl catches at present are very seasonal with good catches of jackass morwong and gemfish being obtained from December to February off the south coast.

A similar pattern exists off the Tasmanian north western continental slope grounds which yield good catches throughout summer until the end of April. This pattern is most striking for blue grenadier which do not occur in great abundance until early January each year.

The northern grounds off Flinders Island appear to yield catches all year round with a slight increase in late summer and autumn.

Inshore fishing for school whiting, tiger flathead and flounder is primarily carried out by Danish seiners. The summer months show peak catches for tiger flathead with school whiting being most abundant in late winter and spring.

Flounder are caught all year round but greatest catches are taken off Stanley in Bass Strait in May and June.

As the Tasmanian trawl fishery is only in its infancy there is no doubt that the seasons and range of the significant commercial species will be extended.

### Biology

Results of research into important species of trawl fish have been published for tiger flathead (Colefax 1934, Dakin 1939 and Fairbridge 1951b, 1952), gemfish (Blackburn 1979), and jackass morwong (Han 1964). As part of the current assessment of the NSW trawl and Danish seine fishery, population dynamics studies of jackass morwong (Smith 1982) and tiger flathead (Montgomery, in press) have been carried out and studies of redfish and gemfish are nearing completion.

### The Fishery

#### Main Ports (see Fig. 1)

NSW trawlers operate predominantly off the central and south coasts; the main ports are Port Stephens, Newcastle, Sydney, Wollongong, Ulladulla and Eden.

Lakes Entrance is the main port for eastern Victorian Danish seiners and trawlers. Port Albert, Port Welshpool, San Remo, Newhaven and Apollo Bay are minor ports of central Victoria where both types of vessel operate and Portland is the base for the western Victorian offshore trawlers.

Appendices I(A) and II(A) show the numbers of vessels operating from NSW and Victorian ports in 1980.

Hobart is at present the main base for Tasmanian Danish seiners and trawlers. Stanley, because of its close proximity to the north west slope grounds and the shallow water flounder grounds, is developing into a significant port.



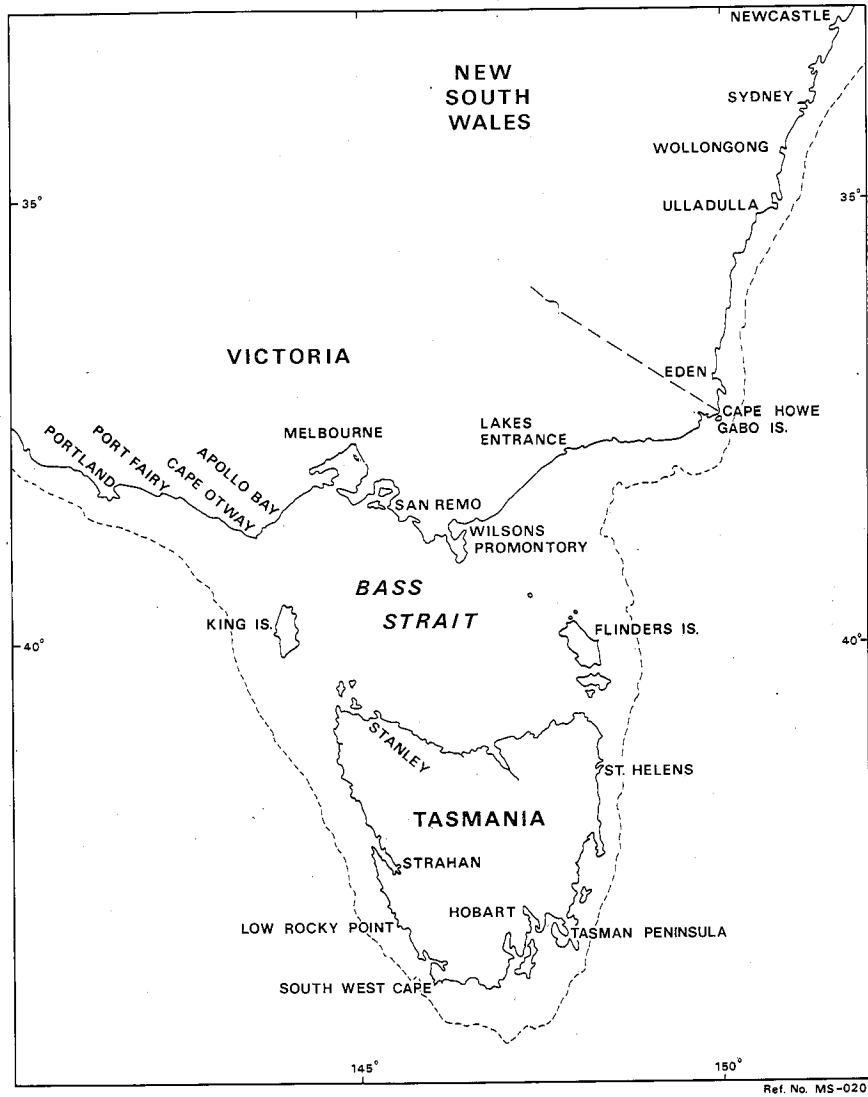


Fig. 1 South eastern Australia showing 200 metre (100 fathom) contour and main localities relating to the trawl and Danish seine fishery.

