Impact of the structural adjustment package on the profitability of Commonwealth fisheries

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Foreword

This report analyses the effects of the fishery concession buyback component of the Securing Our Fishing Future structural adjustment package. This package was announced in late 2005 by the then Minister for Fisheries, Forestry and Conservation and completed in late 2006, to address low profitability and unsustainable fishing effort in Commonwealth fisheries. The fishery buyback component of the package provided $149 million for the purchase of concessions in target fisheries. The target fisheries assessed in this report include the northern prawn fishery, the eastern tuna and billfish fishery, and the Commonwealth trawl and gillnet, hook and trap sectors of the southern and eastern scalefish and shark fishery. Together these fisheries accounted for greater than 90 per cent of total expenditure on the buyback component of the Securing Our Fishing Future structural adjustment package.

Given the fishery concession buyback concluded in late 2006, it is now possible to provide an assessment of the initial effects of this buyback on fishery level economic returns and boat level financial performance for the target fisheries assessed in this report. Changes in economic returns are interpreted in this report through a range of indicators, such as output to input use, catch per unit effort and costs per unit of catch, to assess the initial effects of the fishery concession buyback on fishery economic performance. Factors not related to the buyback that may have influenced economic performance of target fisheries in the post-buyback period are also identified and accounted for in this analysis.

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Phillip Glyde
Executive Director
February 2010

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Summary

In the years immediately prior to 2005, many Commonwealth fisheries were experiencing low profitability. At the same time, the number of fish stocks that were either overfished or subject to overfishing was increasing. In response to these issues, the Australian Government announced the $220 million Securing Our Fishing Future structural adjustment package for Commonwealth fisheries in November 2005. A key component of the package was a $149 million fishing concession buyback to allow fishing businesses to voluntarily exit the industry. By facilitating business exit and reducing fishing capacity (vessel numbers), the buyback aimed to assist remaining industry members adjust to the introduction of tighter fishery management controls intended to eliminate overfishing and rebuild fish stocks in the future (AFMA 2005).

The buyback component of the package was completed in November 2006. Sufficient time has now passed to observe changes in fishery economic performance in the post-buyback period. This report provides an assessment of these changes. Four fisheries were targeted in the buyback and three are assessed here. These are the eastern tuna and billfish fishery, the northern prawn fishery and two sectors of the southern and eastern scalefish and shark fishery: the Commonwealth trawl sector and the gillnet, hook and trap sector. The Bass Strait central zone scallop fishery was also targeted but was closed from 2006 until mid-2009 and so cannot be assessed.

The effects discussed in the current report relate to the immediate effect of removing fishing capacity from a fishery. It is expected that the buyback will have had a positive immediate impact on profitability. The removal of boats from a fishery results in a reduction in total fishery costs as fewer resources (capital, labour, fuel and so on) are expended in the fishery. With less than proportionate reductions in catches and revenues, as would be expected in an overcapitalised fishery, this would result in an increase in profits. It is also likely profits will improve immediately if a buyback has removed the least efficient and least profitable vessels from a fishery, as would be expected with a competitive tender process. However, any positive impacts resulting from the buyback will be difficult to isolate from other factors that may influence fishery economic performance. Such factors can include changes to fishery management, the environment and market conditions.

Assessing the longer term effects of the buyback requires a longer time series of data than is currently available. As a result, the analysis in this report does not compare the benefits to fishers from a buyback (improved profitability) with the costs ($149 million for the buyback).

Buybacks should not be considered as a stand-alone fishery management tool. Ensuring that the benefits of a buyback are not dissipated requires the introduction of fisheries management measures that effectively control harvest and effort. This was a major focus of the Ministerial Direction to AFMA that accompanied the Securing Our Fishing Future package. The same outcome that is achieved with a buyback, a reduction in fishing capacity, can eventuate at relatively low cost through the use of appropriate fishery management settings including total allowable catches or effort. If a rapid change to catch and/or effort is required, buybacks may facilitate this change, albeit at considerable cost.

Key results from the analysis

Indicators of fishery level and boat level economic performance are presented in this report to assess the post-buyback economic performance of fisheries targeted in the buyback. These indicators include net economic returns, output to input ratios, and indices of catch per unit effort and costs per unit of catch. The analysis of these indicators also considers external factors which affect economic performance but that are not related to the buyback, such as changed management arrangements, environmental fluctuations which affect stocks, and movements in market factors such as fish prices and fuel prices.

Northern prawn fishery

The northern prawn fishery is the single most valuable Commonwealth fishery, with an estimated real gross value of production of $76.8 million in 2007-08 (in 2008-09 dollars). The key species caught in the fishery are banana prawns and tiger prawns. Key changes that have occurred in the fishery in the post-buyback period are summarised in table 1.

Active boat numbers in the fishery declined by 36 per cent between 2005-06 and 2008-09 to 55 boats. Over the same period, net economic returns are estimated to have increased by

1 Key changes in the post-buyback period for the northern prawn fishery

	2005-06 (pre-buyback)	2008-09 (post-buyback)		change
Boat numbers	86	55	↓	36%
Fishery level net economic return	$–9.4 million	$11 million	↑	$20.4 million
Catch per boat	63 t	119 t	↑	89%
Real revenue per boat ($000)	$994	$1 426	↑	43%
Real costs per boat ($000)	$1 103	$1 225	↑	11%

Note: Estimates for 2008-09 are only available for the northern prawn fishery. Real values are in 2008-09 dollars.

$20.4 million, from -$9.4 million in 2005-06 to $11 million in 2008-09. Both fishery level revenues and costs fell between 2005-06 and 2008-09, although costs fell faster than revenues so net economic returns improved. At the same time, the amount of output produced per unit of input increased by 94 per cent between 2005-06 and 2008-09. This would normally suggest a considerable improvement in the use of resources by operators remaining in the fishery. However, a higher than average catch rate of banana prawn in 2007-08 and 2008-09 was a major factor that contributed to both the improvement in this ratio and fishery profitability. Annual banana prawn catches are highly variable owing to variable environmental factors.

At the boat level, the decline in boat numbers combined with the increase in fishery level catch (driven by increased banana prawn catches) resulted in an 89 per cent increase in catch per vessel. Costs per vessel did increase over the period but revenues increased more rapidly. As a result, estimated net economic returns per boat increased in 2007-08 and 2008-09.

Eastern tuna and billfish fishery

The eastern tuna and billfish fishery had an estimated real gross value of production of $33 million in 2007-08 (in 2008-09 dollars). The key species caught in the fishery in terms of value include bigeye and yellowfin tuna species and broadbill swordfish. Key changes that have occurred in the fishery in the post-buyback period are summarised in table 2.

2 Key changes in the post-buyback period for the eastern tuna and billfish fishery

	2005-06 (pre-buyback)	2007-08 (post-buyback)		change
Boat numbers	91	57	↓	37%
Fishery level net economic return	$–10.2 million	$-1.1 million	↑	$9.1 million
Catch per boat	63 t	113t	↑	79%
Real revenue per boat ($000)	$519	$771	↑	49%
Costs per boat ($000)	$631	$790	↑	25%

Note: Real values are in 2008-09 dollars.

At the fishery level, it is estimated that net economic returns have improved in the eastern tuna and billfish fishery in the post-buyback period. These improvements have largely been driven by falls in fishery level costs, which have declined significantly as a result of the decline in vessel numbers in the post-buyback period. The amount of output produced per unit of input increased by 75 per cent between 2005-06 and 2007-08. This result and the observed improvement in net economic returns were partly driven by elevated catch rates of highly valued bigeye tuna in 2007-08.

Despite costs per vessel increasing between 2005-06 and 2007-08, revenue per vessel increased by a greater proportion. As a result, net economic returns per boat increased.

Southern and eastern scalefish and shark fishery

Commonwealth trawl sector

The Commonwealth trawl sector (CTS) had an estimated real gross value of production of $47.9 million in 2007-08 (in 2008-09 dollars). Finfish species are predominantly caught in the sector. Key species by value include tiger flathead, blue grenadier, ling and silver warehou. These species together comprised 65 per cent of catch by value in 2007-08. Key changes that have occurred in the fishery in the post-buyback period are summarised in table 3.

3 Key changes in the post-buyback period for the Commonwealth trawl sector

	2005-06 (pre-buyback)	2007-08 (post-buyback)	change
Boat numbers	81	49	↓ 40%
Fishery level net economic returns	$1.6 million	$7.1 million	↑ $5.6 million a
Catch per boat	246 t	310 t	↑ 26%
Real revenue per boat ($000)	$630	$905	↑ 44%
Costs per boat ($000)	$611	$759	↑ 24%

a Discrepancy because of rounding.
Note: Real values are in 2008-09 dollars.

At the sector level, it is estimated that net economic returns in the CTS have increased despite falling sector level revenues. The considerable decline in boat numbers has seen costs fall faster than revenues. A 21 per cent increase in average fish prices has also contributed positively to net economic returns and is a factor external to the buyback. The effectiveness of input use has increased considerably since the buyback, with output per unit input estimated to have increased by 42 per cent between 2005-06 and 2007-08.

Despite a decline in sector level catch, catch per vessel increased in the post-buyback period. Costs per vessel have increased but not as rapidly as revenues. As a result, vessel level net economic returns improved substantially.

Gillnet, hook and trap sector

The gillnet, hook and trap sector (GHTS) was valued at $28.4 million in 2007-08 in real terms (in 2008-09 dollars). The key species caught in the sector is gummy shark, accounting for more than 50 per cent of the sector's catch by value. Key changes that have occurred in the fishery in the post-buyback period are summarised in table 4.

4 Key changes in the post-buyback period for the gillnet, hook and trap sector

	2005-06 (pre-buyback)	2007-08 (post-buyback)	change
Boat numbers	80	67	↓ 16%
Fishery level net economic returns	$1 million	$5 million	↑ $3.9 million a
Catch per boat	56 t	71 t	↑ 27%
Real revenue per boat ($000)	$279	$417	↑ 50%
Costs per boat ($000)	$330	$439	↑ 33%

a Discrepancy because of rounding.
Note: Real values are in 2008-09 dollars.

The effect of the buyback on economic performance was not as pronounced as in other target fisheries as the purchase of entitlements has removed proportionally fewer active vessels. However, by removing vessels from the fishery, the buyback has kept costs lower than

would otherwise have occurred. The estimated increase in net economic returns in the GHTS was strongly linked to factors external to the buyback including higher sector level catches, particularly for gummy shark, and higher fish prices (an 18 per cent increase in average prices between 2005-06 and 2007-08). The ratio of output to input use is estimated to have increased by 13 per cent between 2005-06 and 2007-08. This increase is considerably smaller than increases observed in other fisheries, yet still indicates some improvements in input use.

At the boat level, the decline in boat numbers in 2007-08 resulting from the buyback, combined with an increase in sector level catch, has implied a large increase in catch and revenue per vessel. At the same time, average costs per vessel have increased, owing to an increase in automatic longlining activity and effort increases by gillnet boats remaining after the buyback. However, cost increases have been less than revenue increases. As a result, boat level net economic return improved.

Preserving benefits in the longer term

In each of the target fisheries, net economic returns have improved in the post-buyback period. These changes can be linked to fishery level cost decreases associated with reductions in vessel numbers as well as other factors including positive impacts from environmental and stock variation and previous management changes.

The observed improvements in net economic returns, in absolute terms, across the target fisheries assessed are relatively small when compared with the $149 million that was spent on the buyback. However, it is the responsibility of fishery managers to manage fisheries appropriately to ensure higher net economic returns are maintained so the full long-term benefits of the buyback can be realised. This important role for fishery managers is emphasised by the risk that recent increases in profitability might prompt additional effort in each of the target fisheries. This would effectively undo the reductions in fishing capacity achieved through the buyback and result in the erosion of profits, moving target fisheries toward situations similar to that which prevailed prior to the buyback. Maintenance of a profitable and sustainable operating environment relies on the implementation of fishery management arrangements that effectively control harvests and effort.

Of the three target fisheries assessed here, the southern and eastern scalefish fishery (which includes the Commonwealth trawl sector and the gillnet, hook and trap sector) already has output controls in the form of individual transferable quotas (ITQs). In accordance with the Ministerial Direction which was announced in conjunction with the buyback, both the eastern tuna and billfish fishery and the northern prawn fishery are reviewing their current management arrangements with a view to implementing ITQs. If ITQs are implemented in these two fisheries, management will be better able to ensure recent improvements in economic returns are not lost. This will also require the setting of total allowable catches to allow profits to be maximised over the longer term.

1 Introduction

In November 2005, the Australian Government announced the $220 million Securing Our Fishing Future structural adjustment package for Commonwealth fisheries. The overall aims of the package were to secure the sustainability of Commonwealth fish stocks and ensure a profitable future for the fishing industry. The package was announced in conjunction with a Ministerial Direction to the Australian Fisheries Management Authority (AFMA) by the then Minister for Fisheries, Forestry and Conservation. The direction required that management measures be put in place to cease overfishing and allow overfished stocks to rebuild. The adjustment package was designed to help fishers and communities dependent on the fishing industry adjust to this new operating environment.

A key component of the package was a capped $149 million fishing concession buyback to allow individual fishing businesses to voluntarily exit the industry. Fisheries associated with overfished stocks or stocks at risk of being overfished were targeted. Target fisheries included the eastern tuna and billfish fishery (ETBF), the northern prawn fishery (NPF), the southern and eastern scalefish and shark fishery (SESSF) and the Bass Strait central zone scallop fishery (BSCZSF). The buyback concluded in November 2006 and resulted in significant reductions in fishing concessions in these target fisheries.

It is anticipated that the effects of the buyback will in some cases occur immediately and in other cases over a longer period of time. As a result, it is difficult to assess the full effect of the buyback on economic performance in these target fisheries given the time taken for effects to both eventuate and be observed. However, sufficient data are now available to allow the immediate effects to be assessed. Accordingly, where possible, the current report provides an evaluation of economic performance in the post-buyback period of fisheries targeted in the buyback.

