Australian

FISHERIES

Statistical report 1995

ABARE

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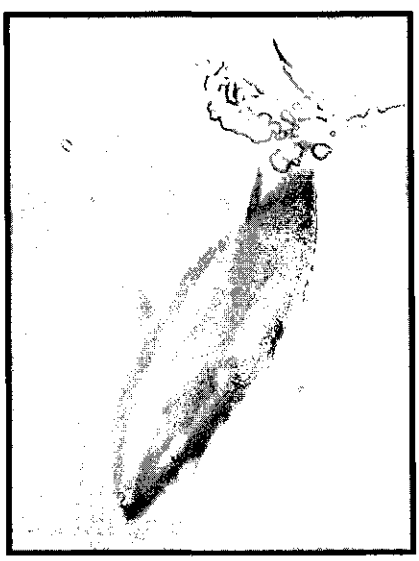
surveys report 1995



ABARE

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ABARE is a professionally independent government economic research agency.

Previous ABARE fisheries surveys

Northern prawn fishery

Years covered	*Reference*
1980-81 to 1981-82	BAE (1984a)
1986-87 to 1987-88	Collins and Kloessing (1989)
1989-90 to 1991-92	ABARE (1993)

East coast prawn fishery

Years covered	*Reference*
1980-81 to 1982-83	BAE (1985a)

East coast tuna fishery

Years covered	*Reference*
1989-90 to 1990-91	ABARE (1993a)
1991-92 to 1992-93	ABARE (1994b)

Southern rock lobster fishery

Years covered	*Reference*
1981-82 to 1982-83	BAE (1985b)

South east fishery

Years covered	*Reference*
1978-79 to 1980-81	BAE (1984b)
1985-86 to 1987-88	Geen, Brown and Pascoe (1989)
1989-90 to 1991-92	ABARE (1993)
1992-93 to 1993-94	ABARE (1994b)

Southern bluefin tuna fishery

Years covered	*Reference*
1980-81 to 1981-82	BAE (1986)

Southern shark fishery

Years covered	*Reference*
1988-89	Battaglene and Campbell (1991)
1990-91 to 1991-92	ABARE (1993)

Torres Strait prawn fishery

Years covered	*Reference*
1989-90	Battaglene, Reid and Collins (1992)

ABARE project 1123

Foreword

In 1992, ABARE commenced a new program of surveys designed to assess the financial and economic performance of a number of key Commonwealth fisheries. The results of these surveys are published annually in ABARE's *Fisheries Surveys Report* series. These data are used by ABARE's Fisheries Economics Section for specific research projects and by the Fisheries Policy Branch of the Department of Primary Industries and Energy to assess the Australian Fisheries Management Authority's performance in managing Commonwealth fisheries.

The information collected in the surveys can be used by industry and fisheries managers when assessing the effectiveness of alternative management policies in improving the economic performance of fisheries. The survey information can also be used to monitor management performance and assess the effectiveness of fisheries management in achieving the objectives set out in fisheries management plans.

Considerable attention has been given by biological research agencies to developing time series of catch and effort data for most fisheries. These data have become increasingly useful over time. In a similar fashion, the economic data from ABARE's surveys will increase in value as the series lengthen. For fisheries that are subject to frequent management changes, such as the south east fishery, it is important that the operators in the fishery are surveyed each year to ensure that a consistent set of time series data is collected.

This fisheries surveys report contains detailed estimates of the financial performance of operators in the fisheries surveyed by ABARE in 1995. Information is included on the southern shark and south east fisheries and the northern and Torres Strait prawn fisheries. The estimates are presented, as far as possible, in a consistent format to facilitate comparisons within and between industries.

Brian S. Fisher
Executive Director

January 1996

Acknowledgments

ABARE staff

The survey information presented in this report was a cooperative effort among industry, fisheries management and research agencies and ABARE staff. The report was compiled by Deborah Brown and Tony Battaglene of the Fisheries Economics Section and Laurie Cannon of the Surveys Section. The analyses were undertaken by Tony Battaglene, Deborah Brown, Peta Every and Craig Pollard of the Fisheries Economics Section.

Sample selection and sample weighting were performed with the assistance of Catherine Cook-Wass of the Statistical Analysis and Systems Development Section. Data were collected, entered and edited by Peter Beath, Lou Sissian, Carolyn Doyle, Ron Godenzi, Ian Milthorpe and Laurie Cannon of the Surveys Section and Tim Bull and Rebecca Standen of the Fisheries Economics Section. The survey questionnaire was designed by Laurie Cannon, Paul Phillips and Tony Battaglene.

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

Industry

ABARE relies heavily on the voluntary cooperation of fishing operators and their accountants in providing data for its fisheries surveys. Without this assistance the surveys would not be possible. The advice provided by industry representatives and the relevant Management Advisory Committees is also greatly appreciated.

Management and research agencies

The Australian Fisheries Management Authority provided logbook information necessary to select a sample and provide relevant population statistics. In particular, Thim Skousen, Trysh Stone and Mark Simpson provided valuable assistance. The Australian Fisheries Management Authority was supportive of the data collection and offered valuable advice.

Funding

The 1995 data collection on the southern shark and south east fisheries and the northern and Torres Strait prawn fisheries was funded by ABARE and the Fisheries Resources Research Fund.

Contents

Figures

Tables

Summary

In 1995, ABARE conducted economic surveys of four major Commonwealth fisheries — the southern shark, south east, northern prawn and Torres Strait prawn fisheries.

In the surveys, information was collected on costs and receipts from domestic operators in each of these fisheries for the 1993-94 financial year. For the southern shark, northern prawn and Torres Strait prawn fisheries, information relating to the 1992-93 financial year was also collected. Information relating to the 1992-93 financial year for the south east fishery was collected in a similar survey conducted in 1994.

For the south east, northern prawn and Torres Strait prawn fisheries, projections for 1994-95 were made of costs and receipts. These projections were based on logbook data of changes in catch and effort levels, and market data of changes in price levels. No projections were made for the southern shark fishery because logbook data for 1994-95 were not available.

South east fishery

In the south east fishery, catches of sixteen major species are allocated to operators through individual transferable quotas. Despite lower recorded catches, average cash receipts per boat were higher in 1993-94, reflecting substantial increases in prices for most species. Higher fuel costs and crew costs, in particular, resulted in higher total cash costs in 1993-94 than in 1992-93. However, average profit per boat is estimated to have been 86 per cent higher in 1993-94 than in 1992-93.

While recorded catches in the fishery declined further in 1994-95, higher average prices for most species sold on the domestic market plus a recovery in export prices for orange roughy and whiting are expected to have resulted in higher cash receipts on average.

Estimates of boat profit for the three sectors of the fishery — inshore trawlers, offshore trawlers and danish seiners — vary for 1994-95. While it is estimated that boat profit for the inshore sector more than doubled in 1994-95, lower catches for offshore sector boats are estimated to have lowered boat profits. For danish seiners the improvement in profitability achieved in 1993-94 is estimated to have continued in 1994-95, with boat profits in this sector estimated to have been 64 per cent higher on average in 1994-95.

Southern shark fishery

The southern shark fishery is managed under a limited entry scheme, with restrictions on the length of gillnet or number of hooks each operator can employ. There are four categories of unit holders in the fishery — operators with ten net units, operators with six net units, operators with five or less net units and hook operators.

Many operators in the southern shark fishery have endorsements to fish in other fisheries. Consequently, a major influence on the financial performance and level of activity of operators in the fishery is income from fishing operations in other fisheries. Generally, operators with ten units of net show a greater dependence on shark fishing than other operators.

On average, cash receipts for operators in the southern shark fishery were lower in 1993-94, because of a fall in catches of shark. While receipts from shark fishing fell, some operators were able to offset this decline through increased income from other fisheries. Consequently, operators with five or less net units or six net units had increased cash receipts in 1993-94.

For the fishery as a whole, on average, cash costs per boat remained constant in 1993-94. However, for operators with six net units or five or less net units, total cash costs

were higher, on average, while hook operators and operators with ten units of net experienced a fall in average cash costs per boat.

For many boats with six or five or less net units, receipts from lobster and other non-shark activities were the most significant contributors to fishing receipts. Profitability was generally lower for boats that did not have endorsements to operate in other fisheries.

Northern prawn fishery

In the northern prawn fishery, variability in environmental conditions and consequent variability in prawn stocks resulted in fluctuations in financial performance in recent years. Low monsoonal rainfall before the 1994 banana prawn season resulted in the lowest catch for twenty years. In contrast, there were large increases in catches of both banana and tiger prawns in 1994-95, with the banana prawn catch more than doubling.

Despite the fall in catches in 1993-94, cash receipts per boat were nearly 15 per cent higher than in 1992-93. This reflected the high prices of Australian prawns on major export markets. Higher catches of tiger prawns in the 1994 fishing season and banana prawns in the 1995 fishing season, on average, are expected to have resulted in higher cash receipts, boat cash incomes and profits in 1994-95.

Torres Strait prawn fishery

The prawn fishery is the most valuable sector of the Torres Strait fisheries, accounting for around half the value of production of all commercial fishing in this region. Prior to 1993, management of the fishery was focused on protecting juvenile prawn stocks through seasonal closures, area closures and gear restrictions. In 1993, in an attempt to reduce the amount of unused fishing capacity in the fishery, an allocation of fishing days per vessel was introduced, based on fishing effort in the previous four financial years. While the licence packages are transferable, the individual day allocations are not.

On average, the quantity of prawns sold per boat was 11 per cent lower in 1993-94 than in 1992-93. However, this was offset by high prices on export markets and, on average, cash receipts per boat were nearly 3 per cent higher in 1993-94. On average, there was little difference in total cash costs for the fishery between 1992-93 and 1993-94. Average boat cash income was 25 per cent higher in 1993-94 than in 1992-93. For 1994-95, it is estimated that the lower catches reduced average total cash receipts per boat by around 6 per cent compared with those in 1993-94.

ABARE fisheries surveys

In 1992, ABARE commenced a program of fisheries surveys to meet the requirements of industry and the Commonwealth government for detailed information about the economic structure, costs and returns in selected fisheries.

In 1995, surveys were undertaken of:

- the trawl component of the south east fishery
- the southern shark fishery
- the northern prawn fishery
- the Torres Strait prawn fishery.

The south east fishery was last surveyed in 1994, when information was collected for the 1992-93 financial year. The southern shark and northern prawn fisheries were last surveyed in 1993 and that survey covered the 1990-91 and 1991-92 financial years. The Torres Strait prawn fishery was previously surveyed by ABARE in 1991, covering the 1989-90 financial year.

The information collected in the latest survey contains data on each of these fisheries for the 1993-94 financial year. For the southern shark, northern prawn and Torres Strait prawn fisheries, information relating to the 1992-93 financial year was also collected.

A sample of boats in each fishery was selected based on logbook and boat registry information collected from all licensed fishing operations in Commonwealth fisheries, and supplied by the Australian Fisheries Management Authority. This information was used to select a representative sample of boats in each fishery, stratified by type of operation, boat size and catch.

Between February and June 1995, the owner of each boat selected in the sample was visited by an ABARE officer. The officer interviewed 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 was also interviewed. Further information was subsequently obtained from accountants, selling agents and marketing organisations, on the signed authority of the survey respondents.

For the Torres Strait and northern prawn and south east fisheries, recent market information and price indexes were used to estimate expected receipts and costs for 1994-95.

Considerable effort has been made to reconcile the information obtained from the various sources and to produce the most accurate description possible of the physical and financial characteristics of each sample boat in the survey. The data presented in this report constitute only a small proportion of the total amount of detailed data collected.

The survey estimates

These surveys provide a broad range of information on the physical characteristics and financial performance of boats that operated in these fisheries. The information gained is summarised in this report.

Projections for 1993-94 reported in the *Fisheries Survey Report 1994* have been replaced by estimates from the latest survey. The 1992-93 and 1993-94 estimates presented in this report are not expected to change as all the data from sampled operators, their accountants and marketing agents relating to these years have now been reconciled.

The 1994-95 figures are preliminary estimates. Recent market and catch information and estimates obtained from operators about major cost items such as fuel, repairs and maintenance, food, bait, ice, insurance, lease and interest payments, licences and management fees were used to estimate expected receipts and costs for 1994-95. These estimates may be changed in the future as more information becomes available.

Definitions of items
and reliability of estimates

The following are definitions and explanations of the main boat characteristics and financial items reported.

Boat characteristics

Information on the physical characteristics of boats was obtained from both the logbook information and the survey interviews.

Boat size is expressed in management units for the northern prawn fishery. These units are the sum of underdeck volume in cubic metres and engine power in kilowatts. For the southern shark fishery, management units have not been historically based on boat size, so boat size is not reported for this fishery. Since the introduction of individual transferable quotas in the south east fishery, boat units are no longer used by fisheries managers and thus are no long reported for this fishery.

Effort is measured in hours for the northern and Torres Strait prawn and south east fishery boats. For northern and Torres Strait prawn fishery boats this is measured in hours of both search time and trawl time. For south east fishery boats, only trawl time is included. For southern shark boats, effort is expressed in thousands of kilometre net lifts. This is the number of nets multiplied by the length of each net and the number of times the nets were in the water.

Catch is expressed in kilograms. The catch information reported applies only to the fishery surveyed. For example, the catch for the northern prawn boats excludes catch taken in Torres Strait or other prawn fisheries for which the boat may be endorsed. The south east fishery catch excludes catch recorded as taken in state waters or taken outside the Australian Fishing Zone. The southern shark catch excludes any catch taken in other fisheries, such as the south east fishery or rock lobster fisheries. However, these other catches are included for the purpose of estimating boat fishing receipts.

Financial items

Cash receipts are the financial inflows to the boat during the year from the sale of fish, non-fishing activities including charter operations, and other sources (insurance claims and compensation, quota/endorsements leased out, government assistance and any other revenue). Receipts shown from the sale of fish are prior to any deductions made by marketing authorities for freight and selling charges. Where appropriate these charges are included in costs. Receipts include amounts received in the survey year for fish harvested and delivered in previous years.

Cash costs include the payments made for both permanent and casual hired labour and payments for materials and services (including payments on capital items subject to leasing, rent, interest, licence fees and repairs and maintenance). Labour costs include wages, salaries and share of catch paid to owner operators, partners and their families. If family or other labour were unpaid, an estimate of the cost of their labour (based on rates comparable with their employed counterparts in the fishery) was obtained at interview and has been included in cash costs. Capital and household expenditures were excluded.

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

Depreciation is a non-cash cost representing the cost of wear and tear on capital items during the survey year. Depreciation figures in previous reports were obtained from the taxation returns of survey respondents.

In this report, depreciation figures for the south east fishery for 1992-93 are as reported in *Fisheries Survey Report 1994* and

were obtained from the taxation returns of survey respondents. However, all other depreciation figures, including depreciation for the hull, engine and other on-board and shore based plant, equipment (excluding gear) and structures were estimated by 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 and an explanation of the new method and a comparison with the previous method appears in the following chapter of this report.

Boat business profit is defined as boat cash income less depreciation.

Profit at full equity is defined as boat profit, plus rent, interest and finance lease payments. It is the return produced by the resources used in the fishing business, and is the profit from fishing that would accrue to the owners if they fully owned the assets employed in the business.

Capital is defined as the value placed on the assets employed by the surveyed boat business. It includes the total gross value of the boat, including the value of the hull, engine and other on-board and shore based plant, equipment (including gear) and structures. Estimates are also reported for the value of quotas and endorsements held by the surveyed boat.

