



# AUSTRALIAN FISHERIES

SURVEYS REPORT 1999

ECONOMIC PERFORMANCE OF SELECTED  
FISHERIES IN 1996-97 AND 1997-98



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# ABARE

*Innovation in Economic Research*

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ABARE is a professionally independent government economic research agency.

## Previous fisheries surveys reports

### *Northern prawn fishery*

<i>Years covered</i>	<i>Reference</i>
1980-81 to 1981-82	BAE (1984a)
1986-87 to 1987-88	Collins and Kloessing (1988)
1989-90 to 1990-91	ABARE (1993a)
1990-91 to 1991-92	ABARE (1993b)
1992-93 to 1993-94	ABARE (1996a)
1994-95 to 1995-96	ABARE (1997)

### *East coast prawn fishery*

<i>Years covered</i>	<i>Reference</i>
1980-81 to 1982-83	BAE (1985a)

### *Eastern tuna and billfish fishery (formerly the east coast tuna fishery)*

<i>Years covered</i>	<i>Reference</i>
1989-90 to 1990-91	ABARE (1993a)
1991-92 to 1992-93	ABARE (1994)
1993-94 to 1994-95	ABARE (1996b)
1995-96 to 1996-97	ABARE (1998a)

### *Southern rock lobster fishery*

<i>Years covered</i>	<i>Reference</i>
1981-82 to 1982-83	BAE (1985b)

### *Bass strait scallop*

<i>Years covered</i>	<i>Reference</i>
1993-94 to 1994-95	BAE (1985b)
1995-96 to 1996-97	ABARE (1998a)

### *South east fishery*

<i>Years covered</i>	<i>Reference</i>
1978-79 to 1980-81	BAE (1984b)
1985-86 to 1987-88	Geen, Brown and Pascoe (1989)
1989-90 to 1990-91	ABARE (1993a)
1990-91 to 1991-92	ABARE (1993b)
1991-92 to 1992-93	ABARE (1994)
1992-93 to 1993-94	ABARE (1996a)
1994-95 to 1995-96	ABARE (1997)

### *Southern bluefin tuna fishery*

<i>Years covered</i>	<i>Reference</i>
1980-81 to 1981-82	BAE (1986)

### *Southern shark fishery*

<i>Years covered</i>	<i>Reference</i>
1988-89	Battaglione and Campbell (1991)
1990-91 to 1991-92	ABARE (1993b)
1992-93 to 1993-94	ABARE (1996a)
1993-94 to 1994-95	ABARE (1996b)

### *Torres Strait prawn fishery*

<i>Years covered</i>	<i>Reference</i>
1989-90	Battaglione, Reid and Collins (1992)
1992-93 to 1993-94	ABARE (1996a)
1994-95 to 1995-96	ABARE (1997)

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# Foreword

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ABARE has been undertaking economic surveys of selected Commonwealth fisheries since the early 1980s. Detailed information on fleet characteristics and business performance has been collected each year and published in an ongoing series of reports, as listed opposite.

ABARE survey information is used by fisheries policy makers, managers, researchers and the fishing industry. For example, it is used by the Department of Agriculture, Fisheries and Forestry in assessing the Australian Fisheries Management Authority's performance in managing Commonwealth fisheries. The information is made publicly available so that the industry can also independently assess the performance of fisheries and the impacts of management policies.

ABARE surveys have been carried out to provide estimates of the financial performance of boats in Commonwealth fisheries. In undertaking these surveys, information has been collected on a basis that is consistent with the approach the

Australian Fisheries Management Authority has used to define and manage the fisheries. This year, the surveys have been extended to include estimates of the economic performance of each surveyed fishery. This new approach can be used to provide a guide to examine the returns from the fishery to the economy as a whole within the policy constraints of safeguarding sustainability and biodiversity.

This fisheries surveys report contains detailed estimates of the performance of operators in the fisheries surveyed by ABARE in 1999. Information is included on the trawl and nontrawl components of the south east fishery and the northern and Torres Strait prawn fisheries.



BRIAN S. FISHER  
*Executive Director*

March 2000

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# Acknowledgments

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ABARE's fisheries surveys program involves a cooperative effort among industry, fisheries management and research agencies and ABARE staff.

## *Industry*

ABARE surveys are voluntary. The cooperation of fishing operators and their accountants in providing data is essential for the success of the fisheries surveys. Without this assistance the surveys would not be possible. The advice and comments on a draft of the report provided by industry representatives and representatives of each of the relevant Management Advisory Committees is also greatly appreciated.

## *Management and research agencies*

The Australian Fisheries Management Authority (AFMA) provided logbook information necessary to select a sample and provide relevant population statistics. In particular, Thim Skousen provided valuable assistance. Chris Grieve, Steve Jackson, Tony Kingston and Trysh Stone from AFMA also provided valuable comments on drafts of the report.

## *ABARE staff*

Paula Holland, Arthur Ha, Peter Gooday and Hazel Lim-Applegate of the Fisheries Economics Section undertook the analyses and compiled the report.

Sample design and estimation were performed by Walter Shafron and Caroline Rasheed of the Rural Economic Analysis Section. Data were collected, entered and edited by Lorraine Crowe, Ron Godenzi, Bob Hill, Ian Milthorpe, Damo Nambiar, Lou Sissian, Robin Stafford and Tano Travia of the Information Services Section. Survey administration and questionnaire design were carried out by Laurie Cannon, Tony Wain and Paul Phillips.

Programming and computer systems support was provided by Shona Lambert, Ken Colbert and Tri Lam of the Information Services Section.

## *Funding*

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# ABARE fishery surveys

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ABARE has been undertaking economic surveys of selected Commonwealth fisheries since the early 1980s and, for particular fisheries, on a regular basis since 1992. The current fisheries survey program involves surveying major Commonwealth fisheries every few years, or more frequently where the fishery is undergoing major changes and monitoring is particularly important. The aim is to develop a consistent time series of economic information for each fishery. Such a database, in conjunction with scientific assessments of each fishery, is vital for assessing the economic performance of fisheries.

The surveys provide a broad range of information on the physical characteristics and financial performance of boats that operate in each fishery. For details on survey methods used and definitions of physical and financial characteristics discussed in the report, see appendix A. Information from the surveys is made publicly available so the performance of fisheries and the impact of management policies can be independently assessed.

Based on logbook and boat registry information collected from licensed fishing operations in Commonwealth fisheries, and supplied by the Australian Fisheries Management Authority (AFMA) and the Queensland Fisheries Management Authority, a representative sample of Commonwealth endorsed boats is selected in each fishery and stratified by type of operation, boat size and catch. In practice this sample is seldom realised.

Nonresponse is relatively high across fishery surveys, often because of the difficulty in contacting fishers and the reluctance of some to be involved in the

survey. Sample design and weighting systems have been developed to reduce the impact of nonresponse, but care is sometimes needed in interpreting the information provided by the survey.

Between February and June the owner of each boat selected in the sample is visited by an ABARE officer. The officer interviews the boat owner to obtain physical and financial details of the fishing business for the survey years. In a number of instances the skipper of the boat is also interviewed. Further information is subsequently obtained from accountants, selling agents and marketing organisations on the signed authority of the survey respondents.

The information obtained from various sources is reconciled to produce the most accurate description possible of the physical and financial characteristics of each sample boat in the survey.

The data presented in the surveys reports constitute only a small proportion of the total amount of data collected.

## The 1999 surveys

ABARE surveyed four Commonwealth fisheries in 1999 — the northern prawn fishery, the Torres Strait prawn fishery, the south east trawl fishery and the south east nontrawl fishery.

The two prawn fisheries and the south east trawl fishery were previously surveyed in 1997 and estimates for 1994-95 and 1995-96, together with forward estimates for 1996-97, were presented in the *Australian Fisheries Surveys Report 1997* (Brown 1997). This is the first year that ABARE has surveyed the south east nontrawl fishery.

Results for all four fisheries for 1996-97 and 1997-98 are presented in this report.

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The 1996-97 information collected in the 1997 survey has been updated. Estimates are presented for all boats endorsed to operate in each fishery, and also for subgroups of boats, where possible.

For the northern prawn fishery, results are provided for boats of different sizes — those with less than 375 class A statutory fishing rights, 375–475 class A rights and boats with greater than 475 class A rights.

For the south east trawl fishery, results are presented separately for inshore boats and Danish seiners.



## **Net returns to the fishery**

In previous years, ABARE surveys have been targeted at providing information on the financial performance of boats operating in the specified fisheries. For various reasons, such measures do not provide a good indication of the economic performance of the fishery (Rose and Stubbs 2000). As a first step in estimating the economic returns from the fisheries surveyed, an additional measure — net returns to the fishery — is included in this report. Measures of the overall performance of boats operating in each fishery, as reported for previous surveys, are also provided.



# South east trawl fishery

## Survey results

*Following higher fishery catches in 1997-98, together with increases in the per unit price of some species, total receipts per boat across the south east trawl fishery were up in 1997-98 to \$663 300 per boat.*

*Average receipts for inshore boats are estimated to have been \$567 200 per boat in 1997-98, with receipts for Danish seiners estimated at \$230 300 per boat.*

*Average costs in 1997-98 rose by around 7 per cent, with cost increases heaviest for inshore operators. The greatest cost increases across the fleet were for repairs and maintenance, although crew costs were also important.*

*Average profit at full equity across the fleet in 1997-98 was an estimated \$128 100 – an improvement from 1996-97.*

*Profit for inshore boats is estimated to have averaged \$46 500 per boat, and for Danish seiners \$9700 per boat.*

*The average level of debt across the fishery fell in 1997-98, while the boat business equity ratio is estimated at 88 per cent, an improvement from the previous survey.*

*Net returns to the fishery (excluding any changes in fish stocks) are estimated to have increased from only 252 000 in 1996-97 to \$2.5 million in 1997-98.*

### The fishery

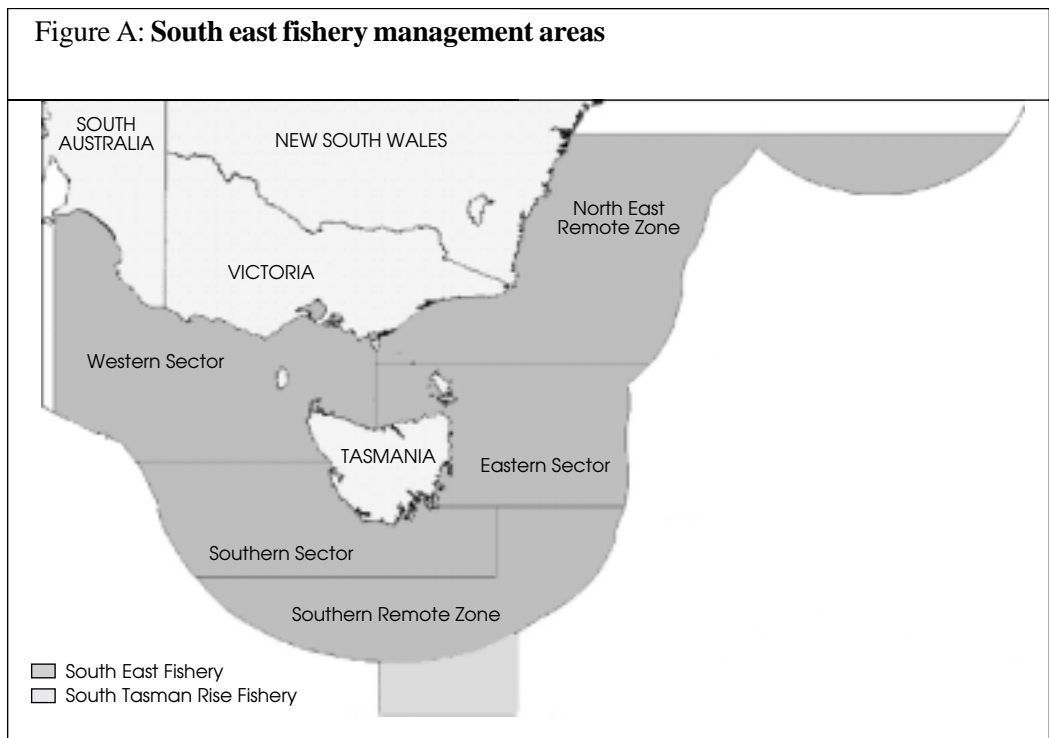
The south east trawl fishery is Australia's major scale fishery, supplying the bulk of the fresh fish requirements of New South Wales, Victoria, Tasmania and South Australia. The fishery includes over a hundred species of finfish and deepwater crustaceans. Many of the fish species caught are also caught in other Commonwealth and state fisheries and by recreational fishers. The majority of catches is taken using three types of trawl method: otter board, Danish seine and midwater trawl. The major species landed are orange roughy, blue grenadier, ling and tiger flathead.

Management boundaries for the fishery extend from a line east from Barrenjoey Point in New South Wales to a line south from Cape Jervis in South Australia, including waters around Tasmania, from a distance of three nautical miles offshore (the limit of the state managed waters) to the 200 nautical mile limit of the Australian fishing zone (figure A) (Tilzey 1998).

The volume and value of catches in the fishery have fluctuated in recent years. The historical production of major species in the fishery is illustrated in figure B.

The real gross value and average unit prices of production are shown in figures C and D.

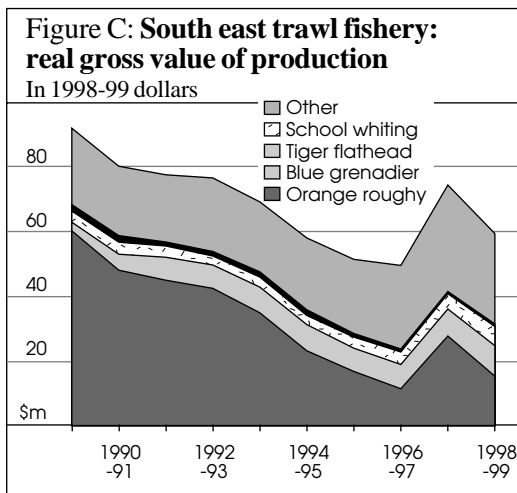
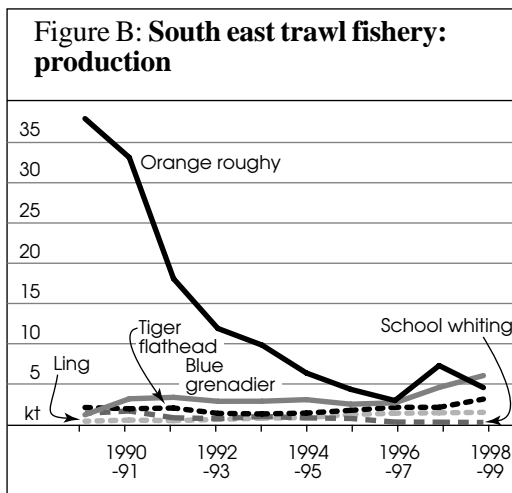
It can be seen that from a low of around \$49 million in 1996-97 the gross value of production from the fishery increased substantially in 1997-98 to around \$74 million. This increase came primarily from an increase in orange roughy catches; however, an increase in average prices was also a contributing factor. The increase in average unit price primarily reflected the relatively strong increases in

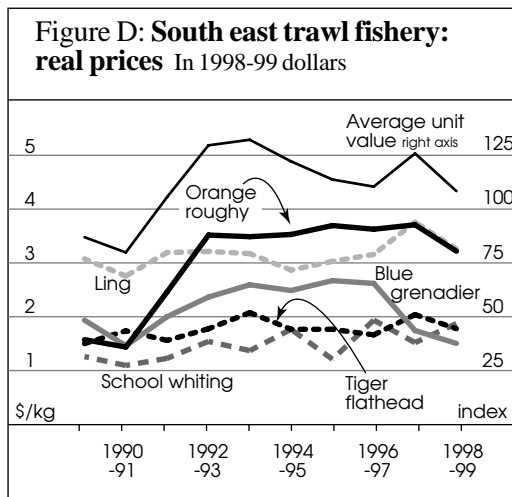


prices of tiger flathead and ling and a slight increase in the price of orange roughy, combined with significantly higher landings of that highly valued species.

By 1998-99, however, the gross value of production in the fishery had fallen to \$59 million, as prices for almost all species fell and as catches of orange roughy dropped (figures B and D).

Until the mid-1980s total south east fishery landings were dominated by catches taken off New South Wales and eastern Bass Strait. Since then, increased targeting of orange roughy and blue grenadier in waters around Tasmania have brought about a marked increase in landings from Tasmanian and Victorian waters (Bureau of Resource Sciences 1997).