The report is structured as follows. An overview of the objectives, rationale and effects of fishery buybacks is first presented, followed by a detailed description of the buyback component of the Securing Our Fishing Future package. In chapter 3, the key economic indicators used in the report to evaluate fishery economic performance in the post-buyback period are outlined. The remaining chapters present the evaluation results for all target fisheries, with the exception of the BSCZSF which was closed between 2006 and 2008 and therefore cannot be evaluated. The current report only evaluates the $149 million buyback component of the Securing Our Fishing Future package and its short-term effects. The longer term effects are not yet evident but will ultimately depend on continued effective management of the fisheries targeted in the buyback.

2 Background

Fishery buyback schemes: an overview

The objectives of buyback schemes

Fishery buybacks, decommissioning schemes and structural adjustment schemes are all schemes through which fishery operators or concession holders are compensated to surrender their rights or concessions to operate in a fishery. Such schemes aim to remove capacity from a fishery and promote an increased rate of structural adjustment relative to the rate that would have otherwise prevailed.

Structural adjustment refers to a process of change in resource allocations (allocations of land, labour and capital) among economic entities (sectors, firms and individuals) to achieve improvements in economic efficiency and net economic returns (Productivity Commission 1999). Structural adjustment is generally ongoing and occurs autonomously of any government intervention through industry responses to external pressures. In fisheries, these pressures can be divided into three key categories:

- *market pressures,* which result from market driven fluctuations in output prices, input prices, exchange rates and interest rates
- *resource use conflicts* between sectors including commercial, recreational, indigenous and conservation sectors
- *fishery capacity management,* which refers to the effect governments have on fishery capacity and profitability through its fishery management policies (Newby et al. 2004).

Some of the market pressures alluded to in Newby et al. 2004 can be managed by the use of appropriate management controls. For example, in quota managed fisheries that allow trade in entitlements, the least efficient operators may trade their quota to the more efficient operators. However, the effectiveness of such systems is dependent on binding catch limits being set.

Fishery buybacks are also typically undertaken with the aim of addressing the effects of these pressures. Specifically, buyback objectives include reducing excess fishing capacity (in terms of vessels and/or licences), improving boat level profitability and fishery level net economic returns, eliminating overfishing and addressing resource allocation issues (Curtis and Squires 2004; Groves and Squires 2004; Holland et al. 1999; Newby et al. 2004). Buybacks can also be used to facilitate a transition to a new fishery management system (Curtis and Squires 2004; Newby et al. 2004).

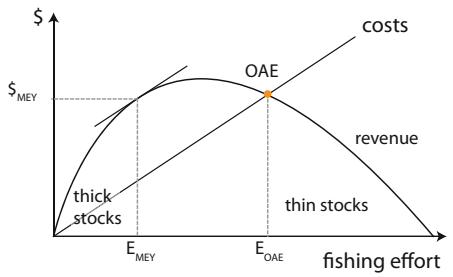
Fishery capacity management

Fishery capacity management is a key pressure for structural change that has been particularly relevant to Commonwealth fisheries. Previous Commonwealth fishery buybacks, including the Securing Our Fishing Future buyback, have largely occurred to address inadequate management of capacity. Fisheries differ to most other industries in that fish stocks are common property resources. As a result, without effective management, the market failures associated with common property resources ('the tragedy of the commons') lead to overcapacity resulting in overfished stocks and dissipated profits. Further information on the 'tragedy of the commons' in fisheries can be found in Gordon 1954, Scott 1955 and Clark 1976.

Effective management requires that catches and/or effort are restricted to be sustainable (Rose 2002). To do this, output controls that limit a total allowable catch (TAC) or input controls that place restrictions on fishing inputs (e.g. boat type, gear type, fishing time etc.) are typically used. These controls are best applied through the allocation of individual tradable property rights: output controls can take the form of individual transferable quotas (ITQs) while input controls can be allocated as individual effort units (e.g. fishing night entitlements). Defining individual property rights largely eliminates any 'race to fish' behaviour, while making allowances for entitlement trade provides operators with flexibility to adjust the scale of their operation while also allowing entitlements to flow to the most efficient operators (Kompas and Gooday 2005).

Where effort and catches are not appropriately restricted via some form of input and/or output control, a 'tragedy of the commons' outcome is likely to occur whereby the fishery gravitates toward an effort level associated with an open access equilibrium (OAE), where economic profits are equal to zero (figure 1). For a comprehensive discussion, see Grafton et al. (2006).

1 Open access equilibrium as shown in a static single period model



Effort here represents the total amount of effort expended by individual vessels in the fishery and also the total number of vessels in the fishery. For all effort levels less than the OAE, additional profits can be earned with an expansion of effort as average revenues are greater than average costs. That is, there is an incentive to increase effort until no positive profits can be earned (at the OAE).

Failure to prevent the open access outcome results in overcapacity, which is the difference between the maximum potential output given current capacity and optimum output. The persistence of overcapacity over the long term results in overfishing and, consequently, lower economic returns, and investments are not fully utilised (Gooday et al. 1999). A preferred outcome is one where economic profits are maximised. This occurs at an effort level associated with maximum economic yield (E_{MEY}) where the difference between fishery level revenues and costs is greatest.

Where overcapacity has already eventuated, fishery managers can eliminate it by tightening catch and/or effort restrictions so that effort levels are less than the $E_{OAE.}$ Reduced catches in the short term will allow fish stocks to rebuild. Larger stocks in the long term will mean catches can be taken at lower cost and higher profit in the future. Indeed, as noted by Hannesson (2004), for a fishery managed under ITQs, structural adjustment can be brought about at relatively low cost with TAC adjustments. Operators who exit the fishery are compensated through the sale of their fishing concessions and quota.

A trade-off exists between how quickly these improvements arise and the initial negative impact on the financial viability of operators who are restricted to catching less in the short term. Where high amounts of overfishing, over-capitalisation and low profits prevail, such improvements will require more drastic actions (in terms of reductions in TACs or effort limits) in the short term. Under such circumstances, a vessel buyback scheme can allow boat numbers and effort to be rapidly reduced away from the OAE and toward MEY with less of a financial shock for operators (Holland et al. 1999). However, buybacks alone are not a fisheries management tool, but only a method of speeding up the change to improved management arrangements. For example, a buyback can facilitate a transition from a competitive TAC to ITQs, from input to output controls or simply to lower fishery TACs.

The key benefit of a fishery buyback is that it avoids the costs associated with a long industry adjustment process. In the absence of a fishery buyback, the inability of fishery managers to introduce needed management changes for fisheries may impose significant cost on industry and supported communities. These costs arise because, in the status quo, a community must accept high risk in regard to the sustainability of fish stocks where stocks are overfished, and persist with achieving low economic returns from the management of fishery resources over a prolonged period.

Buybacks confer significant private benefits to operators leaving the industry because they are compensated to leave and to those remaining because it allows management changes to be made that achieve more sustainable and profitable outcomes more rapidly. Additionally, fishery managers are better able to introduce needed management changes at less cost because of improved industry cooperation, which reduces consultation costs and improves initial compliance with the new arrangements. Avoided adjustment costs, which arise from the accelerated introduction of management changes made possible by a buyback, need to be balanced against the public cost of buying out concessions.

From a public policy perspective, fishery buybacks will only be worthwhile if the expected benefit that may arise from early adoption of management changes outweighs the typically high cost of buying concessions borne by tax payers. Such a comparison should also consider the alternative low cost approach of adjusting management settings over the long term. Under the latter approach, this lower cost is borne by industry members, rather than the public. In practice, it is difficult to make such a comparison of expected benefits and costs. Management changes confer additional benefits that are difficult to disentangle from the benefits that arise from the buyback itself.

Ultimately, the risk of taking a low cost approach using TAC/effort adjustments over a longer time period needs to be compared with the high cost, short-term results of a buyback. The latter cost includes the monetary value of the government funds spent in removing capacity, as well as the value to society of the next best alternative use of those funds (Groves and Squires 2004; Hannesson 2004).

Effects of buyback schemes on economic performance

There are two key mechanisms through which fishery buybacks can have an immediate positive impact on short-term economic profits. In general, the removal of vessels from a fishery will mean that fewer resources (e.g. capital, fuel and labour) are being invested in the fishery and, consequently, fishery level costs will be lower. In figure 1, these effects are shown by the decrease in costs associated with the movement of effort away from E_{OAE} and toward E_{MEY}.

The second mechanism relates to the form of the buyback. Buybacks can be designed to target the removal of the least efficient or least profitable vessels from a fishery. For example, sealed bid or competitive tender buyback schemes are designed to remove operators that value their participation in the fishery least and hence are more willing to accept compensation for exiting the fishery (Metzner and Rawlinson 1998). Such operators are likely to have lower expectations regarding the future profits they can earn from remaining in the fishery and are likely to be the least efficient. In figure 1, the removal of the least efficient boats might be shown by a decrease in the slope of the cost curve. For any given effort level, fishery level costs will be lower with a more efficient fleet.

While the short-term effect of a buyback scheme on economic returns should always be positive, the long-term effects can vary. Table 5 shows the short-term and long-term effects of a fishery buyback under two forms of fisheries management: individual property rights and fishery level restrictions. Under individual property rights, effort entitlements or catch quotas are allocated to operators on an individual basis. Under fishery level restrictions, inputs or catch are controlled at the fishery level rather than at the individual operator level given the absence of individual property rights.

If output controls allocated as individual rights are in place in a fishery, the economic returns to remaining fishers should improve in both the short and long term provided appropriate TACs are set following the buyback. If management is dependent on effort controls allocated as individual rights, effort creep is likely to widen the gap between nominal effort (those inputs restricted by management) and effective effort (all inputs used by operators), thus undoing any short-term effects of a buyback scheme. If fishery level restrictions are in place, there is little scope for a buyback scheme to be successful in the long term (Newby et al. 2004).

Table 5 demonstrates the importance of having appropriate management settings in place to prevent overcapacity and effort creep and encourage autonomous structural adjustment following a buyback (Newby et al. 2004). The increased profits following a buyback will attract increased effort to a fishery. Hence, managers must take immediate actions to ensure catch and/or effort are appropriately set to prevent another build-up of capacity and prevent the

5 Effect of a fishery buyback under different management systems

	individual property rights		fishery level restrictions	
	output controls	input controls	output controls	input controls
Immediate effect	No effect on stock a, improved economic returns to operators	Effort reduced, some stock recovery and improved returns b	No effect on stock a, some increase in economic returns	Effort reduced, some stock recovery and improved returns
Longer term effect	Improved economic returns to operators b	Economic returns dissipated because of effort creep	Economic returns dissipated because of race to fish incentive	Economic returns dissipated because of effort creep

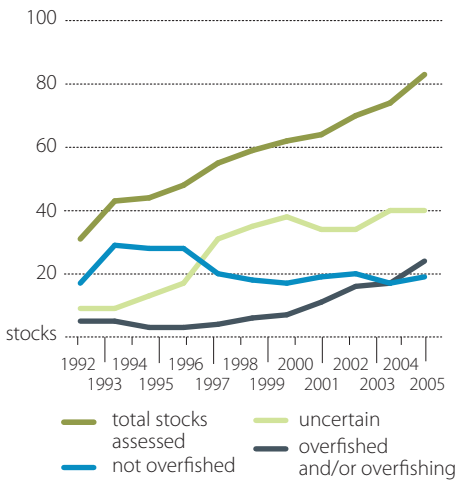
a If there is no excess capacity in the fishery, then initially the TAC may become nonbinding, resulting in some increase in stocks.
b The profits that result from the buyback are the same as the profits that result from autonomous adjustment. Buybacks hasten the process of autonomous adjustment, at a higher cost.
Note: This table assumes that management arrangements are constant and the only instigator of change is the buyback.
Source: Adapted from Newby et al. (2004).

benefits of restructuring being lost (OECD 2006). Failures to do this after buybacks in the 1990s in the Commonwealth trawl sector and northern prawn fisheries saw the economic benefits of these buybacks lost (Newby et al. 2004; Elliston et al. 2004). These fisheries were again targeted in the most recent Securing our Fishing Future buyback.

The Securing our Fishing Future package

Excess capacity in Commonwealth fisheries was a recognised problem prior to 2005 (Szakiel et al. 2006). Fishery management had failed to prevent overcapitalisation and in many cases overfishing and low economic returns resulted. As noted in ANAO (2009), assessments by the Bureau of Rural Sciences indicated there was a trend toward overfishing from 1992 to 2005. Of the 83 fish stocks assessed in 2005, 24 were classified as overfished and/or subject to overfishing (Larcombe and McLoughlin 2007) (figure 2).

2 Number of fish stocks assessed and classified as 'overfished', 'not overfished' and 'uncertain', 1992 to 2005



Source: Adapted from Wilson et al. 2009.

In November 2005, the then Australian Government Minister for Fisheries, Forestry and Conservation issued a Ministerial Direction to the Australian Fisheries Management Authority (AFMA) under section 91 of the *Fisheries Administration Act 1991*. The direction required that AFMA take action to recover overfished stocks, develop a best practice harvest strategy policy for Commonwealth fisheries, and manage the broader effects of fishing.

To assist the transition to this new operating environment, the Australian Government announced the Securing our Fishing Future package in November 2005. The aims of the package were to secure the sustainability of Commonwealth fish stocks and ensure a profitable future for the fishing industry. The package included three key features: requirements that AFMA put in place management arrangements that ensure Commonwealth fisheries remain sustainable; marine protected areas (MPAs) in the south-east marine region; and a $220 million fishery structural adjustment package.

The structural adjustment package consisted of four key components. The major component provided $149 million in business exit assistance for the purchase of Commonwealth fishery concessions to allow fishery operators to exit the industry. An additional $50 million was provided to assist individuals, businesses and communities that were likely to be adversely affected by any reduction in fishing activity. An AFMA levy subsidy of $15 million was provided to reduce the effect on vessels of having recovered management costs shared by fewer concession holders, and $6 million was provided to improve AFMA's research, compliance and data collection capacity (ANAO 2009). The current report evaluates the effect of the $149 million business exit assistance component of the package.

The buyback

The buyback took the form of a voluntary sealed tender process. Concession holders had the opportunity to submit a dollar amount they would be willing to accept as compensation for surrendering their concessions and exiting the fishery. Each application was then considered on the basis of value for money.

The buyback was designed to target Commonwealth fisheries that were associated with overfished stocks or stocks at risk of being overfished. The following fisheries were targeted:

- the eastern tuna and billfish fishery (ETBF)
- the northern prawn fishery (NPF)
- the southern and eastern scalefish and shark fishery (SESSF)
- the Bass Strait central zone scallop fishery (BSCZSF).