### Trawl Grounds

The NSW continental shelf is about 15 to 20 nautical miles wide along most of the coast; between Sydney and Port Stephens it reaches its maximum width of about 30 nautical miles. Trawl grounds on the shelf are small in area along most of the coast. North of Port Stephens, the grounds are less than 120m (60 fm) deep and are fished principally for prawns. Between Newcastle and Eden, the shelf grounds are also very restricted in area, and are often intensively fished during the summer. Larger areas of trawlable bottom exist along the outer shelf (140-200m; 70-100 fm) but much of this ground, especially in the Wollongong-Newcastle area, is unproductive. Off southern NSW, the outer shelf is fished heavily for morwong, redfish and gemfish. Trawlers from Eden carry out most of their fishing in eastern Bass Strait and some occasionally operate off northern Tasmania.

Fish trawling on the NSW continental slope is conducted between Port Stephens and eastern Bass Strait. The slope from 200-600m (100 to 300m) has an average width of three nautical miles along its length and a total area of about 1300 square nautical miles. The grounds are punctuated with ravines and areas of rough bottom.

Results of FRV Kapala's 1978 survey of the trawl grounds off northern NSW have shown that there is little likelihood of any appreciable expansion of the trawl fishery north of Port Stephens. Exploratory trawling on the shelf and slope produced very low catch rates of marketable fish (Gorman and Graham 1978, 1979).

The continental shelf off eastern Victoria is 10 nautical miles wide east of Cape Howe and broadens to 100 nautical miles wide east of Wilsons Promontory. The outer continental shelf and continental slope to a depth of 600m (300 fm) are covered with fine sediments and, with the exception of canyons, most of these deeper grounds are trawled by Eden (east of Port Hicks) and Lakes Entrance based boats. Much of the shallower bottom is coarse sand and gravel and is fished by otter trawlers and Danish seiners. Shallow grounds immediately to the west of Wilsons Promontory are only lightly fished. Obstacles resulting from offshore petroleum exploration and extraction together with lost scallop dredges severely hinder demersal fishing off Lakes Entrance.

Off central Victoria, trawling and Danish seining are conducted mainly on grounds 30-90m (15-45 fm) deep from Cape Patterson to Flinders and to a lesser extent west of Wilsons Promontory and in water 60-90m (30-45 fm) deep offshore from the east coast of the Otway Peninsula.

Some small areas 120-140m (60-70 fm) deep are trawled off western Victoria but the main trawl ground is situated along the continental slope at depths of 200-700m (100-350 fm) from south of Port Fairy west to (and beyond) the South Australian border (Gresik 1977). These grounds are interrupted by canyons.

Much of the Tasmanian continental shelf and slope is untrawlable due to rocky outcrops and limestone slabs. Ground that is presently being worked is somewhat coarser than the main grounds off eastern Victoria and NSW.

The north west slope grounds extend from south of King Island to Strahan with the occasional interruption of deep canyons. The rest of the continental slope appears to be either too rocky or steep to trawl.

Outer shelf and slope grounds presently worked lie between Low Rocky Point and South West Cape (140-160m; 70-80 fm), off the Tasman Peninsula (100-160m; 50-80 fm), east of St Helens (140-160m; 70-80 fm) and east of Flinders Island (100-160m; 50-80 fm and 400-700m; 200-350 fm).

Small areas of trawlable bottom are continually being discovered by both commercial and research trawlers. It will be several years before all the bottom is well defined.

#### Fishing Vessels and Gear

##### Vessels

Up to 130 trawlers and seiners operated from NSW ports during 1980, almost double the size of the fleet in 1970. However many of these vessels operate only on a seasonal basis. Many of the trawlers from Newcastle, Port Stephens and the more northern NSW ports trawl for both fish and prawns according to the season. During summer some Sydney, Wollongong and Greenwell Point trawlers fish for royal red prawns and several Ulladulla and Eden trawlers dismount their trawl gear and operate as tuna poling vessels.

About 60 local and interstate trawlers now fish the winter gemfish run.

During the 1970's there was a dramatic swing from Danish seining to trawling in NSW. In 1970, over half of the fleet were seiners with most of the trawlers working from northern ports for both prawns and fish. By 1980, only six seiners were still working in NSW.