Rate of return to boat capital is calculated on total capital as if all fishing 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. 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). The rate of return to boat capital provides an indication of the impact of management changes on the fishery.

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). This gives operators interested in investing in a new boat and/or licence a measure of the economic performance of the fishery.

Debt information for operators in each of the fisheries was collected at interview. Change in debt over the year is calculated for each boat as the difference between debt at 1 July and the following 30 June. It is an estimate of the change in indebtedness of a given population of boats during the financial year and is thus unaffected by changes in sample or population between years.

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 reported as a percentage of capital employed in, and owned by, the fishing business. The debt and equity figures shown are averages for those boats for which information on debt was available.

Target populations

Population information for the surveyed fisheries was obtained from logbooks and boat registry data supplied by the Australian Fisheries Management Authority. Fishery management plans are usually based on a calendar year so the fleet structure may change in the middle of the financial year. As a result, the target populations included only those boats that operated in the fishery in both the first and second halves of the financial year.

For the south east fishery only those boats which held quota and caught more than 10 tonnes of fish in the year were included in the target population.

In the southern shark fishery, only boats which held a Commonwealth shark gillnet endorsement or a shark hook permit and caught shark (any quantity) were included in the target population of the fishery.

In the northern and Torres Strait prawn fisheries, only boats endorsed to operate in their respective fisheries and that caught prawns in the fishery were included in the target population.

Sample weighting

Because the sample sizes for each sector of a fishery are not necessarily proportional to the actual population sizes of the sectors, 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 by the Australian Fisheries Management Authority, with the corresponding numbers and catch details of the boats in the various survey samples.

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).

Sampling errors

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 estimates that would have been obtained if information had been collected from all boats (the 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. So, for example, boat group estimates are likely to have greater sampling errors than fishery-wide estimates.

As a guide to the reliability of the survey estimates, estimates of 'standard errors' have been calculated. These estimated errors, expressed as a percentage of the survey estimates (termed 'relative standard errors'), are given next to each estimate in parentheses.

Example of the 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. For example, if average total cash receipts are estimated to be $100 000 with a relative standard error of 6 per cent, the standard error for this estimate is $6000.

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

Thus, in the above example, there is an approximately two in three chance that the census value is between $94 000 and $106 000, and an approximately nineteen in twenty chance that the census value lies between $88 000 and $112 000.

Comparing estimates

Greater caution should be exercised when calculating estimates of change derived from the survey estimates than when using the estimates themselves.

When comparing estimates between different industries, it is important to recognise that the differences are also subject to sampling error. An estimate of the standard error of the difference can be constructed by adding the squares of the estimated standard errors (note: not of the relative standard errors) of the component estimates, and then taking the square root of the result.

For example, suppose that total cash receipts were $100 000 in one industry and $125 000 in another — a difference of $25 000 — and that the relative standard errors are given as 6 per cent 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:

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

Similar estimates of the standard errors of differences can be made when comparing years. Under some circumstances, those estimates would be conservative — that is, they would be overestimates of the standard errors of differences.

However, in instances where there are substantial changes in the population from year to year, the estimation of standard errors is more complex and recourse to the survey database would probably be required.

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 relating directly to the sampling procedure. For example, respondents may provide inaccurate information and mistakes may occur in the editing and processing of data.

ABARE's experience in conducting surveys has resulted in procedures designed to minimise non-sampling errors. However, when drawing inferences from estimates derived from sample surveys or from census data, users of data should bear in mind that non-sampling as well as sampling errors can occur.

Depreciation and boat debt

ABARE has made several changes in this report to improve data quality and provide estimates of the financial performance consistent with those in other ABARE industry surveys.

Depreciation

Depreciation figures in previous fish survey reports were obtained from the taxation returns of survey respondents. There are, however, some disadvantages in using this data source that are explained below, along with a description of ABARE's new method of calculating depreciation.

Accountants have a choice of methods when calculating depreciation for taxation purposes and the method chosen can give different results. Therefore, the use of depreciation figures from the taxation returns of survey respondents may result in a different mean survey estimate for depreciation than if the method to calculate depreciation was consistent across the boats in the sample.

Also, boat cost data obtained at the interview are often from company records other than business taxation returns. These alternative data sources sometimes do not contain a depreciation figure, resulting in an underestimate of depreciation in survey results. This situation often occurs when a company operates more than one boat and taxation returns do not exist for individual boats.

To standardise depreciation for fisheries reported in the *Australian Fisheries Surveys Report 1995* (with the exception of south east fishery 1992-93) and beyond, depreciation for the hull, engine and other on-board and shore based plant, equipment (excluding gear) and structures are now estimated by 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.

The new method of calculating depreciation for fisheries surveys is also used in ABARE surveys of other industries.

Boat debt and equity

To improve boat performance analysis and data comparison with other industries surveyed by ABARE, boat business debt data were collected at interview for the first time in fishery surveys conducted during 1995.

These data also enable the calculation of boat equity measures, with debt and equity tables being presented in this report for each fishery surveyed in 1995.

South east fishery

Survey results

The fishery

The south east fishery is a multispecies fishery with a long history of commercial fishing. It is situated off the south east of Australia in waters under Commonwealth jurisdiction adjoining four states — New South Wales, Victoria, Tasmania and South Australia.

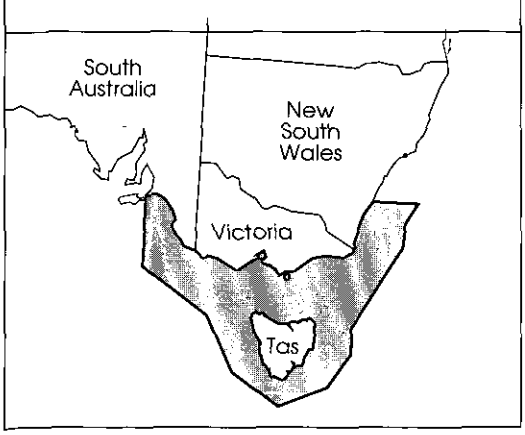
Over eighty species of commercial value are captured in the fishery. Only 22 species or species groups contribute about 95 per cent of the recorded catch (Tilzey 1994).

Most of the catch from the south east fishery is sold domestically in South Australia, New South Wales, Victoria and Tasmania. However, orange roughy and whiting are major export species.

Biological status of the fishery

The fishery has been characterised by increasing fishing capacity and effort. Based on current information on the biological status of sixteen quota species or species groups in the south east fishery, it is suggested that nine species are fully exploited, one overexploited (eastern gemfish) and the rest are uncertain (Staples and Tilzey 1995).

The south east fishery



Management of the fishery

Management boundaries extend from a line east from Barranjoey 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 state managed waters) to the 200 nautical mile limit of the Australian Fishing Zone. Current management arrangements cover only the trawl sector of the fishery, although the Commonwealth also has jurisdiction over the gillnet, hook and trap fisheries.

Since 1992 management of the trawl sector of the south east fishery has been based on a system of individual transferable quotas (ITQs) and the setting of total allowable catches for sixteen species or species groups. From 1 January 1994, full and permanent transferability of quota has been permitted. Prior to this, operators were only allowed to lease quota on a seasonal basis to other operators within the fishery; the sale of quota was prohibited.

Changes in total allowable catches occurred for seven of the sixteen quota species or species groups over the period 1993–95. There was a three year strategy to reduce the orange roughy total allowable catch to biologically sustainable levels, from 13 000 tonnes in 1993, to 8000 tonnes in 1994, to 7500 tonnes in 1995. The total allowable catch for blue grenadier was doubled from 5000 tonnes to 10 000 tonnes in 1994, to provide an incentive to develop the fishery off western Tasmania. The other major change was the increase in the total allowable catch for redfish during 1994, from 600 tonnes to 1000 tonnes. There was a further increase to 1700 tonnes in 1995. A zero total allowable catch for eastern gemfish remained in force during the survey period. However, under a system of trip limits, operators could land incidental catches of eastern gemfish.

Other management changes that occurred during the survey period included the introduction of a system that allows individual operators to carry over any unused quota or be allowed to use part of their next year's allocation. The system is intended to provide fishermen with greater flexibility in adjusting their fishing operations in response to natural fluctuations in fish availability.

In 1994, operators were allowed to carry over 10 per cent of their 1993 allocation or bring forward 10 per cent of their 1995 quota allocation. This allowance was increased to 20 per cent in 1995.

Also, with the view to introducing greater flexibility in the fishery, restrictions on vessel size were relaxed, with vessels longer than 32 metres granted access to certain areas of the fishery. Areas include the southern orange roughy zone, the blue grenadier fishery adjacent to the west coast of Tasmania during the winter months and on St Helen's Hill during the orange roughy season in June and July.

Fishery characteristics

The south east fishery can be divided into two sectors on the basis of gear type — trawl and non-trawl. The estimated gross value of production of catch taken by the trawl sector in 1994-95 is $54 million (ABARE 1995a). The estimated value of catch taken by the non-trawl sector in Commonwealth waters is approximately $3 million (ABARE 1995a).

The trawl sector of the south east fishery can be considered as three separate 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. They target a range of species, most of which are destined for the domestic fresh market.

The danish seine fleet comprises generally small (13–20 metres in length), low powered vessels and operates in shallower waters, mostly off Lakes Entrance, 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.

Only the trawl sector of the south east fishery was surveyed. Based on logbook data, the number of vessels operating in the south east fishery in 1993-94 comprised 63 boats in the inshore sector, 29 in the offshore sector and 25 vessels in the danish seine sector. There was a total sample of 41 from a population of 117 boats. Twenty-one boats were sampled from a subpopulation of 63 boats in the inshore sector, 10 boats from a subpopulation of 29 boats in the offshore sector and 10 boats from a subpopulation of 25 boats in the danish seine sector.

Based on catch and effort information supplied by AFMA, for the offshore trawlers surveyed, average hours fished in 1993-94 were 26 per cent higher than in 1992-93, and a further 9 per cent higher in 1994-95. However, on an individual boat basis, the amount of effort varies widely between boats in this sector and the increase in the average effort for sample boats was less than the total offshore sector average.

Recorded catches in the south east fishery by the sample boats over the same period were 6 per cent lower in 1993-94, and a further 16 per cent lower in 1994-95.

For the inshore boats surveyed, the average catch was 2 per cent lower in 1993-94, but 4 per cent higher in 1994-95. This reflects the increase in the total allowable catches of certain species in this sector. For the danish seine sector, catch for the surveyed boats, on average, was 1 per cent higher between 1992-93 and 1993-94 with a further increase of 24 per cent in 1994-95.

Financial performance

The major measures of financial performance in the south east fishery obtained from the survey are given in table 1.

Receipts

Total recorded catches of quota species fell 14 per cent in 1993-94, while the landed catch of other (non-quota) species fell by 24 per cent in 1993-94 (ABARE 1995a). Despite lower catches, substantial increases in

1 Financial performance of south east fishery boats [a] Average per boat

	Unit	1992-93		1993-94		1994-95 [p]	
				Inshore trawlers			
Receipts							
Fishing receipts	$	398 013	(16)	412 490	(15)	571 700	(15)
Non-fishing receipts	$	33 216	(27)	70 200	(30)	59 500	(33)
Total cash receipts	$	431 229	(17)	482 690	(16)	631 200	(16)
Costs							
Administration	$	7 465	(14)	11 360	(11)	11 700	(11)
Crew costs	$	99 718	(13)	115 520	(16)	160 100	(16)
Freight and marketing	$	87 350	(19)	78 290	(18)	108 500	(18)
Fuel	$	46 749	(20)	63 670	(16)	66 200	(16)
Insurance	$	9 422	(20)	13 670	(14)	11 900	(14)
Interest paid	$	13 365	(35)	11 930	(29)	11 500	(29)
Leasing	$	9 710	(52)	10 690	(39)	11 300	(37)
Licence fees and levies	$	8 069	(18)	13 450	(16)	13 800	(16)
Repairs and maintenance	$	66 689	(14)	67 710	(11)	78 900	(14)
Other costs	$	18 783	(13)	21 110	(15)	21 500	(15)
Total cash costs	$	367 322	(15)	407 400	(14)	495 400	(14)
Boat cash income	$	63 907	(38)	75 290	(39)	135 800	(29)
less depreciation [b]	$	11 951	(23)	22 480	(17)	22 800	(17)
Boat business profit	$	51 956	(47)	52 810	(51)	113 000	(32)
plus interest, leasing and rent	$	23 198	(28)	22 820	(29)	22 900	(29)
Profit at full equity	$	75 154	(36)	75 630	(38)	135 900	(28)
Capital (excl. quota and licences)	$	232 079	(16)	351 570	(18)	351 600	(18)
Capital (incl. quota and licences)	$	663 843	(20)	1 018 520	(16)	1 018 500	(16)
Rate of return to boat capital [c]	%	32.4	(22)	21.5	(33)	38.7	(25)
Rate of return to full equity [d]	%	11.3	(23)	7.4	(31)	13.3	(23)
				Offshore trawlers			
Receipts							
Fishing receipts	$	1 184 212	(12)	1 553 320	(9)	1 242 200	(10)
Non-fishing receipts	$	96 832	(58)	111 840	(25)	101 600	(22)
Total cash receipts	$	1 281 044	(12)	1 665 160	(9)	1 343 800	(9)
Costs							
Administration	$	18 463	(20)	17 410	(11)	19 100	(11)
Crew costs	$	281 497	(10)	319 330	(7)	267 700	(8)
Freight and marketing	$	111 058	(30)	79 240	(19)	70 700	(21)
Fuel	$	112 550	(20)	181 210	(11)	183 200	(13)
Insurance	$	25 313	(17)	45 110	(17)	46 500	(21)
Interest paid	$	92 817	(33)	49 700	(34)	46 000	(43)
Leasing	$	202 241	(44)	238 400	(26)	162 500	(34)
Licence fees and levies	$	19 740	(18)	34 710	(16)	30 500	(17)
Repairs and maintenance	$	174 443	(21)	199 700	(13)	146 300	(11)
Other costs	$	33 746	(26)	48 920	(17)	54 000	(17)
Total cash costs	$	1 071 868	(13)	1 213 730	(10)	1 026 500	(11)
Boat cash income	$	209 176	(42)	451 430	(22)	317 300	(29)
less depreciation [b]	$	53 908	(12)	50 170	(12)	54 000	(13)
Boat business profit	$	155 268	(57)	401 260	(24)	263 300	(36)
plus interest, leasing and rent	$	295 057	(28)	290 680	(25)	211 600	(26)
Profit at full equity	$	450 325	(22)	691 940	(13)	474 900	(19)
Capital (excl. quota and licences)	$	958 098	(8)	1 361 680	(12)	1 326 000	(15)
Capital (incl. quota and licences)	$	2 161 931	(11)	2 646 020	(12)	2 692 900	(12)
Rate of return to boat capital [c]	%	47.0	(24)	50.8	(14)	35.8	(22)
Rate of return to full equity [d]	%	20.8	(17)	26.2	(11)	17.6	(21)

(Continued on next page)