Concession holders in other non-target Commonwealth-managed fisheries (except internationally managed and joint authority managed fisheries) were also eligible to tender for business exit assistance (Abetz 2006 and DAFF 2006c).

Two tender rounds were undertaken. The first closed in June 2006. The second round was announced shortly after and closed in November 2006. Approximately $90 million was spent in the first round to purchase more than 400 boat concessions. This represented around one-quarter of the boat concessions that existed immediately prior to the buyback. The second round resulted in nearly 150 boat concessions being purchased at a cost of approximately $60 million (DAFF 2006a and DAFF 2006b). Overall, the buyback removed approximately 30 per cent of boat concessions from target fisheries (table 6).

6 Fishing concessions purchased in the business exit assistance component of the Securing our Fishing Future package

fishery	type of concession	concessions prior to buyback	concessions bought back	total reduction
		no.	no.	%
Northern prawn Fishery	class B SFR	95	43	45
	gear SFR	53 844	18 365	34
Southern and eastern scalefish and shark fishery	gillnet boat SFR b	88	26	30
	scalefish hook boat SFR b	122	63	52
	shark hook boat SFR b	30	17	57
	trawl boat SFR c	118	59	50
	trap permit / auto longline permit b	20	8	40
	east coast deepwater permit	18	8	44
	SA coastal waters permit	41	17	41
	Tasmanian coastal waters permit	82	38	46
	Victorian coastal waters permit	51	28	55
	redfish quota SFR	586 720	112 822	19
	john dory quota SFR	235 784	30 889	13
	silver trevally quota SFR	538 740	74 912	14
	jackass morwong quota SFR	1 480 633	114 872	8
	royal red prawn quota SFR	485 394	103 296	21
Eastern tuna and billfish fishery	longline permits	218	99	45
	minor line permits	230	112	49
Bass Strait central zone scallop fishery	permit packages	152	22	14
Other fisheries a	other permits	~360	39	
Total	Boat fishery concessions	~1 600	>550	

a Non-target fisheries included the coral sea fishery, eastern skipjack fishery, north west slope fishery, small pelagic fishery, southern tuna and billfish fishery, southern squid jig fishery, western deep water trawl fishery, western skipjack fishery and western tuna and billfish fishery. **b** SFRs specifically related to the gillnet, hook and trap sector. **c** SFRs specifically related to the Commonwealth trawl sector.
Note: Statutory fishing rights are abbreviated to SFR. *Source*: Abetz (2006)

The Commonwealth Fisheries Harvest Strategy Policy

A key aim of the overall Securing our Fishing Future package was to improve the profitability of Commonwealth fisheries (DAFF 2006c). The removal of concessions through the buyback component of the package was a key means of achieving this. First, the reduction of vessel numbers would reduce costs at the fishery level with the expenditure of fewer resources (boats, fuel, labour etc.). Then, lower catches in the short term should allow stocks to rebuild so that catches can be taken at lower cost in the long term. For this to happen, catches need to be adequately restricted to allow stocks to rebuild. The Commonwealth Fisheries Harvest Strategy Policy (HSP) was developed to address this issue.

The HSP was introduced in accordance with the 2005 Ministerial Direction and complements the Securing our Fishing Future package. It aims to improve the effective management of

Commonwealth fishery resources by providing a management framework that focuses on sustainable and profitable fisheries. The framework was developed by the Department of Agriculture, Fisheries and Forestry, in conjunction with AFMA and the former Department of the Environment and Water Resources, and was released in September 2007. In accordance with the policy, AFMA is required to have a harvest strategy in place that is consistent with the HSP for all Commonwealth fisheries (Commonwealth of Australia 2007).

Under the HSP, a harvest strategy must be designed to maintain a fish stock above a limit biomass amount—where the risk to the stock of biological collapse is regarded as too high—and to target a biomass that is consistent with MEY. This is consistent with the Fisheries Management Act, which states that one of AFMA's objectives is to 'pursue the maximisation of net economic returns to the Australian community from the management of Commonwealth fishery resources'. In the context of the Securing Our Fishing Future package, the HSP is a means to ensuring the benefits of the buyback are maintained in the long term through adequate management of stocks.

3 Assessing economic performance in the post-buyback period

This chapter outlines the approach taken to evaluating the effect of the Securing Our Fishing Future buyback. For each target fishery, economic performance since the buyback is evaluated at the fishery level and then at the boat level. Two key indicators of economic performance are used: net economic returns (NER) and output to input ratios. When these indicators are assessed with an understanding of the external drivers of NER, conclusions can be drawn about the effect of the buyback on overall fishery economic performance.

Fishery level net economic returns

NER are the long-term profits earned from a fishery after all costs have been met, including fuel, crew costs, repairs, the opportunity cost of family and owner labour (where a family member or owner has not been paid a market wage), fishery management costs, depreciation and the opportunity cost of capital. Opportunity costs simply refer to the foregone returns that could have been earned had an input been put to its next best alternative use. Further information on the calculation of NER can be found in Vieira and Perks (2009).

NER reveal the actual economic profit earned in a period but not the potential profit that could have been earned, which is the profit associated with MEY (figure 1). Such a comparison of absolute profit to potential profit, however, represents a more accurate assessment of fishery economic performance.

Buyback effects on NER

Changes in fishery NER, and the revenue and cost components that make up estimates of NER, capture both the effects of the buyback and changes resulting from external factors. The major effects of the buyback are likely to occur in the following areas:

- an immediate reduction in total fishery level costs with fewer resources being used to catch fish
- an increase in the overall efficiency of the remaining fleet if less efficient boats have been bought out of the fishery
- a longer term improvement in average catch rates as stocks rebuild assuming TACs and/or effort are initially restricted to allow rebuilding.

The evaluations presented in the current report attempt to examine the degree to which the effects of the buyback have driven changes in NER over the buyback period. To do this, any external factors that may have driven NER must be understood and decomposed. Given the constraints of the current project, it is difficult to quantify the effect of such external factors. If the required data were available, a more comprehensive approach would involve a profit

decomposition as described in Kompas et al. (2009). However, by gaining an understanding of how key external factors have fluctuated since the buyback was undertaken, some broad conclusions about the effect of the buyback can be drawn after accounting for these external factors.

Management effects on NER

Previous management changes and new management measures introduced as part of the Ministerial Direction to AFMA may also have contributed to boosting economic returns in target fisheries in the post-buyback period. For example, changes in total allowable catches of key species in the Commonwealth trawl and the gillnet, hook and trap sectors of the southern and eastern scalefish and shark fishery may have a positive effect on stocks over the longer term and assist with continued autonomous adjustment in the fishery. In most cases, it is difficult to separate the effects on fishery level economic returns arising from changes in management practices from the improvements to returns derived from bringing forward the structural adjustment process through the buyback. As a result, this report recognises that both current and future management arrangements will be a contributing factor affecting economic returns from the management of Commonwealth fisheries, particularly over the longer term.

External short-term effects on NER

Three key external factors that are not related to the buyback and that affect NER are considered below. These external effects are considered throughout each fishery evaluation.

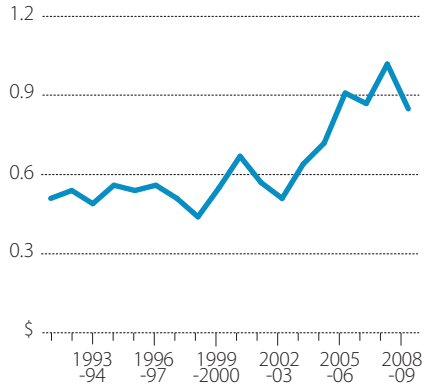
Fish prices

Fluctuations in fish prices are driven by changes in market demand and supply of fish products and affect fishery revenues. A key driver of short-term fluctuations in Australian fish prices in recent years has been exchange rate fluctuations. For export focused fisheries, a higher exchange rate results in lower fish prices; Australian fish products become relatively more expensive on international markets and the quantity demanded falls as a result. For fisheries focused on the domestic market, a higher exchange rate can also result in lower prices as imported substitutes will be relatively cheaper and domestic consumption will, therefore, shift toward these cheaper imports. This latter effect depends on the availability of substitutable imports.

Input prices

Like output prices, input prices fluctuate with changes in market demand and supply, and ultimately affect operating costs. The three major fishery cost items are fuel, labour and repairs and maintenance. Combined, these costs typically account for between 60 per cent and 80 per cent of total cash costs. Fluctuations in fuel prices in recent years have been a key driver of changes in costs. In 2007-08, diesel prices increased considerably, with the average off-road price of diesel rising in real terms from 87 cents a litre in 2006-07 to $1.02 a litre in 2007-08 (2008-09 dollars) (figure 3). The degree to which this has had a negative impact on fishery economic performance is dependent on the total share of operating costs made up by fuel costs. Fluctuations in input

3 Real off-road price for diesel, 1991-92 to 2008-09
2008-09 dollars



Note: The off-road price for diesel reflects the price paid for diesel by fishers taking into account the effect of the diesel fuel rebate.

prices are less of an issue for labour costs and repairs and maintenance. In most fisheries, crew are paid a predetermined share of fishing receipts so crew wages will vary with receipts. Prices paid for repairs and maintenance services and materials would not be expected to exhibit significant short-term variability.

Environmental and stock variability

NER are highly dependent on environmental factors and fish stocks in any given period. These two factors are often interrelated in that environmental factors (currents, rainfall etc.) can affect stock recruitment and abundance. Environmental factors can also affect the fishing behaviour of operators. For example, rough weather can limit the amount of fishing activity in a given period. Such changes typically affect catch rates but can also affect the characteristics of catch (e.g. fish size), which may affect fish prices. Catch and effort data can provide insights into the effect of such factors on NER to some degree. However, it is often difficult to distinguish between short-term fluctuations and longer term changes such as a recovery in fish stocks.

Fishery level output and input use

Analysis of fishery level output and input use is undertaken by examining a ratio of the amount of output that has been produced from a selection of key inputs used in a fishery over time. The ratio takes the form of an index that reveals changes over time compared with some base year. The output to input ratio is constructed by combining an aggregated time series index of an industry's output with an aggregated time series index of some key inputs used by that fishery. Output is the quantity of fish caught. In the current report, the key inputs assessed are labour, capital, fuel and repairs.

Although the output to input ratio used has some similarities to indicators of productivity, the ratio should not be used to draw conclusions about productivity changes for a number of reasons. First, while the costs associated with the key inputs assessed (labour, capital, fuel and repairs) generally account for a large proportion of fishing costs in most fisheries, other cost components can also be substantial and can account for more than one-third of total costs in some fisheries. Additionally, accounting for environmental and stock variability would also be required in a comprehensive analysis of productivity. It has not been possible to include these factors in the analysis presented here. Finally, because this is a fishery level indicator, the potential effects of changing fleet composition cannot be evaluated. While there are qualifications, the current approach still has merit in that it provides a measure of changes in aggregate output relative to a set of important inputs. Future work may provide greater insights with the construction of comprehensive productivity indexes.

The analysis is undertaken by first presenting weighted indexes of the quantities used of each of the four input types (labour, capital, fuel and repairs) together with an aggregated index of partial input use. This aggregated index is calculated by weighting each component's contribution to the aggregate index according to its share of total costs. If an input component accounts for a relatively smaller share of cost, then changes in the quantity of that input will have a relatively small effect on the aggregated input index.

Indexes of output, calculated in a similar fashion, are then presented. Time series indexes of the change in quantity for each key species caught in the fishery are shown with an aggregate index of output. Each output component's weighted contribution to this aggregate index is determined according to its relative share of revenue. Species that account for a greater share of revenue will have a greater influence on the aggregate output index.

The final output to input ratio is the ratio of the aggregated output index to the aggregated partial input index. For further details on the calculation of this ratio, see appendix A.

Analysis of the output to input ratio and its output and input subcomponents can reveal how effectively the above mentioned key inputs have been used in a fishery to catch given amounts of fish over time. It is particularly useful for evaluating the effect of the Securing Our Fishing Future buyback. Given the large reduction in vessels and, therefore, inputs used in fisheries targeted in the buyback, the ratio can reveal to what degree output has also declined (if at all). However, like NER, analysis of this output to input ratio alone will not provide an indication of a fishery's performance relative to potential performance.

Supporting indicators of fishery level performance

A key point made so far is that the use of NER and output to input ratios to draw conclusions about fishery economic performance can only be undertaken with an understanding of the drivers of these factors as well as contributing factors external to the buyback. A number of key indicators are available and are used in the current report to support this purpose.

Catch per unit effort (CPUE)

CPUE is calculated by dividing total catch (in kilograms) by an indicator of fishing effort, such as fishing days, trawl hours or gear length. Data on CPUE are used to assess whether catch rates have changed substantially following the buyback. Such changes could occur as a result of changes in targeting practices, vessel competition, stock abundance and environmental factors. In most cases, conclusions cannot be drawn in the current report about the causes of changes in catch rates but are able to be made about how changes in catch rates are likely to have affected fishery economic performance. For example, when catch rates increase, NER is also likely to increase, and vice versa.

CPUE measures can either be standardised or unstandardised. Standardisation techniques may control for statistical effects, fishing practice effects, environmental effects and vessel competition effects for specific size categories of each species, so that CPUE measures may be directly comparable over time. As a result, these measures may also be used to make

inferences about stock abundance. Unstandardised CPUE measures report catch and effort data without adjustment. Since the CPUE measures for the target fisheries in this report are unstandardised, the analysis of CPUE excludes assessment of stock abundance and is limited to the change in catch rates and their potential effect on fishery profitability.

Costs per unit of catch

Analysis of data on costs per unit of catch provides a way of assessing the combined effect of changes in catch rates and costs on profitability. It is calculated by dividing total fishery costs by total catch. Costs are divided into key cost components so changes in specific components over time can be identified and their effect on profitability explored. This is useful because some costs may be dependent on the operating environment, rather than the effects of the buyback. Whether identified changes have resulted from variations in input use or changes in input price can also be investigated.

Fish prices

The effect of changes in output prices on a fishery's economic performance is a factor which is broadly external to the buyback and has already been discussed. In most cases, fishery operators are price takers and therefore changes in catches should not affect prices. For each fishery evaluated, trends in fish prices and, where relevant, the exchange rate are analysed to determine how price fluctuations may have affected fishery revenues and NER over the buyback period.