The conversion of almost all the NSW tuna poling vessels to combination trawl/tuna boats has also boosted the fleet size. The change from seining to trawling and the overall growth of the fleet is clear in the following figures:

	Danish Seiners	Trawlers
1972	48	32
1974	34	59
1976	18	77
1978	6	95
1980	6	126

Along with the increase in numbers, the average size and power of vessels has increased, mainly to cope with the large catches of gemfish taken during the winter. Most new vessels are in the 20-25m size range. Appendix I(B) shows the size distribution of NSW trawlers.

The engine sizes of trawlers vary from 100 hp or less in the smaller vessels, to over 500 hp in the larger boats. Seiners generally have 100-150 hp engines.

During 1979/80, 28 trawlers and 19 Danish seiners operated from Victorian ports. The number of trawlers has increased from nil in the early 1970's when approximately 25 seiners were operating from Lakes Entrance. The decrease in the number of seiners there reflects a consolidation of the fishery for school whiting and tiger flathead and is not a part of the trend away from seining reported for the NSW fishery.

Trawlers 12-23 m long fish on the continental shelf and slope grounds off Lakes Entrance throughout the year and smaller boats trawl for prawns, southern bay lobsters and swimming crabs in shallow coastal waters during most of the year. The Danish seiners are 11-19m long and work throughout the year.

The Portland-based trawl fleet has grown from zero prior to 1977 to nine boats 18-26 m long in 1979/80. These boats trawl off western Victoria between November and May then move to Lakes Entrance or NSW to continue trawling during the winter.

Appendix II(B) shows the length distribution of trawlers and Danish seiners which operated from Victorian ports during 1979/80. Engine sizes are similar to those of NSW trawlers and seiners.

There are currently three Danish seiners and four trawlers operating from Tasmanian ports. All the trawlers exceed 20 metres in length and usually travel north to Lakes Entrance or Eden during the winter to avoid the adverse Tasmanian winter conditions.

#### Otter Trawl Gear

Lightweight polyethylene nets with headline lengths of 24-50m (12-25 fm) are used on the shelf. Nets used by the larger vessels for gemfish range in size from 40 to 80m (20 to 40 fm) headline length. Most trawls are of local or traditional design with 110-120 mm mesh in the wings and 90 mm mesh in the body and codend. Gemfish nets have long extension sections and codends to cope with the large catches. Imported nets are used on some trawlers, and these may be of nylon construction.

Flat wooden otter boards are used by most vessels, but steel Vee doors and polyvalent doors are also in use.

Sweeps and bridles range in length from 120 to 300m (60 to 150 fm) and are often combination wire-rope.

Winches on the older trawlers are driven mechanically from deck mounted auxiliaries; most new vessels have hydraulic systems. The winch drums usually carry about 1500m (750 fm) of warp and frequently the sweep wires and the wings of the net are wound on top of the main warps. Net drums are in use on a few vessels.

#### Danish Seine Gear

Standard gear consists of synthetic fibre nets with headrope lengths of 40-80m (20-25 fm). Usually seven coils of rope are used on each side. Until the early 1970's manilla seine rope was used exclusively, but most fishermen are now employing synthetic lead combination ropes which are dearer than manilla but last much longer.

These vessels are fitted with seine winches, rope coilers and rope wells.

#### Electronic Equipment

All vessels are fitted with echosounders and two-way radios, and most vessels with automatic pilots and radar. Recently, satellite navigation systems have been fitted to some of the large trawlers.

Production

As detailed in Table 2, total estimated production by trawlers and Danish seiners for NSW, Victoria and Tasmania was around 16,000 tonnes in 1978/79 and almost 20,000 tonnes in 1979/80.

TABLE 2: Production of main commercial species by trawlers and Danish seiners in south eastern Australia (tonnes).

	1978/79	1979/80
blue grenadier	394	585
dory - john	204	250
- mirror	609	290
flathead species	2,216	2,016
gemfish	5,008	6,615
jackass morwong	1,760	1,909
ocean perch	204	197
redfish	1,702	2,648
school whiting	943	1,018
shark	930	1,100
trevally	244	298
other*	2,115	2,922
<b>all species</b>	<b>16,329</b>	<b>19,848</b>

\* Estimates for NSW

New South Wales

Total production (refer Table 3) in NSW is approximately 13,000 tonnes per year.

In 1980 the gemfish catch increased to about 6,000 tonnes. A significant proportion of the landings now come from the Eden area, where vessels are exploiting the winter spawning run in May and June before the fish migrate to the central coast area. Gemfish are processed into frozen fillets at Wollongong and Sydney, and only about one third of the winter catch is sold through the Sydney Fish Markets as fresh fish. Fish for processing remain ungutted while those sold at auction are mainly gutted.