1 Continued

	Unit	1992-93		1993-94		1994-95 p	
				Danish seiners			
Receipts							
Fishing receipts	$	159 014	(8)	157 750	(9)	184 800	(9)
Non-fishing receipts	$	1 058	(28)	1 270	(35)	1 100	(45)
Total cash receipts	$	160 072	(8)	159 020	(9)	185 900	(9)
Costs							
Administration	$	2 077	(18)	4 500	(29)	4 900	(30)
Crew costs	$	57 890	(8)	53 080	(11)	60 900	(12)
Freight and marketing	$	31 982	(8)	31 780	(10)	37 300	(10)
Fuel	$	12 040	(11)	10 610	(9)	11 500	(8)
Insurance	$	7 033	(9)	6 280	(9)	6 200	(11)
Interest paid	$	5 371	(36)	3 110	(30)	3 400	(26)
Leasing	$	172	(72)	2 120	(32)	2 500	(32)
Licence fees and levies	$	5 333	(5)	5 880	(9)	6 400	(8)
Repairs and maintenance	$	20 138	(15)	16 670	(8)	19 700	(10)
Other costs	$	9 688	(8)	8 280	(7)	9 600	(5)
Total cash costs	$	151 722	(7)	142 310	(7)	162 400	(6)
Boat cash income	$	8 350	(88)	16 710	(38)	23 500	(38)
less depreciation b	$	5 247	(19)	6 900	(37)	7 400	(41)
Boat business profit	$	3 103	(244)	9 810	(56)	16 100	(48)
plus interest, leasing and rent	$	5 542	(34)	5 230	(24)	5 900	(22)
Profit at full equity	$	8 645	(81)	15 040	(36)	22 000	(35)
Capital (excl. quota and licences)	$	143 226	(12)	181 150	(15)	198 500	(16)
Capital (incl. quota and licences)	$	388 784	(9)	462 140	(11)	499 400	(10)
Rate of return to boat capital c	%	6.0	(80)	8.3	(36)	11.1	(34)
Rate of return to full equity d	%	2.2	(82)	3.3	(34)	4.4	(33)
				All boats			
Receipts							
Fishing receipts	$	559 339	(9)	640 830	(8)	655 200	(9)
Non-fishing receipts	$	43 750	(36)	65 790	(20)	57 400	(21)
Total cash receipts	$	603 089	(9)	706 620	(8)	712 600	(9)
Costs							
Administration	$	9 320	(12)	11 390	(8)	12 100	(8)
Crew costs	$	139 659	(7)	152 700	(7)	165 600	(9)
Freight and marketing	$	82 747	(15)	68 590	(12)	83 900	(13)
Fuel	$	57 360	(14)	81 470	(9)	83 500	(10)
Insurance	$	13 163	(12)	19 880	(11)	19 200	(14)
Interest paid	$	32 845	(26)	19 410	(24)	18 300	(28)
Leasing	$	58 847	(40)	65 300	(24)	46 900	(29)
Licence fees and levies	$	10 624	(12)	17 100	(10)	16 400	(11)
Repairs and maintenance	$	86 088	(13)	89 520	(9)	83 000	(9)
Other costs	$	20 959	(13)	25 260	(11)	27 000	(11)
Total cash costs	$	511 614	(9)	550 620	(8)	555 900	(8)
Boat cash income	$	91 476	(29)	156 000	(19)	156 700	(20)
less depreciation b	$	21 750	(10)	26 010	(10)	27 300	(10)
Boat business profit	$	69 726	(39)	129 990	(22)	129 400	(23)
plus interest, leasing and rent	$	91 758	(24)	85 460	(22)	66 100	(21)
Profit at full equity	$	161 484	(18)	215 450	(13)	195 500	(16)
Capital (excl. quota and licences)	$	406 976	(7)	565 530	(9)	560 400	(11)
Capital (incl. quota and licences)	$	1 006 701	(10)	1 303 030	(9)	1 322 600	(9)
Rate of return to boat capital c	%	39.7	(18)	38.1	(12)	34.9	(16)
Rate of return to full equity d	%	16.0	(14)	16.5	(10)	14.8	(15)

a Figures in parentheses are relative standard errors. **b** Depreciation adjusted for profit and loss on capital items sold. Figures for 1992-93 refer to depreciation from taxation records. **c** Excluding the value of quota or licence. **d** Including the value of quota or licence. **p** Preliminary.

prices for most species resulted in cash receipts per boat for the fleet of nearly $707 000 in 1993-94, some 17 per cent higher than in 1992-93. On average, receipts from fishing and returns from non-fishing activities were higher in 1993-94.

For inshore boats, average cash receipts per boat in 1993-94 were around $483 000, 12 per cent higher than in 1992-93. Estimates of fishing receipts were 3.6 per cent higher, as a result of higher prices and catches for most of the inshore quota species.

In 1993-94, non-fishing receipts were around $70 000, more than double those in 1992-93. Much of this rise was the result of higher levels of quota leasing. In 1992-93, average receipts from quota leasing were around $12 000, while in 1993-94 this figure was nearly $39 000.

For offshore boats, cash receipts per boat were on average $1.67 million in 1993-94, 30 per cent higher than in 1992-93. Fishing receipts were, on average, 31 per cent higher in 1993-94, despite a decline in the recorded catches of orange roughy in the Australian Fishing Zone, and a fall in the average landed prices in Australia for the two main species caught by offshore boats (orange roughy and blue grenadier) of 1 and 8 per cent respectively. However, in 1993-94, a number of boats in this sector of the fishery began fishing for orange roughy on the high seas off the Lord Howe rise (outside the Australian Fishing Zone). Catches from fishing outside the Australian Fishing Zone are not subject to quota and are not recorded on official south east fishery returns. However, they still appear on the financial returns for these vessels. Catches from these operations were either landed in Australia or New Zealand, depending on the relative price.

On average, cash receipts for danish seiners were $159 000 in 1993-94, compared with $160 000 in 1992-93. Lower receipts occurred despite a small increase in catches of whiting as the Japanese market failed to recover as expected and export prices fell a further 6 per cent from the average price in 1992-93. In addition, recorded catches of flathead, the other main species caught by danish seiners, fell further in 1993-94, although this was partially offset by an increase in price.

Estimates of cash receipts in 1994-95

Estimates of average boat receipts in 1994-95 were based on changes in catch and prices between 1993-94 and 1994-95 (as shown in the graph). Catch information for the two years was obtained from logbooks. Changes in price were based on Sydney and Melbourne market information, as well as information provided by a number of cooperatives and processors.

From the graph it can be seen that the average price received for most species increased in 1994-95 (although recorded catches in the south east fishery declined a further 9 per cent in 1994-95). As a result of these offsetting changes in catches and prices, projected average cash receipts per boat for the south east fishery are estimated to have been less than 1 per cent higher in 1994-95 than in 1993-94, at $713 000.

For danish seiners, cash receipts per boat in 1994-95 are estimated at $186 000, 17 per cent higher than in 1993-94. This reflects an increase in the price of whiting on the domestic and export markets, and an increase in the catch of the other major target species for these boats — tiger flathead.

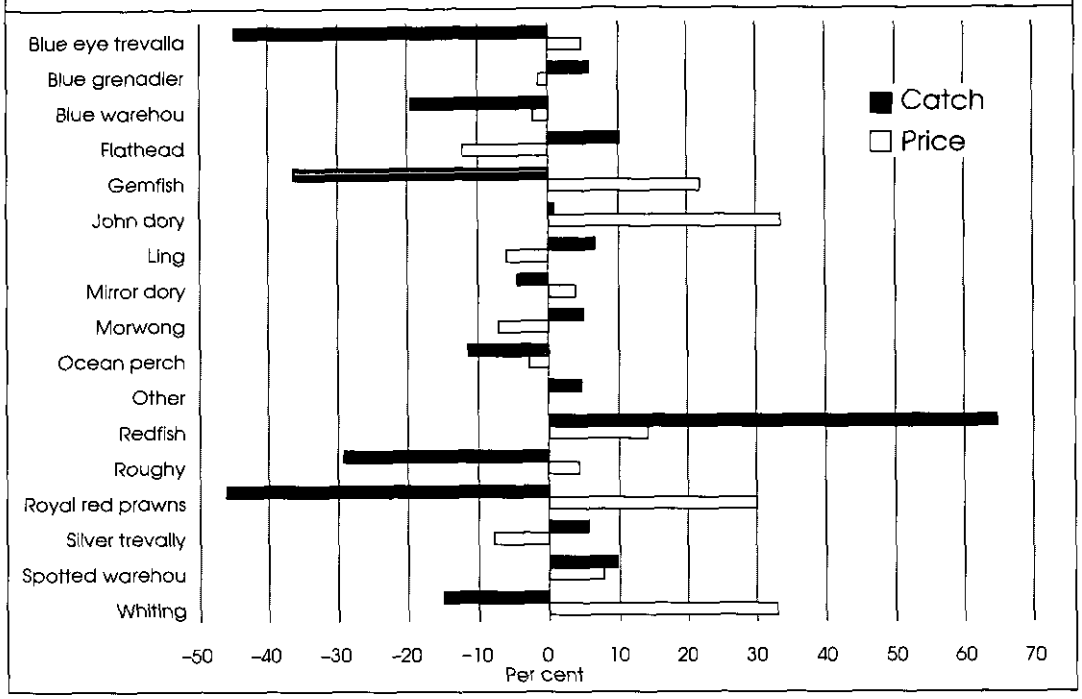
For inshore trawlers, average cash receipts per boat in 1994-95 are estimated at $631 000, 31 per cent higher than in 1993-94. This reflects higher catches and prices for quota species. In particular, blue grenadier catches in this sector were higher in 1994-95, following the doubling of the total allowable catch in 1994. In addition, the total allowable catch of redfish was also increased in 1994 and 1995.

For offshore boats, cash receipts per boat in 1994-95 are estimated at $1.34 million, 19 per cent lower than in 1992-93, following low catches of orange roughy in the south east fishery. However, this may understate total receipts for the offshore boats as they may have been able to increase catches outside the Australian Fishing Zone.

Costs

On average, cash costs for boats in the south east fishery were $551 000 in 1993-94, 8 per cent higher than in 1992-93. On average, approximately 28 per cent of total cash costs were attributable to crew costs, while

Change in prices and catch in the south east fishery, 1993-94 to 1994-95



freight and marketing, fuel, leasing and repairs and maintenance contributed around 55 per cent to total cash costs.

Higher cash costs per boat were not uniform across the fleet, with the danish seine sector experiencing costs, on average, 6 per cent lower, whereas average cash costs in the inshore and offshore sectors were 11 per cent and 13 per cent higher respectively.

The increase in average cash costs per boat across the fleet was influenced strongly by the average 42 per cent increase in fuel costs. On average, fuel costs accounted for around 15 per cent of cash costs per boat in 1993-94. For the offshore sector, fuel costs were estimated at around $181 000 per boat, 61 per cent higher than in 1992-93. Estimated fuel costs for the inshore boats were higher by 36 per cent in 1993-94 relative to 1992-93, at $63 700, whereas fuel costs for danish seine boats, at $10 600, were 12 per cent lower.

The increases in the amounts spent on fuel by the inshore and offshore trawlers is attributable to the increase in effort in the fishery (as measured by hours fished) and to an increase in steaming time and time spent trying to locate fish. In particular, steaming time and search time is likely to have increased for the offshore boats which are fishing in areas that are near or outside the boundaries of the Australian Fishing Zone.

Crew costs, which form the largest single component of all boat costs, were 9 per cent higher, on average, across the fleet (at an estimated $153 000 per boat) in 1993-94 compared with the previous year. Crew costs were higher in 1993-94, on average, by 16 per cent for inshore boats, 13 per cent for the offshore sector, and lower by 8 per cent for danish seiners. Crew costs are a proportion of boat revenue and therefore are correlated with catch and fishing receipts.

Freight and marketing charges were lower in 1993-94 across all the sectors. Average repair and maintenance costs per boat were an estimated 4 per cent higher in 1993-94 compared with the previous year, with the largest increase of 14 per cent occurring in the offshore sector.

Other significant changes include higher costs for insurance, leasing and licence fees, while interest costs fell in 1993-94. Quota

lease payments were 11 per cent higher than in 1992-93 at around $65 000 per boat in 1993-94. However, the amount of quota leasing varied across the fishery, with average leasing costs for the offshore sector at around $238 000, $11 000 in the inshore sector and $2000 in the danish seine sector. Very little quota leasing occurred in the danish seine sector of the fleet as operators pooled their individual quota allocations and fished under a cooperative arrangement.

Estimates for 1994-95

Costs in 1994-95 were calculated using estimates obtained from operators of the major cost items and on a series of indexes based on costs and changes in catch and effort. Catch and effort indexes were derived from logbook information and affect crew payments and marketing costs for 1994-95. The cost indexes were determined by ABARE from a survey of suppliers of goods and services to the rural sector (ABARE 1994a). Based on these indexes and changes in catch and effort, average cash costs per boat are estimated to have been less than 1 per cent higher in 1994-95 than in 1993-94.

For danish seiners, on average, cash costs per boat are estimated at $162 000 in 1994-95, 14 per cent higher than in the previous year. Crew costs and freight and marketing charges are also expected to have been higher along with fishing receipts.

For the inshore sector of the fleet, average cash costs per boat are estimated at $495 000 in 1994-95, 22 per cent higher than in 1993-94. All major cost items are expected to have been higher for this sector, with higher crew costs and freight and marketing charges reflecting the expected improvement in fishing receipts.

While average cash costs per boat are expected to have been higher for the inshore and danish seine sectors, it is estimated that, on average, cash costs for boats in the offshore sector were 15 per cent lower in 1994-95. This largely reflects lower crew costs resulting from lower catches, lower leasing costs and a fall in repair and maintenance costs from the very high level in 1992-93.

Despite a rise in average effort in terms of fishing time in 1994-95, estimated fuel costs are projected to have remained relatively unchanged. Operators in the offshore sector may have reduced their time spent steaming and reduced their fuel consumption.

It should be noted that the number of boats in the sample on which the projections are based changed between 1993-94 and 1994-95. This change in sample size and consequent reweighting of the sample may have affected in particular the estimates for freight and marketing for 1994-95, since the extent of the fall in freight and marketing charges is less than the projected decline in fishing receipts.

Boat cash income and profit

The financial performance of the fleet can be measured by boat cash income and boat business profit. These measures provide an indication of the ability of the operator to remain in the fishery in the short to medium term without the need for recourse to additional finance.

The operational performance of 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 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 which would have been earned by the business unit had the boat and capital (including quota) been fully owned by the operator. As such, this measure provides a common basis for comparison of the operational performance of all boats in the fishery.

Boat cash income

The effect of higher fishing receipts on operators' incomes is evident in the survey estimate of financial performance for 1993-94. Average cash income per boat was 71 per cent higher in 1993-94 at $156 000, due to higher cash receipts. In 1994-95, average cash income per boat is estimated to have remained relatively unchanged, because changes in receipts and fishing costs are expected to have been only small.

In the offshore sector in 1993-94, higher fishing receipts more than offset higher cash costs, resulting in an average cash income per boat of $451 000, more than twice the level in 1992-93. In 1994-95, with expected lower catches and hence fishing receipts more than offsetting lower cash costs, average cash income per boat is estimated at around $317 000, 30 per cent lower than in 1993-94. However, it should be noted that boats in this sector have been seeking fishing opportunities outside the south east fishery and that returns from fishing outside the Australian Fishing Zone may offset this potential decline.

In 1993-94, average cash income per boat in the inshore sector was around $75 000, 18 per cent higher than in 1992-93. It is expected that a further rise in average cash income occurred in 1994-95, due to higher receipts.

Operators in the danish seine sector also experienced a doubling in average cash income per boat in 1994-93 to nearly $17 000 as a result of lower cash costs. In 1994-95, average cash income is estimated at almost $24 000, 41 per cent higher than 1993-94, in line with expected higher fishing receipts.

