Australian fisheries surveys report 2009

Survey results for selected fisheries, 2006-07 and 2007-08 Preliminary estimates for 2008-09

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

Industry

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ABARE staff

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Foreword

This report provides estimates of the performance of operators in the northern prawn fishery and the Torres Strait prawn fishery, both of which were surveyed by ABARE in 2009. Survey based estimates of financial and economic performance are provided for the 2006-07 and 2007-08 financial years. Also provided are non-survey based estimates of economic performance for the 2008-09 financial year. These latter estimates have been calculated using a method recently developed by ABARE.

ABARE estimates of Commonwealth fishery financial and economic performance are relevant to the needs of fisheries policy-makers, managers, researchers and the fishing industry. The Australian Government Department of Agriculture, Fisheries and Forestry can use the information to assess the performance of the Australian Fisheries Management Authority in managing Commonwealth fisheries against its management objectives. As the information is made publicly available, the fishing industry can also independently assess the performance of surveyed fisheries and the effect of management policies.

This report is one of a regular series of fisheries survey reports that have been released every year since the early 1990s. Funding for these reports is provided by the Fisheries Resources Research Fund.

Phillip Glyde
Executive Director
October 2009

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1 Introduction and summary

This report contains estimates of the financial and economic performance of two key Commonwealth fisheries: the northern prawn fishery and the Torres Strait prawn fishery. It contains new survey based estimates for both fisheries for the 2006-07 and 2007-08 financial years, calculated using survey data collected from operators in 2009. It also contains non-survey based preliminary estimates of economic performance for both fisheries in 2008-09. These preliminary estimates were calculated using 2008-09 catch, effort and fish price data in combination with historical survey data and results.

A distinction is made throughout the report between financial performance and economic performance. Financial performance estimates are calculated for the average boat in a fishery and include all cash receipts and cash costs (including the value of any unpaid labour) that have been earned and incurred in the surveyed fishery and any other fisheries the vessel operated in. As such, these estimates largely reflect the average boat's accounts based profit and loss statement for all fishing activities.

The indicator of economic performance presented in the report is net economic returns (NER) which are reported at the fishery level. The main distinction between this and financial performance estimates is that estimates of NER relate only to the surveyed fishery and include non-cash economic costs such as depreciation, the opportunity cost of capital and the opportunity cost of labour. Definitions of these costs are provided in appendix B.

Although both indicators provide slightly different information, both are important. Financial performance information can provide some context to observed trends in a surveyed fishery. For example, positive financial profits at the boat level may reveal how operators continue to operate in a fishery that has experienced economic losses. These estimates are also more relevant to the needs of industry operators, who can compare their performance with that of the average vessel.

Economic performance is most relevant to the needs of fishery managers and policy-makers. First, NER relates only to the specific fishery being managed. Moreover, by taking into account all cash receipts, cash costs and economic costs, NER indicates the economic return to society associated with harvesting that fishery resource. For this reason, NER is the key economic performance indicator referred to in the *Fisheries Management Act 1991*. According to the Act, the Australian Fisheries Management Authority (AFMA) is required to maximise NER to the Australian community from the management of Australian fisheries. Although survey estimates of NER don't reveal how a fishery has performed relative to potential NER (maximum economic yield) in a given period, interpretation of NER trends and drivers can assist in assessing AFMA's performance against the latter objective. Such interpretation is also discussed in appendix B.

ABARE has been undertaking surveys of Commonwealth fisheries since the early 1980s and on a regular basis for key Commonwealth fisheries since 1992. The data that have been collected through these surveys allow the construction of a number of other economic indicators and tools that allow better assessment of AFMA's performance against its economic objective. These include productivity indexes, profit decompositions, efficiency analysis and bioeconomic models that can provide information about the maximum economic yield for a fishery. A list of earlier fisheries surveys reports is presented at the end of this report.

A summary of results for the northern prawn fishery and the Torres Strait prawn fishery is presented below.

Key results

Northern prawn fishery

Financial performance – per boat

- Average per boat total cash receipts for the entire fishery increased from approximately $917 000 in 2006-07 to more than $1.45 million in 2007-08, while average per boat total cash costs rose from $802 000 in 2006-07 to $1.18 million in 2007-08. Labour, fuel and repairs and maintenance accounted for more than 77 per cent of total cash costs for all boats in 2006-07 and almost 78 per cent of total cash costs in 2007-08.
- The proportional increase in average total cash receipts between survey years of 59 per cent was considerably greater than the proportional increase in total cash costs per boat of 47 per cent. As a result, boat cash income rose from $115 000 in 2006-07 to $276 000 in 2007-08.
- The average rate of return to full equity, including the value of quota and licences, increased from 2.7 per cent in 2006-07 to 6.3 per cent in 2007-08.

Economic performance – fishery as a whole

- From 2000-01 to 2004-05, receipts fell more rapidly than costs. As a result, net returns decreased every year, to a minimum of -$14.5 million. Since then, economic performance has been improving and, in 2007-08, net economic returns were $8.1 million.
- Non-survey based estimates of net economic returns show that returns to the fishery (including management costs) are estimated to have increased by 36 per cent to $11 million in 2008-09.

Torres Strait prawn fishery

Financial performance – per boat

- Average total cash receipts per boat rose from $600 000 in 2006-07 to $739 000 in 2007-08. Average total cash costs per boat also increased, from $629 000 in 2006-07 to $733 000 in 2007-08. Crew costs, fuel costs and repair and maintenance costs accounted for 79 per cent of total cash costs in 2006-07 and 78 per cent in 2007-08.

- Average boat cash income increased from -$29 000 a boat in 2006-07 to $6000 a boat in 2007-08.
- The average rate of return to full equity, including the value of quota and licences, increased from -3.5 per cent in 2006-07 to -0.4 per cent in 2007-08.

Economic performance – fishery as a whole

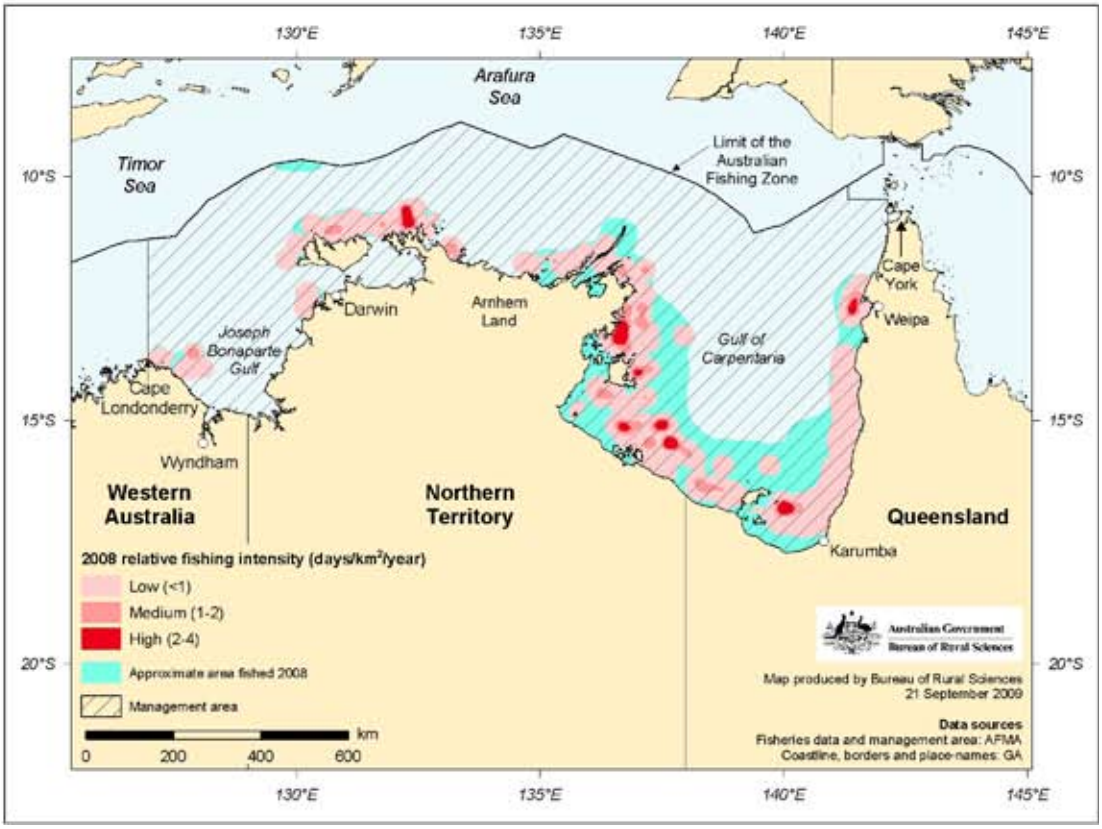
- Fishing receipts in the fishery have fallen every year since 1998-99, with the exception of 2006-07. There has also been a negative trend in costs, but with more variability than total receipts. The fishery has experienced negative returns since 2004-05, reaching a minimum of -$4.1 million in 2006-07. However, economic performance improved in 2007-08, with a net economic return of -$2.7 million.
- Non-survey based estimates suggest that net economic returns to the fishery (including management costs) declined to -$3.3 million in 2008-09, which was a decrease of 23 per cent relative to 2007-08.

2 Northern prawn fishery

The fishery

The northern prawn fishery (NPF) is a multi-species fishery located in Australia's northern waters between Cape York in Queensland and Cape Londonderry in Western Australia (map 1). Two key species groups are targeted in the fishery: tiger prawns and banana prawns.

map 1 Location of the northern prawn fishery



The main management tool for the fishery is input controls in the form of restrictions on the length of trawl net headrope allowed in the fishery. Gear units allocated to each operator specify the length of headrope allowed and operators are free to buy, sell or lease these gear

units. The fishery is also managed with a variety of other input controls including other gear restrictions, vessel restrictions, limited entry, area closures and seasonal closures.

Seasonal closures split operations in the fishery into two distinct fishing seasons: a banana prawn season and a tiger prawn season. AFMA's adaptive management approach to the NPF means that each season's length can vary from year to year depending on catch rates. In 2006-07, the tiger prawn season was open for 15 weeks (1 August to 14 November 2006) while the banana prawn season ran for eight weeks (6 April to 2 June 2007). In 2007-08, a longer 17 week tiger prawn season (1 August to 28 November 2007) and a longer 10 week banana prawn season was permitted (26 March to 5 June 2008).

During the banana prawn season, targeting of banana prawn aggregations (referred to as 'boils') allows large catches to be taken with relatively low trawling time. Such aggregating behaviour is less common in tiger prawn species. Therefore, relatively greater trawling times are typically required for catches of this species. However, tiger prawns receive substantially higher market prices. A large proportion of the tiger prawn catch is exported, predominantly to Japan, and catches sold on the domestic market compete with imports of lower valued prawns. As a result, prices are subject to a number of external factors including demand in foreign markets, competition from other prawn supplying countries and the exchange rate.

The fishery has recently undergone significant changes following the Australian Government's $220 million Securing Our Fishing Future structural adjustment package, which was concluded in December 2006. Forty-three class B Statutory Fishing Rights (SFRs) and 18 365 gear SFRs were purchased from the fishery, representing a 45 per cent and 34 per cent reduction in SFRs, respectively (Abetz 2006a). In line with this reduction, vessel numbers decreased from 86 in 2005-06 to 55 in 2007-08.

A harvest strategy was also implemented for the fishery in 2007 in response to a Ministerial Direction to AFMA given in December 2005. For tiger prawns, the harvest strategy specifies a target of long-term maximum economic yield for tiger prawns and endeavour prawn by-product. No target is currently specified for banana prawns.

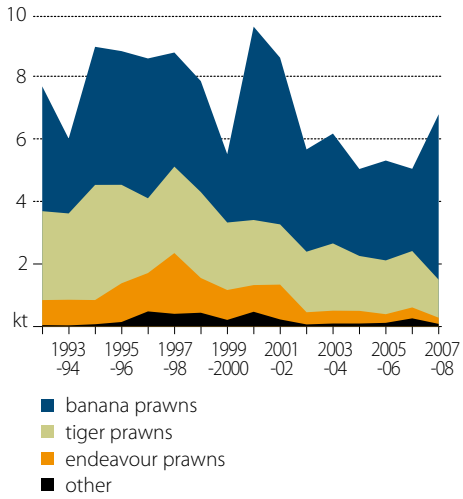
The ministerial direction also required that an output-based management system in the form of individual transferable quotas (ITQs) be considered for the fishery, and in August 2009, the AFMA Commission agreed to move the fishery to ITQs. The decision took into consideration submissions from industry, the Northern Prawn Fishery Management Advisory Committee (NORMAC), an industry-funded cost benefit analysis on implementing output controls in the fishery and AFMA's legislative objectives. The operational details of the quota system are now being developed and a draft management plan is expected to be available for consideration by NORMAC in June 2010 (AFMA 2009).

For an in depth overview of the fishery including its history, management arrangements, biological and economic status, see Larcombe and Perks (2009).