Mirror dory production in 1978 was about 850 tonnes (Sydney Fish Market sales) but dropped to about 400 tonnes in 1979 and to 250 tonnes in 1980. Annual flathead and morwong landings are stable at about 1,000 tonnes each, while the redfish catch increased to about 2,500 tonnes in 1980.

TABLE 3: Production of main commercial species and estimated total production by trawlers and Danish seiners in New South Wales (tonnes).

	1978/79	1979/80
flathead - sand	287	335
- tiger	617	665
dory - john	170	224
- mirror	609	290
gemfish	4,533	5,900*
latchet	80	178
ling	121	180
morwong	950*	1,100
ocean perch	194	173
redfish	1,665	2,523
red gurnard	122	112
school whiting	267	567
shark	873	1,049
trevally	244	298
other *	718	1,359
all species *	11,450	14,953

\* Estimated

#### Victoria

Reported annual production from Victorian waters by trawlers and Danish seiners totals about 4,000 tonnes of which up to 30% is landed in the southern NSW port of Eden. Additional quantities caught in Tasmanian waters in eastern and western Bass Strait and off south eastern South Australia are landed in Victorian ports. Table 4 shows only the production from Victorian waters.

During the 1970's the main growth in production from Victorian waters resulted from developments of trawl fisheries on the outer continental shelf and upper continental slope off eastern and western Victoria and the consequent increased catches of jackass morwong, tiger flathead, gemfish, blue grenadier, dories and warehou.

Sufficient exploitable stocks occur on trawl grounds off eastern and central Victoria to enable most boats to operate from their home ports throughout the year. However, since it began in 1977, the fishery off western Victoria has become seasonal with most boats trawling there between November and May, then moving interstate, usually to southern NSW ports, to continue trawling during winter.

TABLE 4: Production of main commercial species and total production by trawlers and Danish seiners from Victorian waters (tonnes\*). (Preliminary figures from fishermen's monthly returns and Lakes Entrance Fishermen's Co-operative Society Ltd records).

Ports of Landing	1978/79				1979/80				Total
	Eden (NSW)	eastern Vic	central Vic**	western Vic	Eden (NSW)	eastern Vic	central Vic**	western Vic	
blue grenadier	14	9	-	117	43	30	-	88	161
dory - silver	6	7	+	36	13	7	+	24	44
- king	-	-	-	62	-	-	-	26	26
gemfish	257	122	-	55	460	123	-	52	635
flathead species	15	997	63	12	65	925	27	19	971
jackass morwong	108	563	+	46	279	483	+	4	766
octopus	+	38	+	+	4	75	+	+	79
red gurnard	30	7	+	+	113	12	+	+	125
red gurnard	2	73	+	+	9	73	1	+	83
sawsharks	2	53	+	2	46	1	1	3	51
school whiting	+	633	38	+	+	381	53	+	434
snoek	4	59	3	+	7	52	+	3	62
southern bay lobster	+	53	1	+	+	41	2	+	43
squid (Gould's)	5	38	2	9	37	15	2	5	59
warehouse	7	46	1	3	21	63	1	1	86
all species	552	3,077	119	430	1,155	2,662	95	270	4,182

+ Less than 1 tonne

\* Mainly liveweights - some gemfish and blue grenadier headed and gutted

\*\* Central Victorian ports defined as being between Cape Otway and Wilsons Promontory



## Tasmania

Annual production from Tasmanian waters by Danish seiners and trawlers has been around 700 tonnes over recent years (refer Table 5). The Danish seine fishery has shown no growth over the past few years.

The main impetus has come from the trawling sector and in particular from the south west shelf and north west slope grounds. The latter area is likely to develop into a major fishery based on blue grenadier if initial product handling difficulties are overcome.

Year-round production in Tasmania is not sufficient to maintain the local trawlers and all move north to fish in winter, primarily aiming at the seasonal gemfish fishery off NSW.

TABLE 5: Production of main commercial species and total production by trawlers and Danish seiners from Tasmanian waters (tonnes).

	1978/79	1979/80
blue grenadier	254	424
dory - king	34	26
flathead species	225	45
flounder	4	25
gemfish	41	80
jackass morwong	95	43
latchet	2	1
ling	8	11
ocean perch	10	24
red gurnard	8	1
school whiting	5	17
spotted trevalla	8	10
other	7	6
all species	701	713

Markets and Prices

## New South Wales

Most of the NSW catch is sold through the Sydney fish market and average prices at the market from 1975/76 to 1979/80 are given in Table 6. The remainder of the catch is sold locally in the ports of landing. School whiting is exported to Japan from the Clarence River Fishermen's Co-operative and Eden.