Boat business profit

In 1993-94, for the fleet as a whole, boat business profit averaged $130 000, 86 per cent higher than in 1992-93. In 1994-95, average business profit per boat is estimated to have remained relatively unchanged, due to relatively little change in expected average cash income per boat.

It should be noted that the depreciation figures reported for 1992-93 were obtained from taxation accounts; in later years, depreciation was estimated using the diminishing value method. Therefore, measures incorporating depreciation (including boat business profit) are not comparable between years.

Estimates for boat business profit in 1994-95 vary across the three sectors. For the inshore sector, it is estimated that business profit per boat doubled in 1994-95 to around $113 000, mainly reflecting the substantial increases in fishing receipts that resulted from higher catches and returns. Expected lower catches in the Australian Fishing Zone for the offshore sector boats is expected to have led to lower average business profit per boat of around $263 000 in 1994-95, compared with $401 000 in 1993-94. Boat business profit in the danish seine sector is expected to have been $16 000 in 1994-95, 64 per cent higher than 1992-93.

Profit at full equity

Profit at full equity for the fleet in 1994-95 is estimated to have fallen by 9 per cent to $196 000, because of lower leasing costs.

For the offshore trawlers, profit at full equity in 1994-95 is estimated to have been $475 000 per boat, 31 per cent lower than in the previous year because of lower receipts.

Following an improvement in prices and catches for whiting in 1994-95, on average, profit at full equity for danish seiners is expected to have risen to $22 000, 46 per cent higher than in 1993-94. For inshore boats, average profit at full equity is estimated to have been $136 000 in 1994-95, 80 per cent higher than in the previous year.

Rate of return

The estimated average rate of return to full equity across the fishery in 1993-94 was 16.5 per cent. The rate of return for boats in the offshore sector was higher than the fishery average, at 26 per cent in 1993-94. The rate of return in the danish seine sector was estimated at 3.3 per cent.

For 1994-95, it is estimated that the offshore sector was again the best performed sector of the fleet, with a rate of return to full equity of 17.6 per cent, nearly three percentage points higher than the fleet average and higher than the rates for the inshore fleet (13.3 per cent) and danish seiners (4.4 per cent).

There is considerable disparity between rates of return estimated for the different sectors of the fishery. This is partly caused by the newness of the quota management system in the fishery and the fact that structural adjustment is still taking place. The south east fishery has undergone substantial change in terms of fisheries management, the impact of which has had the potential to affect both the physical structure and the financial performance of the fleet.

When ITQs were first introduced into the fishery, some operators had difficulties

2 Boat debt and equity of south east fishery boats in 1993-94 a Average per boat

	Unit	*Inshore boats*	*Offshore boats*	*Danish seiners*	*All boats*
Capital (incl. quota and licences) at 30 June b	$	1 050 530 (18)	1 579 690 (15)	462 140 (11)	978 240 (12)
Boat business debt at 1 July c	$	103 060 (30)	350 400 (54)	30 320 (35)	121 580 (28)
Boat business debt at 30 June c	$	107 750 (31)	415 510 (44)	39 720 (25)	136 610 (25)
Change in debt over year c	$	4 690 (127)	65 110 (76)	9 400 (92)	15 030 (57)
Boat business equity at 30 June b	$	942 780 (19)	1 164 180 (28)	422 420 (12)	841 630 (14)
Boat business equity ratio at 30 June b	%	89.7 (4)	73.7 (17)	91.4 (2)	86.0 (4)

a Figures in parentheses are relative standard errors. b Average per boat responding on debt. c Average per responding boat.

understanding the new system, there were problems in quota allocation and the lack of a developed quota market may have caused some inefficiencies in the fishery. In addition, reductions in total allowable catches for several key species may have reduced the earning potential of some individual operators during the survey years.

In addition, there are some important structural elements that are characteristic of the different sectors.

Danish seiners are smaller operators, with fewer opportunities to expand their fishing operations in terms of new species and locations, because of the difference in fishing method. However, this sector has the smallest debt and the highest equity ratio in the fishery. It is possible that the rates of return for this sector may be too low to be sustainable in the longer term as there are limited opportunities for operators to adjust.

For inshore operators, adjustment has been inhibited by the limitations on quota trading and problems associated with original quota allocations. Operators have had the opportunity to expand fishing activity for non-quota species and increases in prices in recent years have offset declines in catches. It is likely that rates of return will increase in this sector as the quota trading system becomes more efficient.

Offshore sector operations involve the highest capital outlays and debt levels in the fishery. These two factors are reflected in the high rates of returns achieved relative to the other sectors of the fishery. Much adjustment has already occurred in this sector of the fishery. However, as the total allowable catches for orange roughy are reduced, operators may increasingly move into the inshore sector of the fishery.

Debt and equity

Information was collected on the level and purpose of debt for the fleet and is reported in table 2. Across the fleet in 1993-94, the average level of debt per boat rose 12 per cent over the financial year, to an average closing balance of $137 000. Of this, 85 per cent was designated as being used for boat purchase and 6 per cent for quota purchases. Average interest payments for this debt fell by 41 per cent in 1993-94 to $19 000.

Boats in the offshore sector had the highest level of debt, averaging around $416 000, next was the inshore sector at an average of $108 000, while the average level in the danish seine sector was around $40 000. Across the three sectors the major purpose of the debt was for boat purchase.

The debt servicing ratio is the proportion of total receipts needed to make interest payments on the debt. The average debt servicing ratio in 1993-94 across the fleet was 2.8 per cent, a decrease from the 1992-93 ratio of 5.5 per cent. For each of the individual sectors of the fishery, the offshore sector had the highest ratio of around 3 per cent, the inshore sector 2.5 per cent and the danish seine sector 2 per cent.

Equity provides a measure of the financial ownership of a fishing enterprise. The average boat business equity ratio of the south east fishery fleet was 86 per cent in 1993-94. Equity ratios for the individual sectors are, 89.7 per cent for inshore trawlers, 73.7 per cent for the offshore sector and 91.4 per cent for danish seiners.

Southern shark fishery

Survey results

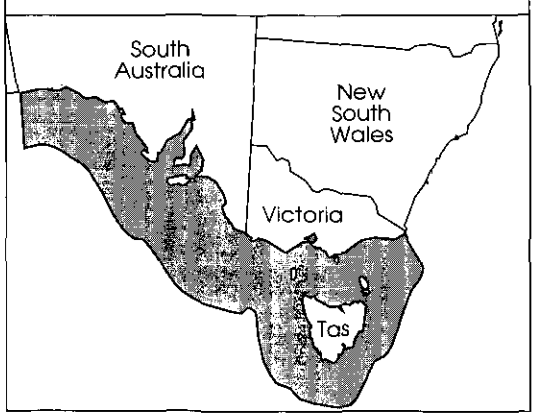
The fishery

The southern shark fishery is located in Commonwealth and state waters off south eastern Australia. Gross value of production in 1993-94 is estimated to have been about $17 million from a total catch of almost 5975 tonnes (carcass weight) (ABARE 1995a).

The southern shark fishery is based primarily on catches of gummy and school sharks, although several other species, including common saw sharks, southern saw sharks and elephant fish account for around 6 per cent of the total landed catch. In addition, a number of shark operators also target scale fish using shark gillnets. Both gillnets and longline are used in the southern shark fishery, although most of the catch is by gillnets (over 90 per cent in 1993-94).

In general the fishery operates all year round, but is heavily reliant on weather conditions. As a result, fishing effort is concentrated in summer and autumn when calmer seas prevail. As many rock lobster fishermen also hold shark endorsements, there is an upsurge in shark fishing in the closed season for rock lobster.

The southern shark fishery



Victoria is the main market for shark caught in the southern shark fishery, with most of the shark caught by boats working out of Victorian ports marketed through the Melbourne fish market for sale on the domestic market as 'flake'.

The landed price for shark in Tasmania is substantially less than that obtained on the mainland. As a result many of the Commonwealth licensed boats fishing in the Bass Strait and off the west coast of Tasmania land their catches in Victoria. In South Australia and Tasmania, much of the shark landed is sold directly to local processors who fillet the shark and on-sell it.

Other uses for shark have been developed in recent years including liver oil, shark fins and shark cartilage.

Biological status of the fishery

Sharks are generally long lived, slow growing and produce relatively few offspring. Consequently stocks are characterised by a strong stock–recruitment relationship. In addition, sharks have a long gestation period, and it is some years before juveniles become vulnerable to fishing.

Gummy shark are endemic to southern Australia from at least Port Stephens, around Tasmania as far as Geraldton in Western Australia. They are demersal in habit and are caught mainly on the continental shelf from the shore to depths of around 80 metres. Gummy sharks are likely to form regional substocks across southern Australia, although some longer movements may occur.

Catches of gummy shark in Bass Strait since 1973 have varied from a low of 738 tonnes in 1979 to a high of 1272 tonnes in 1992. While there is some variation in the annual level of recruits, the apparent long term stability in levels of recruitment suggests that the current catch levels are sustainable (Walker, Stone, Battaglene and McLoughlin 1995).

School shark are distributed around southern Australia from Moreton Bay in Queensland to Perth in Western Australia. They inhabit the continental shelf and upper slope and are captured (mainly near the bottom) from shore to depths of 550 metres, but are also found in the pelagic zone and well offshore.

School shark are likely to form a single stock in southern Australia, with evidence that pupping areas tend to be in the eastern region of southern Australia and that pregnant school sharks tend to aggregate in the Great Australian Bight before August each year.

The latest scientific assessment for school shark was in 1991, when the Southern Shark Research Group concluded that the school shark had been depleted to 10–25 per cent of initial biomass (Walker et al. 1995). On the basis of this assessment, management aimed at restricting catches of large female school shark has been implemented (see following section).

Management of the fishery

Responsibility for the management of the southern shark fishery is shared by the Commonwealth government and the state governments of Victoria, Tasmania and South Australia. State jurisdiction extends up to three nautical miles from the coastline and the Commonwealth government is responsible for the area from the three nautical mile limit to the 200 nautical mile limit of the Australian fishing zone.

Although the fishery is managed under four separate jurisdictions, the state fisheries agencies and the Australian Fisheries Management Authority (AFMA) agreed to apply complementary management arrangements in the areas under their jurisdictions.

The distribution of school and gummy shark extends into Western Australia and New South Wales. Currently, gillnetting is banned in both Commonwealth and state waters off New South Wales. In Western Australia, shark fishing is controlled through a joint authority between the Commonwealth and Western Australian governments under the Offshore Constitutional Settlement agreement.

The southern shark fishery has come under a number of different management strategies since its inception. Management of the fishery has included closed seasons, minimum lengths, minimum gillnet mesh size, limited areas of fishing and limited entry and effort controls.

Under the Commonwealth management plan introduced in April 1988, gillnet endorsements based on units of fishing capacity were issued to fishermen with a history of operating in the southern shark fishery. A unit of fishing capacity was defined as a monofilament gillnet with a headrope length of 600 metres and the net 20 meshes deep, where a mesh was defined as the single square in the net that was not less than 15 centimetres wide. Depending on their catch history, Commonwealth endorsed fishermen were issued with either a category 'A' endorsement for six units of net or a category 'B' endorsement for five or less units of net.

A total of 1234 net units were issued to 241 boats endorsed to operate in the gillnet fishery. During the first two years of the management plan, fishermen could amalgamate two category A endorsements onto one boat, but at a cost of the forfeiture of two units of net to the management authority, which were subsequently withdrawn from the fishery. Amalgamations of two A class licences thus resulted in an increase from six to ten units of net to form the endorsement category 'A10'. The amalgamation process, which ended on 30 May 1990, created 40 'A10' endorsements and removed 40 boats and 80 net units from the fishery. However, 'B' category endorsements were not transferable outside immediate family members.

The requirement by all endorsed operators in the southern shark fishery to pay a levy based on the number of net units has resulted in an additional number of operators leaving the fishery and forfeiting their net units. Some operators elected to leave the fishery as it was uneconomic to continue in the fishery at a low level of participation.

In April 1991, interim net reductions for southern shark fishermen were implemented that reduced the total amount of net units in the fishery by around 33 per cent.

Initially, operators who were originally entitled to use ten nets were reduced to seven nets, operators originally entitled to use six nets were reduced to four nets, and operators who were originally entitled to use three, four or five nets were limited to three nets. Following the airing of concerns relating to inequitable reductions in net numbers between operators, a unit was redefined in April 1993 to be equal to 420 metres in length and original entitlements regarding net numbers were reinstated.

From 1 January 1994, the hook sector of the southern shark fishery was brought under management. By 1 July 1995, 31 applicants had been granted shark hook permits to use either 1000 or 2000 hooks depending on catch history. Applicants unsuccessful in gaining access to the hook sector of the southern shark fishery are permitted to continue to use demersal hook fishing methods in Commonwealth waters, but are limited to a trip bycatch limit of five carcasses of gummy and school sharks.

During 1993 and 1994, seasonal catch restrictions were introduced to protect pregnant school sharks during their period of high vulnerability as they migrate eastwards to their traditional nursery areas. In 1993, the landing of shark was limited to five carcasses during November in the area west of the South Australian–Victorian border and during December east of this border. In 1994, the taking of school and gummy shark and the use of gillnets were prohibited from 8 October to 22 November for the area west of the border and for 11 November to 25 December for the area east of the border, except for a small number of boats targeting blue warehou off eastern Victoria with gillnets of large mesh size.

A study of the effectiveness of seasonal closures in the shark fishery showed no demonstrable reduction in the mortality of female school shark over 1.4 metres (Walker et al. 1995). Based on the results of this study, AFMA decided not to proceed with seasonal closures for Commonwealth waters in 1995, but to implement other measures to provide some protection for mature school sharks.

The mesh size of a gillnet determines the size and age of sharks captured. Shark of different sizes are not equally vulnerable to capture. Small shark are caught most effectively in gillnets with a small mesh size, while larger shark are more vulnerable to a larger mesh size. A slow growing shark is vulnerable to capture for a longer period than a faster growing shark, because it takes longer to grow through the length range of high selectivity. After reaching a threshold length, sharks become progressively less vulnerable as they tend to bounce off the nets.

Sharks first become vulnerable to gillnet fishing when they are around four years old. This means that they are susceptible to capture for a number of years prior to reaching sexual maturity. Larger mesh allows small shark to swim through the net, but increases the probability of capture for large sharks.

AFMA has decided to implement a maximum mesh size for the fishery of 1650 mm (6.5 inches) from 1 January 1997 subject to the results of research into gillnet dropout rates (sharks dying and then dropping out of nets before they are landed).

Fishery characteristics

For the purpose of the survey, the population was defined as boats endorsed for the southern shark fishery that caught shark within the survey years. Therefore, boats that possess endorsements for the fishery but did not fish for shark were excluded from the survey population.

The gillnet fleet was divided into three sectors on the basis of the number of units allocated under the current management plan — boats with ten units, six units or five or less units. As mentioned previously, the units refer to the amount of gillnet a boat may use, where each unit is equivalent to 420 metres. For example, a boat with ten net units may fish with no more than 4.2 kilometres of net in the water at any one time. A sample of boats from each sector was chosen for inclusion in the survey. In addition, operators with shark hook endorsements were also included in the survey.