## Management of the fishery

The south east trawl fishery is currently managed using a combination of individual transferable quotas (ITQs) together with some input controls (limited entry, mesh size and area restrictions). Before ITQ management, the trawl fishery was originally divided into three sectors (eastern A, eastern B and south west) with different input control requirements. Since the introduction of ITQ management in 1992, the orange roughy and gemfish fisheries have been given distinct management zones (Tilzey 1998).

ITQs were initially introduced for the trawl capture of eastern gemfish in 1989. Under the system, each quota species is subject to a total allowable catch apportioned between the operators who are entitled to fish. The total allowable catches can be adjusted each year by the fishery's managers in response to environmental fluctuations or to satisfy management objectives.

The quota management system in the fishery is conducted using a 'carryover' approach where up to a certain amount (usually 20 per cent) of the total individual quota not harvested in one year may be carried over to the next (for one year only). Similarly for overcatches of up to 20 per cent of holdings, the overcatch may be deducted from the following year's allocation. This means that the total allowable catch agreed in one year may differ

from the actual total allowable catch, once the carryover/under has been included.

At the beginning of 1992, the use of ITQs was extended to cover a further fifteen species. Originally, operators were only allowed to lease quota on a seasonal basis to other operators within the fishery and the sale of quota was prohibited. However, full and permanent transferability of quota was permitted between fishers in the fishery from January 1994.

Since the introduction of ITQs, the only total allowable catch that has regularly been exceeded (although still within the actual total allowable catch, which includes agreed carryover limits) is that for orange roughy in the eastern sector. Even when catches recorded in state waters are added, catches of the remaining species have tended to be below their total allowable catches (Bureau of Resource Sciences 1997).

A number of changes have recently been introduced to the management of the fishery. First, restrictions on the length of vessels were lifted in 1997 (Bruce Wallner, AFMA, personal communication, January 1999).

Second, on 1 January 1998, a global total allowable catch for three of the quota species — pink ling, blue warehou and blue eye trevalla — was determined to cover the whole of the south east fishery, including the nontrawl component. This total catch is now divided between the trawl and nontrawl components of the fishery (Caton, McLoughlin and Staples 1998).

Quotas for pink ling and blue warehou can currently be leased across the two sectors, although the permanent transfer of quota across the two sectors is prohibited. On the other hand, nontrawl quota for blue eye trevalla may not be leased to the trawl sector because of an agreement set out in a Memorandum of Understanding between the Tasmanian and Commonwealth governments.

Additionally, AFMA is in the process of granting statutory fishing rights during 1999. These rights are aimed at replacing fishing permits and quotas in the fishery. This means that, to operate in a fishery, operators will have to acquire a boat

# 1 Catches and status of key trawl species in the south east trawl fishery

Species	Total allowable catch – landed		Stock status <sup>a</sup>
	1997 tonnes	1998 tonnes	
Blue eye trevalla	125 (agreed)	100 (agreed)	uncertain
	149 (actual)	116 (actual)	
	113 (caught)		
Blue grenadier	10 000 (agreed)	10 000 (agreed)	uncertain
	12 496 (actual)	12 409 (actual)	
	4 534 (caught)		
Blue warehou	700 (agreed)	820 (agreed)	fully fished
	883 (actual)	880 (actual)	
	789 (caught)		
Flathead	3 500 (agreed)	3 500 (agreed)	fully fished
	4 134 (actual)	4 009 (actual)	
	2 507 (caught)		
Western gemfish	300 (agreed)	300 (agreed)	uncertain
	347 (actual)	334 (actual)	
	227 (caught)		
Eastern gemfish	to be included in the 1999 assessment report		overfished
Jackass morwong	1 500 (agreed)	1 500 (agreed)	fully fished
	1 800 (actual)	1 779 (actual)	
	1 119 (caught)		
John dory	240 (agreed)	240 (agreed)	uncertain
	294 (actual)	296 (actual)	
	90 (caught)		
Ling	1 600 (agreed)	1 921 (agreed)	uncertain
	1 734 (actual)	1 912 (actual)	
	1 735 (caught)		
Mirror dory	800 (agreed)	800 (agreed)	uncertain
	978 (actual)	962 (actual)	
	525 (caught)		
Ocean perch	500 (agreed)	500 (agreed)	fully fished
	603 (actual)	587 (actual)	
	393 (caught)		
Orange roughy: Eastern	2 000 (agreed)	2 000 (agreed)	fully fished
	1 972 (actual)	1 909 (actual)	
	2 063 (caught)		
Southern	1 000 (agreed)	1 000 (agreed)	
	1 813 (actual)	1 000 (actual)	
	454 (caught)		
Western	1 500 (agreed)	1 500 (agreed)	
	1 717 (actual)	1 933 (actual)	
	352 (caught)		
Redfish	1 750 (agreed)	1 750 (agreed)	fully fished
	1 993 (actual)	2 042 (actual)	
	1 543 (caught)		
Royal red prawn	500 (agreed)	500 (agreed)	uncertain
	624 (actual)	625 (actual)	
	188 (caught)		
School whiting	2 000 (agreed)	2 000 (agreed)	uncertain
	2 359 (actual)	2 423 (actual)	
	388 (caught)		
Silver trevally	500 (agreed)	500 (agreed)	uncertain
	614 (actual)	621 (actual)	
	168 (caught)		
Spotted warehou	2 500 (agreed)	3 500 (agreed)	uncertain
	2 675 (actual)	3 383 (actual)	
	2 770 (caught)		

<sup>a</sup> As assessed by the Bureau of Rural Sciences (Albert Caton, personal communication, March 2000).

Source: Tilzey (1998).

statutory fishing right (replacing the former boat permit) and a quota statutory fishing right (replacing the former quota allocation).

The intention with rights is to ensure greater security of long term access for fishing operators. In comparison to quotas and conventional fishing permits which are granted annually, these rights are legally binding and more secure. Rights were determined on the basis of the holding of fishing permits and quota units as at 10 September 1998. A final register of eligibility for the grant of statutory fishing rights has now been produced (AFMA 1999a) and rights have been provisionally granted. The number of rights is currently limited to 118.

Third, development and consultation has occurred with a view to integrating the fishery with various contiguous fisheries (the Commonwealth Victorian inshore trawl fishery and the east coast deepwater trawl fishery) (AFMA 1999b). In addition, a Marine Protected Area in the Southern Tasmanian Seamounts region of the south east trawl fishery was declared by the Environment Minister in 1999 and a management regime for the protection of syngnathid species (seahorses, pipefish, seadragons) in the fishery has been developed.

## Biological status of the fishery

Regular information on the biological status of the south east fishery is published by both the South East Fishery Assessment Group (SEFAG) and the Bureau of Rural Sciences (see Caton, McLoughlin and Staples 1998). The most recent published assessment of the fishery was compiled by SEFAG in 1998 (Tilzey 1998). The key assessments and changes in quotas are summarised in table 1.

Overall, the status of stocks of key species caught in the south east trawl fishery is unknown, although there have been some concerns about particular species such as gemfish.

Over the ABARE survey period (1996-97, 1997-98), the main changes in the agreed total allowable catches for south

east fishery species related to five species. The agreed total allowable catch for blue warehou, ling and spotted warehou were increased and that for blue eye trevalla decreased. After a several years with nil total allowable catches, positive catches for eastern gemfish and orange roughy taken from the Cascade Plateau were introduced. All other agreed total allowable catches remained the same (see Tilzey 1998).

## Boats surveyed

For the purpose of the survey, the population was defined as boats endorsed for the south east fishery that trawled for and caught fish within the survey years. The trawl sector of the south east fishery can be considered as three subfisheries, according to vessel type — inshore trawl, Danish seine and offshore. There is some overlap in the species caught by these subfisheries.

The inshore trawl boats generally operate on the continental shelf and upper shelf to depths of around 500 metres. Boats in this sector target a range of species, most of which are destined for the domestic fresh market. The Danish seine fleet comprises generally smaller, low powered vessels and operates in shallower waters, targeting predominantly whiting and flathead. The offshore fleet consists mainly of the larger boats and operates predominantly out of Tasmanian and Victorian ports, with orange roughy and blue grenadier the main target species. However, with the decline in the total allowable catches for orange roughy, some boats in this fleet are moving toward catching fish for the domestic market.

Based on logbook data, there were 109 trawl vessels that recorded a catch in the south east fishery in 1996-97. Of these, 69 boats were classed as inshore vessels, 19 as offshore vessels and 21 as Danish seiners. A total sample of 41 trawl boats was surveyed: 22 boats in the inshore sector, 5 in the offshore sector and 14 in the Danish seine sector.

In 1997-98, 46 trawl boats of the 109 were surveyed. These included 28 of a possible 67 inshore boats, 2 of the 20

offshore and 16 of the 22 boats Danish seiners. Results for the offshore sector are not presented separately because the number of offshore vessels covered in the survey is insufficient to provide robust estimates. However, the performances of these vessels were included in calculating averages across the fishery.

## Financial performance of boats

The major measures of the financial performance for boats in the fishery over 1997-98 are shown in table 2. Table 3

contains information on the performance of fishery boats by triptile. To calculate triptiles, the population was ranked according to fish sales and the third of the population with the lowest fish sales comprised the lower or bottom triptile. The top or upper triptile includes the third of the population with the highest fish sales values.

The weighted average costs and earnings for operators within each group were then calculated. It is important to note that the figures shown in tables 2 and 3 include costs and earnings from other fisheries such as the south east nontrawl

### 2 Estimated financial performance of boats in the south east trawl fishery <sup>a</sup>

Average per boat

	Inshore boats		Danish seiners		All boats	
	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98
<b>Receipts</b>						
Fishing receipts	\$ 404 180 (5)	494 250 (6)	212 570 (2)	227 760 (2)	537 400 (12)	593 240 (19)
Nonfishing receipts	\$ 47 420 (14)	72 940 (19)	3 140 (36)	2 530 (34)	54 750 (18)	70 070 (24)
Total cash receipts	\$ 451 600 (5)	567 190 (7)	215 710 (2)	230 290 (2)	592 140 (12)	663 310 (19)
<b>Costs</b>						
Administration	\$ 15 180 (15)	12 720 (6)	4 820 (9)	5 070 (8)	13 820 (14)	11 950 (6)
Crew costs	\$ 143 280 (5)	163 190 (5)	85 180 (3)	92 400 (2)	161 370 (9)	177 960 (19)
Freight and marketing	\$ 57 560 (10)	68 330 (13)	43 530 (3)	46 580 (3)	68 210 (12)	59 840 (9)
Fuel	\$ 72 710 (8)	85 650 (10)	15 550 (9)	14 510 (4)	84 340 (9)	90 680 (14)
Insurance	\$ 17 800 (13)	16 870 (11)	7 760 (9)	6 270 (7)	16 990 (15)	19 830 (9)
Interest paid	\$ 21 520 (23)	12 620 (26)	7 000 (18)	5 590 (11)	15 160 (20)	8 890 (23)
Leasing	\$ 15 040 (27)	36 190 (29)	1 380 (17)	8 070 (49)	46 880 (32)	51 020 (67)
Licence fees and levies	\$ 18 240 (9)	16 450 (11)	9 580 (9)	9 330 (6)	21 320 (16)	17 600 (42)
Repairs and maintenance	\$ 68 550 (12)	103 620 (24)	19 910 (8)	20 660 (10)	82 340 (17)	107 200 (26)
Other costs	\$ 22 500 (11)	25 660 (7)	12 720 (15)	14 570 (11)	21 070 (8)	21 870 (8)
Total cash costs	\$ 452 380 (5)	541 300 (9)	207 430 (3)	223 050 (2)	531 500 (8)	566 840 (20)
<b>Boat cash income</b>	\$ -780 (1525)	25 890 (93)	8 280 (48)	7 240 (52)	60 640 (47)	96 470 (19)
less depreciation <b>b</b>	\$ -27 840 (7)	28 850 (9)	12 790 (8)	11 230 (7)	29 760 (6)	28 680 (11)
<b>Boat business profit</b>	\$ -28 620 (42)	-2 960 (822)	-4 510 (101)	-3 990 (95)	30 880 (89)	67 780 (25)
plus interest, leasing and rent	\$ 37 130 (18)	49 470 (22)	8 380 (15)	13 660 (27)	62 400 (25)	60 310 (57)
<b>Profit at full equity</b>	\$ 8 510 (135)	46 510 (38)	3 870 (88)	9 670 (43)	93 280 (42)	128 100 (34)
<b>Capital</b>						
- excl. quota and licences	\$ 439 830 (9)	490 640 (10)	167 960 (8)	172 290 (5)	454 080 (7)	519 850 (6)
- incl. quota and licences <b>\$</b>	na	1 356 790 (9)	na	439 030 (4)	na	1 281 210 (11)
<b>Rate of return to boat capital c</b>	% 2 (134)	9 (42)	2 (85)	6 (43)	21 (39)	25 (35)
<b>Rate of return to full equity d</b>	% na	3 (36)	na	2 (45)	na	10 (25)

<sup>a</sup> Figures in parentheses are relative standard errors. <sup>b</sup> Depreciation adjusted for profit or loss on capital items sold. <sup>c</sup> Profit at full equity expressed as a percentage of capital excluding value of quota and licences. <sup>d</sup> Profit at full equity expressed as a percentage of capital including value of quota and licences. <sup>p</sup> Preliminary **na** Not available.

### 3 Estimated financial performance of boats in the south east trawl fishery, by triptile

Average per boat

	Bottom third			Middle third			Upper third		
	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98	
<b>Receipts</b>									
Fish receipts	\$ 189 640 (9)	186 060 (8)	387 950 (3)	474 980 (5)	1 025 670 (22)	1 168 670 (11)			
Nonfishing receipts	\$ 10 830 (34)	12 460 (19)	49 610 (20)	65 400 (25)	102 840 (27)	137 560 (56)			
Total cash receipts	\$ 200 470 (10)	198 520 (8)	437 560 (4)	540 380 (7)	1 128 510 (22)	1 306 230 (12)			
<b>Costs</b>									
Administration	\$ 6 150 (10)	7 230 (10)	17 220 (21)	11 000 (10)	17 970 (24)	18 140 (15)			
Crew costs	\$ 82 510 (11)	86 150 (8)	139 410 (7)	157 020 (6)	260 310 (18)	301 090 (12)			
Freight and marketing expenses	\$ 34 500 (13)	31 500 (14)	72 760 (5)	77 890 (9)	96 710 (13)	69 540 (41)			
Fuel	\$ 25 730 (16)	22 880 (14)	66 440 (10)	83 220 (13)	159 450 (17)	172 380 (10)			
Insurance	\$ 6 570 (13)	7 130 (14)	16 800 (11)	19 070 (7)	27 370 (21)	34 410 (28)			
Interest paid	\$ 3 460 (26)	1 840 (25)	24 170 (30)	22 700 (22)	17 720 (57)	530 (193)			
Leasing	\$ 2 060 (44)	11 810 (33)	12 640 (35)	32 290 (41)	124 600 (44)	114 910 (33)			
Licence fees and levies	\$ 11 400 (14)	8 580 (8)	15 250 (7)	14 120 (7)	37 030 (25)	31 340 (41)			
Packaging	\$ 1 940 (60)	1 490 (52)	740 (50)	50 (53)	310 (80)	290 (77)			
Repairs and maintenance	\$ 23 750 (16)	22 840 (11)	71 690 (21)	119 260 (33)	150 250 (26)	184 200 (20)			
Other costs	\$ 13 800 (14)	14 870 (10)	19 460 (14)	22 010 (7)	26 850 (15)	27 290 (47)			
Total cash costs	\$ 211 870 (10)	216 320 (7)	456 580 (4)	558 630 (12)	918 570 (17)	954 120 (14)			
<b>Boat cash income less depreciation a</b>	\$ -11 400 (92)	-17 800 (44)	-19 020 (65)	-18 250 (162)	209 940 (48)	352 110 (24)			
	\$ 12 940 (11)	13 450 (10)	24 460 (13)	25 300 (9)	51 480 (12)	49 010 (15)			
<b>Boat business profit plus interest, leasing and rent</b>	\$ -24 340 (42)	-31 250 (25)	-43 480 (27)	-43 550 (70)	158 460 (61)	303 100 (29)			
	\$ 5 520 (19)	13 680 (27)	37 620 (14)	55 800 (24)	142 590 (35)	115 790 (33)			
<b>Profit at full equity Capital</b>	\$ -18 820 (54)	-17 570 (40)	-5 860 (234)	12 250 (165)	301 050 (45)	418 890 (24)			
- excl. quota and licences	\$ 218 230 (13)	208 910 (8)	372 320 (14)	493 800 (14)	765 860 (11)	885 070 (13)			
- incl. quota and licences	\$ na	509 660 (6)	na	1 149 570 (10)	na	2 264 830 (21)			
<b>Rate of return to boat capital b</b>	% -9 (54)	-8 (38)	-2 (239)	2 (175)	39 (40)	47 (20)			
<b>Rate of return to full equity c</b>	% na	-3 (40)	na	1 (171)	na	18 (35)			

a Depreciation adjusted for profit and loss on capital items sold. b Excluding value of quota or licence. c Including value of quota or licence. na not available. Note: Figures in parentheses are relative standard errors. Composition of boats in triptiles may change from year to year due to variation in sales.