TABLE 6: Average prices for major trawl species - Sydney fish market (cents/kg)\*.

	1975/76	1976/77	1977/78	1978/79	1979/80
dory - john	240	190	282	287	345
- mirror	23	32	34	57	82
flathead	75	80	95	103	129
gemfish	32	44	67	58	98
gemfish - fillets	125	120	-	146	203
latchet	17	22	25	24	36
ling	-	114	164	152	169
morwong	83	89	103	103	133
mulloway	186	195	251	274	366
ocean perch	-	43	69	86	90
redfish	26	29	39	34	40
red gurnard	29	36	47	50	61
school whiting	46	57	79	81	108
shark - angel	62	79	104	105	129
- banjo	34	45	56	60	74
- greeneye (dog)	31	33	44	48	53
- saw	52	57	74	73	87
trevally	28	32	41	61	54

\* Most prices are for whole fish; some gemfish is gutted and sharks are headed and gutted.

## Victoria

The average prices paid for trawl fish at the Melbourne fish market in 1978/79 and 1979/80 are given in Table 7.

Most of the trawl fish landed at Lakes Entrance is marketed as fresh fish with about 55%, 35% and 10% sold at the Melbourne fish market, Sydney fish market and local sales (including retail sales direct from the Lakes Entrance Fishermen's Co-operative), respectively. Most of the school whiting is exported to Japan. When high production (at Lakes Entrance or elsewhere) depresses the fresh fish markets, tiger flathead and jackass morwong are processed for sale mainly in Sydney.

Trawl fish catches from central Victorian waters are sold as fresh fish direct to tourists and local buyers or at the Melbourne fish market.

Landings at Portland from trawl grounds off western Victoria, north western Tasmania and south eastern South Australia are sold either fresh at the Melbourne and Adelaide fish markets or fresh or processed to regional buyers.

TABLE 7: Average prices for major trawl species - Melbourne fish market (cents/kg)\*.

	1978/79	1979/80
blue grenadier	65	101
dory - john	171	196
- mirror	95	182
- silver	93	144
flathead - sand	42	85
- tiger	75	99
gemfish	81	111
jackass morwong	89	97
jack mackerel	46	51
latchet	47	73
ling	143	218
ocean perch	54	72
octopus	83	100
redfish	44	50
red gurnard	48	71
sawshark	103	128
school whiting	88	119
snoek	50	56
southern bay lobster	113	130
warehouse	98	147

\* Most prices are for whole fish; some blue grenadier and gemfish is gutted.

#### Tasmania

Over 60% of fish caught in Tasmanian waters is landed in Victoria due to the superior wholesale prices in that State. Domestically landed fish is sold fresh through retail outlets. If supply exceeds local demand, fish are filleted and frozen, and usually sold during the winter months.

Gemfish and morwong fillets are sold into the mainland market. The high freight costs involved in sending fresh fish to either Melbourne or Sydney markets has prevented the development of this outlet for Tasmanian landed fish.

The average price paid to Tasmanian fishermen is 30 to 40% lower than the average Melbourne market price, because of freight charges.

## Management

Entry of large trawlers into the south eastern Australian trawl fishery is strictly controlled under Commonwealth Fisheries Notice 77A which states that in proclaimed waters from the Queensland - New South Wales border south to the eastern end of Kangaroo Island (SA) the number of 32 to 45.7m (105-150ft) long trawlers allowed to fish is four, one each from New South Wales, Victoria, Tasmania and South Australia. No larger trawlers may operate in this region and there is no limitation on the number of smaller trawlers.

The South Eastern Fisheries Committee has adopted an annual total allowable catch of 25,000 tonnes for the demersal trawl fishery on the continental shelf and slope off New South Wales, Victoria, Tasmania and South Australia.

### New South Wales

Several regulations are in force in the NSW fishery:

- (i) All Danish seining and otter trawling for fish are forbidden in estuaries.
- (ii) The legal minimum codend mesh size for a fish trawl is 90 mm and for a Danish seine codend, 80mm.
- (iii) North of Smoky Cape, all species of fish may be retained when caught with a prawn trawl (minimum codend mesh size 40mm); south of Smoky Cape, only fish with no legal minimum size may be retained with a prawn trawl.
- (iv) Legal minimum size lengths are in force for the following species:

	(cm)
flathead - sand and tiger	33
bream - yellowfin and black	25
morwong - rubberlip and jackass	28
mulloway	28
school shark	91
snapper	28
tarwhine	20
teraglin	38

Victoria

Danish seining and trawling are prohibited in Port Phillip Bay, Western Port and all Victorian inlets and estuaries. There are no restrictions on mesh sizes.