Based on logbook data, the number of active vessels in the fleet in 1993-94 included 38 operators with five or less units of net, 23 operators with six units of net, 32

operators with ten units of net, and 20 longline operators (either 1000 or 2000 hooks). For the survey, there was a total sample of 34 from a population of 113 boats. Fifteen boats were sampled from a subpopulation of 38 operators with five or less units of net, 7 boats from a subpopulation of 23 operators with six units of net, 7 boats from a subpopulation of 32 operators with ten units of net and 5 boats from a subpopulation of 20 longline operators.

Many operators in the southern shark fishery have endorsements to fish in other fisheries. Consequently, a major influence on the financial performance and level of activity of operators in the southern shark fishery is income from fishing operations in other fisheries.

For the purpose of this analysis, operators who obtained more than 80 per cent of total receipts from shark fishing operations in the southern shark fishery were defined as specialists. Most of the operators in this category had ten units of net.

Crew statistics

In 1993-94, 37 per cent of boats actively fishing in the southern shark fishery had an employed skipper. While average crew numbers varied between the categories of vessels, most boats carried two or three crew members. As expected, smaller boats had generally fewer crew on board.

Financial performance

The major measures of the financial performance of boats in the southern shark fishery obtained from the survey are given in table 3. It should be noted that these estimates include activities in other fisheries, as well as the southern shark fishery. A major influence on the financial performance of boats in the southern shark fishery over the survey period is income from fishing operations in other fisheries.

A summary of the major measures of financial performance for shark specialist operators is presented in table 4.

Receipts

On average, cash receipts per boat for operators in the southern shark fishery were around $201 000 in 1993-94, 3 per cent lower than in 1992-93. This fall was largely caused by lower shark receipts across all sectors of the fishery in line with lower catches. In 1993-94, production of gummy shark was 2089 tonnes (carcass weight), down from 2342 tonnes in 1992-93. Production of school shark showed a similar decline — down from 1290 tonnes in 1992-93 to 995 tonnes in 1993-94.

On average, cash receipts per boat for operators with five or less units of net and six net units were 5 per cent and 17 per cent higher respectively in 1993-94 than in 1992-93. For operators with ten units of net and the hook operators, cash receipts were 14 per cent and 10 per cent lower respectively. Specialist shark operators' receipts, on average, were $177 000 in 1993-94, 11 per cent lower than in 1992-93, in line with lower catches.

Operators with five or less units of net experienced, on average, a fall in shark receipts of around 13 per cent to $42 000. Operators with six units of net experienced a 23 per cent fall in shark receipts to $62 000. Operators with ten units of net experienced a 14 per cent fall in shark receipts to $219 000. Hook fishermen experienced a 22 per cent fall in shark receipts to $43 000.

The fall in average shark receipts per boat for operators with six or five or less units of net was partly caused by increased activity in other fishing operations leading to less effort expended in the shark fishery. Many southern shark fishery operators hold endorsements in other fisheries, so that shark fishing is a part time or seasonal activity for operators who may also fish for rock lobster, scallops, scale fish or other species.

The degree of involvement and dependence on the shark fishery varies between sectors, with the operators with ten units of net showing a greater dependence on shark fishing than the other sectors.

However, for the holders of five or less net units, in 1993-94 receipts from other fishing operations were 11 per cent higher than in 1992-93, and for holders of six net units receipts from other fishing operations were over 40 per cent higher. These extra returns came largely from returns from rock lobster and scallop fishing.

For operators with ten units of net, non-shark fishing receipts were around 40 per cent lower in 1993-94, because operators had less capacity to expand effort in other fisheries. Hook operators' receipts from fishing other than for shark remained relatively unchanged at $68 000 over the same period, although total cash receipts were around 10 per cent lower in 1993-94 because of lower receipts from shark.

Costs

For the fishery as a whole, average total cash costs per boat remained constant at around $175 000 in 1993-94. However, there were changes in average total costs per boat across the fishery. Operators with six units of net had, on average, 21 per cent higher cash costs than in 1992-93, while operators with five or less net units had cash costs that were only 1 per cent higher than in 1992-93. For operators with five or less net units, the increase was principally caused by higher crew costs and repairs and maintenance.

Operators with ten units of net and hook licence holders, on average, had total cash costs per boat, respectively 8 per cent and 4 per cent lower than in 1992-93. The declines in these sectors were caused mainly by lower crew costs. For the shark specialist operators, on average, cash costs per boat were around 4 per cent lower in 1993-94, largely because of lower crew costs resulting from lower fishing receipts.

Crew costs are the major cash cost for shark operators and are dependent on boat

3 Financial performance of southern shark fishery boats [a] Average per boat

	Unit	1992-93		1993-94		1992-93		1993-94	
		5 or less units				*6 units*			
Receipts									
Shark receipts	$	48 235	(32)	42 150	(17)	80 159	(26)	61 930	(41)
Lobsters receipts	$	106 065	(25)	119 480	(26)	80 933	(41)	90 200	(49)
Scallops receipts	$	2 999	(89)	0	(0)	26 854	(73)	61 270	(76)
Other fishing receipts	$	3 388	(73)	5 120	(60)	2 417	(79)	7 640	(66)
Non-fishing receipts	$	4 971	(42)	7 950	(56)	3 743	(28)	5 820	(46)
Total cash receipts	$	165 658	(17)	174 700	(15)	194 106	(9)	226 860	(10)
Costs									
Administration	$	2 389	(12)	3 100	(11)	5 294	(12)	4 490	(14)
Bait	$	3 185	(44)	2 570	(50)	2 220	(59)	2 490	(60)
Crew costs	$	61 656	(20)	64 750	(17)	84 746	(11)	98 620	(9)
Food	$	1 795	(40)	2 210	(34)	5 841	(26)	6 870	(32)
Freight and marketing	$	8 476	(48)	5 510	(42)	11 922	(42)	16 520	(44)
Fuel	$	9 165	(15)	9 550	(12)	18 483	(14)	21 560	(16)
Insurance	$	2 412	(24)	2 470	(19)	4 182	(28)	4 160	(47)
Interest paid	$	4 507	(35)	3 760	(38)	7 413	(37)	7 680	(31)
Licence fees and levies	$	8 812	(17)	7 600	(15)	10 242	(13)	11 020	(13)
Repairs and maintenance	$	16 074	(13)	19 270	(12)	19 204	(22)	30 710	(36)
Other costs	$	6 042	(22)	5 750	(20)	9 384	(24)	11 940	(22)
Total cash costs	$	*124 874*	*(15)*	*126 540*	*(12)*	*178 931*	*(8)*	*216 060*	*(8)*
Boat cash income	$	40 784	(35)	48 160	(33)	15 175	(42)	10 800	(110)
less depreciation [b]	$	9 605	(11)	9 310	(10)	13 626	(26)	16 630	(18)
Boat profit	$	31 179	(46)	38 850	(41)	1 549	(623)	–5 830	(245)
plus interest, leasing and rent	$	4 842	(32)	3 820	(38)	11 025	(29)	11 880	(23)
Profit at full equity	$	36 021	(39)	42 670	(36)	12 574	(63)	6 050	(202)
Capital									
Excluding quota and licences	$	144 378	(9)	145 650	(8)	260 321	(16)	282 020	(10)
Including quota and licences	$	*na*		*675 870*	*(17)*	*na*		*890 560*	*(23)*
Rate of return [c]	%	24.9	(44)	29.3	(39)	4.8	(74)	2.2	(206)
Rate of return to full equity [d]	%	na		6.3	(20)	na		0.7	(187)

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revenue. In 1992-93 and 1993-94, crew costs represented around 41 per cent of cash receipts.

Crew costs for operators with five or less units of net and six units of net were 5 per cent and 16 per cent higher, respectively, in 1993-94 than in 1992-93. Higher crew costs largely reflected greater receipts from rock lobster fishing and scallop dredging (for operators with six units of net). Whereas, those operators who had lower fishing receipts — holders of ten units of net and hook operators — crew costs were 14 per cent and 5 per cent lower respectively.

On average, interest payment estimates for the fleet as a whole for 1993-94 were 9 per cent higher than in 1992-93. Only the holders of five or less net units had lower interest payments, around 17 per cent lower than in 1992-93. For the holders of six units of net the average interest payment estimates were higher by 4 per cent, while for the holders of ten units of net the average interest payment estimates were higher by 20 per cent. For hook operators, average interest payments were 16 per cent higher.

For specialist shark operators, interest payments remained constant in 1993-94 (table 4).

Fuel costs accounted for around 10 per cent of average total cash costs per boat in 1992-93 and 1993-94. For the fleet as a whole, fuel costs were 3 per cent higher in 1993-94. Holders of six units of net experienced the biggest increase in fuel costs, 17 per cent.

3 Continued

		1992-93		1993-94		1992-93		1993-94	
		10 units				*Hook operators*			
Receipts									
Shark receipts	$	255 439	(10)	218 590	(14)	55 556	(43)	43 100	(40)
Lobsters receipts	$	0	(0)	0	(0)	38 502	(72)	51 290	(76)
Scallops receipts	$	0	(0)	0	(0)	0	(0)	0	(0)
Other fishing receipts	$	35 698	(90)	21 520	(89)	29 767	(88)	16 380	(88)
Non-fishing receipts	$	7 252	(40)	17 750	(41)	4 958	(60)	5 330	(57)
Total cash receipts	$	298 389	(10)	257 860	(12)	128 783	(15)	116 100	(24)
Costs									
Administration	$	4 800	(20)	4 760	(23)	1 452	(35)	1 900	(38)
Bait	$	1 143	(90)	1 000	(89)	9 284	(62)	2 360	(39)
Crew costs	$	118 621	(8)	101 900	(16)	66 102	(11)	62 470	(18)
Food	$	6 924	(22)	6 770	(18)	2 426	(41)	2 910	(43)
Freight and marketing	$	7 366	(90)	6 560	(89)	0	(0)	0	(0)
Fuel	$	27 927	(10)	27 190	(6)	8 532	(22)	8 860	(31)
Insurance	$	7 857	(12)	9 720	(6)	1 754	(45)	2 140	(52)
Interest paid	$	12 121	(25)	14 550	(29)	1 202	(75)	1 400	(53)
Licence fees and levies	$	11 341	(13)	12 180	(18)	3 749	(16)	7 650	(18)
Repairs and maintenance	$	55 701	(22)	46 820	(18)	12 505	(11)	13 100	(26)
Other costs	$	5 258	(23)	5 630	(15)	3 343	(46)	3 120	(41)
Total cash costs	$	259 058	(7)	237 080	(9)	110 348	(6)	105 910	(17)
Boat cash income	$	39 332	(41)	20 780	(75)	18 435	(79)	10 190	(105)
less depreciation b	$	18 934	(15)	27 880	(29)	9 707	(15)	9 710	(15)
Boat profit	$	20 398	(86)	-7 100	(253)	8 728	(179)	480	(2199)
plus interest, leasing and rent	$	13 420	(28)	14 930	(28)	1 202	(75)	1 400	(53)
Profit at full equity	$	33 818	(50)	7 830	(205)	9 930	(159)	1 880	(563)
Capital									
Excluding quota and licences	$	270 714	(9)	306 880	(12)	132 750	(14)	132 750	(14)
Including quota and licences	$	na		506 880	(12)	na		268 030	(24)
Rate of return c	%	12.5	(57)	2.6	(214)	7.5	(167)	1.4	(564)
Rate of return to full equity d	%	na		1.5	(210)	na		0.7	(545)

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Boat cash income and profit

The financial performance of the fleet can be measured by boat cash income and boat business profit. These provide an indication of the ability of the operator to remain in the fishery in the short to medium term without the need for recourse to additional finance.

For the fishery as a whole, average cash income per boat in 1993-94 was 18 per cent lower than in 1992-93. However, differences in the relative dependence on the shark fishery were reflected in differences in the movement of average cash income. While operators with five or less net units had an average cash income per boat 18 per cent higher at $48 000, the other sectors had lower cash incomes.

On average, cash income per boat fell by 29 per cent for holders of six net units, 47 per cent for operators with ten units of net, and 45 per cent for hook operators. Specialist shark operators had the largest average fall in average cash income per boat of around 74 per cent to $5000.

Boat profit (which allows for depreciation of capital) provides a measure of return to the business unit. Boat business profit for the industry as a whole, on average, was about $9000 in 1993-94, only around half that in 1992-93. As stated earlier, the relative performance of the sectors reflects the dependence on shark fishing.

3 Continued

		1992-93		1993-94	
		All boats			
Receipts					
Shark receipts	$	121 288	(9)	101 490	(11)
Lobsters receipts	$	56 033	(21)	64 750	(23)
Scallops receipts	$	6 227	(64)	11 940	(76)
Other fishing receipts	$	17 924	(62)	12 660	(52)
Non-fishing receipts	$	5 449	(23)	10 170	(28)
Total cash receipts	$	206 922	(7)	201 010	(7)
Costs					
Administration	$	3 562	(10)	3 690	(11)
Bait	$	3 392	(34)	2 030	(30)
Crew costs	$	84 970	(6)	82 610	(8)
Food	$	4 320	(15)	4 670	(14)
Freight and marketing	$	7 353	(36)	7 050	(34)
Fuel	$	16 822	(7)	17 310	(6)
Insurance	$	4 369	(10)	5 020	(10)
Interest paid	$	6 921	(17)	7 510	(20)
Licence fees and levies	$	9 027	(8)	9 710	(9)
Repairs and maintenance	$	28 611	(14)	29 090	(12)
Other costs	$	6 103	(13)	6 470	(11)
Total cash costs	$	175 452	(5)	175 160	(6)
Boat cash income	$	31 470	(23)	25 850	(30)
less depreciation **b**	$	13 363	(9)	16 630	(16)
Boat profit	$	18 107	(43)	9 220	(90)
plus interest, leasing and rent	$	8 148	(17)	8 460	(18)
Profit at full equity	$	26 255	(29)	17 680	(43)
Capital					
Excluding quota and licences	$	205 135	(6)	220 600	(6)
Including quota and licences	$			595 600	(10)
Rate of return c	%	12.8	(33)	8.0	(47)
Rate of return to full equity d	%	na		3.0	(39)

a Figures in parentheses are relative standard errors. **b** Depreciation adjusted for profit and loss on capital items sold. **c** Excluding value of quota or licence. **d** Including value of quota or licence. **p** Preliminary. **na** Not available.

For holders of five or less units of net, boat business profit was around 25 per cent higher in 1993-94 ($39 000). For holders of six and ten units of net, estimated losses of around $6000 and $7000 respectively were incurred. For holders of hook licences, business profit per boat was, on average, around 95 per cent lower ($480). Estimated boat business profit for specialist shark operators was around $3000 in 1992-93, but changed to a loss of around $10 000 in 1993-94.

Profit at full equity for the fishery averaged around $18 000 in 1993-94, about 33 per cent lower than in 1992-93. However, there were differences in performance across the fleet. For operators with five or less net units, estimated profit at full equity was higher by 18 per cent. For the holders of six net units, it was 52 per cent lower than in 1992-93, and for holders of ten units of net it was 77 per cent lower. Hook operators' profit at full equity fell from $10 000 in 1992-93 to $2000 in 1993-94, while specialist shark operators' profit at full equity fell from $10 000 in 1992-93 to a loss of $3000 in 1993-94.