Boat level performance

Large changes in fleet size will imply that changes in fishery level indicators of economic performance (such as NER) will often not be consistent with changes in vessel level indicators of profitability. For example, a large decrease in vessel numbers will amplify any changes in fishery level NER at the boat level given that fishery level NERs are being shared by fewer boats. For this reason, some key boat level performance indicators are also evaluated. These indicators include:

- NER per boat
- catch by species per boat
- revenue by species per boat
- costs (by cost component) and effort per boat.

Although boat level changes in profitability are considered when evaluating the effect of the Securing Our Fishing Future buyback, boat level profits are less relevant to AFMA's legislated objective to maximise NER from the management of Commonwealth fisheries. That is, from a policy perspective, NER changes at the fishery level are most relevant when assessing the post-buyback economic performance of fisheries targeted in the buyback.

Terms of evaluation

Evaluations are presented for three of the four fisheries targeted in the buyback: the northern prawn fishery (NPF), the eastern tuna and billfish fishery (ETBF) and the Commonwealth trawl sector (CTS) and the gillnet hook and trap sector (GHTS) of the southern and eastern scalefish and shark fishery (SESSF). The Bass Strait central zone scallop fishery is not assessed as it was closed between 2006 and 2008.

Each fishery evaluation first presents some background information including key economic trends in the fishery prior to the buyback. The effect of the buyback in terms of concessions removed is then discussed. Fishery performance indicators are then evaluated. The analysis focuses on the time period 2005-06 to 2007-08. For the NPF, preliminary estimates that were available for 2008-09 are also analysed. The 2005-06 financial year represents the last year before the buyback took place, 2006-07 represents a transition year in which the buyback was undertaken and 2007-08 (and 2008-09 for the NPF) is the period in which the short-term effect of the buyback can be observed. In some cases, time series that extend to earlier years are presented to reveal trends prior to the buyback.

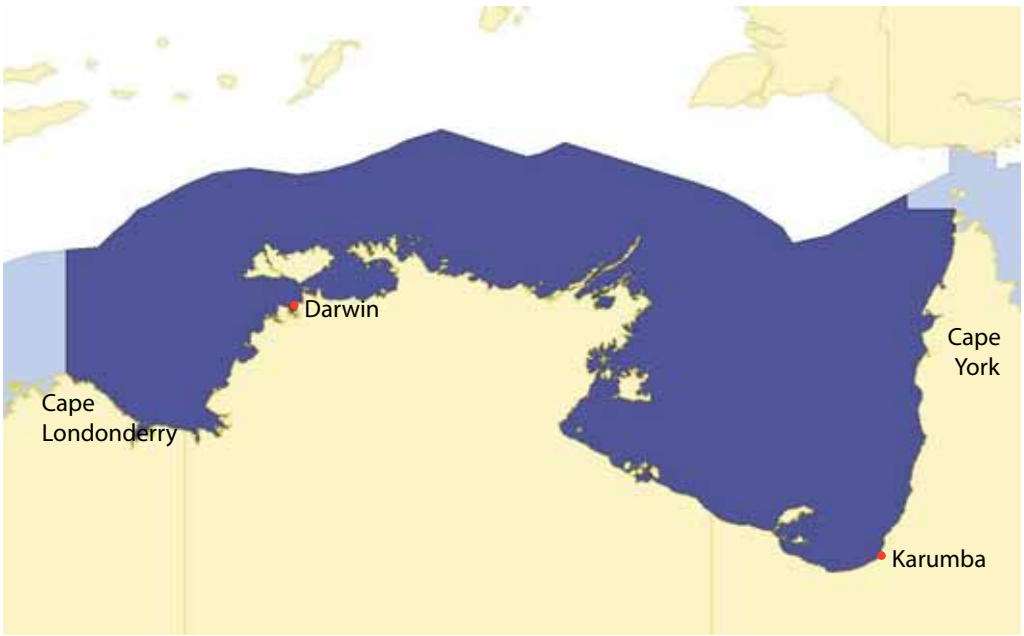
4 Northern prawn fishery

The fishery

Overview

The northern prawn fishery (NPF) is 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: banana prawns and tiger prawns.

map 1 Location of the northern prawn fishery



Banana prawns group in aggregations known as boils and, as a result, large catches of this species can be taken in a relatively short time. Annual recruitment and abundance of banana prawns is highly dependent on rainfall, with high rainfall periods being associated with improved stock recruitment and abundance. Hence, stock recruitment and abundance can be highly variable from year to year, affecting catch rates.

Catch rates of tiger prawns are relatively less affected by environmental factors. Aggregating behaviour is less common in tiger prawn species. Also, stock recruitment and abundance are less dependent on rainfall than is the case for banana prawns. Relatively longer trawl times are typically required for tiger prawn catches. However, tiger prawns receive substantially higher market prices than banana prawns. 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.

Management arrangements

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, which are allocated to each operator according to the number of Class A gear statutory fishing rights (SFRs) they hold, specify the length of headrope an operator can use. Class B SFRs also determine how many vessels can operate in the fishery because a vessel must be nominated to a Class B SFR in order to operate. Operators are free to buy, sell or lease both Class A and B SFRs. The fishery is also managed with a variety of other input controls including other gear and vessel restrictions, 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. Each season's length can vary from year to year depending on catch rates and in accordance with AFMA's adaptive management approach. In 2006-07, the tiger prawn season was open for 15 weeks while the banana prawn season ran for 8 weeks. In both 2007-08 and 2008-09, longer 17 week tiger prawn seasons and 10 week banana prawn seasons were permitted.

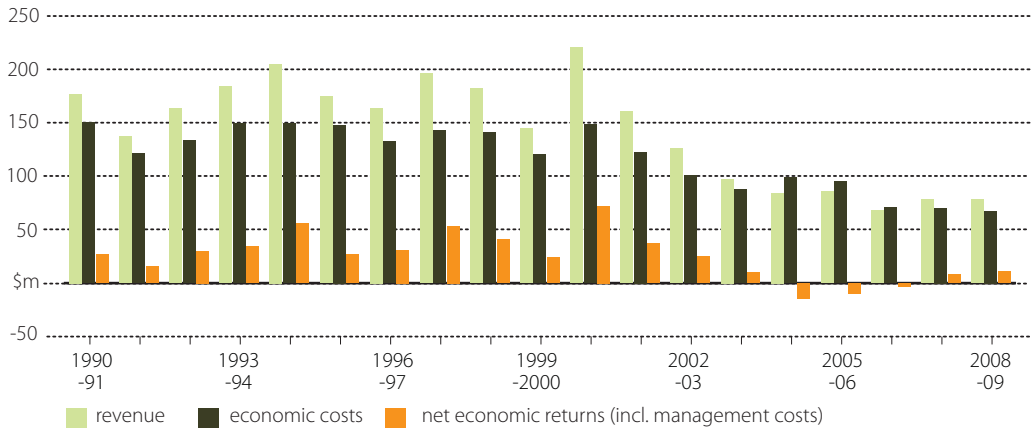
A harvest strategy was implemented for the fishery in 2007 in response to the 2005 Ministerial Direction to AFMA. The harvest strategy specifies a target of long-term maximum economic yield (MEY) for tiger prawns and endeavour prawn by-product. No output target is currently specified for banana prawns. Also, in 2006, the NPF management plan was amended to allow for the use of quad gear (Larcombe and Perks 2009).

The participation of NPF fishers in the buyback was conditional on their agreement to move to output controls (ANAO 2009). As a result, management arrangements in the NPF are currently under review. At its meeting on 21 August 2009, the AFMA Commission agreed to implement output controls for banana and tiger prawn catches in the form of individual transferable quotas (ITQs). This decision was made following consideration of submissions from industry, an industry-funded cost benefit analysis on implementing output controls in the fishery, and recommendations from the Chair of the NPF Management Advisory Committee (NORMAC). A draft management plan incorporating ITQs is anticipated to be available by June 2010 for consideration by NORMAC (AFMA 2009a).

Historical economic performance

Historically, the NPF has experienced high net economic returns (NER) (figure 4). The average NER in the pre-buyback period between 1990-91 and 2005-06 was $28.7 million. However, since a peak of $72.1 million in 2000-01, NER declined to a minimum of -$14.5 million in 2004-05. NER recovered slightly to -$9.4 million in 2005-06. For a summary of ABARE's previous survey results, see Vieira and Perks (2009).

4 Real revenue, costs and net economic returns in the northern prawn fishery, total for fishery, 1990-91 to 2008-09 2008-09 dollars



Note: Economic costs includes total recovered and non-recovered management costs, the opportunity cost of capital, depreciation, the value of owner and family labour and excludes interest and leasing costs and management fees appearing in the accounts of operators. Further details are provided in Vieira and Perks (2009). Costs and net economic returns prior to 1995-96 exclude management costs as they were not available.

Effort removed through the buyback

The buyback component of the Securing Our Fishing Future package had a considerable effect on the NPF. Forty-three Class B SFRs and 18 365 gear SFRs were purchased from the fishery, representing 45 per cent and 34 per cent reductions, respectively (Abetz 2006) (table 7). The 43 Class B SFRs were purchased from 26 operators.

AFMA logbook data for the four years between 2002-03 and 2005-06 and information provided by tenderers have been used to determine how many of the class B SFRs purchased were attached to active fishing boats. Of the 43 class B SFRs purchased from the fishery, 35 were nominated as attached to a boat. Of these 35, none were inactive over the entire four year period from 2002-03 to 2005-06. Of the eight class B SFRs not nominated as attached to a boat, information from AFMA's public registers shows that three were allocated to boats that recorded catch in 2005-06. Hence, for the purposes of this analysis, these boats were considered to be active effort removed from the fishery. Therefore, 38 active boats were considered to have exited the fishery (table 8).

7 Buyback results for the northern prawn fishery

type of concession	concessions prior to buyback no.	concessions surrendered in round one no.	concessions surrendered in round two no.	total reduction no.	total reduction %	remaining concessions no.
Class B SFRs	95	7	36	43	45	52
Gear SFR	53 844	4 734	13 631	18 365	34	35 479

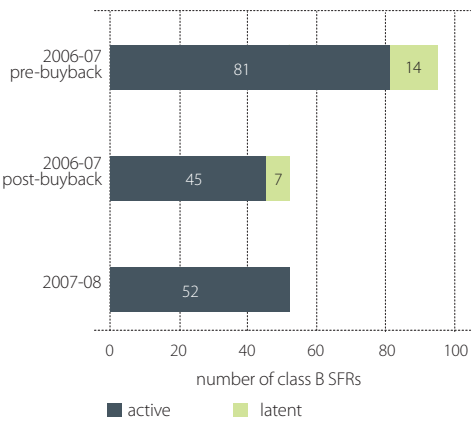
Source: Abetz (2006).

8 Catch of boats removed in the buyback, northern prawn fishery, 2002-03 to 2005-06

		2002-03	2003-04	2004-05	2005-06
Active boats in fishery a	no.	101	98	95	86
Active boats bought out	no.	37	37	37	38
Total fishery catch	tonnes	5 761	6 277	5 124	5 400
Total catch of boats from which concessions were purchased	tonnes	2 147.5	2 423.1	2 010.1	2 219.8
Average catch of boats from which concessions were purchased	tonnes	58.0	65.5	54.3	58.4
% of fishery catch purchased	%	37	39	39	41

a Number of active boats as listed in the Australian Fisheries Surveys Report.
Source: Adapted from Galeano and McQueen (2007).

5 Capacity reduction in the northern prawn fishery



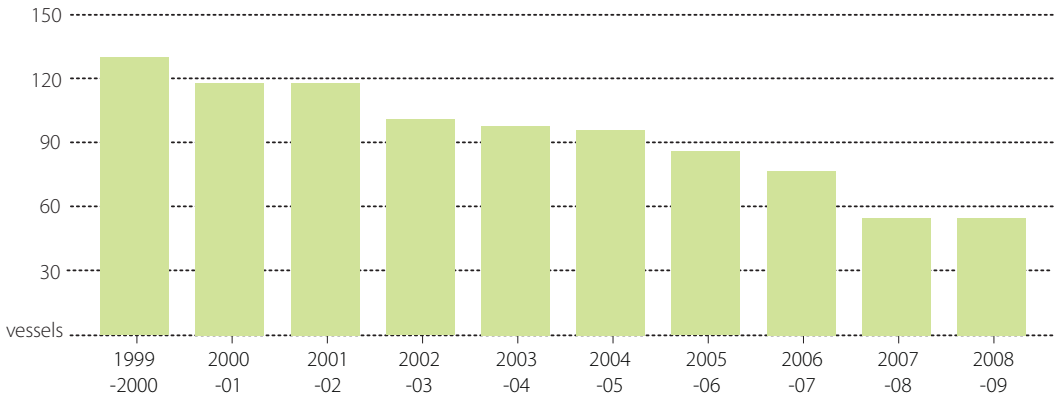
Note: Boat activity in the Australian Fisheries Surveys Report is defined differently to SFR activity.

The 38 boats that did operate in the fishery in 2005-06 recorded a total logbook catch of around 2200 tonnes in 2005-06 or around 42 per cent of the catch from the fishery in that year (table 8). The average catch per boat for those boats from which concessions were purchased was similar to the average catch per boat in the fishery prior to the buyback. For example, in 2005-06, the average catch per boat was around 62 tonnes. This compares with an average of 58 tonnes for those boats that had concessions purchased.

Figure 5 illustrates the change in the fishery's fleet activity. The purchase of 43 class B SFRs included the purchase of seven previously latent SFRs. This left 52 class B SFRs in the fishery. In 2006-07, 45 of these SFRs were active and seven were inactive. Because of the changed economic conditions in the fishery in 2007-08, these seven previously inactive operators re-activated.

The number of active vessels operating in the fishery was already falling prior to the buyback period (figure 6). The average year on year decline in vessel numbers in the fishery prior to the buyback (1998-99 to 2006-07) was 6 per cent. The buyback resulted in a further 29 per cent decline in vessel numbers, from 77 vessels in 2006-07 to 55 vessels in 2007-08. Vessel numbers remained constant in 2008-09.