Legal minimum lengths for important trawled species are:

	(cm)
flathead (all species)	25
ling	33
shark - gummy	45
- school	40
snapper	27
trevally	20

All lengths are measured as the total length of the whole fish except for sharks which are measured along the belly from the fifth gill slit to the point where the tail fin meets the body.

Tasmania

Trawling or seining is illegal within one mile of the Tasmanian coast; in some areas this is extended to three miles (Maria Island and Oyster Bay). The latter regulations were introduced in the 1930's to protect the line fishermen from the new steam trawlers. As lining is no longer a widely employed commercial technique this legislation is currently under review. Legal codend mesh sizes are 7cm and 9cm for Danish seining and trawling respectively.

Legal minimum lengths for trawled species are:

	(cm)
jackass morwong	23
flounder	23
sole	23
flathead (all species)	30
shark - school	90
- gummy	75

All lengths are taken from the tip of the snout to the end of the tail.

Research and DevelopmentNew South Wales

Since 1970, NSW State Fisheries has been undertaking an offshore fish and prawn resource survey with FRV Kapala. The NSW continental slope has been charted in detail and stocks of prawns and fish assessed. An indicated stock of royal red prawns was calculated to be over 1,000 tonnes and an initial estimate of the continental slope fish stock off southern NSW was 20-40,000 tonnes.

Development of the royal red prawn resource has been slow, but by 1980 the fishery was producing about 400 tonnes per annum, with many of the Sydney and Wollongong trawlers working for royal reds during the summer. The continental slope grounds now produce over half the NSW trawl-fish catch, with gemfish, redfish and mirror dory being the main species caught.

Other research by Kapala has included a midwater trawling program to assess the application of this fishing method in NSW waters. Jack mackerel, redfish and anchovy were caught in quantity, but catch rates were generally inconsistent. Demersal trawling off northern NSW produced very low catch rates of marketable species and any expansion of the trawl-fish fishery north of Newcastle is unlikely.

During 1979-81 a second deepwater fish stock assessment program was undertaken to provide better stock estimates for such species as gemfish, mirror dory and blue grenadier, and to provide monitoring data on the fishery.

NSW State Fisheries, with the Commonwealth Department of Primary Industry, is also investigating the level of stock utilisation and the economic state of the fishery. This program will also provide data for any future management changes.

Studies into the levels of heavy metals in NSW fish, including several trawl species, have been commenced by NSW State Fisheries (Bebbington et al. 1977, Chvojka and Williams 1980).

### Victoria

Since 1972 the Fisheries and Wildlife Division has promoted the development of demersal trawling off Victoria in several ways: experimental and exploratory trawling with the FRV Sarda; equipping and chartering of commercial fishing boats for trawling; and providing gear loans and technical advice to commercial fishermen. Some of this development work has been done in collaboration with the Department of Primary Industry.

Between 1974 and 1976, a shark boat was equipped and chartered for trawling on central Victorian grounds which had once been worked on an off season basis by Lakes Entrance Danish seiners (Winstanley 1979). Two other shark boats were equipped and chartered to pair trawl east of Wilsons Promontory and in eastern Bass Strait (Amos 1976). Since then small year-round trawl fisheries have become established on the coastal grounds off central Victoria and with further development work, along the edge of the continental shelf in eastern Bass Strait.

In 1976 the Sarda conducted a topographic survey on the continental shelf and upper slope off western Victoria. This was followed up by exploratory trawling (Gresik 1977) and pilot commercial trawling (Anon. 1977, 1978) and a seasonal trawl fishery is now established, mainly on the continental slope grounds. Further trawl ground survey work (Benwell 1980, Molloy 1980) is continuing on the continental shelf off western Victoria.

### Tasmania

Whilst the FIS Endeavour demonstrated the presence of good grounds off Flinders Island (Dannevig 1913) and these were subsequently exploited by NSW-based steam trawlers, little to no commercial trawling activity had occurred in Tasmania until 1974, when the FV Zeehaan, jointly funded by the Commonwealth and Tasmanian Governments, undertook to survey the shelf waters around Tasmania (Webb and Wolfe 1977). This survey showed some promise and two further surveys funded by the Commonwealth were carried out during 1977 and 1979 (Anon. 1977, 1980a).

Both these surveys demonstrated the potential of the new found slope grounds off north west Tasmania. These have been subsequently exploited by commercial vessels. However, the grounds off Tasmania were in general harder and more sparse than those found off Victoria and NSW. This dictates the accurate plotting of surveyed bottom. As a result the FRV Challenger was converted to a stern trawler and commenced surveying the distribution and abundance of demersal fish species and accurate ground mapping in mid 1980 (Wilson 1980a, 1980b). In addition a comprehensive diary/log book system was introduced to further augment the data base.