Rates of return

The estimated average rate of return to full equity excluding the value of the endorsement, was nearly 5 percentage points lower in 1993-94 at 8 per cent. The rate of return for operators with five or less net units was over 4 percentage points higher than in 1992-93 at 29 per cent; however, declines were experienced in the remaining sectors. The higher rates of return for operators with

4 Financial performance of specialist shark operators in the southern shark fishery a
Average per boat

	Unit	1992-93 *All boats*		1993-94 *10 units*		1993-94 *All boats*	
Receipts							
Shark receipts	$	192 009	(9)	244 400	(12)	169 900	(10)
Lobsters receipts	$	0	(0)	0	(0)	0	(0)
Other fishing receipts	$	988	(77)	0	(0)	1 120	(15)
Non-fishing receipts	$	4 928	(41)	9 160	(50)	5 930	(42)
Total cash receipts	$	197 926	(8)	253 560	(11)	176 950	(9)
Costs							
Administration	$	3 551	(18)	4 640	(32)	3 660	(24)
Bait	$	3 427	(65)	1 330	(89)	1 130	(57)
Crew costs	$	85 474	(8)	114 960	(14)	80 480	(11)
Food	$	4 458	(23)	6 770	(21)	4 630	(19)
Freight and marketing	$	7 991	(55)	8 750	(89)	7 240	(58)
Fuel	$	19 528	(10)	27 660	(5)	18 810	(4)
Insurance	$	5 168	(14)	9 330	(8)	5 770	(7)
Interest paid	$	6 472	(28)	11 370	(45)	6 440	(42)
Licence fees and levies	$	8 222	(13)	11 870	(16)	9 830	(12)
Repairs and maintenance	$	30 577	(18)	44 910	(9)	29 620	(8)
Other costs	$	5 121	(23)	5 190	(20)	4 600	(16)
Total boat cash costs	$	179 991	(5)	246 780	(6)	172 210	(6)
Boat cash income	$	17 935	(53)	6 780	(252)	4 740	(197)
less depreciation b	$	14 838	(14)	19 020	(18)	14 730	(13)
Boat profit	$	3 097	(352)	−12 240	(161)	−9 990	(109)
plus interest, leasing and rent	$	7326	(32)	11 880	(44)	6 710	(42)
Profit at full equity	$	10 423	(95)	−360	(4479)	−3 280	(277)
Capital							
Excluding quota and licences	$	228 617	(7)	277 500	(10)	224 240	(7)
Including quota and licences	$	na		452 500	(12)	390 190	(9)
Rate of return to capital c	%	4.6	(100)	−0.1	(4470)	−1.5	(271)
Rate of return to full equity d	%	na		−0.1	(4474)	−0.8	(274)

a Figures in parentheses are relative standard errors. **b** Depreciation adjusted for profit and loss on capital items sold. **c** Excluding value of quota or licence. **d** Including value of quota or licence. **p** Preliminary. **na** Not available.

five or less unit of nets can be attributed to their activity in the rock lobster fishery.

The lack of transferability of shark endorsements has most likely prevented some operators from leaving the fishery. This, in turn, may have resulted in lower profits for the fishery. In addition, employment prospects in many coastal communities also are not conducive to leaving the fishing industry. Consequently, the opportunity cost of remaining in the industry in the short term is low for many small operators. Similarly, the opportunity cost of maintaining capital in the fishery is low.

With few alternative uses of the boats and low profitability in other fisheries, fishermen may have difficulty selling their boats in the short term. Limitations on entry to other fisheries also prevent operators from using their boats elsewhere.

The shark specialist operator's level of profitability is almost entirely dependent on the profitability of the shark fishery, making them a good indicator of the state of the fishery. Downward pressure on profitability has come from falls in receipts, and increases in the relative cost of labour and lower average catches. Partly offsetting this has been the increase in prices received for school and gummy shark and falls in total cash costs. However, there was a 74 per cent drop in income for shark specialist operators.

Operators with 10 units of net have a much greater dependence on the profitability of the southern shark fishery than the other, more diversified, operators. This is because they have a much larger financial commitment to the shark fishery arising from their initial purchase of the A6 licence to form the amalgamated A10 licence. The other operators, usually having licences for other fisheries, can switch between fisheries during closed seasons and poor harvest times to maintain their income.

Debt and equity

The average level of debt across the fishery as a whole declined in 1993-94, from an opening balance of nearly $73 000 to a closing balance of under $71 000 (table 5). Operators with ten net units had, on average, the highest level of debt, at a closing balance of $158 000 per boat. The hook sector had the lowest average level of debt, at about $13 000. Specialist shark operators had average closing debt levels of around $43 000 in 1993-94 (table 6).

The debt servicing ratio is the proportion of total receipts used for interest payments. On average, the debt servicing ratio for the fleet was 3.3 per cent in 1992-93, and 3.7 per cent in 1993-94. The differences in the level of debt between the sectors is reflected in the various debt servicing ratios. Operators with ten units of net had the highest ratio of 5.6 per cent (4.1 per cent in 1992-93). Operators with six units of net and specialist shark operators had debt servicing ratios of 3.6 per cent (3.8 per cent and 3.3 per cent respectively in 1992-93). Operators with five units of net had a debt servicing ratio of 2.2 per cent (2.7 per cent in 1992-93) and the

5 Boat debt and equity of southern shark fishery boats in 1993-94 a Average per boat

	Unit	*5 units or less*	*6 units*	*10 units*	*Hook*	*All boats*
Capital (incl. quota and licences) at 30 June b	$	675 870 (17)	890 560 (23)	490 000 (14)	268 030 (24)	594 400 (10)
Boat business debt at 1 July c	$	33 580 (33)	65 160 (37)	160 150 (38)	14 150 (61)	72 700 (25)
Boat business debt at 30 June c	$	30 620 (34)	64 700 (39)	157 520 (39)	13 240 (61)	70 700 (26)
Change in debt over year c	$	–2 960 (80)	–460 (749)	–2 630 (134)	–910 (63)	–2 000 (73)
Boat business equity at 30 June b	$	645 250 (19)	825 860 (26)	332 480 (8)	254 790 (26)	523 700 (12)
Boat business equity ratio at 30 June b	%	95.5 (2)	92.7 (4)	67.9 (13)	95.1 (4)	88.1 (4)

a Figures in parentheses are relative standard errors. b Average per boat responding on debt. c Average per responding boat.

6 Boat debt and equity of specialist southern shark fishery boats in 1993-94 [a]
Average per boat

	Unit	*10 units*		*All boats*	
Capital (incl. quota and licences) at 30 June [b]	$	418 000	(13)	367 200	(9)
Boat business debt at 1 July [c]	$	80 830	(63)	43 830	(57)
Boat business debt at 30 June [c]	$	78 580	(67)	42 890	(60)
Change in debt over year [c]	$	–2 250	(223)	–940	(264)
Boat business equity at 30 June [b]	$	339 420	(8)	324 310	(8)
Boat business equity ratio at 30 June [b]	%	81.2	(13)	88.3	(7)

a Figures in parentheses are relative standard errors. b Average per boat responding on debt. c Average per responding boat.

hook sector 1.2 per cent (0.1 per cent in 1992-93).

As expected, operators with ten units of net had the lowest level of equity in the fleet (68 per cent). This occurred because operators with ten units of net each bought out another operator under the provisions of the interim management plan brought in in 1988 and amalgamated two A class licences to increase their net units from six to ten. Many operators were forced to borrow for this capital expansion, thus increasing their debt levels and reducing their level of equity.

The average level of equity for the fleet as a whole was 88.1 per cent in 1993-94. For the holders of five or less net units the ratio was 95.5 per cent, for operators with six units of net 92.7 per cent, and for hook operators 95.1 per cent.

Northern prawn fishery

Survey results

The fishery

The northern prawn fishery is located in Commonwealth waters in the Australian fishing zone and is bordered by Cape Londonderry in the west and Cape York in the east. It is the largest fishery by area in Australia, at over 1 million square kilometres. It is also one of Australia's most valuable fisheries, with production in 1994-95 worth $130 million from a total prawn catch of 8440 tonnes (ABARE 1995a). Over 90 per cent of the catch is exported, with the major market being Japan.

Fishery characteristics

There are four types of prawn caught in the northern prawn fishery — banana, tiger, endeavour and king prawns. In the past ten years, the average prawn catch in the fishery has been around 8000 tonnes. Over this period, banana and tiger prawns have dominated the catch, accounting for 48 per cent and 41 per cent of the total catch respectively.

There are two varieties of tiger prawns — grooved and brown — which are caught in equal amounts. However, there is a marked difference in the effort required for these catches. Seventy per cent of total fishing effort is directed to the more valued tiger prawn component of the fishery (Dann and Pascoe 1994).

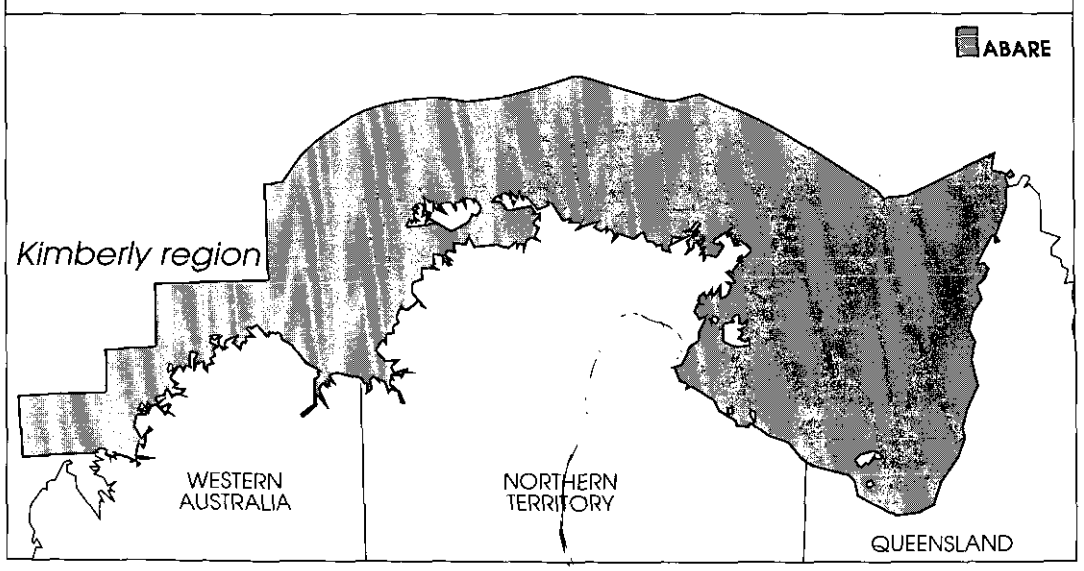
Most of the remainder of the catch consists of endeavour and king prawns. These are generally bycatches of tiger prawn fishing, though some targeting occurs.

The fishing fleet targets banana prawns as soon as the fishing season opens in March or April. The season generally lasts about six weeks, after which the fleet fishes for the more dispersed tiger prawns.

The resource

All the commercial prawn species in the fishery are short lived, with an estimated life span of one to two years. At six months

The northern prawn fishery



the prawns have reached commercial size, with the larger and more valuable sized prawn grade reached by nine to twelve months.

The northern prawn fishery can be separated into two individual fisheries — the banana prawn and the tiger prawn fisheries. A full description of the biology of the commercial prawn species in the northern prawn fishery can be found in Somers (1994a).

Both fisheries are considered to be fully exploited. The availability of banana prawns appears to be closely linked with summer monsoonal rainfall. There is little apparent correlation between fishing effort in one year and stock the next (Staples 1985).

The estimated average long term annual yield for banana prawns is 4000 tonnes. However, estimates of annual yield range between 2000 tonnes and 8000 tonnes (Somers and McLoughlin 1994).

Tiger prawns were lightly exploited in the early 1970s, but heavily fished in the late 1970s and early 1980s. This large increase in fishing effort resulted in large declines in the catch of tiger prawns from the peak catch in 1981. Scientists are unable to identify with certainty the cause of this decline but suggestions have included recruitment overfishing and unidentified environmental conditions.

The current lower catch level is reflected in reduced stock and recruitment levels. Wang and Die (1995) estimated that the present grooved and brown tiger prawn stock and recruitment levels are between 50 and 70 per cent lower than those recorded in the mid-1970s. They also estimated the long term yield for tiger prawns to be between 3800 and 4300 tonnes — a smaller long term yield than previous estimates.

Bycatch accounts for 80 per cent of the catch, but is mostly discarded except for the high valued species — scallops, bugs and squid. The other bycatch is discarded because of the high costs of freezing and storing. Research has indicated that many species that are presently discarded may eventually be commercially viable to retain and market once the northern prawn fishery's processing and market infrastructure is more established (Somers 1994b).

In the 1994-95 season, 130 vessels fished in the northern prawn fishery, with many of the smaller boats also holding entitlements in the nearby fisheries of Torres Strait and Queensland. Boats operating in the northern prawn fishery vary considerably in size, ranging from below 200 class A units to over 700 units (a class A unit being a function of underdeck hull size and engine size). In 1993-94 the average size of vessel in the fleet was 412 units. Crew size is generally higher in the banana prawn season but averages five for the season.

Management of the fishery

Management of the fishery began in the early 1970s and has involved many changes. The main focus of management has been to reduce the number of vessels in the fishery and increase profitability. Management has incorporated controls such as seasonal closures, gear restrictions, closures in hot spots, buyback policies and daylight trawling bans.

In 1984 an initial allocation of 129 404 class A units was provided to operators. Operation in the fishery required one class B unit and a number of class A units, determined by the boat's size and engine capacity. From this allocation, almost 300 vessels were operating in the fishery in 1985.

Through an industry initiative to reduce the number of vessels in the fishery, a voluntary buyback scheme was introduced in September 1985. The aim of the scheme was to reduce the number of class A units in the fishery to 70 000, from the sale of class A units by operators. The majority of funds for the scheme was provided by industry through the collection of levies, with some assistance from the Commonwealth government.

Due to the slow response of operators to this scheme and biological research that recruitment overfishing was likely for tiger prawns (Taylor 1994), the then Australian Fisheries Service proposed a compulsory surrender of units if this target was not met by 31 December 1990. The proposed amendments to the management plan to allow compulsory pro rata surrender of units without compensation in 1990 were

defeated in the Senate in May 1987 (Taylor 1994).

An enhanced buyback scheme, with additional government financial support through a $5 million grant and a commercial loan, was introduced in 1990. The aim of this revised scheme was to reduce the number of units from the then present level of 92 000 class A units to 50 000 class A units (later revised to 54 000 units) by the end of 1992. By the start of the 1993 fishing season this target had not been met, resulting in a compulsory pro rata surrender of class A units, reducing the fleet size by around 31 per cent (ABARE 1995b). In terms of boat numbers this equated to a reduction from around 170 boats in 1992 to around 125 boats in 1993.

In 1994, changes to the management of the fishery included the lengthening of the fishing season by two weeks and the relaxation of daylight trawling bans and net size restrictions. In 1995, a permanent opening date was set at 1 April, unless exceptional monsoonal rainfall occurs.

Fleet characteristics

The number of vessels in the fleet has stabilised since the target levels of class A units were met in 1993, with only a small reduction in the fleet size in 1994-95.

The fleet, for the purposes of the survey, was separated into three homogeneous groups on the basis of size (the unit of measure being the number of class A units). A sample of boats from each group was surveyed. The three groups were:

- smaller than 375 class A units (small boats),
- between 375 and 475 class A units (medium sized boats), and
- larger than 475 class A units (large boats).

The results for the smaller than 375 class A units boats are not reported separately in the financial performance tables as the sample size was too small, but are incorporated into totals for all boats. There was a total sample of 48 from a population of 132 boats. Sixteen boats were sampled from a subpopulation of 48 boats for the medium sized boats and 29 boats from a subpopulation of 41 boats for the large boats.