Catch and gross value of production

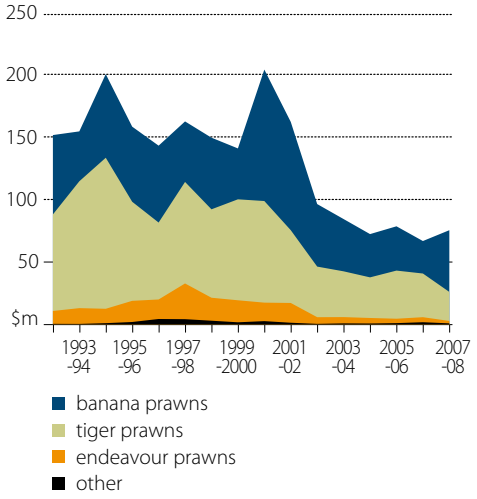
The combined banana and tiger prawn catch has typically accounted for around 90 per cent of the fishery's total catch in recent years. The remainder of the catch is composed of endeavour prawns, king prawns and other non-prawn species. In 2007-08, total catch in the fishery increased by 35 per cent, from 5132 tonnes in 2006-07 to 6903 tonnes (figure a). The 2006-07 banana prawn catch of 2674 tonnes was the lowest since 1999-00 when it was 2222 tonnes. However, in 2007-08, the banana prawn catch more than doubled to 5380 tonnes. This was the largest banana prawn catch since 2000-01 when the catch reached 6286 tonnes. The tiger prawn catch in 2007-08 was the lowest recorded following a 33 per cent decline from 1834 tonnes in 2006-07 to 1235 tonnes in 2007-08.

a Northern prawn fishery: landings



Real gross value of production (GVP) for the NPF has followed a downward trend since 2000-01 when it peaked at $207 million (2008-09 dollars) (figure b). This trend reversed in 2007-08 following a 12 per cent increase in GVP to $76.8 million. This was driven by the increase in banana prawn catch, the value of which almost doubled from $26.4 million in 2006-07 to $50.2 million in 2007-08. The opposite occurred for the gross value of tiger prawn production, which decreased by 34 per cent, from $35.5 million in 2006-07 to $23.6 million in 2007-08.

b Northern prawn fishery: real gross value of production
in 2008-09 dollars



Survey results

Boats surveyed

The objective of the 2009 survey of the NPF was to collect survey data for the 2006-07 and 2007-08 financial years. For the purpose of the survey, the target population was defined as boats that caught prawns in the NPF in either of the two financial years. In 2006-07, the population was 77 vessels, of which 34 were sampled. In 2007-08, 30 vessels were sampled out of a population of 55.

Boat level financial performance

Survey based estimates of average boat level financial performance are contained in table 1. Many boats that operate in the NPF also operate in other fisheries such as the Torres Strait prawn fishery, the north west slope trawl fishery and Queensland east coast otter trawl fishery. Any receipts earned and costs incurred by these boats while operating in these other fisheries are included in the financial performance measures in table 1. Definitions of items contained in table 1 are included in appendix B.

Receipts

Average per boat seafood receipts increased by 66 per cent between survey years, from $841 000 a boat in 2006-07 to $1.4 million a boat in 2007-08. This increase reflects the substantial increase in fishery GVP and the decrease in boat numbers between survey years. That is, fewer boats shared a higher GVP in 2007-08. Total cash receipts increased by 59 per cent, to $1.45 million a boat in 2007-08.

Costs

Average per boat total cash costs also increased between survey years, from $802 000 a boat in 2006-07 to just less than $1.2 million a boat in 2007-08. This 47 per cent increase was comparatively lower than the percentage increase in total cash receipts.

Nearly all cost items increased for the average boat between 2006-07 and 2007-08, with the exception of interest paid. The biggest increases occurred for catch freight and marketing (121 per cent) and packaging (110 per cent). Increases in these catch related costs items can be linked to the relatively large catches of banana prawn per boat in 2007-08.

The key cost components for the average boat in 2007-08 were fuel costs (34 per cent of total cash costs), crew costs (29 per cent) and repairs and maintenance (14 per cent). Increases in these cost items in 2007-08 were the main drivers of the increase in total cash costs observed between survey years. Crew costs increased by 63 per cent, to $345 000 a boat in 2007-08, roughly in proportion to seafood receipts as crew are generally paid a percentage of seafood receipts. Fuel costs increased by 41 per cent to $405 000 a boat in 2007-08. Similarly, repairs and maintenance costs increased by 37 per cent to $162 000 a boat.

Boat cash income and boat business profit

Boat cash income (total cash receipts less total cash costs) more than doubled, from $115 000 a boat in 2006-07 to $276 000 a boat in 2007-08, reflecting a greater proportional increase in cash receipts relative to cash costs.

Boat business profit, which is boat cash income less an allowance for depreciation, also increased, from $66 000 a boat in 2006-07 to $229 000 a boat in 2007-08.

Profit at full equity, which is boat business profit plus interest, leasing and rent, increased from $84 000 a boat in 2006-07 to $243 000 a boat in 2007-08. This profit measure is calculated by removing all costs associated with interest, leasing and rent. While these costs affect the financial position of the operator, they represent profits that have been redistributed to other

1 Financial performance of boats operating in the northern prawn fishery

average per boat

		2006-07		2007-08	
Seafood receipts	$	841 469	(8)	1 399 537	(4)
Non-fishing receipts	$	75 054	(29)	53 767	(15)
Total cash receipts	$	916 523	(8)	1 453 304	(3)
Administration	$	22 991	(16)	25 712	(14)
Crew costs	$	211 744	(9)	344 548	(3)
Freight and marketing expenses	$	23 100	(11)	51 003	(8)
Fuel	$	288 471	(6)	405 429	(2)
Insurance	$	23 430	(12)	33 332	(6)
Interest paid	$	6 766	(32)	4 338	(64)
Licence fees and levies	$	20 264	(10)	25 821	(6)
Packaging	$	22 529	(10)	47 351	(5)
Repairs and maintenance	$	118 328	(9)	162 301	(4)
Other costs	$	64 104	(10)	77 101	(7)
Total cash costs	$	801 727	(7)	1 176 936	(2)
Boat cash income	$	114 797	(30)	276 368	(12)
less depreciation **a**	$	48 964	(10)	46 991	(8)
Boat business profit	$	65 833	(52)	229 377	(14)
plus interest, leasing and rent	$	18 159	(24)	13 149	(27)
Profit at full equity	$	83 992	(38)	242 527	(13)
Capital (excl. quota and licences)	$	879 857	(8)	1 095 111	(4)
Capital (incl. quota and licences)	$	3 097 084	(7)	3 824 277	(2)
Rate of return to boat capital **b**	%	9.5	(37)	22.1	(11)
Rate of return to full equity **c**	%	2.7	(37)	6.3	(11)
Population	no.	77		55	
Sample	no.	34		30	

a Depreciation adjusted for profit or loss on capital items sold. **b** Excluding value of quota and licences. **c** Including value of quota and licences.

Note: Figures in parentheses are relative standard errors. A guide to interpreting these is included in appendix A. For a given standard error, the relative standard error will be higher for mean estimates closer to zero.

investors in the fishery. As such, profit at full equity represents the average return to the business unit had the boat and capital (including quota and licences) been fully owned by the operator.

Rates of return

The estimated average rate of return to boat capital, excluding the value of quota and licences, for the average boat was 9.5 per cent in 2006-07 and 22.1 per cent in 2007-08. To allow the financial performance of all boats to be compared irrespective of the operators' equity in the business unit, rates of return are calculated assuming all capital assets are owned by the operators.

The average rate of return to full equity across the fishery increased from 2.7 per cent in 2006-07 to 6.3 per cent in 2007-08. The rate of return to full equity includes the value of quota and licences in addition to other capital, and therefore provides an indication of the return to

total capital invested in the business unit. It reflects changes in the value of capital, quota and licences as well as changes in boat level profitability.

Fishery level economic performance

The boat level estimates displayed in table 1 indicate the financial performance of the average vessel in the NPF in 2006-07 and 2007-08. However, the measure presented is not an accurate indicator of fishery level economic performance, as it includes receipts and costs relevant to a boat's operations in other fisheries and also excludes some key economic costs.

Table 2 shows receipts, costs and key measures of fishery level profitability; namely, boat cash profit and net economic return. Boat cash profit measures the difference between cash receipts and cash costs in a fishery. As such, it reveals the cash position of the fishery. Net economic return, in comparison, reveals economic profitability, as it incorporates depreciation costs and the opportunity cost of capital and labour and it treats all interest and leasing expenditure as an economic return to external investors in the fishery. Furthermore, it includes the total amount spent on managing the fishery rather than just the management fees recovered from operators. A more detailed explanation of net economic return is included in appendix B of this report.

In recent years, prior to 2006-07, boat cash profit has followed a decreasing trend, given large declines in total fishing receipts relative to fishing costs. Following a peak of $221 million (2008-09 dollars) in total fishing receipts in 2000-01, receipts declined to a low of $68 million in 2006-07. However, the trend was reversed in 2007-08 and receipts recovered to $78.4 million, which was an increase of $10.4 million or 15 per cent. Cash costs in 2007-08 only increased slightly, by 2 per cent to $65.2 million. This resulted in an improvement in boat cash profit of $9.1 million, from $4.1 million in 2006-07 to $13.2 million in 2007-08. This compares with negative boat cash profit estimates of -$5.8 million and -$2.3 million in 2004-05 and 2005-06, respectively.

Once all economic costs are accounted for, real net economic returns (excluding management costs) followed a similar trend to boat cash profit post 2000-01 and became negative for the first time in 2004-05. The declining trend reversed in 2005-06. Net economic returns became positive in 2007-08, following an increase from -$3 million in 2006-07 to $8.1 million in 2007-08.

The improvement in net economic returns corresponded with a rapid decline in cash costs of 28 per cent, from $90.1 million in 2004-05 to $65.2 million in 2007-08. Similarly, capital costs also declined substantially over the same period. The opportunity cost of capital decreased by 59 per cent between 2004-05 and 2007-08, from $4.2 million to $1.7 million, respectively. Depreciation costs also decreased by 55 per cent, from $5.8 million in 2004-05 to $2.6 million in 2007-08. These declines are largely attributable to the reduction in boat numbers and capital invested in the fishery following the recent *Securing our Fishing Future* fishery buyback. With fishery level costs decreasing and fishing income remaining comparatively stable over the survey period, net economic returns to the fishery improved. A time series of boat cash profit and net economic returns for the fishery over the entire period are shown in figure c.

2 Real boat cash profit and net economic returns in the northern prawn fishery, total for the fishery and net economic returns per boat in 2008-09 dollars

		1992-93		1993-94		1994-95		1995-96		1996-97		1997-98	
Cash receipts													
Fishing income	$m	163.3	(4)	183.6	(4)	205.0	(8)	174.8	(3)	163.8	(3)	196.4	(2)
Cash costs													
Operating costs	$m	123.0	(4)	134.1	(6)	141.0	(6)	137.5	(3)	124.7	(3)	134.6	(2)
Boat cash profit	$m	40.3	(8)	49.5	(11)	64.0	(12)	37.2	(10)	39.1	(9)	61.9	(4)
less													
– owner and family labour	$m	9.0	(11)	11.8	(8)	4.2	(13)	3.6	(15)	5.0	(20)	5.2	(18)
– opportunity cost of capital	$m	6.3	(6)	5.5	(5)	6.4	(5)	7.6	(7)	6.7	(7)	6.4	(6)
– depreciation	$m	4.5	(15)	9.2	(5)	9.1	(5)	10.5	(6)	9.6	(7)	10.2	(6)
plus interest, leasing and management fees	$m	9.3	(10)	11.0	(7)	11.4	(14)	12.8	(9)	14.6	(8)	14.9	(6)
Net economic return (excl. management costs)	$m	30.0	(11)	34.1	(16)	55.7	(15)	28.3	(16)	32.4	(12)	54.9	(5)
Management costs	$m	na		na		na		1.4	na	1.4	na	1.4	na
Net economic return	$m	na		na		na		26.9	na	31.1	na	53.5	na
Number of active boats	no.	129		132		133		134		128		130	
Net economic return per boat	$'000	na		na		na		201		243		412	

		1998-99		1999-00		2000-01		2001-02		2002-03		2003-04	
Cash receipts													
Fishing income	$m	181.7	(3)	144.8	(4)	220.5	(3)	160.2	(4)	125.8	(4)	97.4	(5)
Cash costs													
Operating costs	$m	137.2	(3)	113.3	(4)	140.1	(3)	115.3	(4)	98.6	(4)	85.5	(5)
Boat cash profit	$m	44.5	(7)	31.5	(14)	80.4	(6)	44.8	(7)	27.1	(12)	11.9	(25)
less													
– owner and family labour	$m	4.1	(18)	4.8	(21)	4.7	(18)	4.2	(20)	1.7	(32)	1.5	(29)
– opportunity cost of capital	$m	6.1	(8)	4.8	(8)	4.4	(9)	3.6	(9)	2.7	(13)	2.4	(13)
– depreciation	$m	8.7	(8)	7.8	(9)	6.3	(9)	5.6	(9)	3.1	(21)	2.7	(29)
plus interest, leasing and management fees	$m	16.7	(8)	12.2	(6)	9.2	(21)	7.7	(9)	7.0	(12)	7.2	(12)
Net economic return (excl. management costs)	$m	42.3	(7)	26.3	(16)	74.1	(6)	39.1	(7)	26.6	(12)	12.5	(22)
Management costs	$m	1.6	na	2.0	na	2.0	na	1.7	na	1.8	na	2.4	na
Net economic return	$m	40.6	na	24.3	na	72.1	na	37.4	na	24.8	na	10.1	na
Number of active boats	no.	133		130		118		118		101		98	
Net economic return per boat	$'000	306		187		611		317		245		103	

continued...