6 Active vessels in the northern prawn fishery, 1999-2000 to 2008-09



Post-buyback economic performance

Fishery level

Net economic returns

ABARE survey based estimates of fishery level NER are available for the NPF for 2005-06 (the last year prior to the buyback), 2006-07 (the year in which the buyback was undertaken) and 2007-08. To allow the short-term effect of the buyback to be better assessed, non-survey based preliminary estimates of NER for the fishery have been calculated for 2008-09.

NER, including management costs, in the NPF have improved from -$9.4 million in 2005-06 to $11 million in 2008-09 (2008-09 dollars) (figure 4). This increase was driven by a 29 per cent decrease in total operating costs between 2005-06 and 2008-09, which more than offset the negative impact on net economic returns of an 8 per cent decrease in fishing receipts.

The decline in total costs was driven by falls in all cost categories, with the exception of management costs. Fuel, labour and repairs and maintenance accounted for around 80 per cent of operating costs in the NPF in 2008-09. From 2005-06 to 2008-09, all three of these cost components experienced considerable decreases. Fuel costs have decreased by 39 per cent, from $34.1 million to $20.8 million and labour costs have decreased from $22.3 million to $20.1 million. Since crew are generally paid a percentage of receipts, this 10 per cent decrease in labour costs is consistent with the 8 per cent decrease in fishing receipts (table 9).

9 Real revenue, costs and net economic returns for the northern prawn fishery, 2005-06 to 2008-09 2008-09 dollars

		financial year				
		2005-06	2006-07	2007-08	2008-09	change
Catch	t	5 400	5 131	6 904	6 529	21%
Cash receipts	$m	85.5	68.0	78.4	78.4	–8%
less Operating costs						
Fuel	$m	34.1	23.2	22.6	20.8	–39%
Labour (incl. owner and family labour)	$m	22.3	17.1	19.3	20.1	–10%
Repairs and maintenance	$m	12.6	9.2	9.0	9.2	–27%
Other costs	$m	19.9	15.1	14.9	12.9	–35%
Total operating costs	$m	88.9	64.7	65.8	63.0	–29%
plus Interest, leasing, management fees	$m	4.1	3.1	2.1	1.8	–57%
less Capital costs						
Opportunity cost of capital	$m	3.1	2.5	1.7	1.5	–50%
Depreciation	$m	4.9	4.0	2.6	2.4	–51%
Net economic returns (excl. management costs)	$m	–7.3	–0.1	10.4	13.3	$20.6m
less Management costs	$m	2.1	2.9	2.3	2.3	7%
Net economic returns	$m	–9.4	–3.0	8.1	11.0	$20.4m

Note: Estimates for 2008-09 are non-survey based extrapolation estimates. Where base years include negative numbers, changes are given in absolute terms. Discrepancies because of rounding.

Repairs and maintenance are a relatively smaller proportion of operating costs. Since 2005-06, repairs and maintenance costs have decreased by 27 per cent, from $12.6 million to $9.2 million. Other costs, which also includes some components that are influenced by changes in catch (such as freight, marketing and packaging), decreased by 35 per cent from $19.9 million to $12.9 million. Operating costs fell by 29 per cent as a result of these changes.

The opportunity cost of capital fell by 50 per cent to $1.5 million while depreciation decreased by 51 per cent to $2.4 million. This decrease is largely because of the 36 per cent decline in active boats in the fishery since 2005-06. These costs are only a minor component of overall fishing costs.

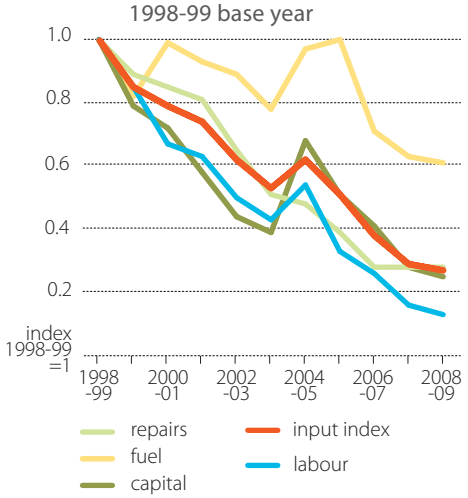
Output and input use

Over the period 1998-99 to 2008-09, the NPF has undergone considerable change. Total estimated fuel use in the fishery has fallen by 39 per cent, from more than 26 million litres to around 16 million litres used in 2008-09. Labour use has also fallen significantly, by more than 85 per cent over this period. In contrast, output from the fishery has fallen to a lesser extent, declining by 19 per cent over the period to 6500 tonnes in 2008-09. The contribution of changes in input use and fishery level output to economic performance is illustrated in this

section through the use of output to input ratios, estimated from historical ABARE survey data and preliminary non-survey based estimates for 2008-09.

7 Aggregate input index and input quantity indexes for the northern prawn fishery, 1998-99 to 2008-09

1998-99 base year



Note: Estimates for 2008-09 are non-survey based preliminary estimates.

An aggregated index of input use at the fishery level has followed a strong declining trend since 1998-99, falling by 73 per cent (figure 7). This was driven by a 59 per cent fall in active vessels in the fishery over the same period.

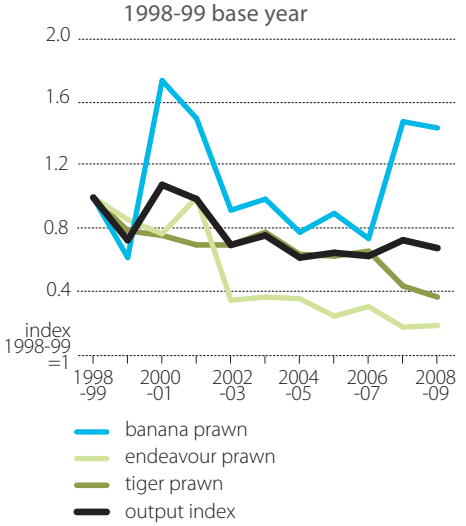
Since the conclusion of the buyback, the decline in fishery level input use has accelerated. The average annual decline in the aggregated input index between 1998-99 and 2004-05 was 6 per cent. The rate of decline increased to 22 per cent in 2005-06 as greater numbers of vessels exited the fishery (following consistent negative returns) and increased further to 26 per cent in 2006-07 and 22 per cent in 2007-08. The index of aggregate input use continued to decline in 2008-09, but fell by only 7 per cent, a rate consistent with the pre-buyback period.

Most of the fall in the aggregate input index in the period 2006-07 to 2008-09 is attributed to lower fuel and labour use. These inputs make up a significant proportion of total operating costs in the fishery, accounting for 64 per cent of these costs in 2007-08, which is the most recently surveyed year. In this period, the quantity index for fuel and labour input use fell at an average annual rate of 15 per cent and 25 per cent, respectively. Another significant input in the fishery is repairs, accounting for around 14 per cent of total operating costs in 2007-08. Following a 28 per cent decline in 2006-07, the quantity index for repairs remained stable for the remainder of the analysis period. Capital decreased by an average annual rate of 20 per cent in the period 2006-07 to 2008-09, but accounts for only a minor share of total operating costs.

The index of aggregated output exhibited some volatility for the period 1989-99 to 2002-03, but has exhibited less volatility since 2002-03 (figure 8). Large fluctuations in the aggregate output index prior to 2002-03 were driven by variability in the quantity index of banana prawn output. Annual catches of this species are significantly affected by environmental factors, in particular rainfall in the pre-season, which tends to increase annual stock recruitment and abundance in the subsequent fishing season (Catchpole and Auliciems 1999). The higher than average rainfall in nursery areas in recent years has led to higher than average banana prawn catches. This has driven movements in the aggregate output index. In contrast, the quantity index for tiger prawns has fallen since the buyback. This has offset some of the increase in the aggregate output index. Endeavour prawns are a commercial by-product in the NPF and comprise a minor proportion of overall catch, and so have a minimal effect on the aggregate

8 Aggregate output index and output quantity indexes for the northern prawn fishery, 1998-99 to 2008-09

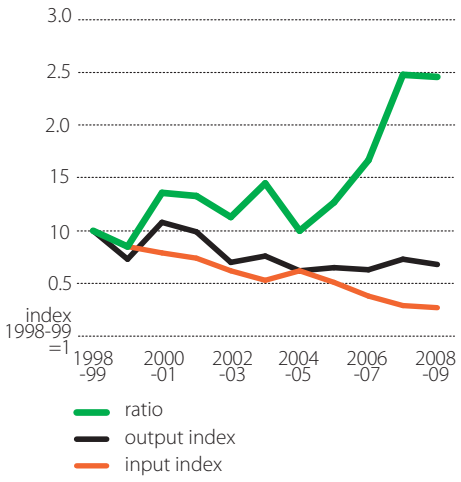
1998-99 base year



Note: Estimates for 2008-09 are non-survey based preliminary estimates. Indexes for king prawns and other catch are not shown as they exhibit minimal change. However, these output categories were included in the calculation of the aggregated output index.

9 Output to input ratio for the northern prawn fishery, 1998-99 to 2008-09

1998-99 base year



Note: Estimates for 2008-09 are non-survey based preliminary estimates.

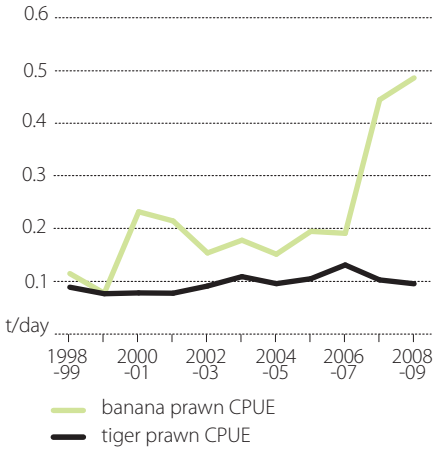
index of output. Relative to the 1998-99 base year, the aggregate index of output was 32 per cent lower in 2008-09, given a gradual decline in the tiger prawn catch.

In 2007-08, the index of aggregate output increased by 16 per cent. This was linked to a significant rise in both banana prawn catch and the relative share that species made up of total revenue in that year. In 2008-09, a 3 per cent fall in the banana prawn quantity index and a 16 per cent decline in the tiger prawn quantity index resulted in a 7 per cent decline in the aggregate output index.

Relative movements in input use and output since 2004-05 have caused a positive trend in the output to input ratio. This positive trend was mainly driven by large falls in active vessels (43 per cent between 2004-05 and 2008-09) and, therefore, inputs combined with comparatively stable output. The output to input ratio rose by 163 per cent over the same period as a result. The average year on year increase in the output to input ratio for the 2004-05 to 2008-09 period was 17 per cent. In 2007-08, following the buyback, the output to input ratio increased by 53 per cent (figure 9).

The relatively large increase in the output to input ratio between 2006-07 and 2007-08 was partly driven by above average catches of banana prawns in 2007-08 and 2008-09. These above average catches are not the result of the buyback but are a result of positive environmental conditions and should be considered an external positive impact on fishery economic performance. In an average year, catches of tiger prawns are the major influence on fishery profitability. Output of that species were at record lows in 2007-08 and 2008-09.

10 Catch per unit effort in the northern prawn fishery, 1998-99 to 2008-09



Note: Catch per unit effort is calculated as catch of a species divided by total effort in the fishery because of the unavailability of effort data by species.

Catch per unit effort

Boat days are readily available for the NPF as an indicator of effort. This measure comprises both vessel trawl hours and vessel search hours into a basic unit of effort in the fishery. Catch per unit effort (CPUE) was calculated for the NPF by dividing the catch of each key species by the total amount of boat days expended in the fishery (figure 10).

There has been a negative movement in tiger prawn CPUE since the buyback. Between 2006-07 and 2007-08, fishery level catches of tiger prawns fell by 33 per cent while boat days fell by 11 per cent. The result was a 22 per cent decrease in tiger prawn CPUE. In 2008-09, the fall in tiger prawn catch was 17 per cent and the fall in boat days was 11 per cent, which resulted in a 7 per cent decrease in CPUE.

Large fluctuations occur in banana prawn catches relative to effort because of environmental variability. Between, 2006-07 and 2007-08, banana prawn catch doubled from 2674 tonnes to 5344 tonnes. This compares with a 14 per cent decrease in boat days. As a result, banana prawn CPUE increased by 133 per cent. This increase is a key factor, unrelated to the buyback, that affected profitability during the buyback period.

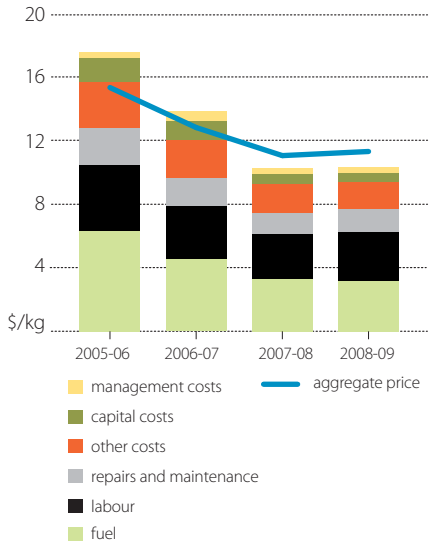
In 2008-09, total banana prawn catch remained stable relative to earlier periods, declining by 2 per cent to 5214 tonnes. This corresponded with a 9 per cent increase in catch per unit effort.

These CPUE estimates reflect catch of the key species as a proportion of total effort in the fishery. They are limited by the fact that effort cannot be directly apportioned to a season. It is possible that the strong banana prawn seasons in 2007-08 and 2008-09 induced fishers to devote a proportionally larger amount of effort to banana prawns relative to tiger prawns and may have resulted in an understatement of tiger prawn CPUE. However, although the exact effect of vessel level production decisions cannot be determined here, the increases in banana prawn CPUE, attributable at least partially to environmental factors, have driven the increases in profitability in the fishery.