The apparently limited amount of ground available off the east coast of Tasmania led the Tasmanian Fisheries Development Authority (TFDA) into funding an exploratory survey of the grounds off Stanley in northern Tasmania by two Danish seiners (Wilson 1980c). This will probably lead to a regular seasonal fishery in this area. TFDA also financed the conversion of a typical small rock lobster vessel to otter board trawling to examine the feasibility of like vessels entering the trawl fishery during winter months or the off-season for rock lobster fishing. Unfortunately, a lack of suitable inshore grounds combined with adverse weather conditions proved the venture to be non-viable (Wolfe 1980).

The offshore regions of Tasmania have often been touted as a likely area for the development of a large Tasmanian based trawl industry. Recent work by the Denebola, an 88 metre Polish factory trawler fishing under a feasibility licence, demonstrated these areas held little potential (Anon. 1980b).

Work to date has demonstrated the potential and difficulties facing the Tasmanian trawl industry and much developmental work is still required in the form of ground demarcation and market development.

#### CSIRO

Initial research into the south eastern trawl fishery was conducted by CSIRO during the 1940's and 1950's. This work concentrated on an analysis of fisheries statistics for the formulation of management policies (Fairbridge 1948, 1951a, 1952, Houston 1955). Other research activities in the early years were attempts to evaluate fishing methods new to Australia. Research vessels operated by CSIRO were the Warreen, Liawenee and Derwent Hunter, and experimental fishing included Danish seining (Blackburn and Fairbridge, 1946).

Oceanographic investigations have led to a better understanding of the marine environment of the eastern seaboard. In the past few years the investigations undertaken with the RV Sprightly by CSIRO physical oceanographers have given an insight into how biological events on the eastern seaboard may vary dramatically under the influence of the East Australian Current. This current is a major feature on the continental shelf over much of the NSW coast (Cresswell 1974, 1976, Godfrey et al 1980b). The winter cold water cascade from the Bass Strait into the Tasman Sea has also been examined (Godfrey et al 1980a).

The most recent development in marine research undertaken by CSIRO in south eastern Australia has been a broadening of the research approach to ecologically dominated studies. From 1975 to 1979 the 25m trawler FV Courageous was chartered and was replaced in 1980 with the 53m stern trawler Soela. These vessels have been engaged in a number of projects which have included some demersal trawling in the south eastern area.

Analysis of the demersal trawl data has shown a distinct change in the shelf faunal community from the mid NSW coast to southern Tasmania with the highest species diversity occurring in the eastern approaches to Bass Strait.

Other research relevant to the fishery includes that by Gardner (1980) on the mercury content of several species of fish trawled off south eastern Australia.



## Economics

A recent economic survey of the southern NSW trawl fishery (Jarzynski 1980) shows that high gross and net incomes were generated during the 1975/76 to 1977/78 period, especially in the latter year, by most boats using the otter trawl and otter trawl/tuna pole fishing strategies. Danish seiners continued to show low returns, as did otter trawlers of under 15m.

In 1977/78, otter trawlers of between 15 and 18m recorded the highest percentage return to capital, on average, outperforming larger boats using similar fishing methods. However, evidence to suggest that the most economically efficient boat size lies within this range is inconclusive.

The high incomes or the potential for high returns has led to several orders for new, large, well equipped and technically efficient catching units. The expansion has generally come from within the fishery.

## Prospects

### New South Wales

All trawling grounds with commercial quantities of fish are now being utilised to some degree. Production from the continental slope of gemfish, ribbonfish, blue grenadier and redfish is expected to increase. Some areas of the continental shelf considered untrawlable because of coral or hard bottom conditions may also be exploited in the future with the introduction of modified gear.

### Victoria

At present the distribution of fishing effort over the known eastern Victorian grounds is very patchy. Most of the grounds off far eastern Victoria and off Lakes Entrance are effectively exploited by Eden and Lakes Entrance boats but the more remote eastern Bass Strait grounds are not fully exploited. The Danish seine fishery is expected to continue although operations and productivity are being hampered by obstructions resulting from oil and natural gas developments and from lost scallop dredges.

The central Victorian coastal trawl grounds are being exploited to a degree that varies with remoteness from ports and with consistency of catch rates. No significant growth is foreseeable.

Trawling has only recently become established on the continental slope off western Victoria and the development potential of this fishery should be considered over the whole region from south eastern Tasmania to south eastern South Australia. It is believed that collectively the demersal stocks on these grounds could yield several thousand tonnes annually. Very little of the continental shelf ground off western Victoria has proved to be trawlable using conventional or rough-bottom trawls. Inadequate port facilities close to most of the trawl grounds will hinder development of this fishery.

#### Tasmania

Future trawl fish catches in Tasmania will show a marked increase over the next decade provided that adequate markets can be developed. For some species, notably blue grenadier, research in product development and handling procedures are urgently required.