## 4 Estimated quantity of fish sold by boats in the south east trawl fishery

Average per boat

		Inshore boats	Offshore boats	Danish seine	All boats
<b>1996-97</b>					
Trawl	kg	182 080 (8)	651 470 (27)	109 830 (3)	249 980 (13)
Other method	kg	680 (83)	0 (0)	10 (36)	430 (82)
Total	kg	182 760 (8)	651 470 (27)	109 840 (3)	250 410 (13)
<b>1997-98</b>					
Trawl	kg	221 250 (6)	na	103 030 (4)	270 980 (27)
Other method	kg	50 (77)	na	0 (0)	30 (77)
Total	kg	221 300 (6)	na	103 030 (4)	271 010 (27)

na Not available.

Note: Figures in parentheses are relative standard errors.

fishery, southern shark fisheries and/or state fisheries. The estimated quantity of fish sold is shown in table 4.

The average financial performance of boats improved in 1997-98. Of those sectors separately reported, the improvement was highest in the inshore sector, where higher fishing and nonfishing receipts factored strongly.

### Receipts

The estimated volume of sales rose by around 8 per cent for the fleet in 1997-98 (table 4). The greatest increase in sales volume occurred in the inshore sector where estimated sales increased by around 21 per cent, offsetting a small decline (6 per cent) in estimated sales in the Danish seine sector.

Average total cash receipts per boat across the fleet are estimated to have been \$663 300 in 1997-98, up 12 per cent from 1996-97 (table 2). Higher receipts overall reflected an estimated increase in both fishing and nonfishing receipts. An increase in cash receipts occurred in the inshore sector, with estimated total receipts increasing by a quarter to \$567 200.

Despite a minor fall in nonfishing receipts, the estimated total cash receipts for Danish seine operators were higher in 1997-98, rising by around 7 per cent in total to \$230 300 per boat. Higher receipts reflected higher per unit prices received for fish, such as flathead and morwong.

As might be expected, fishing receipts and total cash receipts increased with the size of the fishing operation, with operators in the upper triptile earning an esti-

mated \$1.3 million in receipts in 1997-98 and operators in the lower triptile earning an estimated \$0.2 million (table 3).

### Costs

For the fleet as a whole, average total cash costs per boat rose by an estimated 7 per cent in 1997-98. As with previous surveys (Brown 1997), crew costs accounted for the greatest proportion of fishing costs, at around a third of costs in 1997-98. Crew costs rose overall by an estimated 10 per cent across the fleet. As crew costs generally occur as a proportion of boat revenue, this increase in crew costs accompanied the higher receipts for both the inshore and Danish seine sectors of the fishery. Estimated employment on boats operating in the fishery is provided in table 5.

The greatest single cost increase for boats as a whole came from repairs and maintenance, which are estimated to have risen by a third for the fleet as a whole. Costs also increased for crew, fuel, insurance and leasing, although these were more than offset by higher cash receipts.

The increase in per boat fishing costs in 1997-98 were not uniform across the fleet.

## 5 Total employment on boats in the south east trawl fishery <sup>a</sup>

	Total
1996-97	371 (4.3)
1997-98	386 (6.6)

<sup>a</sup> These estimates indicate the number of people normally employed on boats operating in the fishery and do not necessarily equate to full time equivalents.

Note: Figures in parentheses are relative standard errors.



Cash costs per boat for inshore boats increased by an estimated 20 per cent to \$541 300. The greatest cost increase to inshore operators came from repairs and maintenance, which are estimated to have increased by over 50 per cent to \$103 600. Leasing costs also rose substantially, from \$15 000 in 1997-98 to \$36 200. Leasing costs can be partially attributed to the leasing of quota.

The greatest increase in costs for Danish seiners related to crew costs, which are estimated to have increased by 8 per cent in 1997-98 to \$92 400. Cost increases were also experienced for administration, freight and marketing, leasing and repairs and maintenance, although total cost increases were partially offset by reductions in the cost of insurance, interest and licence fees and levies.

As might be expected, total costs per boat were estimated to have been highest for operators in the upper triptile and lowest for operators in the lower triptile. Operators in the upper triptile incurred estimated average costs per boat approaching \$1 million in 1997-98, while operators in the lower triptile incurred an estimated \$0.2 million per boat (table 3).

### ***Boat cash income and profit***

Average boat cash income across the fleet is estimated to have increased by 59 per cent in 1997-98, to \$96 500 per boat. This increase reflected higher overall sales and receipts, more than outweighing increased overall costs per boat.

Boat cash income changed dramatically for the inshore sector, from a small deficit in 1996-97 to an estimated \$25 900 in 1997-98. The improvement in boat cash income reflected higher sales and higher nonfishing receipts in the sector.

Boat cash income for the Danish seine sector is estimated to have fallen by around 13 per cent in 1997-98 to \$7200 per boat. Lower cash income reflected the lower volume of sales (table 4) and higher costs experienced by operators.

Boat business profit (which allows for the depreciation of capital) provides a measure of return to the business unit. Following improved boat cash income in 1997-98, average boat profit for the fleet

as a whole is estimated to have more than doubled to \$67 800.

At a sector level, boat profit improved for the inshore sector to a small loss of just under \$3000 per boat in 1997-98. This stems from the improvement in average boat cash income estimated for inshore operators over the period. By comparison, estimated boat cash income for the Danish seine sector fell slightly, and boat business profit remained negative in 1997-98.

Profit at full equity for the fleet is estimated to have averaged \$128 100 in 1997-98, following higher overall boat profits. Estimated profit at full equity for inshore operators was \$46 500 per boat, compared with an average of less than \$10 000 for the Danish seine sector.

Both sectors experienced an overall increase in profit at full equity — estimated at \$38 000 for inshore operators and \$5800 per boat for Danish seine operators.

### ***Rates of return***

The average rate of return to boat capital (excluding the value of quota and licences) across the fleet in 1997-98 is estimated to have been 25 per cent (table 2), a slight increase from the previous year. The rate of return to capital is estimated to have improved for both the inshore and Danish seine sectors.

The estimated average rate of return to full equity for boats operating in the fishery was 10 per cent in 1997-98. This is an improvement from the previous survey of the south east trawl fishery (Brown 1997), when the average rate of return per boat was estimated at 6 per cent.

### ***Debt and equity***

Information was collected on the level and purpose of debt for the fleet and is reported in table 6. The average level of debt across the fishery fell in 1997-98 by an estimated 10 per cent to \$117 300 per boat. Boat purchases accounted for an estimated 74 per cent of the closing debt and working capital for 17 per cent. The remainder was used to purchase quota, vehicles and machinery.

The debt servicing ratio is the proportion of total receipts needed to make inter-

## 6 Debt and equity of boats in the south east trawl fishery in 1997-98

Average per boat

	All boats	
Capital (incl. quota and licences) at 30 June a	\$ 981 070	(7)
Boat business debt at 1 July b	\$ 130 310	(25)
Boat business debt at 30 June b	\$ 117 290	(28)
Change in debt over year b	\$ -13 030	(41)
Boat business equity at 30 June a	\$ 863 780	(7)
Boat business equity ratio at 30 June a	% 88	(3)

a Average per boat responding on debt. b Average per responding boat.

Note: Figures in parentheses are relative standard errors.

est payments on debt. The average debt servicing ratio in 1997-98 for the fleet was estimated to be 1.3 per cent.

The boat business equity ratio provides a measure of the financial ownership of a fishing enterprise and is estimated to have been 88 per cent in 1997-98 for the south east trawl fishery fleet. This is marginally higher than for 1995-96, when the boat business equity ratio was estimated at around 82 per cent (Brown 1997).

## Economic performance of the fishery

To provide an indication of the economic performance of the fishery, the total net returns to the fishery have been estimated

## 7 Estimated economic performance of the south east trawl fishery

Total for fishery

	1996-97		1997-98	
	\$		\$	
Receipts a	58 384 590	(17)	63 655 870	(16)
Costs a	50 904 350	(11)	53 365 270	(11)
Replacement value of capital	29 353 930	(11)	27 836 110	(12)
Net returns excluding management	2 217 570	ns	5 263 670	(84)
Management costs b	1 965 599	na	2 805 218	na
Net returns c	251 971	ns	2 458 452	(84)

a Amount attributable to the fishery. b Costs to AFMA of managing the fishery. (Source: Andrew Kettle, AFMA, personal communication, December 1999). c Calculated as per the definition in this report.

## 8 Estimated financial performance of the south east trawl fishery

Average per boat

	1996-97		1997-98	
	\$		\$	
Total cash receipts a	586 040	(17)	645 000	(16)
Total cash costs b	526 030	(12)	551 200	(12)
Boat cash income c	60 020	(59)	93 810	(52)
Boat business profit c	30 560	(109)	65 910	(71)
Profit at full equity c	92 320	(52)	124 560	(41)

a Fishing receipts from the south east trawl fishery.

b Average total cash costs per boat weighted by proportion of time spent in the south east trawl fishery. c Amount attributable to the fishery.

(see appendix A for details) and are presented in table 7.

The net returns to the fishery measure includes only those receipts and costs that are attributable to the fishery. As a result, the estimated receipts and costs in table 7 will differ from those in table 2 which include all receipts and costs incurred by boats operating in the fishery, including those incurred while fishing other fisheries such as the south east nontrawl fishery, the southern shark fishery and state fisheries.

As a point of comparison with the per boat figures in table 2, average costs and earnings for south east trawl activities per boat are indicated in table 8.

As can be seen from table 7, net returns in the fishery are estimated to have increased from \$0.25 million in 1996-97 to around \$2.5 million in 1997-98.

The interpretation of the net returns measure should be considered in the light of a number of factors (see Rose and Stubbs 2000 for details). For example, changes in the volume of landings and product prices (figures B and D) in 1996-97 and 1997-98 affected the net return estimates by contributing to an increase in receipts in 1997-98.

As uncertainty exists about the status of some of the stocks, it is difficult to determine whether the estimated net returns are sustainable in the long term. For example, if the fishery is overfished, the estimated net returns in table 7 will overestimate the actual net returns.

# South east nontrawl fishery

## Survey results

*The south east nontrawl fishery was surveyed for the first time by ABARE in 1999.*

*Average receipts across the fishery in 1997-98 were estimated at \$280 200 per boat compared with estimated costs per boat of \$237 700.*

*Over half the south east nontrawl catch came from gillnetting; the other major methods used were longlining and droplining.*

*Average boat business profit was an estimated \$28 900 in 1997-98.*

*Boat business equity for the fishery was 93 per cent.*

*It was not possible or meaningful to estimate net returns to the fishery owing to the degree of overlap between the south east nontrawl and southern shark fisheries. In the future, it is intended that the south east nontrawl and southern shark fisheries be surveyed simultaneously so that a net return measure for the 'combined' fishery can be provided.*

### The fishery

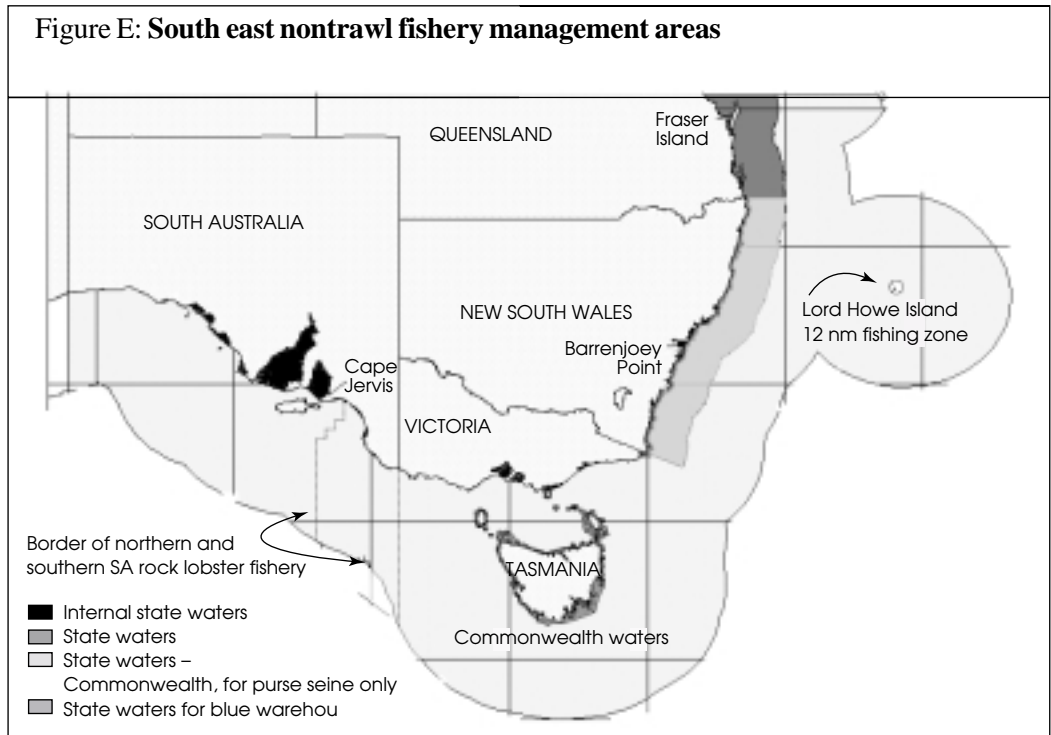
The south east nontrawl fishery is a multi-species fishery situated off the south east coast of Australia. The fishery extends from Sandy Cape in Queensland, around New South Wales, Victoria and Tasmania to the South Australian – Western Australian border (figure E). Off New South Wales and Queensland, waters out to about 80 nautical miles are under state jurisdiction except purse seine, which is Commonwealth managed outside 3 nautical miles from New South Wales (Tilzey 1998).

The fishery incorporates all fishing methods other than trawl and Danish seine, including hook methods, demersal longlining, droplining, troll and hand-lines. As well, gillnets and a small number of fish traps are used.

While many finfish species can be taken in the nontrawl fishery, three main species, blue eye trevalla, pink ling and blue warehou, are the principal species landed, comprising over 80 per cent of nontrawl landings in 1998-99. These three species are, to a certain extent, the only species commonly targeted by the nontrawl operators. However, many of these fishers also operate in other fisheries, such as the southern shark fishery.

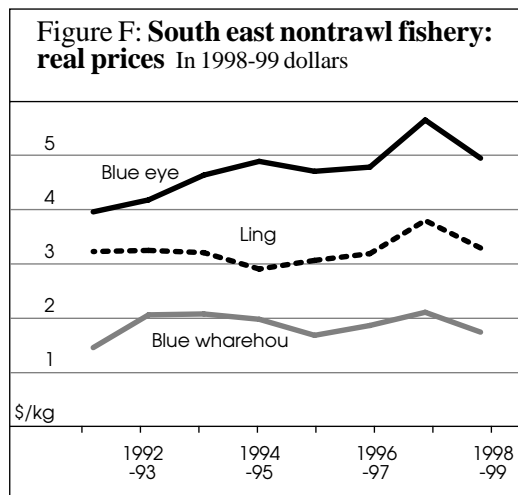
Hapuku, bass grouper, dog sharks, gemfish, ling, redfish, ocean perch, blue grenadier and ray's bream are a common bycatch of dropliners targeting blue eye trevalla. Other scalefish species commonly taken by demersal gillnetters include spotted warehou, boarfish and silver trevalla (Tilzey 1998).

The gross value of production from the fishery in 1998-99 is estimated to have been \$3.8 million from a total catch of 1015 tonnes (liveweight) (ABARE 2000). The



gross value of production in the fishery is estimated to have declined in recent years from a total of \$4.5 million in 1996-97 (ABARE 2000). This reduction occurred when more restrictive management measures were being introduced to the fishery.

Prices for the three major species in the fishery are shown in figure F. It can be seen that in real terms prices peaked in 1997-98.



### Management of the fishery

Under a series of offshore constitutional settlement arrangements, Tasmania has jurisdiction over blue warehou and certain other species taken in state waters, while the Commonwealth has sole jurisdiction over blue warehou taken off Victoria and South Australia. The Commonwealth also has sole jurisdiction over blue eye trevalla and pink ling taken off Tasmania, Victoria and South Australia (AFMA 1999c).

Prior to January 1998, the south east nontrawl fishery was managed exclusively by a combination of input controls (gear and area restrictions) designed to constrain harvesting capacity. However, the ineffectiveness of the input controls in place was evident in the expansion of catches, particularly of blue eye trevalla, in recent years and was one reason for the decision to implement an ITQ scheme (AFMA 1999d).