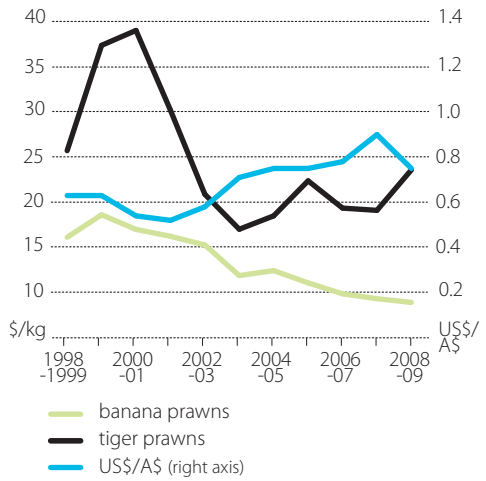
Costs per unit of catch

Costs per unit of catch are likely to vary with changes in CPUE. Costs per kilogram of catch in real terms have fallen considerably, declining by 41 per cent in aggregate terms between 2005-06 and 2008-09 (figure 11). These declines were largely driven by falls in vessel numbers.

11 Real costs per kilogram of catch by cost category and average price per kilogram of catch (based on survey data) in the northern prawn fishery 2005-06 to 2008-09
2008-09 dollars



12 Real beach prices for key species targeted in the northern prawn fishery and the US-Australian exchange rate, 1998-99 to 2008-09
2008-09 dollars



Substantial declines occurred across all cost categories. In absolute terms, these declines were dominated by fuel, which fell by 50 per cent from $6.32 a kilogram of catch in 2005-06 to $3.18 a kilogram of catch in 2008-09. Labour costs followed, but declined by a relatively lower amount, falling from $4.13 a kilogram in 2005-06 to $3.08 a kilogram in 2008-09. The decline in costs per kilogram of catch occurred with declines in the average price recorded for catch. However, declines in costs outweighed declines in revenue per unit of catch in 2007-08 and 2008-09. In 2008-09, an average net return on catch of $1.01 a kilogram was achieved.

Fish prices

In real terms, beach prices for tiger prawns and banana prawns caught in the NPF are low when compared with historical prices (figure 12). Multiple factors have driven this decline. A general appreciation in the Australian dollar has reduced prices for key export species, particularly for tiger prawns. The relative price of imported prawn products that compete with NPF catch on the domestic market (mainly banana prawns) has also decreased. Additionally, increased supply of low quality prawns on international markets from foreign prawn producers that compete with domestic exports has also had a negative impact.

Price fluctuations in the post-buyback period from 2006-07 and 2007-08 were minimal. Tiger prawn prices in real terms declined by only 1 per cent from $19.36 a kilogram to $19.11 a kilogram (2008-09 dollars) while banana prawn prices fell by 6 per cent from $9.87 a kilogram to $9.33 a kilogram. In 2008-09, tiger prawn prices increased substantially, rising by 23 per cent to $23.59 a kilogram and are expected to have had a positive impact on economic returns in the fishery.

Boat level

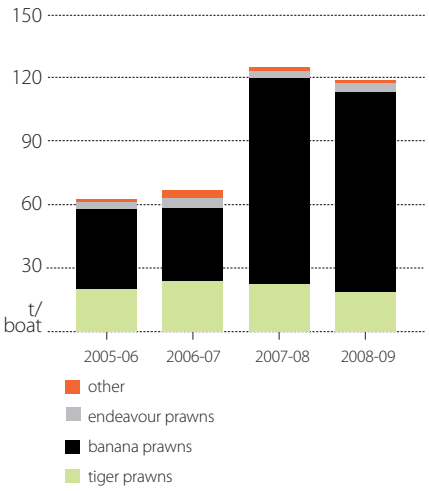
Net economic returns

Real NER, excluding management costs, per vessel are estimated to have recovered from -$85 000 per boat in 2005-06 to $242 000 per boat in 2008-09. The largest year on year increase occurred between 2006-07 (the year of the buyback) and 2007-08 when NER per boat increased from close to a zero return (-$2000) to $189 000 per boat.

Between 2005-06 and 2007-08, fishery level management costs increased by 7 per cent despite a 36 per cent reduction in boat numbers. Management costs are recovered from industry on the basis of fishing concession holdings, not the amount of activity against these holdings. Consequently, management costs charged to active fishing concessions are reduced by the presence of latent concessions. As the buyback removed latent effort from the fishery, management costs per active vessel have increased by 71 per cent from $24 000 to $42 000 over the same period.

The Securing Our Fishing Future package provided funding to subsidise the management costs recovered from remaining concession holders following the buyback, to minimise the negative effect of having fewer concession holders bearing unchanged total management costs. The provision of this subsidy concluded in 2008-09 (AFMA 2009b). AFMA is currently undertaking a business efficiency review (AFMA 2009c) with one of its objectives being the reduction of management costs.

13 Catch per vessel by key species in the northern prawn fishery, 2005-06 to 2008-09



Catch per vessel

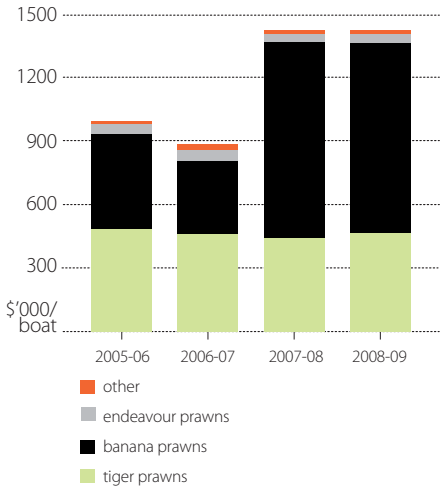
Total catch per vessel was reasonably constant between 2005-06 and 2006-07, then rose substantially from 66.6 tonnes a vessel in 2006-07 to 124.9 tonnes in 2007-08 (an increase of 88 per cent) before declining slightly to 118.7 tonnes a boat in 2008-09 (figure 13). Historically high banana prawn catches in 2007-08 and 2008-09 drove these observed changes, with the large increase in banana prawn catch at the fishery level (100 per cent) translating to an even larger increase at the boat level (180 per cent) given the large drop in vessel numbers from 2006-07 to 2007-08. Tiger prawn catches at the boat level remained relatively constant over the same period.

Revenue per vessel

In the period 2005-06 to 2008-09, there was a significant increase in revenue per vessel (figure 14). This increase largely followed changes in catch, but was also affected by changes in prawn prices. Between 2005-06 and 2008-09, catch per

14 Real revenue by species per vessel in the northern prawn fishery, 2005-06 to 2008-09

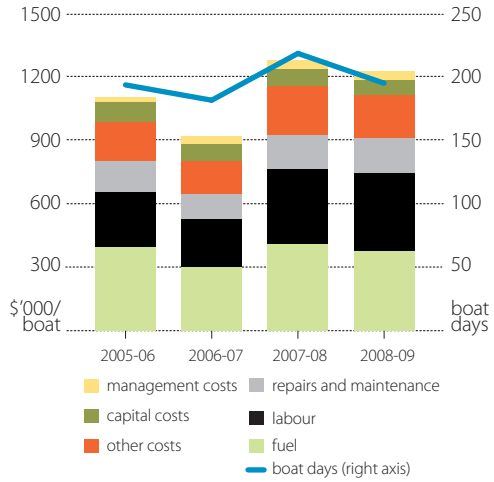
2008-09 dollars



Note: Total revenue here is consistent with fishery level revenue as calculated for NER. The break-up of revenue by species is calculated according to the proportions of fishery level GVP that each species group accounts for.

15 Real costs per vessel by cost category and boat days per vessel for the northern prawn fishery, 2005-06 to 2008-09

2008-09 dollars



vessel increased by 89 per cent. Over the same period, revenue per vessel increased from just less than $1 million to more than $1.42 million, which represents an increase of 43 per cent.

Most of the variation in revenues per boat has been driven by changes in banana prawn revenues. Banana prawn revenues per boat increased by 171 per cent between 2006-07 and 2007-08. This is less than the 180 per cent increase in banana prawn catch per boat because of slightly weaker banana prawn prices.

In 2006-07 and 2007-08, tiger prawn revenues accounted for 52 per cent and 31 per cent of revenues per boat, respectively. In absolute terms, tiger prawn revenues per boat declined over the four year period, despite large price increases in 2008-09.

The largest increase in real revenue per boat occurred the year after the buyback was completed in 2007-08. Revenues increased from $883 000 to more than $1.4 million a boat. This increase was largely driven by an increase in the revenues attributable to banana prawns.

Costs per vessel

Boat level costs in real terms increased by 11 per cent from 2005-06 to 2008-09. In 2005-06, real costs per boat were $1.1 million, but by 2008-09 they had increased to $1.2 million (figure 15).

Costs at the boat level can largely be explained by changes in effort and catch. Each of these affect the key cost items to varying degrees. After the conclusion of the buyback, costs per vessel initially increased by 39 per cent from $922 000 in 2006-07 to almost $1.28 million in 2007-08. All cost categories, with the exception of capital costs, contributed to this increase. Labour costs, which are strongly linked to receipts, increased by 58 per cent. Fuel costs increased by 36 per cent, repairs and maintenance increased by 37 per cent and other costs increased by 48 per cent. Other costs include components that are

linked to catch such as freight, marketing and packaging. From 2007-08 to 2008-09, costs per vessel fell by 4 per cent to $1.22 million. This was driven by declines in effort and average fuel use per vessel in 2008-09.

Conclusions and longer term prospects

The results presented above reveal how fishery and boat level profitability have changed in the NPF in the post-buyback period. The key results from this analysis are:

- NER improved substantially in both 2007-08 and 2008-09.
- Considerable increases in banana prawn CPUE in 2007-08 and 2008-09 reflect increased catch efficiency resulting from favourable environmental conditions and are not a result of the buyback. The increase in banana prawn CPUE in these years has had a significant positive impact on revenues and profits, although has been partially offset by decreases in tiger prawn CPUE.
- The decrease in boat numbers from 2005-06 to 2007-08, when combined with an increase in total catch over the same period, has resulted in a considerable increase in catch per vessel. Costs per vessel have also increased, but revenues have increased more rapidly. As a result, estimated boat level NER have increased in 2007-08 and 2008-09.

In the period immediately prior to the buyback, the fishery was, on average, achieving negative profits. In response to this, vessel numbers in the fishery were steadily reducing from 130 vessels in 1999-2000. The buyback accelerated this autonomous adjustment, further reducing vessel numbers from 86 vessels in 2005-06 to 55 vessels in 2008-09. Latent effort in the fishery has also been reduced and is now negligible, indicating that profitability has improved in the fishery.

To some extent, the fishery has benefitted from factors beyond the control of vessel operators and which are also not necessarily linked to the buyback. The 2007-08 and 2008-09 seasons were characterised by considerably higher banana prawn catch rates than prior to the buyback. These changes are largely the result of rainfall patterns in northern Australia in recent years that have increased banana prawn recruitment and abundance. However, even after accounting for this, the analysis shows that the buyback is likely to have had a positive impact on the fishery by reducing costs. Since there are fewer vessels operating in the NPF, there are fewer resources being expended in the fishery so fishery level costs are lower.

Any improvements that have directly resulted from the buyback have come at a cost. While this analysis is not a cost–benefit analysis, it should be noted that in the two rounds of the buyback approximately $60.3 million (in 2008-09 dollars) was expended to the purchase of entitlements in the NPF (ANAO 2009). It is important that ongoing management arrangements in the fishery 'lock in' the benefits achieved through the buyback so that the benefits from this expenditure are as large as possible.

Unlike other Commonwealth fisheries, the NPF had a specific management target of MEY (for tiger prawns) prior to the buyback. This will have assisted in improving the profitability of the fishery. In addition, new management arrangements in the form of individual transferrable quotas (ITQs) for both tiger and banana prawns are in the process of being implemented

in the NPF (AFMA 2009a). ITQs are integral to preserving the improved economic operating environment that has been achieved through the structural adjustment package. ITQs have the capacity to ensure harvests in the fishery correspond with those set by fishery managers while also providing a greater incentive for fishers to maximise efficiency available. The implementation of ITQs along with the setting of TACs to be consistent with MEY should ensure that effort creep doesn't erode the potential benefits of the buyback.

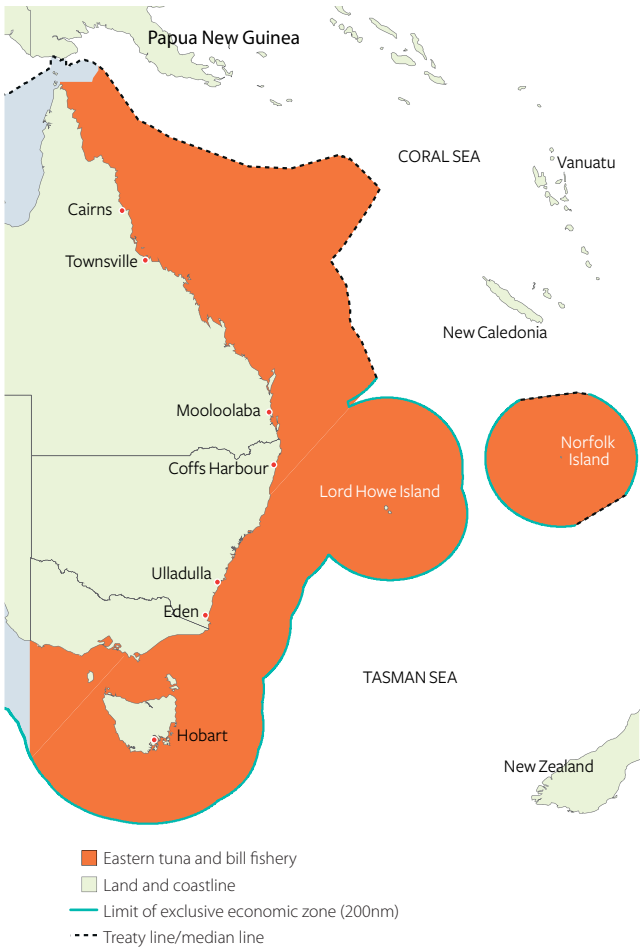
5 Eastern tuna and billfish fishery

The fishery

Overview

The eastern tuna and billfish fishery (ETBF) extends from the tip of Cape York to the South Australia–Victoria border, and includes waters around Lord Howe Island and some waters on the high seas (map 2). Most commercial fishing effort occurs within a few hundred kilometres of ports along the coast of New South Wales and southern Queensland.

map 2 Location of the eastern tuna and billfish fishery



Key tuna species targeted in the commercial fishery include yellowfin tuna, bigeye tuna and albacore tuna while the key billfish species targeted is broadbill swordfish. These species are highly migratory and are part of much larger stocks that have a spatial range which extends across the central and western Pacific Ocean. Approximately 2 million tonnes of tuna are harvested annually in the central and western Pacific Ocean by vessels from multiple countries. As such, catch rates in Australian waters are linked to some degree to the wider stock abundance. However, the magnitude of this link is still not fully understood (Kompas et al. 2009).