Present estimates of the total quantity of fish that could be harvested annually and in safety range between 3-4,000 tonnes. However, until the market constraints in Tasmania are overcome there is little likelihood of these levels of exploitation being achieved.

November 1981

APPENDIX I: New South Wales: Geographical and size distributions of otter trawlers and Danish seiners.

(A) Geographical distribution, January 1981

<u>Port</u>	<u>Seiners</u>	<u>Trawlers</u>
Coffs Harbour	-	1*
Port Macquarie	-	2*
Laurieton	-	2*
Crowdy Head	-	5*
Tuncurry	1	2*
Port Stephens	-	13*
Newcastle	-	12*
Sydney	-	17*
Wollongong	-	9*
Greenwell Point	-	6*
Ulladulla	2	14**
Bermagui	1	4**
Eden	2	32**
Interstate	-	7
<u>Total</u>	<u>6</u>	<u>126</u>

\* Many of these vessels also trawl for prawns

\*\* Several of these vessels fish for tuna in summer

(B) Size distribution, January 1981

<u>Length (m)*</u>	<u>up to 14</u>	<u>15-19</u>	<u>20-24</u>	<u>25-30</u>	<u>Total</u>
Trawlers	24*	72	28	2	126
Seiners	2	4	-	-	6
<u>Total</u>	<u>26</u>	<u>76</u>	<u>28</u>	<u>2</u>	<u>132</u>

\* Overall length (LOA)

APPENDIX II: Victoria: Geographical and size distribution  
of otter trawlers and Danish seiners.

(A) Geographical distribution, 1979/80

<u>Port</u>	<u>Seiners</u>	<u>Trawlers</u>
Lakes Entrance	17	16
Port Albert	-	1
Port Welshpool	-	1
San Remo/Newhaven	1	1
Apollo Bay	1	-
Portland	<u>-</u>	<u>9</u>
Total	19	28

(B) Size distribution, 1979/80

<u>Length (m)*</u>	<u>5-9</u>	<u>10-14</u>	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>Total</u>
Trawlers	2	7	11	7	1	28
Seiners	<u>-</u>	<u>11</u>	<u>8</u>	<u>-</u>	<u>-</u>	<u>19</u>
Total	2	18	19	7	1	47

\* LOA

## APPENDIX III: Index of common names used in the text.

Fishes

blue-eye (trevalla)	<i>Hyperoglyphe antarctica</i>
blue grenadier	<i>Macruronus novaezelandiae</i>
bream - black	<i>Acanthopagrus butcheri</i>
- yellowfin	<i>A. australis</i>
dory - john	<i>Zeus faber</i>
- mirror	<i>Zenopsis nebulosus</i>
- king	<i>Cyttus traversi</i>
- silver	<i>C. australis</i>
flathead - sand	<i>Platycephalus bassensis</i> (Vic)
- tiger	<i>P. caeruleopunctatus</i> (NSW)
- toothy	<i>Neoplatycephalus richardsoni</i>
flounder	<i>N. speculator</i>
gemfish	fam. <i>Pleuronectidae</i>
jack mackerel	<i>Rexea solandri</i>
latchet	<i>Trachurus declivis</i>
ling	<i>Pterygotrigla polyommata</i>
mulloway	<i>Genypterus blacodes</i>
morwong - jackass	<i>Argyrosomus hololepidotus</i>
- rubberlip	<i>Nemadactylus macropterus</i>
ocean perch	<i>N. douglasi</i>
redfish	<i>Helicolenus papillosus</i>
red gurnard	<i>Centroberyx affinis</i>
ribbonfish	<i>Chelidonichthys kumu</i>
sawshark - common	<i>Lepidopus caudatus</i>
- southern	<i>Pristiophorus cirratus</i>
school whiting	<i>P. nudipinnis</i>
shark - angel	<i>Sillago bassensis</i>
- gummy	fam. <i>Squatinae</i>
- school	<i>Mustelus antarcticus</i>
snapper	<i>Galeorhinus australis</i>
snoek	<i>Chrysophrys auratus</i>
spotted trevalla	<i>Leionura atun</i>
tarwhine	<i>Serirolella maculata</i>
teraglin	<i>Rhabdosargus sarba</i>
trevally	<i>Atractiscion aequidens</i>
warehou	<i>Caranx georgianus</i>
	<i>Serirolella brama</i>

Invertebrates

Gould's squid	<i>Nototodarus gouldi</i>
calamary (southern)	<i>Sepioteuthis australis</i>
cuttlefish	<i>Amplisepia apama</i>
octopus	<i>Octopus spp.</i>
royal red prawn	<i>Hymenopenaeus sibogae</i>
southern bay lobster	<i>Ibacus incisus</i>

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