ITQs were introduced into the nontrawl component of the south east fishery on 1 January 1998, applying to blue eye trevalla, pink ling and blue warehou.

## 9 Catches and status of key species in the south east nontrawl fishery

Species	1997 landed catch a	1998 landed total allowable catch	SEFAG status
	tonnes	tonnes	
Blueeye trevalla	1 038 (caught)	530 (agreed) 530 (actual)	unknown
Blue warehou	273 (caught)	1 180 (agreed) 1 180 (actual)	not specified
Ling	300 (caught)	279 (agreed)	unknown

a No total allowable catches prior to 1998.

Source: Data taken from Tilzey (1998).

During 1998, gear and area restrictions were comprehensively reviewed by AFMA in conjunction with the South East Non-Trawl Management Advisory Committee (SENTMAC). Many of the restrictions on line gear were removed while gillnet restrictions were retained, pending the implementation of ITQs in the southern shark fishery (Geoff Richardson, AFMA, personal communication, December 1999).

The ITQ scheme used in the nontrawl fishery forms part of a broader ITQ management strategy for the south east fishery as a whole. A 'global' total allowable catch is determined for the combined trawl and nontrawl sectors of the fishery and is then allocated across the two sectors. As with the ITQ system used in the south east trawl fishery, the total nontrawl quota is apportioned between the operators entitled to fish. The total allowable catches can be adjusted each year by the fishery managers to satisfy legislated management objectives.

Similar to the south east trawl quota management system, the ITQ system in the nontrawl fishery is conducted using a 'carryover' approach where up to 20 per cent of the total individual quota not harvested in one year may be carried over to the next. Similarly for overcatches of up to 20 per cent of holdings, overcatch may be deducted from the following year's allocation. This means that the total allowable catch agreed in one year may differ from the actual total allowable catch, once the carryover/under has been included (table 9).

During 1998, the first year under ITQ management arrangements for the fishery, the three nontrawl quota species formed 84 per cent of the catch (AFMA 1999d).

Currently, quotas within the nontrawl fishery are fully transferable. However, while pink ling and blue warehou quotas may also be leased across the trawl and nontrawl fisheries, the permanent transfer of quota across the two sectors is prohibited and nontrawl quota for blue eye trevalla may not be leased to the trawl sector (AFMA 1999c).

### Biological status of the fishery

Catches in the fishery have fluctuated in recent years, from as low as 997 tonnes in 1997-98 to over 1532 in 1996-97. Information on the biological status of the fishery is published by both the South East Fishery Assessment Group (SEFAG) and the Bureau of Rural Sciences (Caton, McLoughlin and Staples 1998).

The most recent assessment of the fishery was compiled by SEFAG in 1998 (Tilzey 1998) in which it was concluded that the status of the three key nontrawl species was unknown (table 9), although SEFAG stressed the need for improved monitoring of the nontrawl catch composition of blue eye trevalla (Tilzey 1998).

In addition, it was noted that the current south east fisherywide catch (nontrawl fishery plus trawl fishery catches) of blue warehou was unlikely to be sustainable in the medium term (Tilzey

1998). While the stock status of ling is officially unknown, SEFAG commented that exploitation by both the trawl and non-trawl sectors did not appear to have had a significant impact on the stocks. SEFAG also noted that a recent survey by *FRV Kapala* had indicated that ling abundance had not decreased between 1976-77 and 1996-97 (Tilzey 1998).

## Boats surveyed

For the purpose of the survey, the population was defined as boats endorsed for the south east fishery that caught fish using nontrawl methods within the survey years. According to logbook data, 158 boats were active in the nontrawl south east fishery over 1997-98. Of these 34 boats in a population of 151 boats were surveyed (insufficient data on the remaining seven boats meant it was not possible to include them in the survey population).

## Financial performance of boats

The major measures of the financial performance for boats in the fishery in over 1997-98 are shown in table 10.

Table 11 contains information on the performance of boats by triptiles. To calculate these triptiles, the population was ranked according to fish sales and the third of the population with the lowest fish sales values comprised the lower or bottom triptile. The top or upper triptile includes the third of the population with the highest fish sales values. The weighted average costs and earnings for operators within each group were then calculated. It is important to note that the figures shown in tables 10 and 11 include costs and earnings from other fisheries such as the southern shark fishery.

### Receipts

The estimated average receipts per boat in the fishery in 1997-98 was \$280 200 (table 10). Boat receipts are made up of fishing receipts from the sale of catch from the fishery as well as from other fisheries and nonfishing receipts such as charter fees and rebate payments. Receipts from

fishing activities are estimated to have been \$271 900, representing 97 per cent of estimated total cash receipts. Nonfishing receipts are estimated to have been around \$8300.

As might be expected, estimated average fishing receipts per boat increased with the size of the fishing operation. Operators in the lower triptile are estimated to have earned an average of \$205 200 in fishing receipts per boat, while operators in the upper triptile earned \$338 800 per boat (table 11).

Estimated average catch per boat in 1997-98 was around 25.9 tonnes (a relative standard error of 10 is associated with this

## 10 Estimated financial performance of boats in the south east nontrawl fishery – all boats a Average per boat

	1997-98	
<b>Receipts</b>		
Fishing receipts	\$ 271 930	(8)
Nonfishing receipts	\$ 8 250	(38)
Total cash receipts	\$ 280 180	(9)
<b>Costs</b>		
Administration	\$ 5 570	(8)
Crew costs	\$ 112 380	(8)
Freight and marketing	\$ 8 140	(36)
Fuel	\$ 20 320	(12)
Insurance	\$ 6 910	(13)
Interest paid	\$ 7 870	(25)
Leasing	\$ 10 050	(50)
Licence fees and levies	\$ 14 470	(10)
Repairs and maintenance	\$ 34 690	(10)
Other costs	\$ 17 330	(9)
Total cash costs	\$ 237 730	(7)
<b>Boat cash income</b>	\$ 42 450	(34)
less Depreciation b	\$ 13 550	(12)
<b>Boat business profit</b>	\$ 28 900	(48)
plus Interest, leasing and rent	\$ 18 260	(30)
<b>Profit at full equity</b>	\$ 47 160	(31)
<b>Capital</b>		
Capital (excl. quota and lic.)	\$ 247 380	(10)
Capital (incl. quota and lic.)	\$ 1 029 700	(11)
<b>Rate of return to boat capital c</b>	% 19.1	(32)
<b>Rate of return to full equity d</b>	% 4.6	(30)

a Figures in parentheses are relative standard errors.

b Depreciation adjusted for profit or loss on capital items

sold. c Profit at full equity expressed as a percentage of capital excluding value of quota and licenses. d Profit at full

equity expressed as a percentage of capital including value of quota and licences. p Preliminary na not available.

# 11 Estimated financial performance of boats in the south east nontrawl fishery, by triptile, 1997-98

Triptiles based on fish sold Average per boat

		Lower third	Middle third	Upper third
<b>Receipts</b>				
Other fishing receipts	\$	201 580 (17)	291 110 (15)	328 210 (7)
Nonfishing receipts	\$	3 660 (55)	10 790 (72)	10 560 (51)
Total cash receipts	\$	205 240 (16)	301 900 (17)	338 770 (6)
<b>Costs</b>				
Administration	\$	3 520 (26)	5 600 (10)	7 790 (14)
Crew costs	\$	75 850 (16)	121 100 (13)	142 940 (8)
Freight and marketing expenses	\$	50 (87)	4 620 (52)	20 690 (38)
Fuel	\$	13 360 (16)	21 760 (21)	26 380 (21)
Insurance	\$	3 730 (20)	9 790 (21)	7 300 (8)
Interest paid	\$	11 820 (36)	7 780 (41)	3 670 (28)
Leasing	\$	660 (86)	11 140 (44)	19 120 (80)
Licence fees and levies	\$	10 020 (13)	19 360 (13)	14 120 (17)
Packaging	\$	0 na	0 na	0 na
Repairs and maintenance	\$	28 630 (20)	40 080 (23)	35 570 (8)
Other costs	\$	12 510 (14)	19 750 (17)	20 020 (17)
Total cash costs	\$	160 140 (10)	260 970 (13)	297 600 (8)
<b>Boat cash income</b>	\$	45 100 (48)	40 930 (80)	41 170 (34)
less depreciation a	\$	11 120 (21)	16 880 (20)	12 660 (17)
<b>Boat business profit</b>	\$	33 980 (64)	24 050 (132)	28 510 (52)
plus interest, leasing and rent	\$	12 480 (33)	19 700 (39)	23 020 (65)
<b>Profit at full equity</b>	\$	46 460 (45)	43 750 (79)	51 530 (30)
<b>Capital</b>				
– excl. quota and licences	\$	152 330 (15)	324 460 (17)	269 050 (11)
– incl. quota and licences	\$	939 610 (18)	1 330 200 (18)	808 570 (18)
<b>Rate of return to boat capital b</b>	%	30 (48)	13 (82)	19 (27)
<b>Rate of return to full equity c</b>	%	5 (38)	3 (78)	6 (31)

a Depreciation adjusted for profit and loss on capital items sold. b Excluding value of quota or licence. c Including value of quota or licence. na Not applicable.

Note: Figures in parentheses are relative standard errors. Composition of boats in triptiles may change from year to year due to variation in sales.

estimate). Gillnetting contributed over half of the catch.

## Costs

Costs across the fleet are estimated to have been \$237 700 per boat in 1997-98 (table 10). As might be expected, operators in the upper triptile recorded the highest fishing costs per boat and operators in the lower triptile the lowest (table 11). Crew costs were estimated to have been the largest single cost in 1997-98 at \$112 400, or nearly half estimated total cash costs. It is estimated that 378 people were employed on boats operating in the fishery in 1997-98 (this estimate does not necessarily equate to full time equivalent employment).

Other major costs were repairs and maintenance, fuel and licence fees and levies — estimated at around \$34 700, \$20 300 and \$14 500 respectively. Together with crew costs, these items accounted for around three quarters of total costs.

## Boat cash income and profit

In 1997-98, average boat cash income in the fishery was an estimated \$42 500. Estimated boat business profit (which allows for depreciation of capital) was \$28 900 in 1997-98.

Profit at full equity is estimated by adding leasing costs, interest charges and rent payments to boat profit. While these costs affect the financial position of the individual operator in the fishery, from a

broader perspective they represent profits that are redistributed to other investors in the fishery. Profit at full equity provides a measure of the return that would have been earned by the business unit had the boat and capital (including entitlements) been fully owned by the operator.

Average profit at full equity in the fishery is estimated to have been \$47 200 in 1997-98. Average boat cash income and profit at full equity were similar across the triptiles (table 11).

### Rates of return

The average rate of return to boat capital was an estimated 19 per cent in 1997-98 (table 10). The estimated average rate of return to full equity for boats operating in the fishery was 4.6 per cent.

### Debt and equity

The change in estimated debt levels in 1997-98 is shown in table 12. The average level of debt is estimated to have fallen by around 14 per cent in 1997-98 from \$90 200 to \$77 300. Boat purchases accounted for an estimated 76 per cent of the closing debt and working capital 14 per cent. The remainder of the estimated closing debt was used to purchase quota and other capital items.

The debt servicing ratio is the proportion of total estimated receipts used for interest payments. The estimated average debt servicing ratio for the fleet was 3 per cent in 1997-98 (table 10). The estimated average level of equity across the fleet was 93 per cent in that year (table 12).

## Economic performance of boats

It was not possible to generate economic performance indicators for 1997-98 for the south east nontrawl fishery because of the degree of overlap between this fishery and the southern shark fishery. Under current management arrangements, many southern shark fishers catch south east nontrawl species as bycatch.

## 12 Debt and equity of boats in the south east nontrawl fishery in 1997-98

Average per boat

	All boats	
Capital (incl. quota and licences)		
at 30 June <b>b</b>	\$	1 035 130 (13)
Boat business debt at 1 July <b>b</b>	\$	90 210 (30)
Boat business debt at 30 June <b>b</b>	\$	77 340 (32)
Change in debt over year <b>b</b>	\$	-12 870 (61)
Boat business equity at 30 June <b>b</b>	\$	957 790 (14)
Boat business equity ratio		
at 30 June <b>b</b>	%	93 (2)

**a** Average per boat responding on debt. **b** Average per responding boat.

Note: Figures in parentheses are relative standard errors.

Where southern shark fishers land nontrawl quota species as bycatch (pink ling, blue eye trevalla or blue warehou), the catches are regarded for management purposes as south east trawl catch, despite being caught while targeting southern shark. Similarly, south east trawl fishers may land as bycatch shark that would otherwise be regarded for management purposes as shark fishery catch, had it been landed by a shark operator.

This blurring of boundaries between the southern shark and south east trawl fisheries means it is not possible or meaningful to report on the net returns to this fishery. In the future, it is intended that the south east nontrawl and southern shark fisheries be surveyed simultaneously so that a net return measure for the 'combined' fishery can be provided.

This difficulty in assessing the economic performance of the south east trawl fishery is symptomatic of a broader management problem. The potential to fully integrate the two fisheries to overcome problems of bycatch and management inefficiency has already been proposed by fisheries managers (see AFMA 1999d as an example). Discussion of this issue is still in the early stages.



# Northern prawn fishery

## Survey results

*Following higher per unit prawn prices in 1997-98, average receipts per boat across the fishery increased by almost \$170 000 in 1997-98 to over \$1.1 million per boat.*

*Costs per boat are estimated to have increased by 6 per cent across the fishery in 1997-98. Cost increases were heaviest for boats with less than 375 A statutory fishing rights.*

*Estimated average boat business profit across the fleet increased to \$256 300 in 1997-98 from just under \$135 000 in 1996-97.*

*Average debt across the fishery is estimated to have declined slightly in 1997-98 to \$416 000 per boat. The boat business equity ratio for 1997-98 was 87 per cent.*

*Net returns to the fishery (excluding any changes to stocks) rose from an estimated \$14 million in 1996-97 to around \$30 million in 1997-98.*

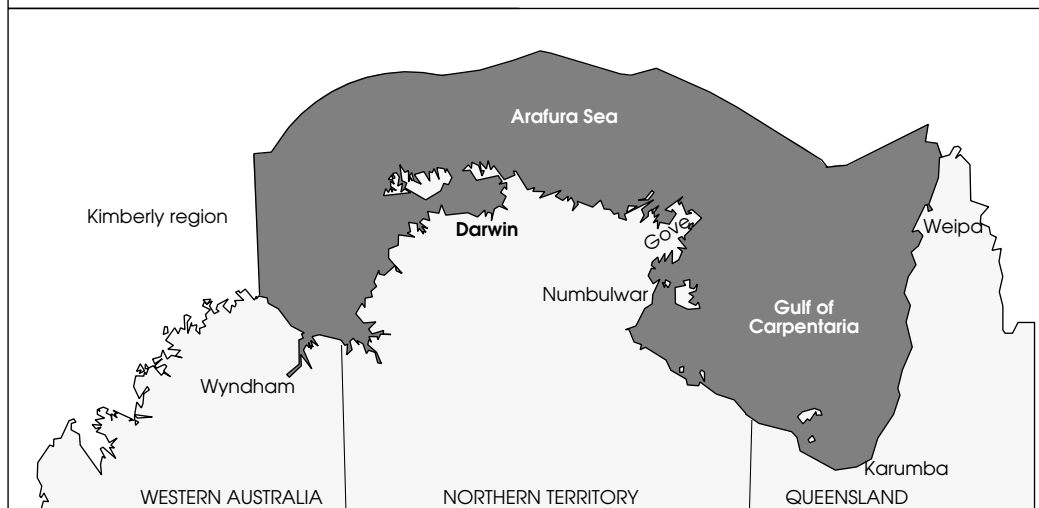
### The fishery

The northern prawn fishery is located in Commonwealth waters in the Australian fishing zone and is bordered by Cape York (Queensland) in the east and Cape Londonderry (Western Australia) in the west (figure G). It is the largest fishery by area in Australia, at over one million square kilometres. The fishery targets nine commercial species of prawn including white banana (*Fenneropenaeus merguensis*), red legged banana (*F. indicus*), brown tiger (*Penaeus esculentus*), grooved tiger (*P. semisulcatus*), blue endeavour (*Metapenaeus endeavouri*) and red endeavour (*M. ensis*). Bycatch includes squid, scallops and bugs (AFMA 1999c).

Commercial prawn species have a life span of up to two years. Juvenile prawns live in coastal and estuarine areas in beds of seagrass or mangrove lined creeks. After one to two months on the nursery grounds, the prawns move offshore into the fishing grounds. While banana prawns reach commercial size at around six months of age, tiger prawns are usually required to be larger for the market, reaching commercial size at around nine to twelve months of age.