Low monsoonal rainfall level before the banana prawn season in 1994 resulted in a very low banana prawn catch for 1993-94. Despite an early opening to the banana prawn season the 1994 banana prawn catch at 2433 tonnes was the lowest in twenty years.

In contrast, the 1994-95 season, with a total catch of 8441 tonnes, was the most successful since the bumper season of 1990-91. There were large increases in catches of both banana and tiger prawns compared with 1993-94, with the banana prawn catch increasing by around 68 per cent to 4095 tonnes. The gross value of production estimates were higher by 25 per cent, from a below average $104 million in 1993-94 to $130 million in 1994-95 (ABARE 1995a).

Despite the poor catches in 1993-94, total effort for the total fishery rose by 4 per cent over 1992-93. This was mainly caused by the lengthening of the 1994 season. A similar increase in effort was experienced for the sample boats selected in the survey. The largest rise in effort, at 7 per cent per boat, occurred for the large boats, while average effort per sample boat in the medium boat class rose by 1 per cent.

Total effort in the fishery in 1994-95, based on logbook data supplied by AFMA, remained at a similar level to that in 1993-94. Average effort across the fleet rose from 1947 fishing hours in 1993-94 to 1973 fishing hours in 1994-95, due mainly to the small increase in the number of boats fishing during 1994-95.

The sample boats in the large boat class experienced a decline in both total and average effort. Average effort, in the large boat class declined by 7 per cent from 2046 fishing hours in 1993-94 to 1903 hours in 1994-95. For sample boats in the medium boat class, average effort per boat declined by 3 per cent in 1994-95.

Financial performance

The principal measures of financial performance for boats in the northern prawn fishery obtained from survey results are provided in table 7.

There are a number of external factors that affected performance in the fishery over the survey period. Prices in export

7 Financial performance of northern prawn fishery boats [a] Average per boat

	Units	1992-93		1993-94		1994-95 p	
				375–475 units			
Receipts							
Prawn receipts	$	939 545	(5)	944 060	(2)	1 204 700	(2)
Other fishing receipts	$	3 010	(75)	3 550	(67)	3 600	(69)
Non-fishing receipts	$	22 927	(29)	34 100	(29)	27 500	(24)
Total cash receipts	$	965 482	(5)	981 710	(2)	1 235 800	(2)
Costs							
Administration	$	53 830	(26)	52 410	(28)	58 600	(29)
Crew costs	$	211 294	(5)	206 140	(6)	251 200	(6)
Freight and marketing	$	44 411	(9)	37 640	(8)	50 800	(7)
Fuel	$	165 188	(10)	161 870	(8)	161 600	(9)
Insurance	$	25 577	(6)	25 580	(6)	26 500	(6)
Interest paid	$	17 991	(36)	16 570	(33)	16 000	(35)
Leasing	$	2437	(29)	2 440	(32)	2 000	(45)
Licence fees and levies	$	38 259	(11)	49 290	(9)	50 200	(9)
Packaging	$	14 798	(22)	11 060	(21)	17 900	(21)
Repairs and maintenance	$	180 551	(7)	203 570	(4)	193 700	(3)
Other costs	$	44 757	(9)	30 730	(15)	31 400	(17)
Total cash costs	$	799 094	(5)	797 300	(3)	859 900	(3)
Boat cash income	$	166 388	(22)	184 410	(15)	375 900	(9)
less depreciation	$	35 117	(22)	52 080	(43)	53 900	(45)
Boat profit	$	131 271	(28)	132 330	(28)	322 000	(14)
plus interest, leasing and rent	$	22 730	(30)	21 090	(27)	19 800	(31)
Profit at full equity	$	154 001	(22)	153 420	(24)	341 800	(12)
Capital (excl . quota and licences)	$	724 213	(5)	685 490	(6)	714 300	(5)
Capital (incl. quota and licences)	$	na		1 848 270	(4)	1 887 100	(4)
Rate of return to capital c	%	21.3	(24)	22.4	(24)	47.8	(12)
Rate of return to full equity d	%	na.		8.3	(23)	18.1	(12)
				Larger than 475 units			
Receipts							
Prawn receipts	$	931 476	(3)	1 131 320	(2)	1 360 300	(2)
Other fishing receipts	$	17 144	(14)	29 080	(10)	29 400	(10)
Non-fishing receipts	$	5 243	(42)	2 560	(33)	2 200	(38)
Total cash receipts	$	*953 863*	(3)	*1 162 960*	(2)	*1 391 900*	(2)
Costs							
Administration	$	31 115	(21)	31 190	(19)	33 500	(19)
Crew costs	$	212 798	(2)	268 340	(2)	323 200	(2)
Freight and marketing	$	20 702	(16)	19 990	(18)	23 400	(20)
Fuel	$	*181 893*	(3)	*170 720*	(2)	*173 600*	(3)
Insurance	$	43 262	(4)	49 210	(3)	49 800	(3)
Interest paid	$	5 716	(36)	3 990	(28)	3 900	(29)
Leasing	$	2 131	(22)	1 740	(21)	1 600	(23)
Licence fees and levies	$	39 404	(4)	49 330	(1)	46 900	(2)
Packaging	$	23 386	(7)	22 910	(4)	33 200	(3)
Repairs and maintenance	$	181 346	(3)	204 980	(3)	206 300	(3)
Other costs	$	37 883	(5)	41 120	(4)	41 900	(4)
Total cash costs	$	779 637	(2)	863 520	(2)	937 300	(2)
Boat cash income	$	174 227	(11)	299 440	(3)	454 600	(3)
less depreciation b	$	66 900	(4)	69 480	(2)	71 800	(2)
Boat profit	$	107 326	(16)	229 960	(4)	382 800	(3)
plus interest, leasing and rent	$	8 456	(27)	6 270	(22)	6 000	(23)
Profit at full equity	$	115 783	(15)	236 230	(4)	388 800	(3)
Capital (excl . quota and licences)	$	1 493 359	(5)	1 569 120	(4)	1 582 400	(4)
Capital (incl. quota and licences)	$	na		3 086 590	(2)	3 101 600	(2)
Rate of return to capital c	%	7.8	(15)	15.1	(6)	24.6	(5)
Rate of return to full equity d	%	na		7.7	(5)	12.5	(4)

(Continued on next page)

7 *Continued*

	Units	1992-93		1993-94		1994-95 p	
				All boats			
Receipts							
Prawn receipts	$	823 923	(4)	935 460	(3)	1 183 200	(4)
Other fishing receipts	$	7 735	(15)	12 390	(12)	12 500	(12)
Non-fishing receipts	$	9 664	(25)	16 500	(29)	11 000	(25)
Total cash receipts	$	841 323	(4)	964 350	(3)	1 206 700	(4)
Costs							
Administration	$	31 500	(17)	31 580	(18)	34 700	(19)
Crew costs	$	224 636	(5)	255 970	(6)	322 400	(6)
Freight and marketing	$	26 057	(8)	24 030	(7)	31 300	(7)
Fuel	$	146 151	(5)	140 250	(4)	141 200	(4)
Insurance	$	27 612	(4)	30 650	(3)	31 700	(4)
Interest paid	$	13 330	(31)	11 450	(30)	11 000	(28)
Leasing	$	1 527	(19)	1 430	(22)	1 200	(28)
Licence fees and levies	$	33 831	(7)	43 890	(4)	44 000	(4)
Packaging	$	14 275	(11)	13 900	(8)	20 700	(8)
Repairs and maintenance	$	149 744	(6)	185 260	(9)	177 000	(3)
Other costs	$	35 280	(5)	31 850	(7)	32 500	(8)
Total cash costs	$	703 944	(3)	770 260	(4)	847 700	(3)
Boat cash income	$	137 379	(12)	194 090	(13)	359 000	(11)
less depreciation b	$	48 777	(6)	55 320	(15)	56 900	(15)
Boat profit	$	88 602	(19)	138 770	(19)	302 100	(13)
plus interest, leasing and rent	$	15 854	(27)	13 800	(26)	13 000	(25)
Profit at full equity	$	104 456	(14)	152 570	(19)	315 100	(13)
Capital (excl. quota and licences)	$	893 377	(3)	898 980	(3)	913 600	(3)
Capital (incl. quota and licences)	$	na		2 153 180	(2)	2 171 900	(2)
Rate of return to capital c	%	11.7	(14)	17.0	(19)	34.5	(12)
Rate of return to full equity d	%	na		7.1	(19)	14.5	(13)

a Figures in parentheses are relative standard errors. b Depreciation adjusted for profit and loss on capital items sold. c Excluding value of quota or licence. d Including value of quota or licence. p Preliminary. na not available.

markets throughout 1993-94 and 1994-95 remained steady at a high level. Although there has been strong downward pressure on prices in recent years caused by high production of farmed prawns, there was a reduction in supplies of farmed prawns on the Japanese market caused by problems with disease, resulting in increased prices for Australian sea caught prawns.

There is an expectation that farmed prawn production may contract because current production levels are thought to be unsustainable, thereby assisting in maintaining prawn prices (FAO 1993). The steady decrease in the value of the Australian dollar against the yen, particularly in 1995, also assisted in maintaining the price level received by Australian operators.

Receipts

On average, cash receipts per boat for the fishery were $964 000 in 1993-94, nearly 15 per cent higher than in 1992-93. Despite the fall in catches in 1993-94, prawn receipts also increased by almost 14 per cent in response to the high prices for Australian prawns on major export markets. Prawn receipts were slightly higher in 1993-94 for medium sized boats, but for the larger boats were up by 21 per cent to $1.13 million in 1993-94. For the larger sized boats there was a 21 per cent rise in the quantity of tiger prawns sold, plus higher sales of endeavour prawns. In contrast, the medium boat sector experienced falls in the quantity of sales of tiger prawns and was relatively more affected by the poor banana prawn season.

Estimates of average receipts per boat in 1994-95 are based on changes in catch and prices between 1993-94 and 1994-95. The higher catches of tiger prawns in the 1994 fishing season and of banana prawns in the 1995 fishing season were expected, on average, to have increased cash receipts per

boat to $1.2 million in 1994-95, from $964 000 in 1992-93.

Costs

On average, cash costs per boat for the entire fishery were around $770 000 in 1993-94, 9 per cent higher than in 1992-93. The major components of total costs are crew costs, fuel costs and costs for repairs to boat and equipment. In 1993-94, on average, crew, licensing, and repairs and maintenance costs were 14 per cent, 30 per cent and 24 per cent higher, respectively, than in 1992-93. Conversely, freight, marketing and fuel costs were lower.

These changes in average total cash costs per boat, however, were not uniform throughout the fishery. Average total cash costs per boat for the medium boat class remained relatively unchanged from the 1992-93 level, while average total costs in the large boat class increased by 11 per cent, principally due to higher crew, and repairs and maintenance costs.

Crew costs account for around a third of cash costs. In 1993-94, average crew costs per boat were 14 per cent higher for the entire fleet. For the large boat class, crew costs in 1993-94 were 26 per cent higher. As crew costs are generally a percentage of receipts, this increase in crew costs reflects the increases in receipts for this boat class. However, crew costs for the medium boat class were slightly lower.

In the medium boat class, on average, payments to crew and employed skippers have decreased but payments to owners, spouses of owners/operators and children were estimated to have increased. As crew costs include costs of labour from any related shore based activities, it appears from these figures there may have been increased participation by family members in fishing operations for this sector.

The fall in marketing costs between 1992-93 and 1993-94, of 18 per cent for the medium class and 14 per cent for the large boat class, had a greater influence on the medium boat class because, on average, that class spends proportionately more on marketing, at $13 000 in 1993-94 compared with $5000 for the large boat class.

Costs in 1994-95 were estimated using a series of cost indexes, as well as on the basis of changes in catch and effort. Changes in catch and effort, derived from logbook information, affect crew payments, marketing costs and fuel costs. The cost indexes were determined by ABARE from a survey of suppliers of goods and services to the rural sector (ABARE 1994a).

Based on these indexes and changes in catch and effort, average total cash costs per boat in 1994-95 are estimated to have been around $848 000, 10 per cent higher than in 1993-94. Most individual cost items remained similar to levels in the previous year. However, costs directly related to increased catches — that is, crew costs and freight and marketing charges — are expected to have risen by 26 per cent in 1994-95.

Boat cash income and profit

The financial performance of the fleet can be measured by boat cash income and boat business profit. These measures provide an indication of the ability of the operator to remain in the fishery in the short to medium term without the need for recourse to additional finance. They reflect fluctuations in receipts and costs.

On average, cash income per boat for the entire fishery was $137 000 in 1992-93 and $194 000 in 1993-94. On average, larger boats had a 72 per cent higher cash income per boat in 1993-94 ($299 000), while for medium sized boats, it was 11 per cent higher at $184 000. The disparity in boat cash income between these sectors in 1993-94 reflects the greater capacity of the larger boats to increase catches of tiger prawns to compensate for the poor banana prawn season.

Average boat profit for the fleet was 57 per cent higher in 1993-94 than in 1992-93. The boat profit for larger boats in 1993-94 was more than twice that in 1992-93, due to higher fishing receipts.

Profit at full equity provides a measure of the return that would have been earned if the business was fully owned by the operator. To derive profit at full equity, lease, interest and rent payments are added to boat profit. Boat profit at full equity thus provides a measure which allows comparison of economic performance in the fishery. On average, for the fleet as a whole, profit at full equity in 1993-94 was $153 000,

8 Boat debt and equity of northern prawn boats in 1993-94 a Average per boat

	Unit	*375–475 units*		*Larger than 475 units*		*All boats*	
Capital (incl. quota and licences) at 30 June b	$	1 933 070	(5)	3 224 050	(3)	2 140 080	(2)
Boat business debt at 1 July c	$	255 160	(30)	74 510	(33)	141 260	(31)
Boat business debt at 30 June c	$	239 160	(31)	59 820	(34)	117 880	(27)
Change in debt over year c	$	–16 000	(69)	–14 690	(31)	–23 380	(61)
Boat business equity at 30 June b	$	1 693 910	(6)	3 164 230	(3)	2 022 200	(3)
Boat business equity ratio at 30 June b	%	87.6	(4)	98.1	(1)	94.5	(2)

a Figures in parentheses are relative standard errors. b Average per boat responding on debt. c Average per responding boat.

46 per cent higher than in 1992-93. For the larger boats, profit at full equity was $236 000 in 1993-94, compared with $116 000 in 1992-93.

Boat business profit and boat profit at full equity in 1994-95 are expected to have been, on average, over double their levels in 1993-94, because of the large increases in receipts in 1994-95 that came with good catches of prawns.

The rate of return to capital in the three years surveyed increased from 11.7 per cent in 1992-93 to 17.0 per cent in 1993-94 and is estimated to have doubled to 34.5 per cent in 1994-95. This value excludes the value of units and may present a more favourable view of returns to investment in the fishery than was actually realised. When the value of units are included, the rate of return is 14.5 per cent in 1994-95, compared with 7.1 per cent in 1993-94. It should be recognised that performance in the fishery is highly variable between years and is highly correlated with the effect of the weather on recruitment of prawns to the fishery. Consequently, rates of return should not be used to infer trends in the fishery.

Debt and equity

The average level of debt in the fleet fell by over $23 000 in 1993-94 (table 8). Falls in debt were experienced across all boat classes. However, the medium boat class had an average debt level of $239 000 at 30 June 1994, four times that of the large boat class.