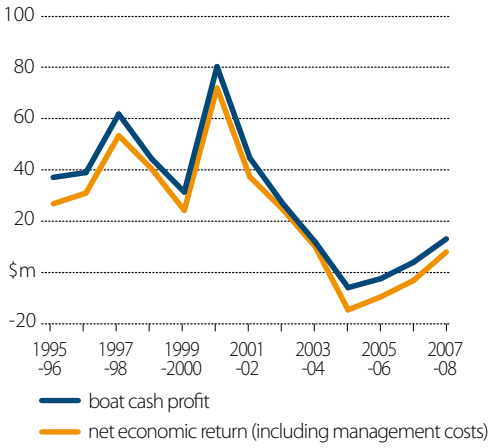
2 Real boat cash profit and net economic returns in the northern prawn fishery, total for the fishery and net economic returns per boat

in 2008-09 dollars continued

		2004-05		2005-06		2006-07		2007-08	
Cash receipts									
Fishing income	$m	84.3	(5)	85.5	(6)	68.0	(9)	78.4	(4)
Cash costs									
Operating costs	$m	90.1	(4)	87.8	(5)	63.8	(7)	65.2	(3)
Boat cash profit	$m	–5.8	(38)	–2.3	(76)	4.1	(56)	13.2	(15)
less									
– owner and family labour	$m	1.2	(31)	1.1	(29)	0.9	(23)	0.6	(19)
– opportunity cost of capital	$m	4.2	(14)	3.1	(14)	2.5	(11)	1.7	(8)
– depreciation	$m	5.8	(14)	4.9	(14)	4.0	(10)	2.6	(8)
plus interest, leasing and management fees	$m	4.9	(15)	4.1	(18)	3.1	(10)	2.1	(10)
Net return (excl. management costs)	$m	–12.1	(23)	–7.3	(25)	–0.1	(1683)	10.4	(17)
Management costs	$m	2.4	na	2.1	na	2.9	na	2.3	na
Net return (incl. management costs)	$m	–14.5	na	–9.4	na	–3.0	na	8.1	na
Number of active boats	no.	96		86		77		55	
Net return per boat (incl. management costs)	$'000	–151		–110		–40		147	

na Not applicable.
Note: Figures in parentheses are relative standard errors. For any given standard error, a relative standard error will be higher for estimates closer to zero. A guide to interpreting these is included in appendix A. Management costs prior to 1995-96 are not available.

C Real boat cash profit and net economic return (including management costs) for the northern prawn fishery, total for the fishery in 2008-09 dollars



Note: Net economic returns prior to 1995-96 exclude management costs which were not available.

Non-survey based results

Background

Survey based estimates of economic performance for the NPF in 2008-09 will not be available until after the fishery is surveyed again in 2011, with the results to be published in late 2011. However, preliminary estimates of the fishery's economic performance in 2008-09 have been calculated using techniques outlined in appendix C. These techniques use historical survey data and already available information on fishery catch and effort and fish prices for all years up to and including 2008-09.

Preliminary estimates of fishery level economic performance

Non-survey based estimates of net economic returns for 2008-09 are contained in table 3, together with survey based estimates for 2007-08 for comparison. The break up of revenues and costs in table 3 differs to that of table 2 given the different approach taken to estimating each individual cost component shown in table 3. Summary statistics relevant to the 2008-09 preliminary estimates for the NPF are in appendix D.

Despite a reduction in fishery level catch between 2007-08 and 2008-09, cash receipts in real terms are expected to have remained unchanged between 2007-08 and 2008-09, at $78.4 million (2008-09 dollars). This is largely because of an estimated 27 per cent increase in the average price paid for tiger prawns in the fishery.

Total operating costs in the NPF are anticipated to have fallen by 4 per cent (from $65.8 million to $63 million) in 2008-09. This decrease has been driven by substantial decreases in other costs (13 per cent) and fuel (8 per cent). The expected 8 per cent decrease in fuel cost is consistent with decreases in fishery level effort and relatively stable fuel prices (table 4). Slight increases in repairs and maintenance (2 per cent) and labour costs (4 per cent) are expected to have partially mitigated the overall decrease.

3 Preliminary non-survey based estimates of real net economic returns for the northern prawn fishery in 2008-09, total for fishery and total per boat

in 2008-09 dollars

		financial year		percentage change
		2007-08	2008-09	%
Fishery level				
Cash receipts	$m	78.4	78.4	0
less adjusted operating costs				
Fuel	$m	22.6	20.8	–8
Labour	$m	19.3	20.1	4
Repairs and maintenance	$m	9.0	9.2	2
Other costs	$m	14.9	12.9	–13
Total adjusted operating costs	$m	65.8	63.0	–4
plus interest, leasing, management fees	$m	2.1	1.8	–17
less capital costs				
Opportunity cost of capital	$m	1.7	1.5	–9
Depreciation	$m	2.6	2.4	–9
Total capital costs	$m	4.3	3.9	–9
Net economic returns (excl. management costs)	$m	10.4	13.3	28
less management costs	$m	2.3	2.3	–3
Net economic returns (incl. management costs)	$m	8.1	11.0	36
Boat level				
Population	no.	55	55	0
Net economic return per boat (incl. management costs)	$'000	147.0	200.4	36

Note: Labour costs include opportunity cost of owner and family labour.

Net economic returns to the fishery (including management costs) are estimated to have increased from $8.1 million in 2007-08 to $11 million in 2008-09. This represents an increase of 36 per cent. At the boat level, net economic return per boat increased by an estimated 36 per cent, from $147 000 to $200 000. The key drivers of these changes in net economic returns are shown in table 4.

4 Key drivers of change in net economic returns in the northern prawn fishery

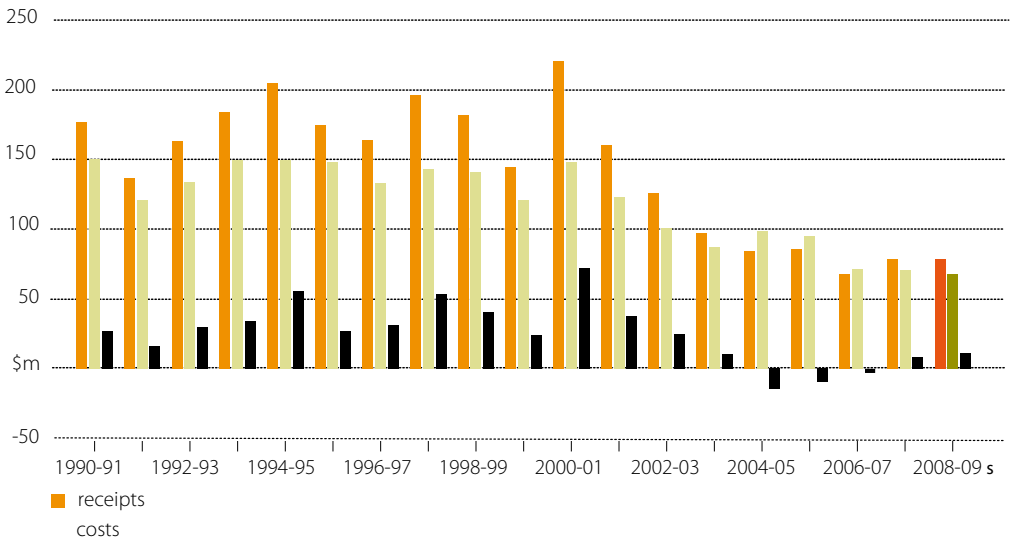
2007-08 and 2008-09

	2007-08	2008-09	variable percentage change %
Active vessel numbers	55	55	0
Total catch (kilotonnes)	6.9	6.5	–5
Average catch price per kilogram ($)	11.12	11.33	2
Effort – boat days ('000)	12.0	10.7	–11
Effort – trawl hours ('000)	79.0	72.4	–8
Diesel fuel price ($)	1.37	1.37	0

Note: All 2008-09 estimates are preliminary. Prices are in real terms (2008-09 dollars). Catch data based on logbook data.

Figure d shows receipts, costs and net economic returns for all previous survey years together with the non-survey based estimates for 2008-09 presented above. The *Fisheries status report 2009* (Wilson et al. 2009) has more details on the drivers of changes in economic performance in this fishery.

d Real revenue, costs and net economic returns in the northern prawn fishery, total for fishery in 2008-09 dollars



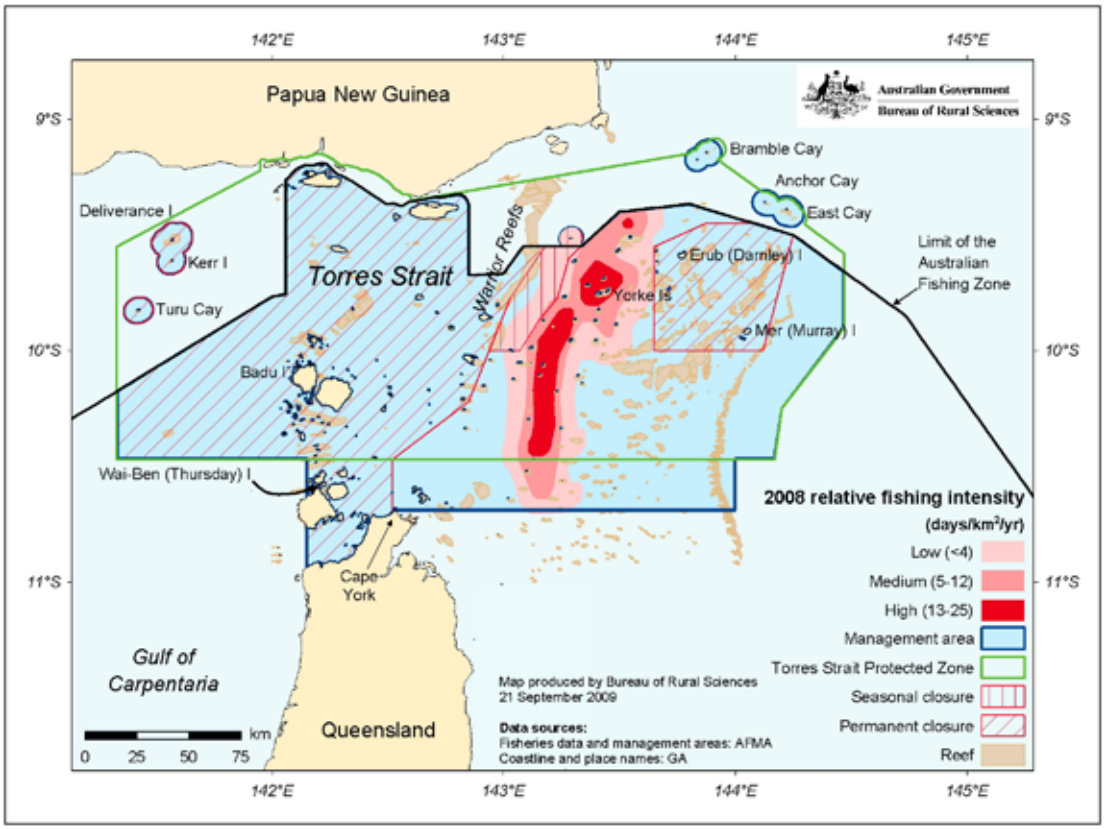
s Preliminary estimate.
Note: Costs and net economic returns prior to 1995-96 exclude management costs which were not available.

3 Torres Strait prawn fishery

The fishery

The Torres Strait prawn fishery (TSPF) operates in an area of water shared by Australia and Papua New Guinea that is referred to as the Torres Strait Protected Zone (TSPZ). The zone is bordered by Papua New Guinea in the north, Cape York Peninsula in the south, the Coral Sea to the east and the Arafura Sea to the west (map 2). Since the fishery operates in the waters of two countries, the *Torres Strait Treaty* (ratified in 1985) dictates resource sharing arrangements within the zone (Taylor et al. 2007).

map 2 Location of the Torres Strait prawn fishery



The Protected Zone Joint Authority (PZJA) is responsible for the management of the fishery and consists of representatives of the Australian Government and Queensland Ministers responsible for fisheries and the Chair of the Torres Strait Regional Authority (PZJA 2006). The PZJA was established under the *Torres Strait Fisheries Act 1984*.

The two target species in the fishery are brown tiger prawn and blue endeavour prawn. Boats in the fishery use otter trawl nets, with all fishing undertaken at night. The fishery is managed with a variety of input controls. The main input control limits the number of nights that can be fished. The current management plan allows for nights in the fishery to be permanently traded and seasonally leased. Seasonal and area closures are also enforced in the fishery, with the season running from 1 March to 1 December. Other key input controls include a restriction on boat size to 20 metres and restrictions on trawl net dimensions in terms of combined headrope and footrope length and mesh size.

When operating in the TSPF, vessels have generally been supported by motherships and supply barges located in anchorages throughout the fishery, which allow vessels to remain at sea for extended periods of time. However, in recent years, these services have been reduced as effort and vessel numbers in the fishery have declined in response to low prawn prices and high fuel costs (Turnbull et al. 2009). Most vessels do not operate exclusively in the TSPZ, instead choosing to split their time between the TSPF and the Queensland east coast otter trawl fishery to the south. Some also operate in the northern prawn fishery to the west.