Fishing in the northern prawn fishery is divided into two main seasons: a daytime fishery targeting schooling banana prawns, and a night time fishery for tiger prawns. The fleet starts fishing for banana prawns at the beginning of the fishing season on 1 April. However, the banana prawn fishery presently lasts only about three to four weeks so the fleet progressively changes to tiger prawn fishing as banana prawn catch rates decline. The tiger prawn fishery continues until the end of November, interrupted by a closure in June-July (Wang and Die 1996).

Figure G: Northern prawn fishery management areas



As financial years (July–June) are used for reporting revenue and cost information, the figures contained in this report are not directly comparable with those for a fishing season. For example, the April–June period of the 1997 fishing season is included in the 1996–97 financial year with the July–November period of the 1996 season.

Banana and tiger prawns account for the majority of the landed catch in the fishery (figure H). Together with prawn catches, a considerable amount of bycatch has traditionally been taken in the fishery (Pender and Willings 1989). Most bycatch

species have a nil or extremely low value and are discarded; a few species which have commercial value are retained (for example, small shark, squid, scallops and bugs).

The gross value of catch in the northern prawn fishery is the highest of any of the Commonwealth fisheries. In 1998–99 the northern prawn fishery accounted for 27 per cent of the total value of production from Commonwealth fisheries.

The real gross value of production in the northern prawn fishery is estimated to have varied between \$102 million and \$149 million over the period 1989–90 to

Figure H: Northern prawn fishery: production

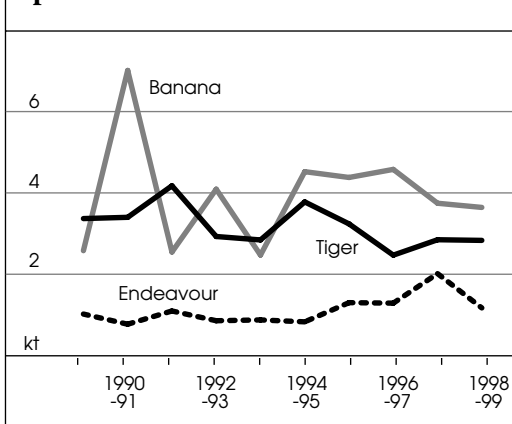
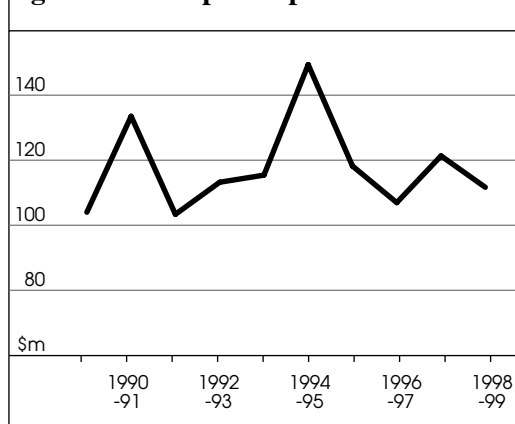
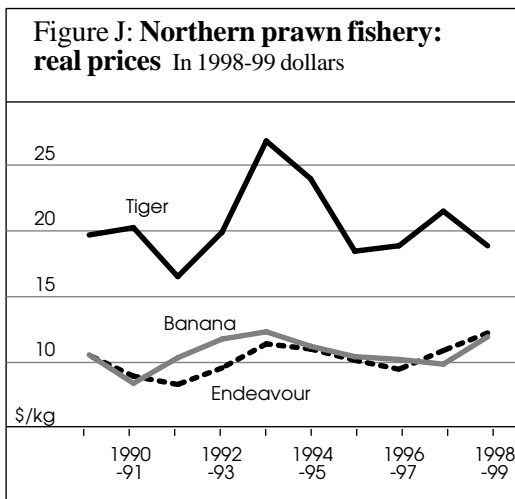


Figure I: Northern prawn fishery: real gross value of prawn production





1998-99 (figure I). This variation was driven mainly by considerable fluctuations in catches of both banana and endeavour prawns (figure H), with catches of banana prawns ranging from 2400 to 7000 tonnes over the period.

Movements in real prices of banana, tiger and endeavour prawns are shown in figure J.

## Management of the fishery

From the mid-1960s, the northern prawn fishery was managed under a variety of arrangements by the Queensland, Western Australian, Northern Territory and Commonwealth governments.

In 1988, the Commonwealth government accepted responsibility for the fishery under the terms of an Offshore Constitutional Settlement. Under this, the Commonwealth has jurisdiction for the target species of prawns, bugs, scallops, scampi and, where taken by prawn trawl gear, squid. The Commonwealth also has jurisdiction over any bycatch taken with the target species, for example turtles.

Management of the fishery has involved the use of input controls. The key feature of the current management system is limited entry, complemented by a unitisation system, permanent and seasonal closures, gear limitations, controlled season start and, in recent years, a reduction in the size of the fleet.

Under the seasonal closures system, the fishery is closed during the winter months to reduce fishing effort on the prespawning stock of tiger prawns. This closure, until recently, usually operated from 15 June until 1 August. The end of year closure, operating usually from 1 December until 30 March, is aimed at preventing the capture of small tiger prawns that begin to recruit to offshore grounds at about this time. It also protects small banana prawns that appear in the new year.

Biological overfishing has for some time been considered an issue in the northern prawn fishery, starting with the release of a 1985 study by CSIRO indicating the existence of recruitment overfishing for tiger prawns (Taylor and Die 1999).

Despite the introduction of a voluntary buy back scheme (early 1990s), a compulsory surrender scheme (1993) and continued restrictions on boat numbers, the northern prawn fishery was still assessed as being overfished by the late 1990s.

During the survey period, a number of changes were under discussion for the fishery.

First, NORMAC made recommendations in November 1997 for a substantial change to the management of the fishery, with the introduction of gear based management. Under such management, the existing limits on boat and engine sizes would be replaced with limits on the length of nets an operator could use. To address the need for effort reduction under gear based management, the length of the nets in the fishery would be reduced by 15 per cent.

Following public consultation and consideration by an independent Allocation Advisory Body, the Minister for Agriculture, Fisheries and Forestry, the Hon Warren Truss, accepted the amended management plan in late 1999. AFMA is currently implementing the new arrangements, including the process of allocating statutory fishing rights and hope to have this management in place for the second half of the season in 2000 (AFMA 1999e). At present, there is a Senate review of this legislation.

Second, the 1997 end of year closure for the northern prawn fishing season was changed to commence on 7 November, leaving only 174 days available to work. This closure was introduced as an interim means of reducing fishing effort on tiger prawns while gear unit management arrangements were progressed (Taylor and Die 1999).

Third, the 1998 closure was changed to a partial area only closure of the principal tiger prawn grounds for the entire month of November. This measure was intended to result in an effort reduction similar to that in 1997. However, because some areas remained open, the number of fishing days was restored to 198 and the closure failed to achieved its objective.

In 1999, the midyear closure was extended to start on 1 June and to finish on 4 August and the end of year closure was to start on 15 November, reducing the number of working days available for the whole year to 164.

Additionally, a compulsory vessel satellite monitoring system was introduced to the fishery in 1998 as part of general compliance and monitoring. The use of this monitoring system has also facilitated a number of alternative start-of-season arrangements, improved the flow of information to the fleet and provided details about the distribution of effort in the fishery.

There has also recently been agreement to introduce the compulsory use of turtle excluder devices and bycatch reduction devices from 2000. These devices have been trialed in the fishery on a voluntary basis for several years.

## Biological status of the fishery

The biological status of the northern prawn fishery is assessed on a regular basis by the Northern Prawn Fishery Assessment Group (NPFAG) whose last assessment was released in 1999 (Taylor and Die 1999). The biological status of the fishery affects the short and long run returns to the fishery and the fishing business.

### *Banana prawns*

Banana prawn catches in the northern prawn fishery are made up of white banana prawns and red legged banana prawns. Total catches of banana prawns have fluctuated widely in the past, ranging between 2000 and 12 000 tonnes (AFMA 1998). The high year to year variation in catches appears to be linked to environmental conditions, especially rainfall (AFMA 1999b).

The NPFAG assessed the white banana prawn part of the fishery as being fully exploited and, although there is no firm evidence of recruitment overfishing, the NPFAG noted that this possibility could not be overlooked. A new research project funded by the AFMA Research Fund was initiated in 1999 to test this hypothesis (Taylor and Die 1999).

A recent study on the status of red legged banana prawns in the Joseph Bonaparte Gulf revealed that the seasonal patterns of fishing effort in the Gulf change not only as a result of fishing closures but also as a function of the level of prawn recruitment in other areas. According to the NPFAG (Taylor and Die 1999), yield per recruit and value per recruit has increased since the fisherywide midyear closure in 1987. This suggests that the current closures, although designed to optimise production of white banana prawns and tiger prawns in other parts of the fishery, also benefited red legged banana prawn stocks in this area (Taylor and Die 1999).

A subsequent tagging study of red legged banana prawns in 1997 and 1998 revealed that the estimate of recruitment for 1998 was only a third the size of the 1997 estimate of recruitment. Stock size estimates for 1998 have not yet been analysed but suggest that the stock was much smaller in 1998 than in 1997 (Taylor and Die 1999).

The sustainable long term average annual catch for both species of banana prawns in the northern prawn fishery is thought to be around 4000 tonnes (Taylor and Die 1999), which is approximately the average annual catch for the past ten years (Bureau of Resource Sciences 1997).

### ***Tiger prawns***

After a high of 4142 tonnes in 1991-92, total landings of tiger prawns (brown tiger and grooved tiger) had decreased by almost a third in 1998-99 to around 2795 tonnes (figure H). The fall in tiger prawn landings occurred despite substantial effort reductions aimed at increasing stock size (Taylor and Die 1999).

The NPFAG considers effort in the tiger prawn fishery to be currently above that estimated to produce the maximum sustainable yields. In addition, it noted that the spawning stock of tiger prawns during late 1996 and 1997 was well below the target levels of spawning stock required to achieve maximum sustainable yields. Together with a considerable increase in effective effort for 1998, the NPFAG reported the tiger prawn portion in the northern prawn fishery to be currently overexploited and that any rebuilding of spawning stocks would require significant and urgent effort reductions (Taylor and Die 1999).

While overexploitation of the tiger prawn stock is the most likely hypothesis consistent with the historical data on stocks, the NPFAG acknowledges that another possible explanation is that recruitment has been determined by as yet unidentified environmental factors that affect larval dispersion and/or productivity in nursery areas.

The long term sustainable average catch for tiger prawns is considered to be around 4000 tonnes while that for other (nonbanana) prawns is thought to be around 500 tonnes.

### **Boats surveyed**

For the purposes of the survey, the fleet was separated into three groups according to boat size (measured by the number of class A statutory fishing rights). A sample of boats from each group was surveyed. The three groups were: less than 375 class A rights (small boats), between 375 and 475 A rights (medium boats) and more than 475 A rights (large boats). It is important to note that while the number of class A rights are indicative of a boat's capacity to catch prawns,

full compliance to the statutory fishing rights allocation system may not always occur.

The target population for the survey was defined as boats that held a Commonwealth northern prawn endorsement for the fishery and fished during that year. The total number of boats eligible for the survey in 1996-97 was 128. Of these, 8 boats were sampled from a population of 30 small boats, 37 from a population of 60 medium sized boats and 24 from a population of 38 large boats. In 1997-98, the total eligible population was 130 boats, of which 8 out of 31 small boats were sampled, 38 of 61 medium sized boats and 24 out of 38 large boats were sampled. Note that appropriate weights are assigned to sample boats to represent the target populations and total catches recorded in AFMA logbook data (for details, see appendix A).

### **Financial performance of boats**

The major measures of the financial performance for boats in the northern prawn fishery over 1997-98 are shown in table 13. It is important to note that the figures shown in table 13 include costs and earnings from other fisheries such as the Torres Strait prawn, Kimberley and Queensland east coast prawn fisheries. The estimated quantity of prawns sold is shown in table 14.

A number of external factors affected the performance in the fishery over the survey period. With around 90 per cent of the product from the northern prawn fishery being exported, market conditions overseas and exchange rate conditions have a major bearing on returns for this fishery. In particular, there was an increase in the recorded value of prawn exports in 1997-98 over the preceding year, reflecting both an increase in volume of exports as well as a rise in the unit price (ABARE 1998b). In addition, environmental factors such as monsoonal rains also have an influence on the availability of prawns for harvesting, particularly banana prawns.

## Receipts

The estimated average volume of prawns sold per boat across the northern prawn fishery in 1997-98 remained relatively stable compared with the previous year, increasing less than 1 per cent overall (table 14). For the fleet as a whole, the volume of tiger and endeavour prawns sold per boat increased by an estimated 27 per cent and 16 per cent respectively to 24 tonnes and 14 tonnes, while sales of banana prawns declined by 18 per cent to around 31 tonnes per boat.

Despite the relative stability in the estimated volume of prawns sold for the

fishery as a whole, total cash receipts increased from \$952 900 in 1996-97 to around \$1.12 million per boat in 1997-98, an increase of 18 per cent (table 13). An increase in unit prices of tiger and endeavour prawns, together with increases in catches contributed to this increase in receipts.

## Costs

Estimated average cash costs for boats in the fleet increased by 6 per cent from \$763 300 in 1996-97 to \$808 800 in 1997-98 (table 13). As the crew are generally paid based on share fishing agreements, payments to crew can be expected to

## 13 Estimated financial performance of boats in the northern prawn fishery

Average per boat

	Under 375 units		375-475 units	
	1996-97	1997-98	1996-97	1997-98
<b>Receipts</b>				
Prawn receipts	\$ 639 130 (13)	910 000 (10)	926 980 (4)	1 106 970 (2)
Other fishing receipts	\$ 13 180 (96)	1 500 (88)	26 900 (13)	27 490 (18)
Nonfishing receipts	\$ 27 100 (68)	10 300 (55)	22 510 (10)	15 770 (18)
Total cash receipts	\$ 679 410 (13)	921 800 (10)	976 390 (4)	1 150 230 (2)
<b>Costs</b>				
Administration	\$ 6 990 (33)	9 460 (31)	9 550 (10)	8 000 (11)
Crew costs	\$ 233 900 (22)	323 310 (14)	256 960 (5)	298 090 (2)
Freight and marketing expenses	\$ 9 680 (38)	15 000 (34)	21 320 (7)	18 960 (6)
Fuel	\$ 86 700 (11)	83 630 (9)	167 300 (2)	153 490 (2)
Insurance	\$ 21 480 (14)	20 570 (10)	48 530 (6)	51 210 (5)
Interest paid	\$ 17 790 (64)	25 240 (48)	41 200 (21)	32 790 (14)
Leasing	\$ 9 010 (80)	8 240 (87)	7 110 (44)	4 850 (43)
Licence fees and levies	\$ 33 320 (8)	39 110 (8)	49 530 (3)	55 910 (6)
Packaging	\$ 9 010 (34)	10 390 (25)	17 530 (7)	17 370 (4)
Repairs and maintenance	\$ 102 400 (28)	104 580 (8)	177 910 (4)	182 230 (4)
Other costs	\$ 19 160 (20)	21 800 (14)	58 350 (7)	51 140 (5)
Total cash costs	\$ 549 440 (17)	661 330 (11)	855 290 (3)	874 040 (1)
<b>Boat cash income</b>	\$ 129 970 (29)	260 470 (16)	121 100 (20)	276 190 (6)
less depreciation <b>a</b>	\$ 36 980 (23)	39 590 (19)	71 040 (10)	74 150 (7)
Boat business profit	\$ 92 990 (48)	220 880 (20)	50 060 (51)	202 040 (10)
plus interest, leasing and rent	\$ 27 470 (47)	34 490 (37)	48 480 (22)	38 600 (14)
<b>Profit at full equity</b>	\$ 120 460 (34)	255 370 (18)	98 540 (28)	240 640 (8)
<b>Capital</b>				
- excl. quota and licences	\$ 694 020 (13)	734 820 (10)	1 210 630 (5)	1 238 810 (4)
- incl. quota and licences	\$ na	3 144 370 (7)	na	3 815 120 (1)
<b>Rate of return to boat capital b</b>	% 17 (37)	35 (16)	8 (29)	19 (10)
<b>Rate of return to full equity c</b>	% na	8 (17)	na	6 (8)

a Depreciation adjusted for profit and loss on capital items sold. b Excluding value of quota or licence. c Including value of quota or licence. p Preliminary. na Not available.

Note: Figures in parentheses are relative standard errors.

increase by the same proportion as receipts. The total number of crew on northern prawn boats for the fleet is estimated to have remained roughly the same over the two years (table 15).