Management arrangements

Historically, the fishery has been managed with annual fishing permits under transitional arrangements set out in the management plan. Under these arrangements, each permit authorises an operator to employ either pelagic longline or minor line (poling, trolling, rod and reel and hand line) fishing methods.

Currently, the fishery is moving to introduce management arrangements based on individual transferable quotas (ITQs). This is consistent with the 2006 Ministerial Direction that requires the Australian Fisheries Management Authority (AFMA) implement output controls in the form of ITQs in all Commonwealth fisheries unless significant impediments to their introduction can be identified for individual fisheries.

Statutory fishing rights (SFRs) were formally granted by AFMA in August 2009 for the eastern tuna and billfish fishery (ETBF) under the Eastern Tuna and Billfish Fishery Management Plan 2005 and came into effect on 1 November 2009. It is planned that interim SFR based effort management arrangements that came into effect on 1 November 2009 will remain in place until 28 February 2011. These arrangements mean the fishery will be managed under a total allowable effort (TAE) based on hook numbers until that time. The fishery will then move to quota based management arrangements on 1 March 2011 (AFMA 2009a).

Historical economic performance

ABARE estimates of net economic returns (NER) to the fishery have generally always been low. In the years immediately prior to the announcement of the structural adjustment package, estimates of real NER in the ETBF were negative at -$9.1 million in 2004-05 and -$10.2 million in 2005-06 (2008-09 dollars) (figure 16). A positive return has only been estimated for three of the 12 financial years between 1994-95 and 2005-06. The average NER over the same period was -$5.1 million.

Throughout the 1990s, revenue increases occurred with near to proportional increases in costs. Positive NER were earned in the late 1990s with the targeting of swordfish off Mooloolaba (Queensland), but were quickly dissipated by 2001-02 following significant increases in effort and localised depletions of inshore stocks. Substantial net economic losses have prevailed in all years that followed. Kompas et al. (2009) use profit decomposition and vessel level productivity analysis to show that reductions in swordfish stock abundance can be linked to lower profits in the fishery. Their results show that swordfish stock depletion reduced the average profit per boat by around 14 per cent a year between 1997-98 and 2006-07.

16 Real revenue, costs and net economic returns in the eastern tuna and billfish fishery prior to the buyback, total for fishery 2008-09 dollars

Note: Economic costs includes total recovered and non-recovered management costs, the opportunity cost of capital, depreciation, the value of owner and family labour and excludes interest and leasing costs and management fees appearing in the accounts of operators.

Kompas et al. (2009) also suggest that a build-up of capital in the fishery also contributed to low returns in the fishery. The estimated value of capital in real terms increased from $16.2 million in 1994-95 to $80.6 million in 2003-04 (2008-09 dollars) (figure 17). However, declines did occur after 2003-04 following substantial negative returns. Overcapitalisation and dissipated NER are both characteristics of an unregulated open access fishery.

17 Depreciated replacement value of capital (in real terms) in the eastern tuna and billfish fishery, total for fishery 2008-09 dollars

Effort removed through the buyback

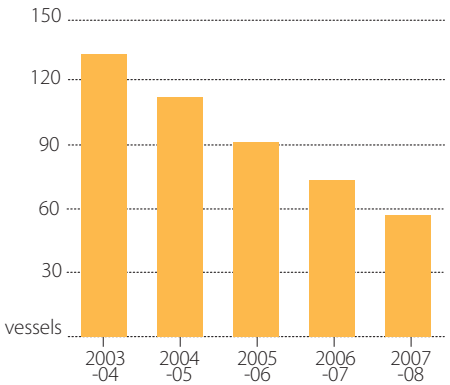
A total of 99 longline permits and 112 minor line permits were purchased from the ETBF in the buyback (DAFF 2006a and 2006b) (table 10). This represents a 45 per cent and 49 per cent reduction in the number of longline and minor line permits, respectively. As 99 per cent of the catch in the ETBF is caught using longline, all discussion of the buyback that follows is limited to the effect on the longline sector.

10 Buyback results for the eastern tuna and billfish fishery

type of concession	concessions prior to buyback	concessions surrendered in round one	concessions surrendered in round two	total reduction		remaining concessions
	no.	no.	no.	no.	%	no.
longline permits	218	98	1	99	45	119
minor line permits	230	103	9	112	49	118

Source: DAFF (2006a and 2006b).

18 Active vessels in the eastern tuna and billfish fishery, 2003-04 to 2007-08



It is important to note that in the years leading up to the buyback not all permits were actively fished against in the ETBF. AFMA logbook data indicate that 132, 112 and 91 boats operated in the fishery in 2003-04, 2004-05 and 2005-06, respectively. This indicates that, on average, only around one-half of the 218 longline concessions available were fished against over this period. As a result, many of the concessions purchased are likely to have reduced latent effort in the fishery rather than actual effort. However, active vessel numbers following the buyback are substantially lower. In 2007-08, 57 vessels were active in the fishery (figure 18).

Analysis of tender information and AFMA log books indicates that despite around one-half of the longline concessions being removed from the fishery, these concessions related to approximately 29 per cent of actual catch in the fishery in the period 2003-04 to 2005-06 (table 11). Of the 99 longline concessions purchased, 52 were nominated to a boat. Of the 52, only 28, 31 and 28 of those boats operated in the fishery in 2003-04, 2004-05 and 2005-06, respectively. These boats recorded an average annual logbook catch of around 1800 tonnes in each of these three years.

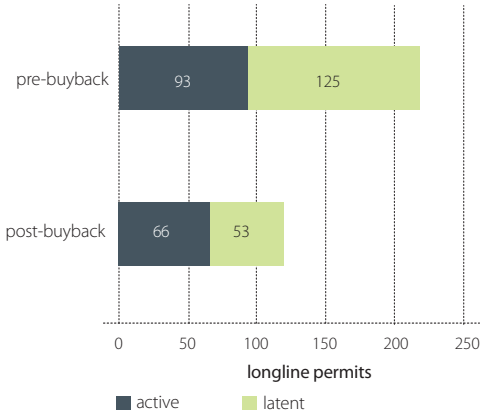
Figure 19 provides an indication of the capacity reduction that occurred as a result of the fishery buyback. Of the 218 permits existing prior to the buyback, 57 per cent were latent.

11 Catch of boats removed in the buyback, eastern tuna and billfish fishery 2003-04 to 2005-06

		2003-04	2004-05	2005-06
Active boats in fishery a	no.	132	112	91
Active boats bought out	no.	28	31	28
Total catch in fishery	tonnes	7 021.5	6 376.4	5 805.5
Total catch of boats from which concessions were purchased	tonnes	1 786.1	1 942.7	1 802.0
Average catch of boats from which concessions were purchased	tonnes	63.8	62.7	64.4
% of fishery catch purchased	%	25	30	31

a Number of active boats as listed in the Australian Fisheries Surveys Report.
Source: Adapted from Galeano and McQueen (2007).

19 Capacity reduction in the eastern tuna and billfish fishery



Note: Boat activity in the Australian Fisheries Surveys Report is defined differently to SFR activity. *Source:* Adapted from Galeano and McQueen (2007).

After the buyback, 119 permits remained, of which 45 per cent were latent. Given there were several different types of longline permits in the fishery (which allowed for fishing in different areas of the fishery) prior to the buyback, it is difficult to determine if the 119 permits available after the buyback allow for more effort to be applied in the fishery than the 93 active boats that operated prior to the buyback (Galeano and McQueen 2007).

Generally, latent effort in the form of inactive entitlements in a fishery creates the potential for economic profits to be dissipated, as effort is activated once economic conditions in the fishery improve. However, the recent implementation of interim effort controls in the ETBF in the form of TAE based on hook numbers, ahead of the eventual move to an ITQ system, allows AFMA to address this issue. By changing the primary effort control from entitlements to the number of hooks set in the fishery, management can focus on setting effort that is consistent with maximising economic returns, which should result in low amounts of latent hooks. This can be achieved independently of the number of active entitlements in the fishery.

Post-buyback economic performance

Fishery level

Net economic returns

ABARE survey based estimates of fishery level NER are available for the ETBF for 2005-06 (the last year prior to the buyback) and 2006-07 (the year in which the buyback was undertaken). To allow the short-term effect of the buyback to be better assessed, non-survey based preliminary estimates of NER for the fishery have been calculated for 2007-08.

In 2006-07, when the buyback was conducted, NER were negative at -$10.5 million (table 12). In 2007-08, the first year to follow the buyback, NER are estimated to have recovered to around -$1.1 million. An estimated 7 per cent decline in fishing receipts between 2005-06 and 2007-08 was outweighed by declines in both total operating costs (24 per cent) and capital costs (36 per cent) and resulted in the improvement in NER.

12 Real revenue, costs and net economic returns for the eastern tuna and billfish fishery, 2005-06 to 2007-08 2008-09 dollars

		financial year			
		2005-06	2006-07	2007-08	change
Catch	t	5 758	7 695	6 452	12%
Cash receipts	$m	47.2	42.5	44.0	−7%
less Operating costs					
Fuel	$m	9.6	8.1	7.6	−21%
Labour (incl. owner and family labour)	$m	11.6	10.7	11.0	−6%
Repairs and maintenance	$m	6.0	6.4	5.0	−18%
Other costs	$m	24.0	20.7	15.1	−37%
Total operating costs	$m	51.2	45.9	38.7	−24%
plus Interest, leasing, management fees	$m	4.3	2.6	1.5	−64%
less Capital costs					
Opportunity cost of capital	$m	3.1	2.5	1.8	−43%
Depreciation	$m	4.4	4.0	3.0	−32%
Net economic returns (excl. Management costs)	$m	−7.2	− 7.4	2.0	$9.2m
less Management costs	$m	3.0	3.1	3.1	2%
Net economic returns	$m	− 10.2	− 10.5	− 1.1	$9.1m

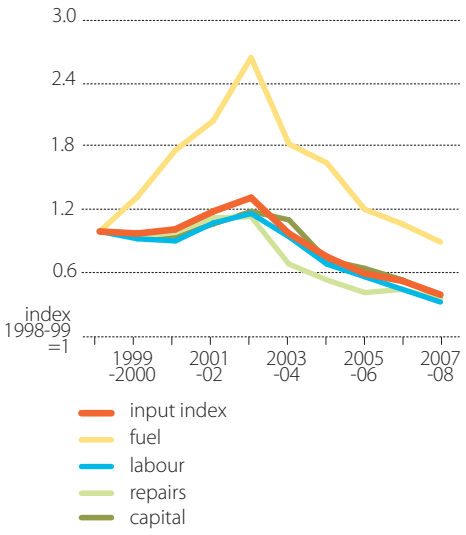
Note: Estimates for 2007-08 are non-survey based extrapolation estimates. Where base years include negative numbers, changes are given in absolute terms. Discrepancies because of rounding.

The declines in costs at the fishery level are largely attributable to the decline in the number of boats and, therefore, the quantity of resources invested in the fishery. Fuel costs provide a good example of this. Between 2006-07 and 2007-08, fuel prices increased by 14 per cent and estimated fuel use per boat increased by 3 per cent. However, the substantial reduction in boat numbers and the corresponding reduction in total fuel used by the fleet mean fuel costs are estimated to have declined by 6 per cent from $8.1 million in 2006-07 to $7.6 million in 2007-08. When compared with 2005-06, the decline is even greater at 21 per cent.

Relative to fuel costs, all other components of operating costs are estimated to have declined by larger amounts between 2005-06 and 2007-08. Estimated declines for these cost components range between 18 per cent, for repairs and maintenance, and 37 per cent, for other costs.

Both capital cost components are estimated to have declined substantially. The opportunity cost of capital invested in the fishery is expected to have declined by 43 per cent from $3.1 million in 2005-06 to $1.8 million in 2007-08. Depreciation also decreased, but to a lesser degree, from $4.4 million in 2005-06 to $3 million in 2007-08, which was a reduction of 32 per cent.

20 Aggregate input index and input quantity indexes for the eastern tuna and billfish fishery, 1998-99 to 2007-08
1998-99 base year



Note: Estimates for 2007-08 are non-survey based preliminary estimates.

Output and input use

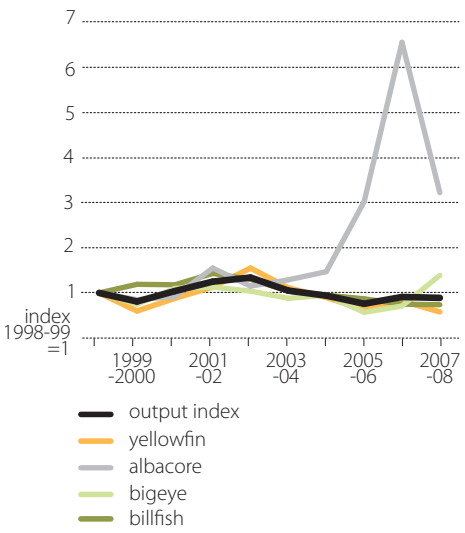
Output and input use in the ETBF can be broadly described as increasing with a build-up in effort and capital in the period between 1998-99 and 2002-03, then declining in the following period given low economic returns. To more accurately illustrate the effect of these changes on fishery level profitability, the relative changes in output and input use must be examined. Time series of output to input ratios allow comparisons to be made over time as to how well a selection of key inputs have been used to harvest catch. The analysis presented here for the ETBF was undertaken using historical survey data as well as non-survey based estimates of key input costs and outputs for 2007-08.

Aggregate input use in the ETBF has been declining since 2002-03 (figure 20). The rate of annual decline was highest in 2003-04 at 26 per cent, then gradually slowed in each year to 2006-07 (a 12 per cent decline occurred between 2005-06 and 2006-07). However, the rate of decline in 2007-08 increased to 24 per cent. This is likely to be linked to the buyback induced reduction in vessel numbers.

Falls in the quantity indexes of all input categories (fuel, labour, repairs and capital) are shown to have contributed to the observed decline in the aggregated input index since 2002-03. Between 2005-06 (before the buyback) and 2007-08 (after the buyback), falls were most pronounced for labour and capital, which both fell by 43 per cent.