Key changes to the fishery in recent years include a reduction in the total fishery effort cap from 13 454 fishing nights in 2005 to 9200 in the 2006 season, following stock assessment estimates of effort to achieve maximum sustainable yield for tiger prawns in the fishery (Woodhams and Perks 2009). Additionally, the Australian Government instigated a voluntary tender process in early 2006 for the surrender of licences by operators. The purpose of this tender was to assist Australia in meeting its resource sharing obligations with Papua New Guinea as stipulated in the Torres Strait Treaty. Ultimately, the process resulted in the removal of 16 licences from the fishery and the surrender of approximately 25 per cent of total fishing effort (Abetz 2006b). Despite these changes, large amounts of unused or latent effort remained in the fishery because of unfavourable economic conditions in the form of low prawn prices and high costs.

In 2007, Papua New Guinea made its effort entitlements in the Australian fisheries jurisdiction of the TSPZ available to Australian licence holders. This arrangement was rolled over for the 2008 season. A second change of note occurred in 2009, when the Torres Strait Prawn Fishery Management Plan 2009 was implemented. This plan formalised a number of arrangements for the fishery, including internal leasing of Australian effort units (Woodhams and Perks 2009).

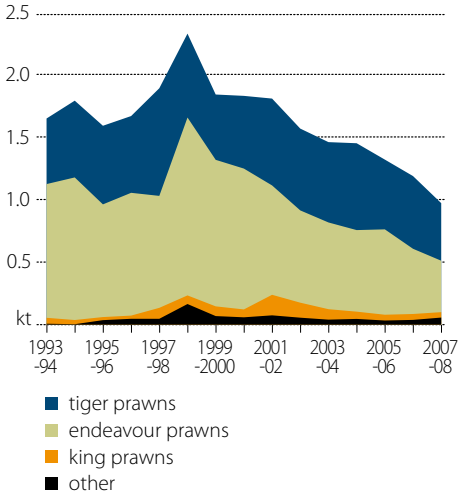
For more information on the fishery including its history, management arrangements, biological status and economic status, see Woodhams and Perks (2009).

Catch and gross value of production

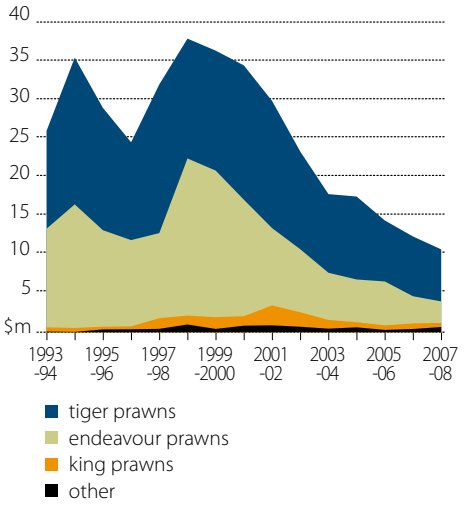
In 2006-07, 1208 tonnes of prawns were landed, consisting of 591 tonnes of tiger prawns, 530 tonnes of endeavour prawns, 48 tonnes of king prawns and 11 tonnes of other prawn species (figure e). In 2007-08, total prawn catch fell to 989 tonnes. This consisted of 469 tonnes of tiger prawns, 418 tonnes of endeavour prawns, 44 tonnes of king prawns and 32 tonnes of other prawn species. Non-prawn by-product is dominated by Moreton Bay bugs, scallops and squid.

The real gross value of production of the fishery fell in 2006-07 to $12.5 million and again in 2007-08 to $10.8 million (2008-09 dollars) (figure f). Prices for the key species (tiger and endeavour prawns) fell in 2006-07, before recovering in 2007-08.

e Torres Strait prawn fishery: landings



f Torres Strait prawn fishery: real gross value of production
in 2008-09 dollars



Survey results

Boats surveyed

The objective of the 2009 survey of the TSPF was to collect survey data for the 2006-07 and 2007-08 financial years. Accordingly, the target population was defined as boats that caught prawns in the TSPF in the 2006-07 and 2007-08 financial years. In 2006-07, the population was 50 vessels, of which 13 were sampled. In 2007-08, 12 vessels were sampled, out of a smaller population of 39.

Boat level financial performance

Key measures of boat level financial performance are contained in table 5. Definitions of items contained in table 5 are included in appendix B. Many boats that operate in the TSPF also operate in other fisheries such as the northern prawn fishery and the Queensland east coast otter

trawl fishery. Any receipts earned and costs incurred by these boats while operating in other fisheries are included in the financial performance measures presented in table 5.

5 Financial performance of boats operating in the Torres Strait prawn fishery

average per boat

		2006-07		2007-08	
Seafood receipts	$	533 070	(8)	656 778	(8)
Non-fishing receipts	$	67 266	(11)	82 586	(5)
Total cash receipts	$	600 337	(8)	739 364	(7)
Administration	$	11 736	(31)	23 250	(20)
Crew costs	$	148 372	(11)	200 412	(10)
Freight and marketing expenses	$	16 566	(12)	27 867	(13)
Fuel	$	269 219	(8)	296 338	(7)
Insurance	$	24 717	(10)	22 614	(15)
Interest paid	$	9 647	(54)	19 527	(30)
Licence fees and levies	$	8 520	(13)	10 402	(18)
Packaging	$	10 571	(12)	13 581	(23)
Repairs and maintenance	$	82 349	(12)	77 429	(13)
Other costs	$	47 608	(23)	41 836	(14)
Total cash costs	$	629 306	(7)	733 256	(6)
Boat cash income	$	–28 969	(76)	6 108	(500)
less depreciation **a**	$	34 426	(15)	33 281	(13)
Boat business profit	$	–63 395	(38)	–27 173	(106)
plus interest, leasing and rent	$	11 528	(46)	21 514	(26)
Profit at full equity	$	–51 867	(44)	–5 659	(544)
Capital (excl. quota and licences)	$	608 458	(8)	617 381	(12)
Capital (incl. quota and licences)	$	1 464 270	(9)	1 382 132	(13)
Rate of return to boat capital **b**	%	–8.5	(44)	–0.9	(546)
Rate of return to full equity **c**	%	–3.5	(46)	–0.4	(547)
Population	no.	50		39	
Sample	no.	13		12	

a Depreciation adjusted for profit or loss on capital items sold. **b** Excluding value of quota and licences. **c** Including value of quota and licences.

Note: Figures in parentheses are relative standard errors. For any given standard error, a relative standard error will be higher for estimates closer to zero. A guide to interpreting these is included in appendix A.

Receipts

Average per boat seafood receipts rose from approximately $533 000 to $657 000 between 2006-07 and 2007-08, which was an increase of 23 per cent. This is mainly attributable to relatively higher boat level catches and higher tiger prawn prices in 2007-08.

Costs

Average total boat cash costs rose by 17 per cent between 2006-07 and 2007-08, from approximately $629 000 a boat to $733 000 a boat.

Fuel costs were the highest expense in the fishery in both survey years. Average per boat fuel costs made up 43 per cent of total cash costs in 2006-07 and 40 per cent in 2007-08. These are the highest proportions ever estimated for this fishery.

Estimated at $148 000 in 2006-07 and $200 000 in 2007-08, labour costs were the second largest cost item in the fishery, and accounted for 24 per cent and 27 per cent of total cash costs, respectively. Boat labour is generally paid a share of revenue. Therefore, the 35 per cent increase that occurred in 2007-08 is linked with the increase in cash receipts in the same year.

Repairs and maintenance expenses decreased by 6 per cent from 2006-07 to 2007-08 to an average of $77 000 a boat. These were the third largest cost item in both survey years.

Together, fuel, labour and repairs and maintenance costs accounted for 79 per cent of total cash costs in 2006-07 and 78 per cent in 2007-08.

Boat cash income and boat business profit

An increase in seafood receipts relative to total boat cash costs has driven a positive change in average per boat cash income, from -$29 000 to $6000.

Boat business profit, which is boat cash income less an allowance for depreciation, remained negative. However, the average loss per boat decreased between 2006-07 and 2007-08 from -$63 000 to -$27 000.

Profit at full equity (which is boat business profit plus interest, leasing and rent) was estimated to be negative in both years at -$50 000 in 2006-07 and -$6000 in 2007-08. Profit at full equity represents the average return that would have been earned by the business unit if the boat and capital (including quota and licences) were fully owned by the operator. While these costs affect the financial position of the operator, they represent some profits that have been redistributed to other investors in the fishery.

Rates of return

The estimated average rate of return to boat capital, excluding the value of quota and licences, was -8.5 per cent in 2006-07 and -0.9 per cent in 2007-08. The rate of return to boat capital is based on total physical capital, excluding the value of quota and licences, invested in the fishery and assumes that operators wholly own all assets. This allows the financial performance of all boats to be compared regardless of the operators' equity in the business.

The rate of return to full equity includes the value of quota and licences and provides an indication of the return to total capital invested in the business unit. Fluctuations in this measure represent changes in the value of quota and licences, including quota and licences for other fisheries, physical capital as well as changes in profitability. For the fleet as a whole, the resulting rate of return to full equity was estimated to be -3.5 per cent in 2006-07 and -0.4 per cent in 2007-08.

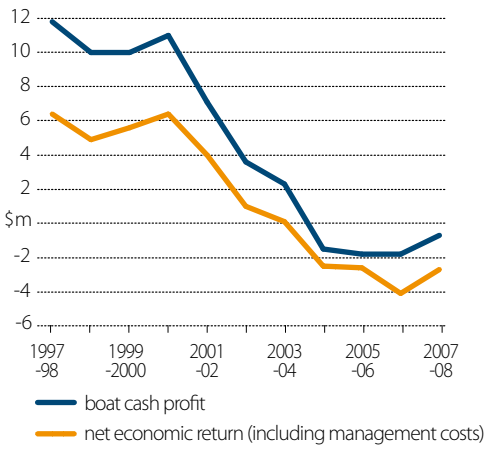
Fishery level economic performance

The average receipts and costs of boats that operated in the TSPF in 2006-07 and 2007-08 are displayed in table 5. However, this summary doesn't fully reveal the economic performance of the fishery because it includes receipts and costs earned and incurred from operations in other fisheries. Furthermore, it excludes a number of key economic costs.

Table 6 shows receipts, costs and key measures of fishery level profitability in the TSPF; namely boat cash profit and net economic return. Boat cash profit measures the difference between cash receipts and cash costs in the fishery. As such, it reveals the cash position of the fishery. Net economic return, in comparison, reveals economic profitability, as it incorporates depreciation costs and the opportunity cost of capital and labour and it treats all interest and leasing expenditure as an economic return to external investors in the fishery. Furthermore, it includes the total amount spent on managing the fishery rather than just the management fees recovered from operators. A more detailed explanation of net economic return is included in appendix B.

Boat cash profit in real terms was negative in both survey years, although did recover from -$1.8 million in 2006-07 to -$0.7 million in 2007-08 (2008-09 dollars). This recovery occurred despite a 26 per cent decline in fishing receipts from $15.2 million in 2006-07 to $11.3 million in 2007-08. The year on year decline in fishing receipts has continued since 1998-99, when fishing receipts peaked at $42.2 million. Cash costs declined by 30 per cent in 2007-08 to $12 million.

g Real boat cash profit and net economic returns (including management costs) in the Torres Strait prawn fishery, total for the fishery in 2008-09 dollars



Once all economic costs are taken into account, real net economic returns are estimated to have fallen from a peak of $6.4 million in 2000-01 to a low of -$4.1 million in 2006-07, before recovering slightly in 2007-08 to -$2.7 million (2008-09 dollars). The recovery in 2007-08 was mainly the result of declines in cash costs (30 per cent), the opportunity cost of capital (39 per cent) and depreciation (36 per cent). Figure g shows boat cash profit and net economic returns for the fishery for the past decade.

Non-survey based results

Background

The timing of survey data collection for the current report meant that survey data for the recently concluded 2008-09 financial year were not collected for this fishery. Consequently, survey based estimates of economic performance for the TSPF in 2008-09 will not be available until after the fishery is surveyed again in 2011, with the results to be published in 2012.