Fuel costs, which are another major component of total costs, fell by 8 per cent. Average costs per boat for interest, leasing, packaging and other costs are also estimated to have fallen in 1997-98, while average costs per boat for administration, insurance, licence fees and levies cost and repairs and maintenance rose.

Changes in cash costs were different across the fleet. On average, actual and relative cost increases in 1997-98 were

greatest for boats with less than 375 A rights (small boats), rising an estimated 20 per cent per boat to \$661 300. Cost increases for boats with 375-475 A rights (medium boats) and over 475 A rights (large boats) were around 2 per cent and 5 per cent per boat at around \$874 000 and \$824 400 respectively.

Crew costs were particularly important, rising for small boats by an estimated 38 per cent, while medium and large boats faced smaller crew cost increases, of 16 per cent and 5 per cent respectively. In general, crew costs are based on shares of catches and are determined by the value of the catch. The percentage increase in

## 13 Estimated financial performance of boats in the northern prawn fishery *Continued*

Average per boat

	Over 475 units				All boats				
	1996-97		1997-98		1996-97		1997-98		
<b>Receipts</b>									
Prawn receipts	\$	1 100 610	(3)	1 205 170	(2)	911 060	(3)	1 088 700	(2)
Other fishing receipts	\$	32 500	(17)	21 290	(16)	22 610	(10)	19 480	(13)
Nonfishing receipts	\$	7 690	(33)	7 920	(26)	19 190	(24)	12 170	(17)
Total cash receipts	\$	1 140 800	(3)	1 234 380	(2)	952 860	(3)	1 120 350	(2)
<b>Costs</b>									
Administration	\$	8 130	(16)	12 700	(23)	8 530	(9)	9 720	(12)
Crew costs	\$	268 470	(3)	281 500	(3)	254 970	(5)	299 250	(4)
Freight and marketing expenses	\$	12 110	(20)	12 000	(16)	15 850	(8)	15 980	(9)
Fuel	\$	159 580	(4)	144 320	(4)	146 120	(2)	134 150	(2)
Insurance	\$	27 980	(5)	30 300	(3)	36 090	(5)	37 790	(3)
Interest paid	\$	19 480	(34)	20 220	(23)	29 270	(18)	27 310	(14)
Leasing	\$	370	(87)	3 710	(59)	5 550	(40)	5 320	(39)
Licence fees and levies	\$	59 500	(10)	54 580	(7)	48 690	(4)	51 510	(4)
Packaging	\$	17 310	(5)	12 800	(9)	15 470	(6)	14 370	(6)
Repairs and maintenance	\$	182 630	(6)	220 650	(5)	161 610	(5)	174 950	(3)
Other costs	\$	31 270	(6)	31 640	(7)	41 120	(6)	38 440	(4)
Total cash costs	\$	786 830	(2)	824 420	(2)	763 270	(3)	808 790	(2)
<b>Boat cash income</b>	\$	353 970	(7)	409 960	(6)	189 590	(8)	311 560	(5)
less depreciation <b>a</b>	\$	42 630	(7)	37 670	(14)	54 620	(7)	55 250	(6)
<b>Boat business profit</b>	\$	311 340	(8)	372 290	(7)	134 970	(13)	256 310	(6)
plus interest, leasing and rent	\$	20 020	(34)	24 770	(20)	35 110	(18)	33 580	(12)
<b>Profit at full equity</b>	\$	331 360	(8)	397 060	(7)	170 080	(10)	289 890	(5)
<b>Capital</b>									
- excl. quota and licences	\$	1 010 570	(5)	1 052 970	(4)	1 030 160	(4)	1 064 300	(3)
- incl. quota and licences	\$	na		4 068 990	(2)	na		3 729 380	(2)
<b>Rate of return to boat capital b</b>	%	33	(9)	38	(9)	17	(11)	27	(6)
<b>Rate of return to full equity c</b>	%	na		10	(7)	na		8	(6)

a Depreciation adjusted for profit and loss on capital items sold. b Excluding value of quota or licence. c Including value of quota or licence. p Preliminary. na Not available.

Note: Figures in parentheses are relative standard errors.

## 14 Estimated quantity of prawns sold by boats in the northern prawn fishery

Average per boat

	1996-97		1997-98	
	kg		kg	
Tiger prawns	19 160	(4)	24 310	(4)
Banana prawns	37 200	(3)	30 670	(3)
Endeavour prawns	12 480	(4)	14 440	(4)
King prawns	350	(14)	350	(16)
Other	1 700	(19)	1 370	(24)
Total	70 890	(2)	71 140	(2)

Note: Figures in parentheses are relative standard errors.

receipts and crew costs from 1996-97 to 1997-98 are shown in table 16.

Larger boats were most affected by increases in repairs and maintenance costs, which rose by an estimated 21 per cent, whereas repairs and maintenance costs for smaller and medium sized boats remained relatively unchanged.

### Boat cash income and profit

On average, estimated cash income per boat for the fleet was \$189 600 in 1996-97, rising by an estimated 64 per cent in 1997-98 to \$311 600 (table 13). The increase was different for the various sectors of the fleet. On average, estimated boat cash income of small and medium boats more than doubled in 1997-98 to \$260 500 and \$276 200 respectively. This reflects the effect of higher prawn prices on the receipts of small and medium boats. By comparison, the estimated boat cash income of larger boats increased by 16 per cent to almost \$410 000 (table 13).

For the fleet as a whole, estimated boat business profit in 1997-98 rose, on average, by 90 per cent to \$256 300 (table 13).

## 15 Total employment on boats in the northern prawn fishery

	Total
1996-97	625 (2.2)
1997-98	637 (1.8)

a These estimates indicate the number of people normally employed on boats operating in the fishery and do not necessarily equate to full time equivalents.

Note: Figures in parentheses are relative standard errors.

## 16 Changes in receipts and crew costs

	Increase in receipts	Increase in crew costs
	%	%
Under 375 units	36	38
375-475 units	18	16
Over 475 units	8	5

Boat business profit more than doubled for both small and medium boats, while larger boats' profit increased by 20 per cent. This increase reflects higher estimated boat cash income driven by higher prawn prices.

Profit at full equity is estimated by adding leasing costs, interest charges and rent payments to estimated boat profit. While these costs affect the financial position of the individual operator in the fishery, from a broader perspective they represent profits that are redistributed to other investors in the fishery. Profit at full equity provides a measure of the return that would have been earned by the business unit had the boat and capital (including entitlements) been fully owned by the operator.

Estimated profit at full equity for the fleet averaged \$289 900 per boat in 1997-98, considerably higher than that estimated for 1996-97 (table 13). The higher estimated performance across the sectors reflects the trends in average estimated boat profit, with all sectors experiencing improvements in estimated profit at full equity.

### Rates of return

The rate of return to boat capital is calculated on total capital (excluding the value of licences) as if all assets were wholly owned by the proprietors so that the financial performance of all sample boats can be compared regardless of the proprietors' equity in the business. The estimated rate of return to boat capital in the two survey years increased on average for the fleet from 17 per cent in 1996-97 to 27 per cent in 1997-98 (table 13).

The estimated rate of return at full equity includes the value of the statutory



fishing rights and licences. For the fleet as a whole, the estimated rate of return at full equity was estimated at 8 per cent in 1997-98 (table 13). This is an improvement on the last rate of return at full equity estimated for the fishery of 4 per cent for 1995-96 (Brown 1997).

### Debt and equity

Information on estimated debt and equity for boats surveyed is shown in table 17. The average level of debt across the fishery fell in 1997-98 by an estimated 4 per cent to just under \$416 000 per boat (table 17). Around 54 per cent of boat debt was designated as being used for licence and endorsement purchase, 32 per cent for working capital and 13 per cent for boat purchase.

## 17 Debt and equity of boats in the northern prawn fishery in 1997-98

Average per boat

	All boats	
Capital (incl. quota and licences) at 30 June a	\$ 3 319 080	(4)
Boat business debt at 1 July b	\$ 431 060	(33)
Boat business debt at 30 June b	\$ 415 950	(31)
Change in debt over year b	\$ -15 110	(235)
Boat business equity at 30 June a	\$ 2 903 130	(6)
Boat business equity ratio at 30 June a	% 87	(4)

a Average per boat responding on debt. b Average per responding boat.

Note: Figures in parentheses are relative standard errors.

The debt servicing ratio is the proportion of total receipts needed to make interest payments on the debt. The average debt servicing ratio in 1997-98 for the fleet was 2.4 per cent (table 13). The boat business equity ratio provides a measure of the financial ownership of a fishing enterprise. The average boat business equity ratio of the northern prawn fishery fleet was 87 per cent in 1997-98 (table 17). This compares with a debt equity ratio in 1995-96 of 88 per cent (Brown 1997).

## Economic performance of boats

To provide an indication of the economic performance of the northern prawn fish-

ery, the net returns to the fishery have been estimated (see Rose and Stubbs 2000 for details) and presented in table 18. The net returns to the fishery measure includes only the receipts and costs that are attributable to the northern prawn fishery. As a result, the estimated receipts and costs in table 18 will differ from those in table 13 which include all receipts and costs for boats operating in the fishery, including those incurred while fishing in other fisheries such as the Torres Strait prawn, Kimberley and Queensland east coast prawn fisheries. As a point of comparison with the per boat figures in table 13, average costs and earnings for northern prawn activities per boat are indicated in table 19.

As can be seen from table 18, estimated net returns for the northern prawn fishery rose from around \$14 million in 1996-97 to nearly \$30 million in 1997-98. These measures should be interpreted in the light of a number of factors such as changes in fish stocks and capital stocks (see Rose and Stubbs 2000 for details).

Prices for northern prawn products varied from 1996-97 to 1997-98, with estimated prices for tiger and endeavour prawns rising and those for banana and king prawns falling (figure J). The overall effect of the changes in prices for all northern prawn species in 1997-98 was a rise in per unit production values in the fishery.

## 18 Estimated economic performance of the northern prawn fishery

Total for fishery

	1996-97	1997-98
	\$	\$
Receipts a	119 407 090 (3)	143 623 400 (2)
Costs a	93 147 920 (3)	100 610 940 (2)
Replacement value of capital	62 205 660 (7)	66 170 660 (6)
Net returns excluding management	14 922 200 (19)	30 925 680 (7)
Management costs b	985 058 na	1 020 804 na
Net returns c	13 937 142 (19)	29 904 876 (7)

a Amount attributable to the fishery. b Costs to AFMA of managing the fishery (Source: Andrew Kettle, AFMA, personal communication, 13 December 1999). c Calculated as per the definition in this report.

## 19 Estimated financial performance of the northern prawn fishery

Average per boat

	1996-97	1997-98
	\$	\$
Total cash receipts <b>a</b>	951 910 (3)	1 117 100 (2)
Total cash costs <b>b</b>	762 510 (3)	806 440 (2)
Boat cash income <b>c</b>	189 400 (10)	310 660 (5)
Boat business profit <b>c</b>	134 840 (15)	255 570 (6)
Profit at full equity <b>c</b>	169 910 (12)	289 050 (5)

**a** Fishing receipts from the northern prawn fishery.

**b** Average total cash costs per boat weighted by proportion of time spent in the northern prawn fishery. **c** Amount attributable to the fishery.

Together with an increase in the volume of product landed (table 14), this is estimated to have resulted in an increase in receipts of \$24 million and explains, to a

large degree, the increase in estimated net returns for the fishery over the period.

The replacement value of capital invested in the fishery increased from an estimated \$62 million in 1996-97 to \$66 million in 1997-98. This increase may reflect a number of factors such as the upgrading of equipment.

While there is no firm evidence of recruitment overfishing in the banana prawn fishery, concerns have been raised over the status of the tiger prawn fishery which, while highly valuable, has been assessed by the NPFAG as biologically overfished. It is possible that the net returns estimated for the fishery include some return from the liquidation of part of the tiger prawn stock. If this is the case, the estimates of net return provided in table 18 are unlikely to be sustainable and will overestimate resource rent.

# Torres Strait prawn fishery

## Survey results

*Following high prawn catches and higher per unit prices for prawns in 1997-98, total receipts increased by an estimated 28 per cent to \$661 200 per boat.*

*Estimated costs increased for the fleet by around 10 per cent in 1997-98. The greatest cost increase came from crew costs, although repairs and maintenance are also estimated to have increased substantially per boat.*

*The average rate of return to full equity across the fleet in 1997-98 is estimated to have been 9 per cent.*

*The average estimated level of debt across the fishery in 1997-98 rose in comparison with earlier surveys. The boat business equity ratio in 1997-98 is estimated to have been 84 per cent, an improvement from the last survey estimate for 1995-96 of 81 per cent.*

*Net returns to the fishery in 1997-98 are estimated to have been \$3 million. It appears that these returns are sustainable.*

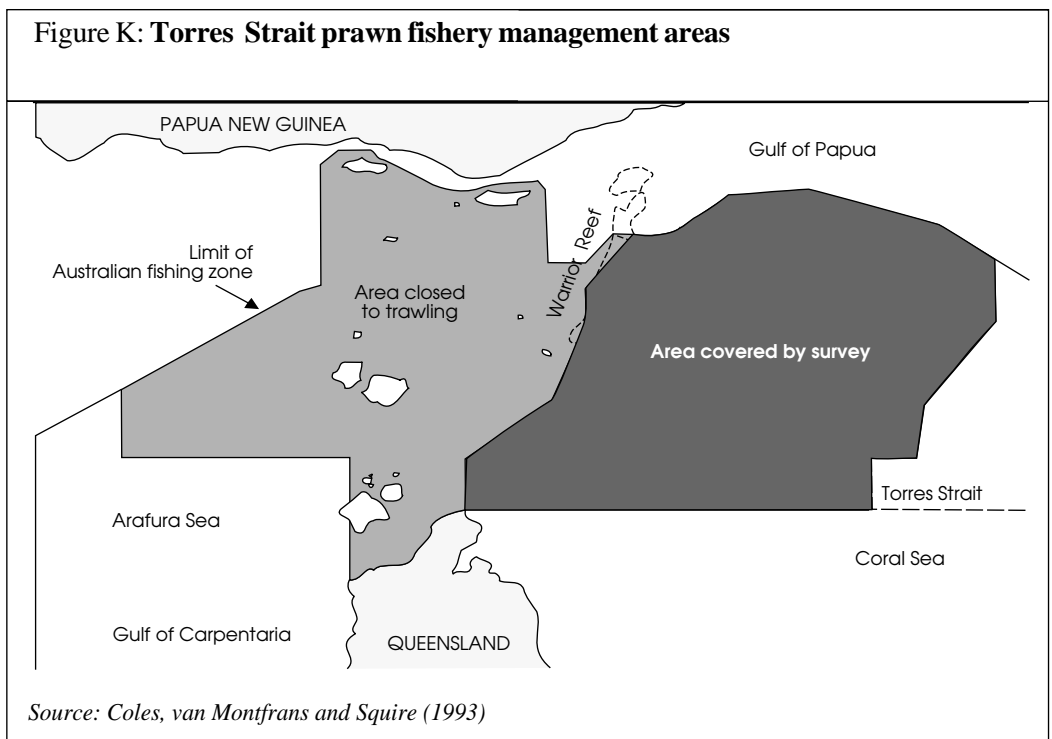
### The fishery

The Torres Strait prawn fishery is located between the tip of the Cape York Peninsula to the south coast of Papua New Guinea and bordered in the west by the Arafura Sea and the Coral Sea to the east. The main prawn fishing ground in the Torres Strait is east of the Warrior Reef complex, with a focus around Yorke Island, which is the main anchorage for the fleet (figure K).

Operators in the fishery target tiger and endeavour prawns. Endeavour prawns have comprised 30–65 per cent of the total catch of the fishery since 1980, and tiger prawns 30–61 per cent. The remaining 1–4 per cent is mostly made up of red spot king prawns (Caton, McLoughlin and Staples 1998).

The real gross value of production from the Torres Strait prawn fishery has increased from around \$10 million in 1989-90 to almost \$27 million in 1998-99 (figure L), with substantial increases since 1996-97 reflecting rising real prices for each of the major species (figure M) and increases in aggregate catch, although catches of each species have varied (figure N).