The major components of this debt are for boat purchase and working capital, at 67 per cent and 32 per cent respectively. The large difference in debt between the two boat classes is caused by the boat purchase portion of the debt. Around 87 per cent of debt for the medium boat class is incurred for working capital, with the remaining 13 per cent for boat unit purchases.

There is a large difference in the level of equity (that is, the proportion of the value of the boat which is not indebted) between boat sectors. This measure provides a guide to the level of financial ownership of a vessel. The average equity level for the fleet is around 95 per cent. The medium boat class has a level of equity of 88 per cent, while the large boat class has a level of equity of 98 per cent.

Torres Strait prawn fishery

Survey results

The fishery

The Torres Strait is located between the tip of the Cape York Peninsula of Queensland to the south coast of Papua New Guinea and bordered in the west by the Arafura Sea and the Coral Sea to the east. There are four main fishing regions in the Torres Strait prawn fishery. The main focus of fishing occurs in the east and south east region off the Warrior Reef.

Fishery characteristics

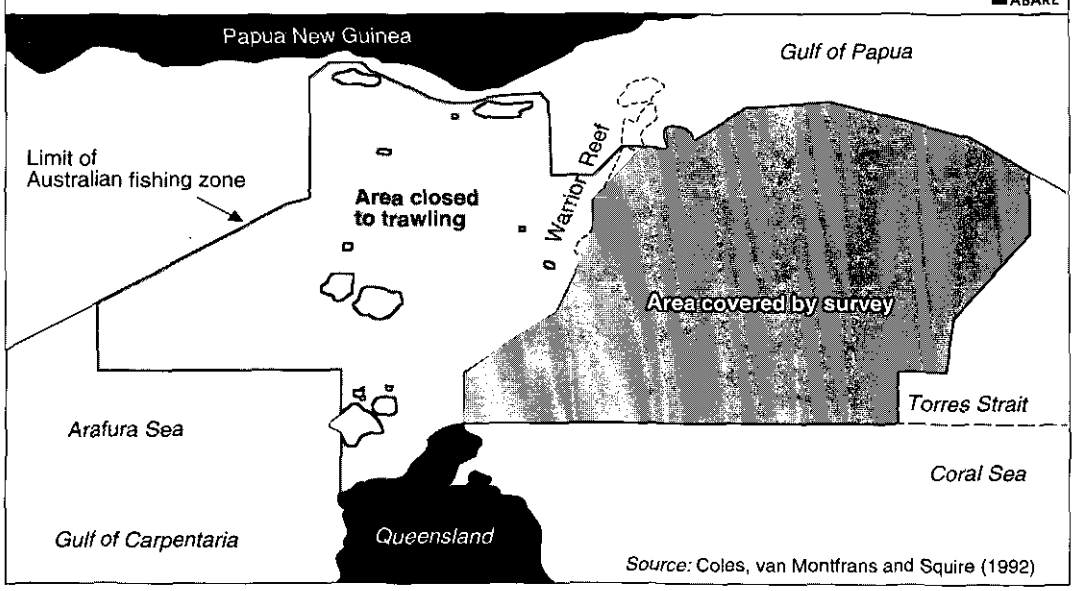
The prawn fishery is the most valuable sector of the Torres Strait fisheries, accounting for around half the value of production of all commercial fishing in the Strait. The gross value of prawn production of the Torres Strait prawn fishery is estimated to have been $14.9 million in 1994-95 from a total prawn catch of around 1655 tonnes (ABARE 1995a).

The Torres Strait prawn fishery is fully exploited. The average sustainable yield has been estimated at 1370 tonnes, comprising of 585 tonnes of tiger prawns, 685 tonnes of endeavour prawns and 100 tonnes of king prawns (Staples, Turnbull and Watson 1994).

However, recent studies have indicated that there may be some economic potential for underutilised bycatch species such as coral prawns, squid, octopus, crabs and various fish species (Reid, Collins and Battaglene 1993).

The catch consists of three types of prawns — brown tiger, endeavour and red spot king prawns. The average annual catch over the past five years has been around 1500 tonnes. Tiger and endeavour prawns make up 95 per cent of the catch. Prior to 1989, catches were dominated by tiger prawns; since then endeavour prawns have accounted for approximately 58 per cent of the total catch.

The Torres Strait prawn fishery



Source: Coles, van Montfrans and Squire (1992)

Most prawns are exported, with the destination depending on the size and type of prawn. The principal market for the larger tiger prawns is Japan, while endeavour prawns are exported to the United States and Spain. There is also a large bycatch of Moreton Bay bugs, with a value in 1994-95 of around $0.6 million. In some cases, rock lobsters are also caught in commercial quantities but under regulations have to be returned to the ocean.

Gear restrictions limit vessels to less than 20 metres in length and an engine size of under 300 kW. In 1994-95, 67 boats operated in the Torres Strait prawn fishery, all of which also had entitlements in the Queensland east coast prawn fishery. Some boats are also entitled to operate in the northern prawn fishery.

The average crew size of vessels operating in the Torres Strait prawn fishery is three (including the skipper) with the majority of boats being owner operated.

As the fleet is highly mobile, dual endorsed boats are able to move in and out of the fishery, depending on conditions in the adjoining fisheries, such as season openings and closures, profitability and fishing patterns. For example, there is an increase in fishing effort midyear when the dual endorsed northern prawn boats enter the Torres Strait fishery during the northern prawn midseason closure.

The Torres Strait prawn season opens in March. Catches, according to type of prawn, tend to be similar at the start of the season but tiger prawns tend to be targeted because of the higher price premium they attract in the valuable Japanese market. In the latter part of the season, catches are dominated by endeavour prawns. Fishing effort is higher at the start of the season as this coincides with the peak in the availability of brown tiger prawns for harvest.

Management of the fishery

Management of the fishery as a separate jurisdiction began with the ratification of the *Torres Strait Treaty* in 1985. Before 1985 any vessel endorsed in Queensland was able to fish in the Torres Strait.

The management of the fishery has focused on protecting juvenile prawn stocks in nursery grounds through seasonal closures, area closures and gear restrictions and reducing latent effort in the fishery.

Following concerns about the amount of latent effort (that is, the additional effort in the fishery that could be expended above that actually expended) in the fishery, new management measures in the form of an allocation of fishing days per vessel were introduced at the start of the 1993 fishing season. This allocation was based on the maximum number of days spent fishing in the Torres Strait prawn fishery in any of the four financial years prior to 1993. An additional component was allocated to compensate for non-fishing and breakdowns. These licence packages are transferable, but individual day allocations are not individually transferable.

Fleet characteristics

For the purposes of the survey, the fleet was defined as boats that only operated in the Torres Strait prawn fishery. Boats that operated in the northern prawn fishery were not included in this survey as they were included in the survey of the northern prawn fishery. Because of the uniformity in the size of boats and types of operations in the fishery, the fleet was not divided into sectors as for other fishery surveys, and results are presented only for the fleet as a whole.

The total prawn catch in 1994-95 fell to 1655 tonnes, a decline of only 1 per cent compared with the previous year (ABARE 1995a). There were falls in the catches of both tiger and endeavour prawns, of 7 per cent and 3 per cent respectively. Over the same period, there was a decrease of 11 per cent in the gross value of prawn production from the fishery, from $17.4 million to $14.9 million. Average catch per boat also fell over the same period.

The variability in catch is reflected in changes in the level of effort — both nominal and average per boat effort declined in 1994-95. Despite the small increase in the number of boats active in the fishery in 1994-95, nominal effort declined by approximately 15 per cent to 80 930 boat days. This may be a result of the new management policy placing restrictions on time spent in the fishery.

Financial performance

The principal measures of financial performance obtained from survey results are presented in table 9.

Receipts

The quantity of prawn sales per boat, on average, was 11 per cent lower in 1993-94 than in 1992-93, because of lower tiger prawn sales. However, offsetting these falls were high prawn prices in export markets, so that average prawn receipts per boat were almost $381 000 in 1993-94, less than 1 per cent lower than in 1992-93.

Average cash receipts per boat of the Torres Strait fleet from operations in the east coast prawn fishery were higher in 1993-94 ($38 000) than in 1992-93 ($13 000), because of higher average catches in that fishery.

On average, cash receipts per boat increased by less than 3 per cent in 1993-94 to $397 000. This improvement came largely from increases in receipts from bycatch species from $3000 in 1992-93 to $16 000 in 1993-94.

Estimates of average total cash receipts per boat for 1994-95 were based on changes in catch and effort recorded in logbooks between 1993-94 and 1994-95. In 1994-95, total cash receipts per boat, on average, are estimated at $371 000, 6 per cent lower than in 1993-94, because of lower catches.

Costs

On average, cash costs per boat for the fishery remained almost $350 000 in 1993-94. There were, however, fluctuations in the components of total cash costs, including falls in fuel and crew costs and increases in repairs and maintenance costs.

9 Financial performance of Torres Strait prawn fishery boats a Average per boat

		1992-93		1993-94		1994-95	
				All boats			
Receipt							
Prawn receipts	$	383 512	(10)	380 580	(12)	355 600	(14)
Other fishing receipts	$	2 955	(39)	15 900	(44)	15 300	(54)
Non-fishing receipts	$	307	(86)	300	(65)	300	(63)
Total cash receipts	$	386 774	(10)	396 780	(10)	371 200	(12)
Costs							
Administration	$	8 668	(18)	7 480	(14)	8 500	(15)
Crew costs	$	137 508	(10)	133 230	(11)	125 100	(12)
Freight and marketing	$	10 153	(13)	9 780	(17)	9 600	(19)
Fuel	$	66 874	(12)	60 860	(10)	59 300	(11)
Insurance	$	11 943	(9)	11 920	(7)	12 200	(8)
Interest paid	$	14 880	(37)	11 190	(33)	12 900	(36)
Leasing	$	3 104	(42)	1 090	(67)	1 000	(78)
Licence fees and levies	$	4 179	(14)	4 810	(13)	5 100	(16)
Packaging	$	3 863	(20)	3 860	(22)	4 700	(17)
Repairs and maintenance	$	69 302	(16)	85 850	(14)	68 800	(12)
Other costs	$	19 170	(17)	20 270	(21)	22 400	(23)
Total cash costs	$	349 645	(9)	350 340	(10)	329 600	(7)
Boat cash income	$	37 129	(32)	46 440	(24)	41 600	(71)
less depreciation b	$	27 069	(12)	26 890	(10)	28 900	(11)
Boat profit	$	10 059	(113)	19 550	(60)	12 700	(224)
plus interest, leasing and rent	$	18 391	(36)	12 390	(32)	14 000	(34)
Profit at full equity	$	28 451	(37)	31 940	(43)	26 700	(103)
Capital (excl. quota and licences)	$	322 985	(9)	343 270	(7)	349 600	(9)
Capital (incl. quota and licences)	$	na		503 050	(7)	518 600	(8)
Rate of return to capital c	%	8.8	(34)	9.3	(42)	7.6	(102)
Rate of return to full equity d	%	na		6.4	(41)	5.2	(101)

a Figures in parentheses are relative standard errors. b Depreciation adjusted for profit and loss on capital items sold. c Excluding value of quota or licence. d Including value of quota or licence. *p* Preliminary. **na** Not available.

Crew costs are the largest component of total cash costs, representing almost 40 per cent of average total cash costs per boat. Generally, the crew receives a percentage of receipts from which they have to pay a share of boat running costs, such as fuel and food. In 1993-94, crew costs were 3 per cent lower, reflecting the small fall in prawn receipts.

Fuel and repair costs are the other major component of total cash costs, accounting for around 40 per cent of total cash costs. In 1993-94 fuel costs were $61 000, around 9 per cent lower than in 1992-93, reflecting lower effort levels. However, this was offset by a 24 per cent increase in repairs and maintenance costs over the same period.

Costs in 1994-95 were estimated using a series of cost indexes, as well as on the basis of changes in catch and effort. Changes in catch and effort, derived from logbook information, affect crew payments, marketing costs and fuel costs. The cost indexes were determined by ABARE from a survey of suppliers of goods and services to the rural sector (ABARE 1994a). On the basis of these indexes and changes in catch and effort, average cash costs per boat in 1994-95 are estimated at almost $330 000, 6 per cent lower than 1993-94. Lower crew costs and repairs and maintenance are the main factors contributing to the lower cost.

Boat cash income and profit

The financial performance of the fleet can be measured by boat cash income and boat business profit. These provide an indication of the ability of the operator to remain in the fishery in the short to medium term without the need for recourse to additional finance. They reflect fluctuations in receipts and costs. In 1993-94, on average, cash income per boat was 25 per cent higher than in 1992-93 (mainly from increased fishing receipts). Boat cash income in 1994-95 is expected to have been 10 per cent lower than in 1993-94, at almost $42 000, following lower average total cash receipts per boat.

Boat profit has followed the same pattern. Boat profit is calculated by deducting depreciation from boat cash income. Boat profit was nearly $20 000 in 1993-94, 94 per cent higher than 1992-93. On average, boat profit in 1994-95 is estimated at almost $13 000, 35 per cent lower than in 1993-94. The lower estimated average boat profit in 1994-95 reflects a fall in prawn catches in that year.

The operational performance of 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 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 which would have been earned by the business unit had the boat and capital (including quota) been fully owned by the operator. As such, this measure provides a common basis for comparison of the operational performance of all boats in the fishery.

Profit at full equity per boat was around $32 000 in 1993-94, 12 per cent higher than in 1992-93. Profit at full equity per boat in 1994-95 is expected to have fallen to $27 000 because of lower fishing returns.

Rate of return

Rate of return to boat capital is calculated on total capital as if all fishing 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. 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). The rate of return to boat capital provides an indication of the impact of management changes on the fishery.

The rate of return to capital per boat was 8.8 per cent in 1992-93, 9.3 per cent in 1993-94 and is expected to have fallen slightly to 7.6 per cent in 1994-95. As this rate does not include the value of any licences, this rate of return may present a more favourable view of returns to investment in the fishery than were actually realised.

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). This gives operators interested in investing in a new boat and/or licence a measure of the economic performance of the fishery. This measure was 6.4 per

cent in 1993-94 and is estimated at 5.2 per cent in 1994-95.

Debt and equity

Average boat debt rose during 1993-94 from an opening balance of $90 000 to a closing balance of $133 000 (table 10). Around 59 per cent of the debt is incurred for boat purchases, while the other 41 per cent is for working capital. Interest payments for this debt decreased by 25 per cent in 1993-94 to $11 000.

Equity provides a measure of the degree of financial ownership of a vessel. The average equity ratio of the Torres Strait fleet is 73.5 per cent. This is substantially lower in comparison to the average equity ratio of 94.5 per cent in the northern prawn fishery. This higher level of indebtedness is linked to the higher proportion of owner operators in the Torres Strait prawn fishery, relative to the northern prawn fishery.

10 Boat debt and equity of Torres Strait prawn boats in 1993-94 a
Average per boat

	Unit	*All boats*	
Capital (incl. quota and licences) at 30 June b	$	503 050	(7)
Boat business debt at 1 July c	$	90 420	(35)
Boat business debt at 30 June c	$	133 390	(31)
Change in debt over year c	$	42 970	(72)
Boat business equity at 30 June b	$	369 660	(13)
Boat business equity ratio at 30 June b	%	73.5	(11)

a Figures in parentheses are relative standard errors. **b** Average per boat responding on debt. **c** Average per responding boat.

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