6 Real boat cash profit and net economic returns in the Torres Strait prawn fishery, total for the fishery and net economic returns per boat in 2008-09 dollars

		1993-94		1994-95		1995-96		1996-97		1997-98		1998-99		1999-00		2000-01	
Cash receipts																	
Fishing income	$m	33.6	(15)	34.3	(14)	30.2	(8)	33.0	(11)	38.2	(6)	42.2	(15)	40.1	(13)	38.2	(14)
Cash costs																	
Operating costs	$m	25.9	(15)	28.4	(14)	25.5	(8)	24.0	(11)	26.4	(7)	32.2	(16)	30.1	(13)	27.2	(14)
Boat cash profit	$m	7.8	(17)	5.9	(26)	4.7	(16)	9.0	(17)	11.8	(9)	10.0	(24)	10.0	(20)	11.0	(19)
less																	
– owner and family labour	$m	3.8	(16)	2.0	(25)	2.4	(16)	5.6	(16)	5.0	(16)	3.8	(20)	3.4	(18)	2.5	(29)
– opportunity cost of capital	$m	1.4	(14)	1.4	(14)	1.1	(10)	1.0	(9)	0.8	(7)	1.3	(22)	1.1	(17)	1.1	(26)
– depreciation	$m	2.3	(14)	2.1	(14)	1.8	(9)	1.5	(11)	1.4	(7)	2.0	(22)	1.9	(17)	1.6	(27)
plus interest, leasing and management fees	$m	1.2	(27)	1.6	(24)	1.6	(13)	2.3	(16)	2.2	(9)	2.3	(26)	2.4	(19)	1.1	(35)
Net economic return (excl. management costs)	$m	1.6	(81)	2.0	(61)	1.0	(54)	3.2	(39)	6.7	(16)	5.2	(41)	6.0	(28)	6.8	(22)
Management costs **a**	$m	na	na	na	na	na	na	na	na	0.3	na	0.3	na	0.4	na	0.4	na
Net economic return	$m	na	na	na	na	na	na	na	na	6.4	na	4.9	na	5.6	na	6.4	na
Number of active boats	no.	64		60		60		80		83		82		79		78	
Net economic return per boat	$'000	na		na		na		na		77		59		71		82	

		2001-02		2002-03		2003-04		2004-05		2005-06		2006-07		2007-08	
Cash receipts															
Fishing income	$m	32.2	(10)	25.0	(11)	23.0	(10)	21.6	(19)	14.8	(16)	15.2	(19)	11.3	(15)
Cash costs															
Operating costs	$m	25.1	(11)	21.4	(12)	20.7	(12)	23.1	(18)	16.7	(14)	17.0	(18)	12.0	(17)
Boat cash profit	$m	7.1	(13)	3.6	(29)	2.3	(32)	−1.5	(53)	−1.8	(44)	−1.8	(29)	−0.7	(86)
less															
– owner and family labour	$m	2.0	(20)	1.6	(17)	1.9	(22)	0.5	(51)	0.2	(58)	0.5	(41)	0.8	(28)
– opportunity cost of capital	$m	0.9	(16)	0.8	(22)	0.6	(18)	0.7	(13)	0.5	(14)	0.6	(25)	0.4	(18)
– depreciation	$m	1.5	(16)	1.1	(24)	0.9	(19)	0.9	(13)	0.7	(14)	1.0	(24)	0.6	(18)
plus interest, leasing and management fees	$m	1.7	(19)	1.3	(16)	1.7	(15)	1.5	(33)	1.0	(25)	0.6	(28)	0.6	(22)
Net return (excl. management costs)	$m	4.3	(14)	1.4	(45)	0.5	(163)	−2.1	(39)	−2.2	(36)	−3.4	(26)	−2.0	(27)
Management costs	$m	0.4	na	0.4	na	0.3	na	0.4	na	0.4	na	0.7	na	0.7	na
Net economic return	$m	4.0	na	1.0	na	0.1	na	−2.5	na	−2.6	na	−4.1	na	−2.7	na
Number of active boats **a**	no.	75		74		68		63		54		50		39	
Net economic return per boat	$'000	53		14		2		−39		−49		−83		−69	

a Management costs here refer to the total management costs of AFMA and QDPI.

Note: Figures in parentheses are relative standard errors. For any given standard error, a relative standard error will be higher for estimates closer to zero. A guide to interpreting these is included in appendix A. **na** Not applicable.

However, preliminary estimates of the fishery's economic performance in 2008-09 have been calculated using a combination of techniques outlined in appendix C. These techniques make use of historical survey data and available data on fishery catch and effort, fish prices and fishery management costs.

Preliminary estimates of fishery level economic performance

Non-survey based estimates of net economic returns for 2008-09 are contained in table 7, together with a comparison to 2007-08 survey based estimates. The break up of revenues and costs in table 7 differs to that of table 6 given the different approach taken to estimating each individual cost component in table 7. Summary statistics relevant to the 2008-09 preliminary estimates for the TSPF are in appendix D.

Cash receipts are estimated to have declined by around 35 per cent in real terms in 2008-09, from $11.3 million in 2007-08 to $7.3 million (2008-09 dollars). This decline follows a reasonably large reduction in fishery level catch in 2008-09 (approximately one-third). Falls are also expected to have occurred across all cost categories for the fishery in 2008-09. Most notably,

7 Preliminary non-survey based estimates of real net economic returns for the Torres Strait prawn fishery in 2008-09, total for fishery and total per boat

in 2008-09 dollars

		financial year		percentage change
		2007-08	2008-09	%
Fishery level				
Cash receipts	$m	11.3	7.3	–35
less adjusted operating costs				
Fuel	$m	5.5	4.1	–26
Labour	$m	3.1	2.1	–33
Repairs and maintenance	$m	1.3	1.1	–16
Other costs	$m	2.9	2.3	–21
Total adjusted operating costs	$m	12.8	9.6	–25
plus interest, leasing, management fees	$m	0.6	0.5	–18
less capital costs				
Opportunity cost of capital	$m	0.4	0.3	–12
Depreciation	$m	0.6	0.6	–8
Total capital costs	$m	1.0	0.9	–10
Net economic returns (excl. management costs)	$m	–2.0	–2.8	–37
less management costs **a**	$m	0.7	0.5	–19
Net economic returns (incl. management costs)	$m	–2.7	–3.3	–23
Boat level				
Population	no.	39	35	–10
Net economic return per boat (incl. management costs)	$'000	–68.6	–94.2	–37

a Combined management cost for AFMA and QDPI.
Note: Labour costs include opportunity cost of owner and family labour.

fuel costs are estimated to have fallen by around 26 per cent, from $5.5 million in 2007-08 to $4.1 million in 2008-09. This is in line with observed decreases in fishery level effort (in terms of hours trawled) and relatively stable fuel prices.

Overall, it is estimated that the real net economic return to the fishery (including the deduction of total management costs) declined from -$2.7 million in 2007-08 to -$3.3 million in 2008-09. This was a decrease of 23 per cent. At the boat level, the decline is more pronounced, with an expected fall in net economic returns of 37 per cent, from -$69 000 to -$94 000. The key drivers of these changes in net economic returns are shown in table 8.

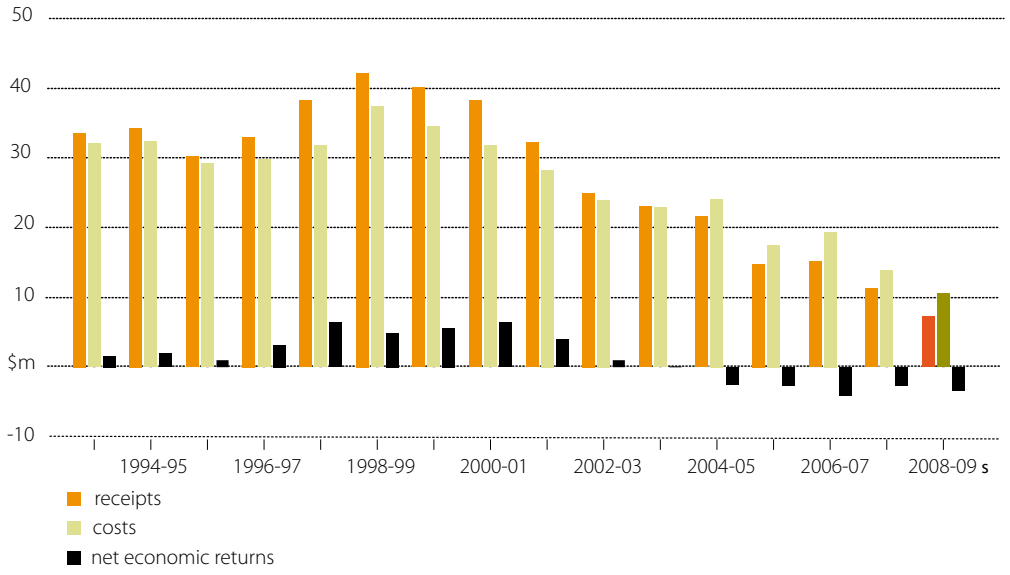
8 Key drivers of change in net economic returns for the Torres Strait prawn fishery 2007-08 and 2008-09

	2007-08	2008-09	variable percentage change
			%
Active vessel numbers	39	35	–10
Total catch (tonnes)	989	705	–29
Average catch price per kilogram ($)	10.89	9.15	–16
Effort – trawl hours	40.2	29.3	–27
Diesel fuel price ($)	1.37	1.37	0

Note: All 2008-09 estimates are preliminary. Prices are in real terms (2008-09 dollars). Catch data based on logbook data.

Figure h shows receipts, costs and net economic returns for all previous survey years, together with the non-survey based estimates for 2008-09 presented above. The *Fisheries status report 2009* (Wilson et al. 2009) has more details on the drivers of change in economic performance for this fishery.

h Real revenue, costs and net economic returns in the Torres Strait prawn fishery, total for fishery in 2008-09 dollars



s Preliminary estimate.
Note: Costs and net economic returns prior to 1995-96 exclude management costs which are unavailable for these earlier years.

appendix A Survey methods

Collecting economic survey data

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

Information from the surveys is made publicly available so the performance of fisheries and the effect of management policies can be independently assessed.

ABARE surveys are designed and samples selected on the basis of information supplied by the Australian Fisheries Management Authority (AFMA). This information includes data on the size of the catch, fishing effort and boat characteristics.

Because it is not possible to survey all the boats in a fishery, a sample of boats is selected based on how representative they are. Where possible, boats are classified into subgroups based either on the fishing method used (for example, longline, purse seine and trawl) or on the size of operations (typically small, medium and large producers). A number of representative boats from each subgroup are then targeted for the survey.

In practice, this sample is seldom fully realised. Non-response is relatively high across fishery surveys, reflecting the difficulty in contacting some operators and a reluctance of others to participate in the survey. Sample design and weighting systems have been developed that reduce the effect of non-response, but care is still required when interpreting the information from the surveys.

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

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

Sample weighting

All population estimates presented in this report are calculated from the weighted survey data of sample boats. A weight is calculated for each boat in the sample based on how representative that boat is in the population. Sample weights are calculated such that the weights sum to the population of boats that the sample is representing, and the weighted sum of catch reported by the sample boats equals the total catch for the fishery according to AFMA logbook data.

That is, $\sum w_i = P$ and $\sum w_i x_i = X$

where

wi is the weight for the ith boat

P is the number of boats in the population

xi is the catch for the ith boat

X is the total catch for the target population.

Technical details of the method of weighting used are given in Bardsley and Chambers (1984).

Reliability of estimates

A relatively small number of boats out of the total number of boats in a particular fishery are surveyed. Estimates derived from these boats are likely to be different from those that would have been obtained if information had been collected from a census of all boats. How closely the survey results represent the population is influenced by the number of boats in the sample, the variability of boats in the population and most importantly the design of the survey and the estimation procedures used.

To give a guide to the reliability of the survey estimates, measures of sampling variation have been calculated. These measures, expressed as percentages of the survey estimates and termed 'relative standard errors', are given next to each estimate in parentheses. In general, the smaller the relative standard error, the more reliable the estimate.

Use of relative standard errors

Relative standard errors can be used to calculate 'confidence intervals' for the survey estimate. First, calculate the standard error by multiplying the relative standard error by the survey estimate and dividing 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' (the value that 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 19 in 20 chance that the census value is within two standard errors of the survey estimates. Thus, in this example, there is approximately a two in three chance that the census value is between $94 000 and $106 000, and approximately a 19 in 20 chance that the census value is between $88 000 and $112 000.

Comparing estimates

When comparing estimates across groups or years, it is important to recognise that the differences are also subject to sampling error. As a rule of thumb, a conservative estimate of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and then taking the square root of the result.

For example, suppose the estimates of total cash receipts were $100 000 in one year and $125 000 in the previous year — a difference of $25 000 — and the relative standard error is given as 6 per cent for each estimate. The standard error of the difference can be estimated as:

$$\sqrt{(0.06 \times \$100\,000)^2 + (0.06 \times \$125\,000)^2} = \$9605$$

so the relative standard error of the difference is:

$$(\$9605 / \$\$25\,000) \times 100 = 38 \text{ per cent}$$

There may be changes in the population of a fishery from one year to the next. If these population changes are substantial, differences in estimates may be caused more by the changes in population than by changes in the variables themselves.

Non-sampling errors

The values obtained in a survey may be affected by errors other than those directly related to the sampling procedure. For example, it may not be possible to obtain information from certain respondents, respondents may provide inaccurate information or respondents may differ from non-respondents for a particular variable being surveyed.

In conducting surveys, ABARE draws upon a depth of experience. The survey staff are generally very experienced and undergo rigorous pre-survey training, aimed at minimising non-sampling errors. However, when drawing inferences from estimates derived from sample surveys, users should bear in mind that both sampling and non-sampling errors occur.

appendix B Survey definitions

This chapter contains definitions of key financial performance variables, net economic returns (NER) and ABARE's method of calculating NER. The use of NER as an indicator of economic performance is also discussed briefly.

Financial performance

The definitions of key variables used in the analysis of boat level financial performance are in box 1.

box 1 **Definition of key financial performance variables**

Total cash receipts represent returns from the sale of fish from all fisheries, non-fishing activities including charter operations, and other sources (insurance claims and compensation, quota and or endorsements leased out, government assistance and any other revenue) in the financial year.

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

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

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

Total 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). Capital and household expenditures are excluded.