Fishing in the Torres Strait prawn fishery is carried out at night using otter trawls up to 20 metres long and averaging 15 metres (Caton et al. 1998). Few vessels fish exclusively in the Torres Strait and most move between the Queensland east coast prawn fishery and the northern prawn fishery. The fishing season in the Torres Strait prawn fishery is from March to December. The use of financial years (July–June) for reporting revenue and cost information results in the figures contained in this report not being directly comparable with a fishing season. For



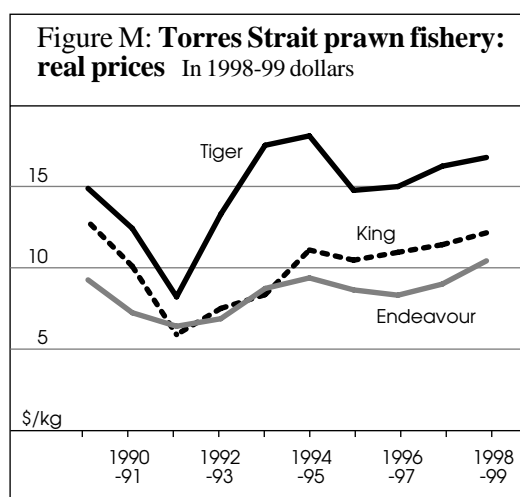
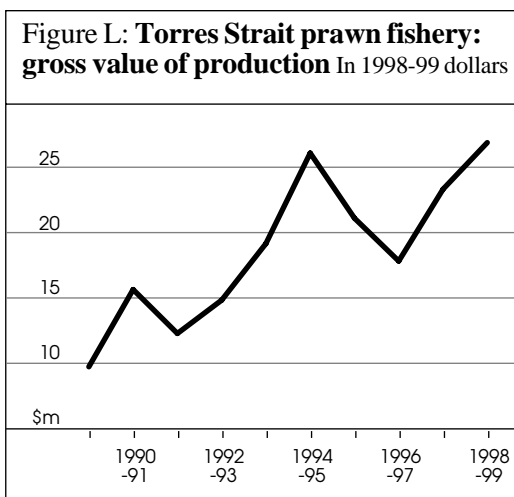
example, the March–June period of the 1997 fishing season is included in the 1996–97 financial year with the July–December period of the 1996 season.

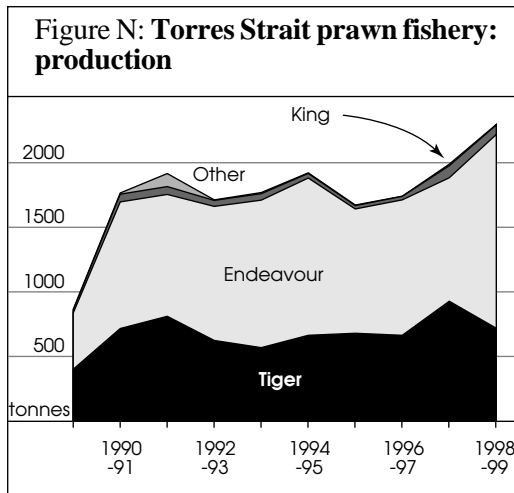
### Management of the fishery

Management of the Torres Strait prawn fishery as a separate fishery from the northern prawn fishery and Queensland east coast otter trawl fishery occurred

when the Torres Strait Treaty was ratified in 1985. At the time of ratifying the treaty about 500 vessels had obtained a licence to operate in the Torres Strait prawn fishery.

The Protected Zone Joint Authority is responsible for monitoring the condition of the Torres Strait prawn fishery and for formulating policies and plans for its management. The authority is comprised of the Commonwealth and Queensland





ministers responsible for fisheries. The fishery is managed under the provisions of the *Commonwealth Torres Strait Fisheries Act 1984*. Management, licensing, enforcement and research activities are carried out on behalf of the authority by the Australian Fisheries Management Authority, the Queensland Fisheries Management Authority, the Queensland Boating and Fisheries Patrol and the Queensland Department of Primary Industries.

The major objectives of management in the Torres Strait are to conserve the prawn stocks while allowing their optimum use and maximising opportunities for traditional inhabitants to participate in the fishery. In 1987, among other restrictions, limited entry management of the prawn fishery was introduced to reduce latent effort and to prepare for the catch sharing provisions of the treaty.

This management arrangement effectively reduced the number of vessels holding a licence to operate in the Torres Strait prawn fishery to 150. In addition, a boat replacement policy was proposed but this was rejected. In 1989 a freeze on the transfer of licences instead of a boat replacement policy was implemented and by June 1992 around 110 vessels were licensed to operate in the fishery.

In 1993 interim management provisions were introduced in an attempt to cap effort by allocating each vessel a number of fishing days in which it may operate in

the Torres Strait prawn fishery. This allocation was based on the greatest number of days the vessel fished in the strait in a financial year over the period 1988-89 to 1991-92, with an additional allocation for nonfishing time and breakdowns.

In 1994 the interim management provisions were approved under which fishing access (in blocks) was made transferable across operators in the fishery. Under these arrangements, operators selling fishing access are prevented from operating in the fishery in the next year.

Together with these controls, restrictions apply on sizes of boat and gear used in the fishery. Seasonal and area closures of the prawn fishery are an important management tool, keeping sensitive areas free from trawling and allowing protection for areas at important times — such as during recruitment of small prawns to the fishery. In particular, the Torres Strait prawn fishery is closed between 1 December and 1 March each year.

By February 1999 the fleet comprised 82 licensed vessels assigned 13 570 fishing days (Jackson, Gaffney and Turnbull 1999). All vessels are currently required to hold Queensland east coast prawn endorsements and 17 vessels also held entitlements to fish in the northern prawn fishery (Jackson et al. 1999).

In 1996 the Protected Zone Joint Authority agreed that the cost of managing the prawn fishery should be recovered from operators in the fishery. Cost recovery commenced on 1 July 1997 and is being phased in over three years at 40 per cent, 70 per cent and 100 per cent respectively.

## Biological status of the fishery

Biological overfishing has not been considered a threat in the Torres Strait prawn fishery under the existing management arrangements. While 1998-99 catches for tiger, endeavour and red spot king prawns were 676 tonnes, 1428 tonnes and 70 tonnes respectively (ABARE 2000), the estimated total sustainable yields for the fishery range between 1370 and 2850 tonnes. These estimates are considered to

be realistic given the variability and uncertainty in stock size and cover the range of historical catches (Caton et al. 1998).

Additionally, estimates of optimal effort required to fish the prawns in the Torres Strait vary between 8400 and 12 600 boat days. The suggestion is that, based on actual catch and effort data and that the fleet could expand fishing effort to the maximum effort quota of 13 570 days, the fishery is fully fished (Caton et al. 1998).

## Boats surveyed

To obtain coverage over the entire fishery, the population was defined as any boat endorsed to fish the Torres Strait prawn fishery that fished within the survey years. This is a departure from previous ABARE surveys in which the population was defined as boats that were endorsed to fish the Torres Strait prawn fishery, but not those endorsed to fish both the Torres Strait prawn and northern prawn fisheries.

This means that the survey population in 1996-97 and 1997-98 for the Torres Strait prawn fishery is more extensive than for previous surveys. Estimates of receipts, costs and value of capital for the fishing population thus changed substantially, affecting profitability as well as rates of return. Any comparisons between the results of the current surveys and previous surveys should be treated with caution.

Based on logbook data, there were 80 active trawl vessels operating in the Torres Strait prawn fishery in 1996-97 and 83 active in 1997-98. Of these vessels, 21 boats were sampled for 1996-97 and 26 for 1997-98. Because of the size of the fishery, it was not possible to group Torres Strait prawn operators into subgroups.

## Financial performance of boats

The principal measures of financial performance obtained from survey results are presented in table 20, while table 21 contains information on the performance of Torres Strait prawn boats triptiles. To calculate these triptiles, the population

was ranked according to fish sales and the third of the population with the lowest fish sales values comprised the lower or bottom triptile, the top or upper triptile the third of the population with the highest fish sales values. The weighted average costs and earnings for operators in each group were then calculated.

## 20 Estimated financial performance of boats in the Torres Strait prawn fishery

Average per boat

	1996-97	1997-98
<b>Receipts</b>		
Prawn receipts	\$ 493 990 (10)	617 960 (8)
Other fishing receipts	\$ 16 450 (24)	36 550 (25)
Nonfishing receipts	\$ 4 910 (56)	6 670 (41)
Total cash receipts	\$ 515 350 (10)	661 180 (8)
<b>Costs</b>		
Administration	\$ 12 630 (30)	13 240 (17)
Crew costs	\$ 198 450 (8)	231 860 (8)
Freight and marketing expenses	\$ 11 970 (18)	12 740 (13)
Fuel	\$ 79 170 (9)	76 760 (5)
Insurance	\$ 15 000 (12)	15 280 (7)
Interest paid	\$ 20 390 (40)	17 840 (24)
Leasing	\$ 5 060 (43)	2 050 (42)
Licence fees and levies	\$ 28 670 (49)	20 800 (14)
Packaging	\$ 5 260 (18)	6 670 (17)
Repairs and maintenance	\$ 72 240 (9)	96 770 (7)
Other costs	\$ 21 890 (21)	23 140 (10)
Total cash costs	\$ 470 730 (11)	517 150 (6)
<b>Boat cash income</b>	\$ 44 620 (41)	144 030 (19)
less depreciation	\$ 27 100 (22)	16 530 (29)
<b>Boat business profit</b>	\$ 17 520 (109)	127 500 (21)
plus interest, leasing and rent	\$ 25 690 (32)	20 800 (23)
<b>Profit at full equity</b>	\$ 43 210 (35)	148 300 (19)
<b>Capital</b>		
– excl. quota and licences	\$ 496 280 (14)	498 560 (9)
– incl. quota and licences	\$ na	1 717 130 (13)
<b>Rate of return to boat capital b</b>	% 9 (34)	30 (14)
<b>Rate of return to full equity c</b>	% na	9 (13)

a Depreciation adjusted for profit or loss on capital items sold. b Profit at full equity expressed as a percentage of capital excluding value of quota and licences. c Profit at full equity expressed as a percentage of capital including value of quota and licences. p Preliminary na Not available. Note: Figures in parentheses are relative standard errors.

## 21 Estimated financial performance of boats in the Torres Strait prawn fishery, by triptile

Average per boat

Triptiles based on prawns sold

	Lower third			Middle third			Upper third		
	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98	1996-97	1997-98	
<b>Receipts</b>									
Prawn receipts	\$ 326 060 (18)	352 630 (8)	442 500 (10)	666 140 (10)	695 570 (6)	835 830 (5)			
Other fishing receipts	\$ 10 200 (19)	24 240 (41)	16 100 (39)	8 420 (17)	11 750 (28)	64 800 (30)			
Nonfishing receipts	\$ 10 na	3 920 (56)	400 (74)	1 330 (77)	13 280 (52)	15 680 (50)			
Total cash receipts	\$ 336 270 (18)	380 790 (8)	459 000 (9)	675 890 (10)	720 600 (5)	916 310 (5)			
<b>Costs</b>									
Administration	\$ 9 190 (8)	11 640 (23)	6 310 (19)	8 930 (10)	21 400 (40)	19 940 (25)			
Crew costs	\$ 153 870 (16)	167 640 (10)	176 420 (4)	254 510 (14)	256 940 (9)	267 340 (5)			
Freight and marketing expenses	\$ 13 710 (26)	11 880 (16)	14 230 (20)	13 030 (26)	8 370 (42)	13 230 (24)			
Fuel	\$ 61 810 (17)	56 270 (11)	67 310 (12)	77 170 (7)	104 990 (8)	96 190 (5)			
Insurance	\$ 10 470 (18)	12 020 (10)	12 680 (7)	17 030 (12)	21 020 (9)	16 350 (9)			
Interest paid	\$ 11 570 (114)	9 870 (36)	16 740 (42)	20 650 (20)	31 310 (59)	22 240 (50)			
Leasing	\$ 8 480 (79)	2 270 (87)	850 (148)	540 (80)	6 040 (40)	3 630 (55)			
Licence fees and levies	\$ 7 010 (24)	9 260 (23)	8 560 (33)	17 500 (24)	65 790 (42)	35 970 (12)			
Packaging	\$ 4 620 (29)	4 060 (28)	5 610 (33)	7 340 (22)	5 480 (44)	8 400 (33)			
Repairs and maintenance	\$ 46 640 (8)	67 270 (6)	76 240 (14)	100 680 (13)	90 420 (10)	120 800 (8)			
Other costs	\$ 11 070 (28)	22 340 (17)	19 830 (18)	18 190 (7)	33 030 (21)	29 800 (19)			
Total cash costs	\$ 338 470 (8)	374 520 (8)	404 790 (7)	535 570 (10)	644 800 (10)	633 870 (5)			
<b>Boat cash income</b>	\$ -2 200(1 490)	6 270 (159)	54 200 (64)	140 320 (17)	75 800 (49)	282 440 (13)			
less depreciation a	\$ 16 050 (24)	6 930 (77)	20 120 (17)	28 770 (9)	42 990 (24)	11 290 (124)			
<b>Boat business profit</b>	\$ -18 250 (159)	- 660(1 544)	34 080 (97)	111 550 (21)	32 810 (139)	271 150 (14)			
plus interest, leasing and rent	\$ 20 390 (33)	12 530 (25)	17 590 (45)	21 580 (19)	37 720 (54)	27 890 (46)			
<b>Profit at full equity</b>	\$ 2 140(1 066)	11 870 (101)	51 680 (57)	133 130 (15)	70 530 (41)	299 040 (15)			
<b>Capital</b>									
- excl. quota and licences	\$ 282 590 (26)	235 600 (18)	464 290 (22)	553 600 (10)	708 600 (14)	688 760 (6)			
- incl. quota and licences	\$ na	759 240 (14)	na	1 925 470 (15)	na	2 400 630 (6)			
<b>Rate of return to boat capital b</b>	% 1(1 041)	5 (88)	11 (46)	24 (15)	10 (49)	43 (15)			
<b>Rate of return to full equity c</b>	% na	2 (108)	na	7 (12)	na	12 (17)			

a Depreciation adjusted for profit and loss on capital items sold. b Excluding value of quota or licence. c Including value of quota or licence. na Not available.  
 Note: Figures in parentheses are relative standard errors. Composition of boats in triptiles may change from year to year due to variation in sales.

## 22 Estimated quantity of prawns sold by boats in the Torres Strait prawn fishery

Average per boat

	1996-97	1997-98
	kg	kg
<b>All boats</b>		
Tiger prawns	18 170 (17)	20 360 (8)
Banana prawns	2 160 (51)	4 330 (35)
Endeavour prawns	17 730 (10)	19 680 (6)
King prawns	830 (27)	2 160 (27)
Other prawns	1 630 (77)	1 230 (46)
<b>Total</b>	<b>40 520 (10)</b>	<b>47 760 (7)</b>

Note: Figures in parentheses are relative standard errors.

It is important to note that the figures shown in tables 20 and 21 include costs and earnings from other fisheries such as the northern prawn, Kimberley and Queensland east coast prawn fisheries. The estimated quantity of catch sold is shown in table 22.

### Receipts

The estimated quantity of prawn sales of nearly 48 tonnes per boat in 1997-98 was 18 per cent higher than the estimate for 1996-97 (under 41 tonnes) (table 22). This follows higher overall prawn catches in the Torres Strait in 1997-98, with overall catches at their highest point of the 1990s. This increase in average prawn catches was accompanied by slightly higher per unit prices for key prawn species, particularly tiger, endeavour and king prawns in 1997-98. The effect was an increase in the estimated average total prawn receipts to almost \$618 000 in 1997-98, up 25 per cent from the previous year (table 20).

Average overall cash receipts (including nonprawn and nonfishing receipts) for Torres Strait prawn boats are estimated to have increased by around 28 per cent in 1997-98 to \$661 200 per boat. While this increase was mostly the result of higher prawn receipts, there were also estimated increases in nonprawn fishing receipts and nonfishing receipts for the fleet overall.

As might be expected, cash receipts for boats in the fleet increased with the size of operation. Thus, operators with total prawn catches in the lower triptile are

## 23 Total employment on boats in the Torres Strait prawn fishery<sup>a</sup>

	Total
1996-97	266 (3.6)
1997-98	272 (3.1)

<sup>a</sup> These estimates indicate the number of people normally employed on boats operating in the fishery and do not necessarily equate to full time equivalents.

Note: Figures in parentheses are relative standard errors.

estimated to have earned the lowest prawn receipts and operators with total prawn catches in the upper triptile the highest (table 21). Interestingly, operators in the lower triptile were estimated to have earned higher nonprawn fishing receipts per boat than operators in the middle triptile, although operators in the upper triptile still had the highest average nonprawn receipts overall.

### Costs

Total estimated costs per boat for the Torres Strait prawn fishery increased in 1997-98 by around 10 per cent to \$517 200, although these were more than offset by higher fishing receipts. The greatest single increase in costs arose from crew costs, which rose by an estimated 17 per cent in 1997-98 to an average \$231 900 per boat. Over the two years, the estimated number of people employed on boats in the fishery remained relatively stable, with around 270 people estimated to have worked on boats operating in the fishery in 1996-97 and 1997-98 (table 23).