Labour costs are often the highest cash cost in the fishing operation. Labour costs include wages and an estimated value for owner/partner, family and unpaid labour. Labour costs cover the cost of labour involved in boat related aspects of the fishing business, such as crew or onshore administration costs, but do not cover the cost of onshore labour involved in processing the fisheries products.

On many boats, the costs of labour are reflected in the wages paid by boat owners and/or in the share of the catch they earn. However, in some cases such as where owner skippers are involved,

continued...

box 1 **Definition of key financial performance variables** *continued*

or where family members work in the fishing operation, the payments made can be low or even nil, which will not always reflect the market value of the labour provided. To allow for this possible underestimation, all owner/partner and family labour costs are based on estimates collected at the interview of the amount it would cost to employ someone else to do the work.

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

Depreciation costs have been estimated using the diminishing value method based on the current replacement cost and age of each item. Capital items are catagorised into several groups and relevant depreciation rates are applied. 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.

Boat business profit is boat cash income less depreciation.

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

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

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

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

Rate of return to full equity is calculated by expressing profit at full equity as a percentage of total capital, including quota and licence value.

Net economic returns

Net economic returns (NER) are the long run profits from a fishery after all costs have been met, including fuel, crew costs, repairs, the opportunity cost of family and owner labour, fishery management costs, depreciation and the opportunity cost of capital.

More specifically, a fishery's NER for a given time period can be defined as:

$$\underbrace{NER = R}_{\text{cash receipts}} - \underbrace{CC - OWNFL + ILR}_{\text{operating costs}} - \underbrace{OppK - DEP}_{\text{capital costs}} + \underbrace{recMC - totM}_{\text{management costs}}$$

where:

NER net economic returns

R total cash receipts attributable to the fishery, excluding leasing income

CC total cash costs attributable to the fishery, including recovered management costs

$OWNFL$ imputed cost of owner and family labour

ILR interest and quota/permit leasing costs

$OppK$ opportunity cost of capital

DEP depreciation

$recMC$ recovered management costs and

$totMC$ total management costs.

Note that recovered management costs are those management costs paid by industry via management fees and are included in total cash costs. These costs are removed (as indicated by '+ $recMC$') to prevent double counting given that these costs are a component of total management costs. Similarly, interest and quota/permit leasing costs are removed (indicated by '+ ILR') as these costs at the fishery level represent revenues that have been redistributed to external investors in the fishery.

The method of collecting data for each component and then calculating an estimate is outlined in the last section of this chapter.

Survey based estimation of net economic returns

Fish sale receipts

Fish sale receipts are usually taken from fishers' financial accounts. Where a fisher operates in more than one fishery, they are asked to indicate what proportion of total fish sales is attributable to the fishery being surveyed. Any freight or marketing costs must also be deducted. This provides an estimate of net fishing receipts that incorporates only the 'beach price' that has been received for catch, that is, the price received for fish at its first landing point.

Income received from the leasing out of quota and licences is not included as income in the calculation of NER. This item represents a redistribution of profits among investors in the fishery. Also, the amount a fisher earns from leasing out quota and licences is related to the amount of profits that the fishery is generating. Including leasing revenue would therefore result in double counting.

Operating costs

Operating costs include day-to-day operational expenses that are incurred to harvest fish in the fishery. Cash costs (CC) are a component of operating costs which includes those cost items that are easily identified in fishers' accounts such as fuel, repairs and gear replacements.

Labour costs are often specified in fishers' accounts as wages. However, for the calculation of NER, an estimate of the opportunity cost of labour is required. The opportunity cost of labour is the wage that could have been earned performing a similar role elsewhere. Where a market wage is paid, it is assumed to represent the opportunity cost of labour and is included in the cash costs component of operating costs. In contrast, the opportunity cost of owner and family labour is not easily identifiable in fishers' accounts. Often owners and their families are involved in the operation of a boat, either as skippers and crew or onshore as accountants and shore managers. While some will be paid the market value for their labour, some will not be paid at all and others paid very high amounts often as 'director fees' or 'manager fees'. When this is the case, ABARE survey officers ask survey respondents to estimate the market value of owner and family labour, that is, the amount that would need to be paid to employ a non-family member to fulfil the same position. This amount is entered as a component of operating costs — $OWNFL$.

Quota and licence leasing costs and interest expenses are a component of cash costs. However, these costs must be removed from the calculation of NER for the same reason they are excluded from income (see fish sale receipts above) — these costs represent a redistribution of returns to other investors in the fishery.

Capital costs

To calculate capital costs, an estimate of the value of capital is needed. ABARE survey officers ask fishers to provide information for all capital items associated with the fishing business, including hull, engine, onboard equipment, vehicles and sheds. Information collected for each item includes the year the capital item was manufactured and an estimate of what it would cost to replace that item with a new and equivalent item. By accounting for previous depreciation and inflation, this data are used to estimate the total value of capital invested in the fishery for the survey year.

As mentioned previously, capital costs include the opportunity cost of capital ($OppK$) and depreciation (DEP). The opportunity cost of capital is the return that could have been earned if capital was invested elsewhere, rather than in the fishery. This cost is not identifiable in fishers' accounts. A real interest rate that represents the rate of return that could be earned on an investment elsewhere is applied to the value of capital in the fishery. ABARE uses a rate of 7 per cent a year for fisheries surveys.

Depreciation expense is the cost of capital becoming less valuable over time because of wear and tear and obsolescence. Depreciation expense is not consistently identifiable in fishers' accounts, so ABARE calculates the annual depreciation of boats based on the capital inventory list collected during the surveys (described above) and predetermined depreciation rates for each capital item type.

Management costs

Management costs are incurred to ensure the fishery continues to operate and is therefore a cost that must be accounted for. Management costs are made up of two components: recovered management costs and non-recovered management costs. Recovered management costs ($recMC$) refer to those costs that are recovered from fishers and appear in the accounts of fishers as payments of management fees or levies. Non-recovered management costs refer to those management costs that are not charged to fishers, but instead are covered by the managing body or government. The calculation of NER requires the deduction of total management costs, which is the sum of these two components.

Total cash costs (CC) include an estimate of recovered management costs based on management levy expenses that are contained in fishers' accounts. As this estimate of recovered management costs is based only on a sample of the fishery, it may not be consistent with the actual value of management costs recovered from the entire fishery. AFMA is able to provide an estimate of total management costs for each fishery, that is, the sum of both recovered and non-recovered management costs. For these reasons, recovered management costs from fishers' accounts are ignored (as indicated by $+recMC$ in the net returns equation). Then, total management costs ($totM$) as supplied by AFMA are used in the estimation of NER.

Net economic returns and economic performance

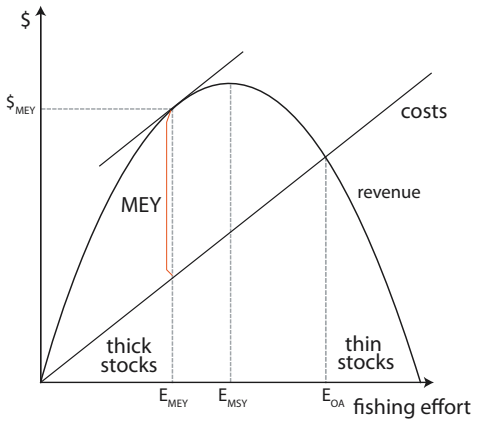
AFMA fishery managers require information on the performance of fisheries against the objective of maximising NER from the use of fish stocks, which is commonly referred to as maximum economic yield (MEY). If a fishery is operating at MEY, effort, catch and stocks are at levels where the difference between discounted revenues and costs, and therefore profits, are maximised. The term 'discounted' simply means that the difference in the value of a dollar earned today relative to a dollar in the future is accounted for. If income can be generated from a dollar today (e.g. by putting it in a bank account to earn interest), the rate at which future revenues should be discounted is positive. Therefore, assuming a positive discount rate, revenue earned today (e.g. from harvesting fish) is more valuable than revenue earned in the future.

The concept of MEY is best explained using a static single period model (box 2). A static model, as opposed to a dynamic model described above, is simplistic as it ignores the relative value of future profits by assuming a discount rate of zero, and it does not account for the dynamic transition path to MEY or uncertainty (Kompas et al. 2008).

The major factors that influence MEY include costs (which are a function of input use and input prices), output prices, stock biomass, the stock-recruitment relationship and discount rates. Understanding how these factors vary over time and interact to affect the effort level associated with MEY is difficult. Consequently, estimating the level of effort that will lead to MEY in a given period typically requires a bioeconomic model that combines the economic, biological and management characteristics of a fishery (Gooday and Galeano 2003). Bioeconomic models are complex and data intensive and in many cases will not be available.

box 2 **Explanation of maximum economic yield**

i A static single period model of maximum economic yield



A static single period model of maximum economic yield is shown in figure i. The relationship between effort and catch in dollar terms (price multiplied by catch) is shown by the total revenue curve. This is derived from a biological stock–recruitment relationship, translated into effort units. Every point along this curve represents an effort and catch combination that is biologically sustainable. Setting effort at E_{MSY} means the maximum sustainable yield (MSY) is harvested, generating the largest total revenue. Although total revenue is maximised at E_{MSY}, this is not where total profits are maximised.

The total cost curve gives the cost of applying each effort level. Maximum economic yield (MEY) is the level of catch that maximises profit, the difference between total revenue and total cost. This occurs at E_{MEY} with a corresponding catch value of $\$_{MEY}$. This is where net economic returns are maximised. It is also where the optimal amount of society's scarce resources are allocated to the fishery, including fishing vessels, labour etc.

Typically, a fishery will not gravitate to the effort level associated with MEY without intervention from a management authority. Instead, effort is most likely to settle at a point known as the open access equilibrium (E_{OA}). In an open access fishery, all fishers, acting in their own interest, are induced to fish more because they do not take into account the effect of their fishing activity on other fishers in the fishery. That is, one fisher's decision to increase fishing effort further depletes stocks so that harvesting costs increase for all. A fisher has no incentive to reduce effort to conserve stocks because the benefits of doing so will be captured by other fishers. At E_{OA}, net economic returns are zero and fish stocks are thinner.

MEY and E_{MEY} are influenced by changes in fish prices, which stretch or compress the total revenue curve, and the costs of fishing, which pivot the total cost curve about the origin. Higher fish prices would shift MEY to the right, and vice versa, while higher fishing costs per unit of effort would shift MEY to the left, and vice versa.

In such cases, other indicators can be used to broadly assess a fishery's performance relative to MEY in a given period.

The estimates of NER presented in this report are an example of one such indicator. Estimates of NER cannot be used in isolation to reveal how a fishery has performed relative to MEY. However, if the key drivers of changes in NER are understood, it may be possible to infer whether a fishery is moving towards or further away from MEY. The major drivers of NER returns are broadly the same factors that influence MEY.

Presented below are examples of different scenarios associated with a positive trend in a fishery's NER. The implications of that positive trend are shown to be dependent on what factors are driving the trend. If it is assumed that effort and/or catch limits in a fishery are binding and all other factors are held constant, then if NER in a fishery have increased with:

- a reduction in effort (in boat numbers for example), this will mean that a fishery has moved towards MEY
- a long-term increase in a fishery's stock biomass (as opposed to short-term increases because of natural stock variability), this will mean that a fishery has moved towards MEY. Such a change could be driven by catch reductions that allow stocks to rebuild
- an increase in catch prices or a decrease in input costs, then fishery performance relative to MEY cannot be determined unless it is known where the fishery was relative to MEY prior to the change, as is explained in box 3.

Complicating the link between changes in NER and MEY is that, in most cases, all factors (effort levels, stocks, prices, costs, etc.) are changing over time. Each factors' effect on NER in terms of magnitude and direction is also always changing. If the magnitude of change in one factor outweighs all other changes (e.g. a massive effort reduction following a vessel buyback scheme), it may be easier to draw some conclusions. But generally, interpretation will not be as simple as this.

To better assess a fishery's performance in the absence of a bioeconomic model, the analysis of NER can be undertaken in conjunction with other economic and biological indicators. In particular, economic indicators such as productivity indexes, profit decompositions and stochastic frontier analysis can provide greater clarity. For example, if biological indicators suggest that harvests are sustainable, a positive trend in both NER and total factor productivity (the ratio of outputs produced to inputs used) over time would generally indicate that a fishery is moving towards MEY.

Further information on the concept of MEY and assessing fishery performance against the MEY objective may be found in Kompas et al. (2009) and Gooday and Galeano (2003).

box 3 Interpreting changes in net economic returns when driven by changes in output prices or input prices

It is assumed that fishery managers have effectively controlled effort at a given level, for example by using some form of input control. The effect of an increase in fish price is considered according to two scenarios as presented in figures j and k.

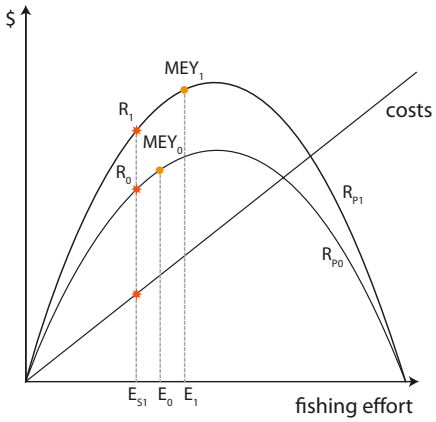
Under the first scenario (figure j), effort levels are fixed at E_{S1}, below the level associated with MEY_0. This means that, under current economic conditions, if effort were to increase the fishery would move closer to MEY_0. Under the second scenario (figure k), the opposite is true and effort levels are set beyond MEY_0 at E_{S2}. NER will increase with a reduction in effort.

An increase in fish price is represented by an upward shift in the revenue curve from R_{P0} to R_{P1}. A number of key changes occur following such a price increase. First, NER increases at any fixed effort level given that greater amounts of revenue can be earned for the same cost. Second, MEY also increases for the same reason, as indicated by MEY_1. However, the increased wedge between revenue and costs also means that MEY_1 is now associated with a higher level of effort (E_1). It is this change that has different implications for each of the two scenarios being considered.

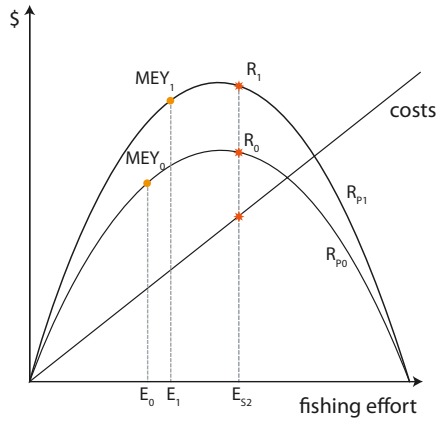
Under the first scenario, the increase in price results in MEY_1 being further away from the fixed effort level E_{S1}. Under the second scenario, however, the price increase results in the new MEY_1 being closer to the fixed effort level E_{S2}.

Changes in input prices produce similar results, with the change represented by a movement in the cost curve rather than the revenue curve.

j Scenario 1



k Scenario 2



appendix C Non-survey based estimation of net economic returns

Background

ABARE's Fisheries Surveys Program involves the collection of survey data on a biannual basis. An implication of this approach is that there is a delay associated with reporting survey results for individual fisheries. Fishing business operators are given an extended time to submit their fishing business income details to the Australian Taxation Office for a given financial year. As a result, a vessel's financial statements will often not be finalised for up to nine months after the conclusion of a given financial year. Additionally, considerable time is required to collect financial data and estimate survey results. As a result, the normal delay for publication of survey results is either one or two years, depending on whether a financial year is the first or second year in a given survey.

To address this issue, ABARE has developed a non-survey based method of estimating net economic returns (NER) for financial years where survey data are not yet available. It allows more timely estimation and reporting of NER estimates that can be used in both industry and government decision-making. This method is intended to complement the collection of data and publication of results normally undertaken through the ABARE's fisheries surveys program.

The method first involves defining the revenue and cost components in the calculation of NER. Historical survey data are then used to establish relationships between each component and more readily available indicators such as fish prices, fishery catch and effort. In cases where no significant relationships can be estimated, component trends over time are used. These relationships are then used to calculate preliminary estimates of each component for the non-survey year. The calculation of net economic returns is the same as outlined in the previous chapter. Further detail on the calculation of each component is provided below.

Method

The method used to calculate non-survey based estimates of NER for a non-survey year (i.e. a year for which no survey data are available) is similar to that used by Wood et al. (2008). Following this general method, varying approaches are used to calculate each component of NER as outlined below. Estimation approaches may also differ across fisheries given the unique characteristics of individual fisheries. Details of the estimation process that were unique to the calculation of 2008-09 estimates for the Torres Strait prawn fishery (TSPF) and northern prawn fishery (NPF) are also provided below. Where relevant, summary statistics related to each component's estimation are in appendix D for both fisheries.

Cash receipts

Gross value of production (GVP) can be used as a proxy for cash receipts in the calculation of net economic returns in a non-survey year. ABARE calculates GVP at the end of every financial year for all Commonwealth fisheries. This calculation uses landings data provided by AFMA and average yearly prices of key species obtained from fish markets and industry contacts. The product of estimated landings and beach prices by species is an approximation of the gross value of production.

Fish sales receipts, net of freight and associated marketing costs, are approximately equal to an operator's gross value of production. As a result, gross value of production is a viable proxy for cash receipts. For some fisheries, a consistent discrepancy between historical estimates of fish sale receipts and GVP exists. In such cases, GVP is used to estimate fish sale receipts under the assumption that a similar discrepancy will prevail in the non-survey year.

For both the NPF and TSPF, final estimates of GVP for 2008-09 were not available, so preliminary estimates of GVP had to be made using preliminary catch and price data.

Operating costs

The accurate calculation of operating costs for a non-survey year is highly dependent on obtaining preliminary estimates of three key expenses: fuel, labour, and repairs and maintenance. These three cost items on average account for between 75 per cent and 80 per cent of a boat operator's total operating costs.

Fuel

Fuel is typically the most expensive cost item for a boat operator. Accurately estimating fuel expenditure in a non-survey year requires information on fuel consumption and the price at which the fuel was purchased. The quantity of fuel consumed by a vessel in a given period will be influenced by effort, gear size and vessel characteristics such as hull size and engine power. The survey program does not collect information on fuel consumption. Instead a sampled boat's fuel expense (as obtained from profit and loss figures) can be divided by an average fuel price to calculate a fuel consumption estimate. A relationship between fuel consumption and effort (as provided by the Australian Fisheries Management Authority) can then be derived using regression analysis. Once observed, this relationship is used to predict fuel use, given total effort expended in the non-survey year. This estimate is then multiplied by the year's average fuel price, and provides a proxy for the survey's normal calculation of fuel expenditure.

Both the NPF and the TSPF are trawl-based fisheries for which trawl hours can be used as an indicator of effort. In the case of the TSPF, a relationship between historical fuel use for surveyed boats and their trawl hours was estimated as outlined above. This relationship, together with 2008-09 trawl hours data, was used to estimate 2008-09 fuel use. At the time of estimation, only preliminary effort data for 2008-09 was available for the TSPF. It is expected that the total hours trawled contained in this preliminary data set are slightly below the actual amount that occurred in 2008-09. Consequently, the estimated fuel cost for the TSPF in 2008-09 is likely to be a conservative estimate.

For the NPF, the relationship between fuel use and trawl hours is complicated by two key considerations. First, the dual season characteristic of the fishery (distinct banana prawn and tiger prawn seasons) required that a different approach be taken to estimating fuel costs. To deal with this, all 2007-08 sampled boats that also operated in 2008-09 were assumed to represent a proxy sample for 2008-09. For these boats, a ratio of 2007-08 fuel use to 2007-08 trawl hours was calculated using the 2007-08 survey and effort data. Each boat's 2007-08 ratio was then assumed to hold in 2008-09. Each boat's 2008-09 fuel use was then calculated using the product of its 2008-09 trawl hours and its assumed fuel to trawl hours ratio. All boat level fuel use estimates were then weighted up to a total estimate for the fishery using weights calculated for boats in the 2008-09 proxy sample (see appendix A for further explanation of sample weights).

The second consideration relevant to the estimation of fuel use in the NPF relates to the price paid for diesel by fishery operators. In recent years, operators have jointly negotiated with fuel suppliers to bulk purchase fuel at relatively lower prices. As a result, using an Australian average price for diesel may not be consistent with the price that was negotiated in 2008-09. Information regarding the negotiated diesel price and what proportion of operators benefited from the negotiations was not available. A per litre diesel price was assumed based on ABARE estimates of the Australian average offroad diesel price and by adjusting this price to exclude any rebates. Given that NPF operators are likely to have paid relatively lower prices for diesel, it is likely that fuel expense for the NPF in 2008-09 has been overestimated.

Labour

Labour is often the second most expensive cost item for a boat operator, depending on the fishery. In most fisheries, the skipper and the crew are paid a share of the boat's fishing revenues. Therefore, the historical relationship between cash receipts and labour costs can be used to estimate labour costs in a non-survey year once cash receipts have already been estimated for that year (as outlined above).

Repairs and maintenance

Repairs and maintenance are generally addressed by boat operators as needed. Significant repairs or major overhauls are unlikely to be undertaken annually. At the boat level, repairs and maintenance costs can be expected to vary considerably from year to year. However, at the fishery level, it is reasonable to expect that the aggregate repairs and maintenance costs will be more stable and the numbers of operators undertaking major overhauls will be approximately constant from year to year. Often, there is no obvious relationship between this expense item and other key variables such as catch or effort. In such cases, trends in repairs and maintenance costs over time may provide the best preliminary cost estimate.

When constructing estimates of repairs and maintenance for the NPF and TSPF in 2008-09, a variety of explanatory relationships were tested according to a number of hypotheses. One general hypothesis tested was that operators will tend to undertake greater amounts of repairs and maintenance when a vessel's overall cash position or profitability is favourable. Accordingly, for the NPF, a significant positive relationship was estimated between historical average per boat NER and average per boat repairs and maintenance costs. For the TSPF,

the relationship between average boat level repairs and maintenance costs and average per boat NER was relatively weak. However, a more significant relationship was estimated against average per boat fishing receipts. These relationships were then used to estimate boat level repairs and maintenance costs in 2008-09 given 2008-09 estimates of boat level NER (for the NPF) and fishing receipts (for the TSPF).

Other operating costs

All other non-major cost items can be classified as either fixed or variable costs. Fixed costs generally show minimal fluctuations from year to year. Therefore, estimation of fixed costs in a non-survey year is best undertaken with a historical time trend. Fixed costs include administration costs, bank fees and insurance premiums. Variable costs may be a function of other variables such as effort and catch and can be estimated given changes in these variables according to some explanatory relationship. Examples of variable costs include catch freight, packing and marketing.

For the NPF, an estimate of other costs in 2008-09 was formulated by breaking down other costs into three subcomponents: other material costs, variable service costs and fixed service costs. Relationships with average per boat catch were estimated using regression analysis for material costs and catch dependent service costs, which includes freight, marketing, packing charges and aerial spotting fees. Other service costs were estimated using a time trend. For the TSPF, other costs in 2008-09 were estimated according to a time trend of total other costs. This was because of difficulties encountered in finding significant explanatory variables. Because of recent structural changes in each fishery, calculating time trends at the fishery level would be inaccurate. Instead, a relationship at the boat level was modelled and then applied to the number of active operators in the fishery in 2008-09.

Interest, leasing and management fees

Interest and leasing fees represent a redistribution of profits to investors in the fishery. As such, they are not costs at the fishery level and should be removed from total cash costs (see appendix B). Information on the leasing of permits and quota is available from AFMA, however valuing these would be extremely difficult without operator cooperation.

Total management costs are deducted from net economic returns as a final step in the net economic return calculation, where total management costs include management fees recovered from industry operators as well as non-recovered management costs that are paid for by government. As such, recovered management fees (which appear in the financial statements of operators) need to be removed from total cash costs to avoid double counting of this component.

Since the combined cost of interest, leasing and management fees generally constitutes a relatively small percentage of operating costs, the application of a historical trend may be the best way to calculate a preliminary estimate of this cost. This approach was used for both the TSPF and NPF.

Opportunity cost of capital and depreciation

There are two ways to obtain preliminary estimates of the opportunity cost of capital and depreciation. The first approach involves an appraisal of trends in capital values and depreciation expenses in the fishery and extrapolating out from the historical survey data to obtain a preliminary estimate of each component. For the calculation of the opportunity cost of capital, an interest rate assumption of 7 per cent can then be applied to the estimated capital value.

The alternative method involves identifying those boats sampled in the last survey year that also operated in the following non-survey year. These boats are then assumed to represent a proxy sample for the non-survey year. Capital values, the opportunity cost of capital and depreciation expense can then be estimated for each boat in the proxy sample assuming a depreciation rate equal to that which prevailed in the most recent survey year. All boat level estimates can then be weighted up to a total estimate for the fishery using weights calculated for individual boats in the 2008-09 proxy sample (see appendix A for further explanation of sample weights). This estimation assumes that no capital upgrades have taken place in the non-survey year and, as such, is likely to provide a conservative estimate of capital costs. Estimation of the opportunity cost of capital and depreciation for the TSPF and NPF in 2008-09 followed this method.

Management costs

Total management costs (recovered and non-recovered) for 2008-09 for the TSFP were obtained from AFMA and Queensland Primary Industries and Fisheries. Total management costs for the NPF for 2008-09 were not available at the time of estimation. As a result, it was assumed that management costs did not change between 2007-08 and 2008-09.

appendix D Non-survey based estimates-regression results

Presented below are the summary statistics for regressions formulated to estimate individual components of net economic returns in 2008-09. Relationships were estimated using data from years up to and including the 2007-08 financial year. The estimated relationships were then used to extrapolate out to 2008-09 given known or assumed values of the relevant explanatory variables for 2008-09.

Results for the northern prawn fishery

	coefficient	standard error	t-statistic	P-value
2007-08 fuel use to effort ratio (L/hr)				
R^2 = 0.77				
F p value = 0.000				
Intercept	43.7	18.91	2.309	0.029
2006-07 fuel use to effort ratio (L/hr)	0.777	0.09	9.022	0.000

Note: This relationship tests how much variation occurs in individual boat's fuel to effort ratio between two years (2006-07 and 2007-08). It provides an indication of the suitability of assuming that the 2007-08 fuel use to effort ratio for individual boats will remain constant in 2008-09.