In addition to crew costs, costs related to repairs and maintenance increased by around a third in 1997-98, raising total costs by around \$25 000 per boat. Administration, freight, insurance, packaging and other costs were also estimated to have risen in 1997-98. However, per boat costs for fuel, interest paid, leasing and licence fees are estimated to have fallen over the same period (despite an increase in levies following the introduction of new cost recovery fees during the period).

As might be expected, estimated total cash costs were lowest for operators with total catches in the lower triptile, at \$374 500 per boat, and highest for operators with total catches in the upper



triptile, at \$633 900 per boat, in 1997-98 (table 21).

### **Boat cash income and profit**

Average boat income in 1997-98 was estimated at \$144 000, up threefold from the preceding year. This increase in boat cash income reflected higher catches and higher per unit prawn prices, offsetting slightly higher fishing costs.

Boat profit allows for the depreciation of capital to provide a measure of return to the operator. Boat profit in 1997-98 was estimated at \$127 500 per boat, a significant increase from 1996-97, following higher boat receipts.

The operational performance of boat businesses involved in the fishery can be measured by profit at full equity. This is estimated by adding leasing costs, interest charges and rent payments back into boat profit. While these costs affect the financial position of the individual fishing business, from a broader perspective they represent profits that are redistributed to other investors in the fishery.

Profit at full equity provides a measure of the return that would have been earned by the business unit had the boat and capital (including licences) been fully owned by the operator. As such, this measure provides a common basis for comparison of the operation performance of all the boats involved in the fishery.

Profit at full equity for vessels involved in the Torres Strait prawn fishery was an estimated \$148 300 in 1997-98, a threefold increase from the previous year.

### **Rates of return**

The rate of return to boat capital is calculated on total capital (excluding the value of licences) as if all assets were wholly owned by the proprietors so that the financial performance of all sample boats can be compared regardless of the proprietors' equity in the business.

The estimated rate of return to boat capital for boats involved in the Torres Strait prawn fishery was 30 per cent in 1997-98 (table 20). This is high in comparison with both the previous year and with previous surveys. The high estimated rate of return in 1997-98 reflects the relatively

high prawn prices and, in particular, the high prawn landings in the Torres Strait in that year. Rates of return to capital were highest per boat for large operators in the fishery (estimated at around 43 per cent) and lowest for small operators at 5 per cent in 1997-98 (table 21).

The rate of return to full equity is calculated by expressing profit at full equity as a percentage of total capital (including licence values). This gives proprietors interested in investing in a new boat and/or licences a measure of the economic performance of a business involved in the Torres Strait prawn fishery. The rate of return to full equity in 1997-98 was estimated to be around 9 per cent.

### **Debt and equity**

Average boat debt for boats operating in the Torres Strait prawn fishery in 1997-98 is estimated to have risen from an opening balance of \$196 000 to a closing balance of \$252 100 (table 24). Around 57 per cent of the debt is estimated to have been incurred for the purchase of fishing endorsements and 30 per cent for boat purchases.

Boat business equity provides a measure of the financial ownership of a fishing enterprise. Following a trend in improved boat business equity, the average equity ratio for vessels involved in the Torres Strait prawn fishery in 1997-98 was an estimated 84 per cent. This is an improvement on previous Torres Strait prawn fishery surveys, when the boat

## **24 Debt and equity of boats in the Torres Strait prawn fishery in 1997-98** Average per boat

	All boats	
Capital (incl. quota and licences) at 30 June a	\$	1 620 520 (16)
Boat business debt at 1 July b	\$	196 020 (25)
Boat business debt at 30 June b	\$	252 080 (35)
Change in debt over year b	\$	56 060 (99)
Boat business equity at 30 June a	\$	1 368 440 (17)
Boat business equity ratio at 30 June a	%	84 (5)

a Average per boat responding on debt. b Average per responding boat.

Note: Figures in parentheses are relative standard errors.

## 25 Estimated economic performance of the Torres Strait prawn fishery

Total for fishery

	1996-97	1997-98
	\$	\$
Receipts a	23 238 420 (12)	25 971 950 (8)
Costs a	20 270 510 (11)	21 182 770 (8)
Depreciated replacement value of capital	8 903 700 (10)	8 149 770 (8)
Net returns excluding management	1 270 020 (68)	3 254 750 (23)
Management costs b	na na	229 402 na
Net returns c	na na	3 025 348 (23)

a Amount attributable to the fishery. b Combined management costs for AFMA, QFMA and surveillance (source: Tony Kingston, AFMA, personal communication, 31 January 2000). c Calculated as per the definition in this report.

business equity ratio was estimated at 81 per cent (1995-96) and 74 per cent (1993-94) (Brown 1997).

## Economic performance of boats

To provide an indication of the economic performance of the Torres Strait prawn fishery, the net returns to the fishery have been estimated (see appendix A for details) and are presented in table 25. The net returns to the fishery measure includes only those receipts and costs that are attributable to the Torres Strait prawn fishery. As a result, the estimated receipts and costs in table 25 will differ from those in table 20 which include all receipts and costs incurred by boats operating in the fishery, including those incurred while fishing in other fisheries such as the northern prawn, Kimberley and Queensland east coast prawn fisheries.

As a point of comparison with the per boat figures in table 20, average costs and earnings for Torres Strait prawn activities per boat are indicated in table 26.

As can be seen from table 25, net returns to the Torres Strait prawn fishery

## 26 Estimated financial performance of the Torres Strait prawn fishery

Average per boat

	1996-97	1997-98
	\$	\$
Total cash receipts a	349 300 (10)	400 280 (8)
Total cash costs b	319 060 (11)	313 080 (6)
Boat cash income c	30 240 (41)	87 200 (19)
Boat business profit c	11 880 (109)	77 190 (21)
Profit at full equity c	29 290 (35)	89 780 (19)

a Fishing receipts from the Torres Strait prawn fishery. b Average total cash costs per boat weighted by proportion of time spent in the Torres Strait prawn fishery. c Amount attributable to the fishery.

are estimated to have been around \$3 million in 1997-98. It was not possible to estimate net returns to the fishery in the previous year because of a lack of information on the cost of managing the fishery. However, it can be seen from table 25 that estimated net returns to the fishery before management costs are deducted rose from \$1.3 million in 1996-97 to \$3.3 million in 1997-98.

The interpretation of the net returns measure should be considered in the light of a variety of factors such as changes in fish stocks and capital stocks (see Rose and Stubbs 2000 for details). The increase in estimated net returns in the fishery occurred against a background of rising per unit prices for prawns and relatively high landings (figures M and N). In addition, the value of capital investment in the fishery was relatively static — there was less than a 1 per cent increase in the value of capital employed.

While the fishery is considered to be fully exploited, it is not currently considered to be in danger of being overfished. It appears that, provided other factors in the fishery are efficiently managed (for example, stock and overall effort), the net returns earned in the fishery could be sustained.

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# Appendix A

## Survey methods and definitions

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### Collecting survey data

ABARE surveys are designed and the samples selected on the basis of information supplied by AFMA. Information on catch, effort and boat characteristics for Commonwealth fisheries is obtained from AFMA.

Because it is not possible to survey all the boats in a fishery, a sample of boats are selected based on their 'representativeness' of the fleet. Where possible, boats are classified into subgroups according to the type of fishing method that they use (for instance, longline boats, purse seine boats, trawlers, etc) or according to the size of their operations (say, big producers, medium size producers and small producers). A number of representative boats from each subgroup is then targeted for survey.

The owners of the sample boats targeted for survey are contacted by ABARE and face to face interviews are conducted. Interviewers ask for information on the physical and financial details of the fishing business. In a number of instances, the skipper of the boat may also be interviewed.

In general, information is collected for the preceding two financial years and major Commonwealth fisheries are surveyed every two years.

### Definitions of key variables

*Cash receipts* are the financial inflows to the boat during the year from the sale of fish, nonfishing activities including charter operations, and other sources (insurance claims and compensation, quota or endorsements leased out, government assistance and any other revenue).

For the majority of operators, this information is readily available from their own records. However, different operators record their fishing income in different ways. In some cases, such as where fish are sold through a cooperative, some operators may only record the payments received from the cooperative. These payments may be net of commissions and freight as well as net of other purchases made through the cooperative.

In other cases, the crew is paid directly for the catch by the cooperative or agency and the owner's financial records might include only the amount of revenues they received after the crew's share had been deducted.

For these reasons, operators are asked to provide a breakdown of the total catch of their boat and an estimate of the total value of that catch. For consistency, marketing charges may need to be added back into fishing receipts for some boats to give a gross value. Where this is necessary these selling costs are also added into the cost estimates to offset the new revenue figure. Receipts also include amounts received in the survey year for fish sold in previous years.

*Cash costs* include the payments made for both permanent and casual hired labor and payments for materials and services (including payments on capital items subject to leasing, rent, interest, licence fees and repairs and maintenance). Capital and household expenditures are excluded.

*Labor costs* are usually the highest cash cost in the fishing operation. Labor costs include wages, salaries and an imputed value for owner, family and unpaid labor. Labor costs cover the cost of labor involved in boat related aspects of the fishing business, such as crew or onshore

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administration costs, but do not cover the cost of onshore labor involved in processing the fisheries products.

On many boats, the costs of labor activities are reflected in the wages paid by boat owners and/or in the share of the catch they earn. In some cases, however, such as where owner skippers are involved, or where friends and family work in the fishing operation, the payments made do not always reflect the market value of the labor provided.

In previous surveys, values were imputed for any unpaid labor based on estimates made at the time of the interview of the amount it would cost to employ someone else to do the work. In the current surveys, this imputation has been extended to all owner and family labor.

The impact of the change in method for imputing labor values depends on the extent to which fishing operations rely on unpaid and family labor. Where fishing operations rely only on nonfamily labor, there would be no impact on estimated labor costs. These labor arrangements are most commonly found in fisheries where corporate bodies dominate the fleet, such as the northern prawn fishery.

Equally, there should be little impact on the estimated value of labor where any owner or family labor is paid at rates similar to those paid for similar labor on other boats.

**Boat cash income** is the difference between total cash receipts and total cash costs.

**Depreciation** costs have been estimated using the diminishing value method based on the current replacement cost and age of each item. The rates applied are the standard rates allowed by the Commissioner of Taxation. For items purchased or sold during the survey year, depreciation is assessed as if the transaction had taken place at the midpoint of the year. This method of calculating depreciation is also used in other ABARE industry surveys.

A comparison with the method used to calculate depreciation in ABARE fish surveys prior to 1995 is contained in ABARE (1996a).

**Boat business profit** is boat cash income less depreciation.

**Profit at full equity** is boat profit, plus rent, interest and lease payments.

**Capital** is the value placed on the assets employed by the surveyed boat business. It includes the value of the boat, hull, engine and other onboard equipment (including gear). Estimates are also reported of the value of quotas and endorsements held by the surveyed boat. Estimates of the value of capital are based on the market value of capital and are usually obtained at interview but in some cases quota and endorsement values are obtained from industry sources.

**Depreciated replacement** value is the depreciated capital value based on the current age and replacement values of boat and gear. The value of quota and endorsements held is not included in the estimate.

**Rate of return to boat capital** is calculated as if all fishing assets were wholly owned by the proprietors so that the financial performance of sample boats can be compared, regardless of the proprietor's equity in the business. Rate of return to boat capital is computed by expressing profit at full equity as a percentage of total capital (excluding quota and licence value).

**Rate of return to full equity** is computed by expressing profit at full equity as a percentage of total capital (including quota and licence value).

**Debt** information was collected at interview. Change in debt over the year is calculated as the difference between debt at 1 July and the following 30 June.

**Boat business equity** is derived by deducting the boat business debt from the value of capital employed in, and owned by, the fishing business.

**The equity ratio** is boat business equity expressed as a percentage of capital employed in the fishing business. The debt and equity figures shown are averages for boats for which information on debt was available.

**Net returns to the fishery** are estimated as the gross revenue earned in a single fishery, less an estimate of the fishing costs

incurred in that fishery, less the full annualised cost of capital.

### *Apportioning boat receipts and costs among fisheries*

Many boats operate in more than one fishery during the course of a year. To provide estimates of the economic returns from an individual fishery, it is necessary to apportion boat receipts and costs among the fisheries.

Apportioning fishing receipts to particular fisheries is generally straightforward as information on sales by major species can generally be used to calculate the receipts associated with a fishery. Calculating the costs of a fishing operation that are attributable to a fishery can be more difficult. Costs have been apportioned to a fishery based on the proportion of total fishing revenue associated with that fishery.

The net return to the fishery is defined as:

Net returns to the fishery

$$= \sum_{i=1}^n R_i - \sum_{i=1}^n p_i (OC_i - (d_i + r)K_i) - M$$

where

$R_i$  = total cash receipts attributable to the fishery, excluding any receipts from leasing or sales of licences or quota for boat  $i$

$p_i$  = proportion of total fishing receipts attributable to the fishery for boat  $i$

$OC_i$  = total cash costs less interest paid on debt less expenditure on leasing or purchase of licences or quota for boat  $i$

$K_i$  = value of capital associated with boat  $i$  (depreciated replacement value)

$d_i$  = depreciation rate for boat  $i$  (depreciation less capital appreciation associated with boat  $i$  divided by  $K_i$ )

$r$  = real interest rate (assumed at 7 per cent for calculations in this report)

$M$  = costs of managing the fishery

$n$  = number of boats operating in the fishery.

## Sample weighting

Because the sample sizes for each sector of a fishery are not necessarily proportional to the actual population sizes of the sector, the estimates presented in this report are all calculated by appropriately weighting the data collected from each sample boat. The sample weights are derived by comparing the total numbers of boats in the target populations and total catches from the annual logbook data collected from AFMA, with the corresponding numbers and catch details of the boats in the various survey samples (ABARE 1996b).

Different sample weights are used in the estimates for the different years because of differences in population numbers and outputs, as well as in sample numbers and outputs between years. Technical details of the method of weighting used are given in Bardsley and Chambers (1984).

### *Reliability of estimates*

Only a small proportion of the total number of boats in a particular fishery are sampled to produce the survey estimates. The differences between these estimates and the values that would have been obtained if information had been collected from all the boats (population or census values) are called sampling errors.

The more boats there are in the sample, the smaller the sampling error is likely to be. For example, boat group estimates are likely to have greater sampling errors than fisherywide estimates.

To indicate the reliability of the survey estimates sampling errors have been calculated. These 'relative standard errors', expressed as a percentage of the survey estimates are given next to each estimate in parentheses. In general, the smaller the relative standard error, the more reliable the estimate. Box 2 contains an example of the use of relative standard errors.

### *Comparing estimates*

When comparing estimates between years, or between different industries it is important to recognise that the differences are also subject to sampling error.

### Box 2: Use of relative standard errors

To obtain the standard error from the relative standard error, multiply the relative standard error by the survey estimate and divide by 100. If average total cash receipts are estimated to be \$690 000 with a relative standard error of 6 per cent, this yields a standard error of \$41 400.

There is roughly a two in three chance that a survey estimate is within one standard error of the value which would have been obtained had all boats in the target population been surveyed (the census value). There is roughly a nineteen in twenty chance that a survey estimate is within two standard errors of the census value.

Thus, in the above example, there is an approximately two in three chance that the census value is between \$648 600 and \$731 400 and an approximately nineteen in twenty chance that the census value lies between \$607 200 and \$772 800.

As a rough rule of thumb, a conservative estimate (an overestimate) of the standard error of the difference can be constructed by adding the squares of the estimated standard errors (not the relative standard errors) of the component estimates, and then taking the square root of the result.

For example, suppose that the average total cash receipts were estimated in one year to be \$100 000 and in the next year to be \$125 000 — a difference of \$25 000 — and that the relative standard errors are given as 6 and 8 per cent respectively. The standard error of the difference can be estimated as:

$$\sqrt{[(0.06 \times \$100\,000)^2 + (0.08 \times \$125\,000)^2]} \\ = \$11\,662.$$

Hence, the relative standard error of the difference is:

$$(\$11\,662 / \$25\,000) \times 100 = 47 \text{ per cent.}$$

When comparing estimates for change from year to year it should be noted that there may be changes in fishing industry populations from one year to the next. If these population changes are substantial, differences in estimates may be more due to changes in the population than to changes in the variables themselves.

There may also be differences in data quality between the two estimates being compared: final estimates are more reliable than preliminary estimates because the final data have been cross checked against a greater number of external data sources, lowering the probability of non sampling errors.

### *Non sampling errors*

The values obtained in a survey are affected by errors other than those related directly to the sampling procedure. For example it may not be possible to obtain information from certain types of boats, respondents may provide inaccurate information or the respondent may differ from nonrespondents in a variable being surveyed.

ABARE's experience in conducting surveys has resulted in procedure designs aimed at minimising non sampling errors. However, when drawing inferences from estimates derived from sample surveys, users of survey data should bear in mind that both sampling and non sampling errors do occur.

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