Repairs and maintenance cost, average per boat ($)				
R^2 = 0.69				
F p value = 0.001				
Intercept	141 526	5 258	26.912	0.000
Net economic return average per boat ($)	0.108	0.023	4.755	0.001
Other materials costs, average per boat ($)				
R^2 = 0.75				
F p value = 0.025				
Intercept	20 578	7 988	2.576	0.061
Catch	0.361	0.103	3.503	0.025
Variable service costs, average per boat ($)				
R^2 = 0.90				
F p value = 0.004				
Intercept	-22 859	8 907	-2.567	0.062
Catch, average per boat (kg)	0.688	0.115	5.976	0.004

Note: Although the above relationship suggests a negative cost is expected with a zero average catch the relationship provides reasonable estimates of the dependent variable over the likely range of the explanatory variable. A relationship assuming an intercept value of zero was tested and rejected given a lower adjusted R^2.

continued...

Results for the northern prawn fishery *continued*

Fixed service costs, average per boat ($)				
R^2 = 0.87				
F p value = 0.006				
Intercept	33 286 990	6 290 463	5.292	0.006
Year	-16 515	3 137	-5.265	0.006
Interest, leasing & management fees, average per boat ($)				
R^2 = 0.79				
F p value = 0.008				
Intercept	11 744 903	2 720 469	4.317	0.008
Year	-5 830	1 357	-4.300	0.008

Results for the Torres Strait prawn fishery

	coefficient	standard error	t-statistic	P-value
Fuel use (L)				
R^2 = 0.66				
F p value = 0.000				
Intercept	0	na	na	na
Trawl hours	104.2	7.285	14.302	0.000
Repairs and maintenance cost, average per boat ($)				
R^2 = 0.72				
F p value = 0.000				
Intercept	0	na	na	na
Fish sale receipts, average per boat ($)	0.149	0.007	20.948	0.000
Other costs ($)				
R^2 = 0.49				
F p value = 0.14				
Intercept	4 920 776	3 015 050	1.632	0.141
Year	-2 416	1 505	1.606	0.147
Interest, leasing & management fees				
R^2 = 0.49				
F p value = 0.012				
Intercept	2 424 926	782 258	3.100	0.011
Year	-1 200	391	-3.072	0.012

References

Abetz, E 2006a, *Commonwealth fisheries set for a more secure and profitable future: Results of Round 2 of the fishing concession buyback announced*, media release, 22 December.

–– 2006b, *Torres Strait prawn tender concluded*, media release, 28 February.

Australian Fisheries Management Authority 2009, *AFMA Update: a newsletter from the Australian Fisheries Management Authority*, Vol. 6, Iss. 8, 16 September 2009. Available at: http://www.afma.gov.au/information/publications/newsletters/afma_update/docs/update_0618/update_0618.htm

Bardsley, P and Chambers, RL 1984, 'Multipurpose estimation from unbalanced samples', *Journal of the Royal Statistical Society*, vol. 33, pp.290-299.

Gooday, P and Galeano, D 2003, *Fisheries management: a framework for assessing economic performance*, ABARE eReport 03.7, prepared for the Fisheries Resources Research Fund, Canberra, April.

Grafton, RQ, Kompas, T and Hilborn, R 2007, *The economics of exploitation revisited*, Science, 7 December.

Kompas, T, Che, N and Grafton, Q 2008 'Fisheries Instrument Choice under Uncertainty', *Land Economics*, 84, 652-66.

Kompas, T, Grafton, QR, Che, N and Gooday, P 2009, *Development of methods and information to support the assessment of economic performance in Commonwealth fisheries*, ABARE research report 09.5, Canberra, March.

Larcombe, J and Perks, C 2009, 'Northern Prawn Fishery', in Wilson, DT, Curtotti, R, Begg, GA, Phillips, KL (eds) 2009, *Fishery Status Reports 2008: status of fish stocks managed by the Australian Government*, Bureau of Rural Sciences and ABARE, Canberra.

MacDonald, I 2005, *Securing Our Fishing Future*, media release, 14 December.

PZJA (Protected Zone Joint Authority) 2006, *Protected Zone Joint Authority Annual Report 2004-2005*, The Australian Fisheries Management Authority, Canberra.

Taylor, S, Turnbull, C, Marrington, J and George, M (eds) 2007, *Torres Prawn Handbook 2007*, Australian Fisheries Management Authority, Canberra.

Turnbull, CT, Tanimoto, M, O'Neill, MF, Campbell, A and Fairweather, CL 2009, *Torres Strait Spatial Management Research Project 2007-09*. Final Report for DAFF Consultancy DAFF83/06. Department of Employment, Economic Development and Innovation, Brisbane.

Wilson, D, Curtotti, R, Begg, G and Phillips, K (eds) 2009, *Fishery status reports 2008: status of fish stocks and fisheries managed by the Australian Government*, Bureau of Rural Sciences and ABARE, Canberra.

Wood, R, Hohnen, L and Newton P 2008, *'Timely Estimation of Economic Performance Indicators: a case study of the northern prawn fishery'*, In AARES (Australian Agricultural and Resource Economics Society) Annual Conference, Canberra, 5-8 February 2008.

Woodhams, J and Perks, C 2009, 'Torres Strait Prawn Fishery', in Wilson, DT, Curtotti, R, Begg, GA, Phillips, KL (eds) 2009, *Fishery Status Reports 2008: status of fish stocks managed by the Australian Government*, Bureau of Rural Sciences and ABARE, Canberra.

Previous fishery survey reports

Northern prawn fishery

1980-81 to 1981-82

BAE (Bureau of Agricultural Economics, now ABARE) 1984, *Northern Prawn Fishery Survey, 1980-81 and 1981-92*, Canberra.

1986-87 to 1987-88

Collins, D and Kloessing, K 1988, 'Financial performance in the northern prawn fishery – latest survey by ABARE', *Australian Fisheries,* vol. 47, no. 12, pp. 38–44.

1989-90 to 1990-91

ABARE 1993, *Fisheries Surveys Report 1992*, Canberra.

1990-91 to 1991-92

ABARE 1993, *Fisheries Surveys Report 1993*, Canberra.

1992-93 to 1993-94

ABARE 1996, *Australian Fisheries Surveys Report 1995*, Canberra.

1994-95 to 1995-96

Brown, D 1997, *Australian Fisheries Surveys Report 1997*, ABARE, Canberra.

1996-97 to 1997-98

ABARE 2000, *Australian Fisheries Surveys Report 1999*, Canberra.

1998-99 to 1999-2000

ABARE 2002, *Australian Fisheries Surveys Report 2001*, Canberra.

2000-01 to 2001-02

ABARE 2004, *Australian Fisheries Surveys Report 2003*, Canberra.

2002-03 to 2003-04

ABARE 2006, *Australian Fisheries Surveys Report 2005*, Canberra

2004-05 to 2005-06

ABARE 2007, *Australian Fisheries Surveys Report 2007*, Canberra.

East coast prawn fishery

1980-81 to 1982-83

BAE 1985, 'BAE report on south-eastern prawn fishery', *Australian Fisheries*, vol. 44, no. 1, pp. 36–7.

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

1989-90 to 1990-91

ABARE 1993, *Fisheries Surveys Report 1992*, Canberra.

1991-92 to 1992-93

ABARE 1994, *Fisheries Surveys Report 1994,* Canberra.

1993-94 to 1994-95

ABARE 1996, *Australian Fisheries Surveys Report 1996*, Canberra.

1995-96 to 1996-97

ABARE 1998, *Australian Fisheries Surveys Report 1998*, Canberra.

1997-98 to 1998-99

ABARE 2001, *Australian Fisheries Surveys Report 2000,* Canberra.

1999-2000 to 2000-01

ABARE 2003, *Australian Fisheries Surveys Report 2002*, Canberra.

2001-02 to 2002-03

ABARE 2005, *Australian Fisheries Surveys Report 2004,* Canberra.

2003-04 to 2004-05

ABARE 2007, *Australian Fisheries Surveys Report 2006*, Canberra.

2005-06 to 2006-07

ABARE 2008, *Australian Fisheries Surveys Report 2008,* Canberra.

Gillnet, hook and trap
(formerly the south east nontrawl fishery and the southern shark fishery)

1988-89

Battaglene, T and Campbell, D 1991, 'Economic survey of the southern shark fishery', *Australian Fisheries*, vol. 50, no. 5, pp. 12–15.

1990-91 to 1991-92

ABARE 1993, *Fisheries Surveys Report 1993*, Canberra.

1992-93 to 1993-94

ABARE 1996, *Australian Fisheries Surveys Report 1995*, Canberra.

1993-94 to 1994-95

ABARE 1996, *Australian Fisheries Surveys Report 1996*, Canberra.

1995-96 to 1996-97

ABARE 1998, *Australian Fisheries Surveys Report 1998*, Canberra.

1997-98

ABARE 2000, *Australian Fisheries Surveys Report 1999*, Canberra.

1997-98 to 1998-99

ABARE 2001, *Australian Fisheries Surveys Report 2000*, Canberra.

1998-99

ABARE 2001, *Australian Fisheries Surveys Report 2000*, Canberra.

1999-2000 to 2000-01

ABARE 2003, *Australian Fisheries Surveys Report 2002*, Canberra.

2001-02 to 2002-03

ABARE 2005, *Australian Fisheries Surveys Report 2004*, Canberra.

2003-04 to 2004-05

ABARE 2007, *Australian Fisheries Surveys Report 2006*, Canberra.

2005-06 to 2006-07

ABARE 2008, *Australian Fisheries Surveys Report 2008*, Canberra.

Southern rock lobster fishery

1981-82 to 1982-83

BAE 1985, *Southern Rock Lobster Fishery Survey, 1981-82 and 1982-83*, Canberra.

1993-94 to 1994-95

BAE 1985, *Southern Rock Lobster Fishery Survey, 1981-82 and 1982-83*, Canberra.

Bass Strait scallop fishery

1995-96 to 1996-97

ABARE 1998, *Australian Fisheries Surveys Report 1998*, Canberra.

1997-98 to 1998-99

ABARE 2001, *Australian Fisheries Surveys Report 2000*, Canberra.

South east fishery

1978-79 to 1980-81

BAE 1984, *Southern Trawl Fishery Survey, 1978-79 and 1980-81*, Canberra.

1985-86 to 1987-88

Geen, G, Brown, D and Pascoe, S 1989, 'ABARE survey of the south east trawl fishery', *Australian Fisheries*, vol. 48, no. 10, pp. 45–7.

1989-90 to 1990-91

ABARE 1993, *Fisheries Surveys Report 1992*, Canberra.

1990-91 to 1991-92

ABARE 1993, *Fisheries Surveys Report 1993*, Canberra.

1991-92 to 1992-93

ABARE 1994, *Fisheries Surveys Report 1994*, Canberra.

1992-93 to 1993-94

ABARE 1996, *Australian Fisheries Surveys Report 1995*, Canberra.

1994-95 to 1995-96

Brown, D 1997, *Australian Fisheries Surveys Report 1997*, ABARE, Canberra.

Commonwealth trawl (formerly the south east trawl fishery)

1996-97 to 1997-98

ABARE 2000, *Australian Fisheries Surveys Report 1999*, Canberra.

1998-99 to 1999-2000

ABARE 2002, *Australian Fisheries Surveys Report 2001*, Canberra.

2000-01 to 2001-02

ABARE 2004, *Australian Fisheries Surveys Report 2003*, Canberra.

2002-03 to 2003-04

ABARE 2006, *Australian Fisheries Surveys Report 2005*, Canberra.

2003-04 to 2004-05

ABARE 2007, *Australian Fisheries Surveys Report 2006*, Canberra.

2005-06 to 2006-07

ABARE 2008, *Australian Fisheries Surveys Report 2008*, Canberra.

Southern bluefin tuna fishery

1980-81 to 1981-82

BAE 1986, *Southern Bluefin Tuna Survey*, 1980–82, Canberra.

Southern squid jig fishery

1997-98 to 1998-99

ABARE 2001, *Australian Fisheries Surveys Report 2000*, Canberra.

1999-2000 to 2000-01

ABARE 2003, *Australian Fisheries Surveys Report 2002*, Canberra.

Torres Strait prawn fishery

1989-90

Battaglene, T, Reid, C and Collins, P 1992, 'An economic survey of the Torres Strait prawn fishery', *Australian Fisheries*, vol. 50, no. 7, pp. 28–31.

1992-93 to 1993-94

ABARE 1996, *Australian Fisheries Surveys Report 1996*, Canberra.

1994-95 to 1995-96

Brown, D 1997, *Australian Fisheries Surveys Report 1997,* ABARE, Canberra.

1996-97 to 1997-98

ABARE 2000, *Australian Fisheries Surveys Report 1999*, Canberra.

1998-99 to 1999-2000

ABARE 2002, *Australian Fisheries Surveys Report 2001*, Canberra.

2000-01 to 2001-02

ABARE 2004, *Australian Fisheries Surveys Report 2003*, Canberra.

2002-03 to 2003-04

ABARE 2006, *Australian Fisheries Surveys Report 2005*, Canberra.

2004-05 to 2005-06

ABARE 2007, *Australian Fisheries Surveys Report 2007*, Canberra.

Western tuna and billfish fishery
(formerly the southern and western tuna and billfish fishery)

2001-02

ABARE 2004, *Australian Fisheries Surveys Report 2003*, Canberra.

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