Prior to 2006-07, the aggregated output index generally follows a similar trend to input use. Substantial increases in output occurred in 2001-02 and 2002-03 (figure 21), but were followed by falls in output between 2002-03 and 2005-06. However, despite a continued fall in input use in 2006-07, aggregated output is estimated to have increased by 20 per cent in the same year. This was largely driven by increases in the output quantity indexes for albacore (117 per cent), yellowfin (30 per cent) and bigeye tuna (25 per cent). In 2007-08, the year following the buyback, aggregate output remained relatively stable and declined by only 2 per cent between 2006-07 and 2007-08. Falls in the output quantities of yellowfin (29 per cent) and albacore tuna (51 per cent) in 2007-08 were largely offset by a 96 per cent increase in the output quantity of bigeye tuna.

21 Aggregate output index and output quantity indexes for the eastern tuna and billfish fishery 1998-99 to 2007-08
1998-99 base year

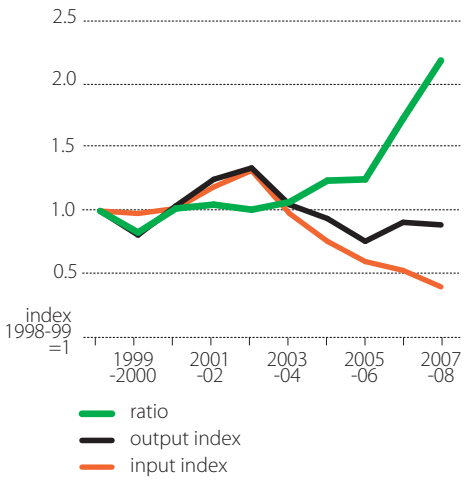


Up to and including 2002-03, the combined effect of input use and output left the output to input ratio reasonably stable (figure 22). Substantial increases in input use in 2001-02 and 2002-03 were associated with similar increases in output. Falls in input use between 2002-03 and 2005-06 were also associated with falls in output although declines in input use began to outweigh declines in output in 2003-04. The output to input ratio started to increase marginally as a result. The rate of increase grew substantially in 2006-07 when the output to input ratio increased by 38 per cent, as the aggregated output index increased by 20 per cent and input use continued to fall. The increasing trend continued in 2007-08 with a 29 per cent increase in the output to input ratio, which resulted from a 2 per cent decline in output and a 24 per cent decline in input use.

The historical indexes in figure 22 highlight three key periods of change in the fishery. The first period is associated with a build-up of capital between 1998-99 and 2002-03, which occurred in response to high catch rates and positive NER. The average growth in the output to input ratio during this period was relatively low at 2 per cent. Vessel numbers and capital fell in the three year period that followed (2003-04 to 2005-06) given lower catch rates, lower fish prices and dissipated rents. The average increase in the output to input ratio during this period was 10 per cent, which suggests that declines in vessel numbers resulted in some improvement in input use. The final period (2006-07 to 2007-08) is associated with the buyback and the relatively rapid decline in vessel numbers that it caused. Output per unit input increased by

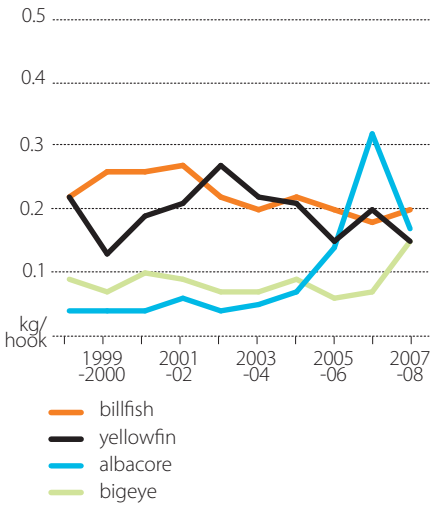
22 Output to input ratio for the eastern tuna and billfish fishery, 1998-99 to 2007-08

1998-99 base year



Note: Estimates for 2007-08 are non-survey based preliminary estimates.

23 Catch per hook set by key species in the eastern tuna and billfish fishery, 1998-99 to 2007-08



38 per cent and 29 per cent in 2006-07 and 2007-08, respectively.

Catch per unit effort

Analysis of historical catch per unit effort (CPUE) data can provide a rough indication of the effect of changes in stocks, catch efficiency and changed targeting practices on economic performance.

Figure 23 shows catch per hook set in the ETBF for the four key species groups targeted in the fishery. CPUE of albacore increased rapidly in 2005-06 and 2006-07. This was driven by raised targeting of this species in response to low catch rates for other key species, particularly swordfish (Sands et al. 2009). Albacore CPUE dropped off in 2007-08, although evidence suggests this was more the result of a change in targeting practices rather than a decrease in albacore abundance (Sands et al. 2009). Indeed, the increased CPUE of bigeye tuna suggests that targeting is likely to have substituted away from the less valuable albacore tuna species (valued at $2 a kilogram in 2007-08) to the relatively high valued bigeye tuna (valued at $8.67 a kilogram in 2007-08).

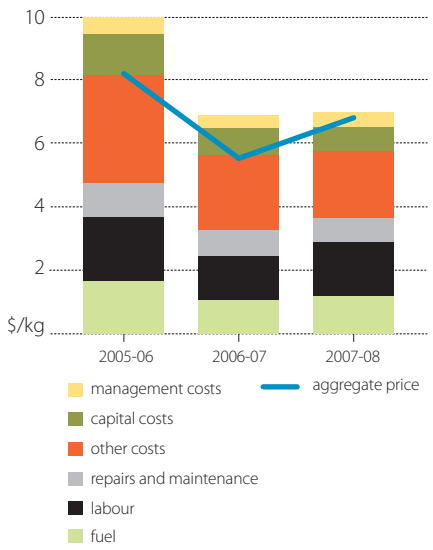
CPUE for bigeye tuna species in 2007-08 was as high as it has ever been for the time period presented in figure 23. The high CPUE of this species has had a positive impact on fishery profitability given its relatively high price, and is reflected in the increase in the aggregated output index for this species in 2007-08. While the cause of this CPUE increase cannot be assessed here, it should be noted that catches of key species in the ETBF show high inter-annual variability because of the likely link between tuna migration patterns and variations in oceanographic factors. Relative to albacore and bigeye tuna, CPUE for yellowfin tuna and billfish has been stable in the post-buyback period.

Costs per unit of catch

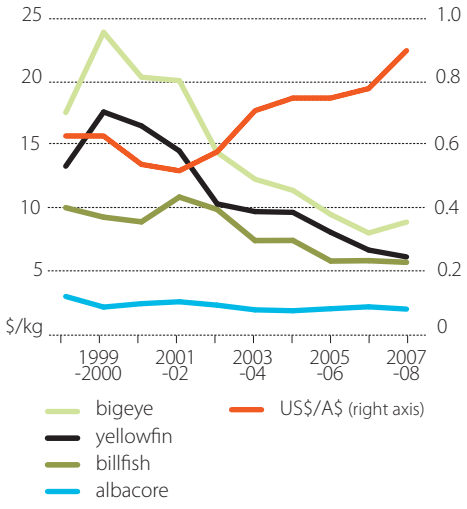
If the abundances of key ETBF stocks increase, it is expected that costs per unit of catch should

24 Real costs per kilogram of catch by cost category and average price per kilogram of catch (based on survey data) in the eastern tuna and billfish fishery, 2005-06 to 2007-08

2008-09 dollars



25 Real beach prices for key species targeted in the eastern tuna and billfish fishery 2008-09 dollars



decrease given a higher CPUE. However, given that stocks in the ETBF are internationally shared, reductions in catch and effort might not have a strong positive affect on future catch rates.

Figure 24 shows that costs per kilogram of catch have declined in the fishery in real terms in 2006-07 and 2007-08 relative to 2005-06. The decline is consistent with the decline in vessel numbers participating in the fishery and is driven in part by increased catch rates for bigeye tuna and billfish.

Also shown in figure 24 is the average price received per kilogram of catch in the fishery. When compared with costs per kilogram of catch, operating in the fishery would have been far less viable had 2005-06 per unit catch costs (and vessel numbers) prevailed in 2007-08.

Fish prices

In real terms, beach prices for key species targeted in the ETBF have generally followed a downward trend for the majority of this decade (figure 25). This decline has been largely driven by an appreciation in the Australian dollar over the same period.

This downward trend continued in 2007-08 for all key species, with the exception of bigeye tuna. The average price of bigeye tuna increased from $8.08 a kilogram to $8.94 a kilogram, which was an increase of 11 per cent (2008-09 dollars). The increased output of this species and the positive impact this has had on profitability in 2007-08 has already been discussed. The average per kilogram price increase for bigeye tuna would have augmented this positive impact. Prices declined by 8 per cent for yellowfin tuna and albacore tuna and 2 per cent for billfish species between 2006-07 and 2007-08.

Boat level

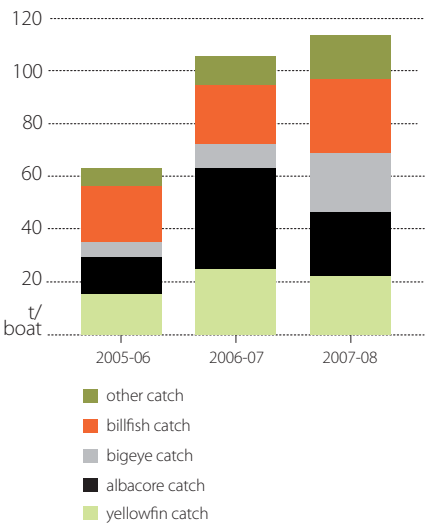
Net economic returns

Real NER, excluding management costs, per vessel are estimated to have initially decreased from -$79 000 a boat in 2005-06 to -$101 000 a boat in 2006-07 before recovering to $36 000 a boat in 2007-08. These NER estimates exclude management costs as these latter costs include both management costs recovered from industry and non-recovered management costs that are paid for by AFMA. This latter component does not affect the economic performance of individual operators so it is inaccurate to include it in estimate of vessel level NER.

Between 2005-06 and 2007-08, fishery level management costs increased by 2 per cent despite a 37 per cent reduction in boat numbers. Management costs are recovered from industry on the basis of fishing concession holdings, not the amount of activity against these holdings. Consequently, management costs charged to active fishing concessions are reduced by the presence of latent concessions. As the buyback removed latent effort from the fishery, management costs per active vessel increased by 64 per cent from $33 000 to $54 000 over the same period.

The Securing Our Fishing Future package provided funding to subsidise the management costs recovered from remaining operators following the buyback, to minimise the negative effect of having fewer vessels bearing unchanged total management costs. The provision of this subsidy concluded in 2008-09 (AFMA 2009b). AFMA is currently undertaking a business efficiency review (AFMA 2009c), with one of its objectives being the reduction of management costs.

26 Catch per vessel by species in the eastern tuna and billfish fishery, 2005-06 to 2007-08

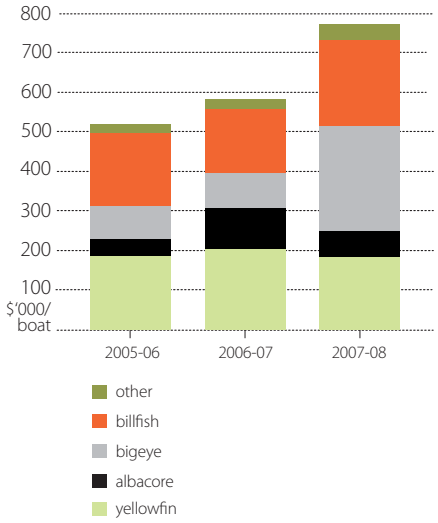


Catch per vessel

With the reduction in vessel numbers, total catch per vessel has increased in every year since 2005-06 when it was 63.3 tonnes a boat. By 2007-08, catch per boat had risen by 79 per cent to 113.2 tonnes (figure 26). These large increases in catch per vessel occurred despite a relatively constant CPUE between 2005-06 and 2007-08 because of an increase in the number of hooks set per boat over the same period.

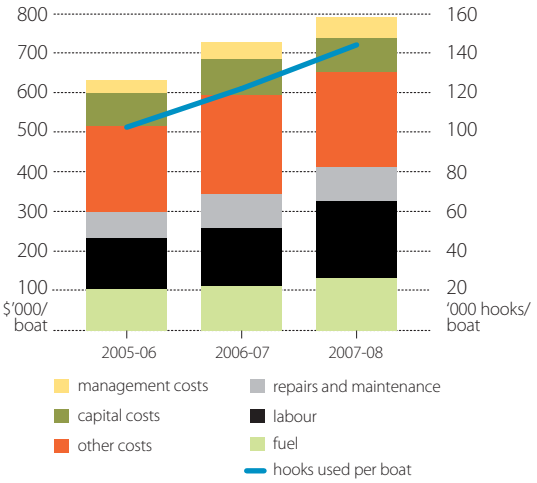
Catch of all species groups increased between 2005-06 and 2006-07 at the boat level. The largest increase occurred for albacore, which rose by 170 per cent. In 2007-08, the key driver was a 150 per cent improvement in the catch of bigeye tuna. Also contributing were 27 per cent and 48 per cent increases in per boat catches of billfish species and other non-specified species, respectively. Albacore catches per boat fell by 37 per cent in 2007-08.

27 Real revenue by species per vessel in the eastern tuna and billfish fishery, 2005-06 to 2007-08 2008-09 dollars



Note: Total revenue here is consistent with fishery level revenue as calculated for NER. The break-up of revenue by species is calculated according to the proportions of fishery level GVP that each species group accounts for.

28 Real costs per vessel by cost category and effort per vessel for the eastern tuna and billfish fishery, 2005-06 to 2007-08 2008-09 dollars



Revenue per vessel

The large increase in catch between 2005-06 and 2006-07 (67 per cent) was driven by higher catches of albacore. As relatively low prices are paid for albacore, total revenue per boat remained relatively stable when compared with catch, increasing by 12 per cent in real terms from $519 000 a boat in 2005-06 to $583 000 a boat in 2006-07 (2008-09 dollars) (figure 27).

In 2007-08, improved bigeye tuna catches per boat combined with an 11 per cent rise in bigeye tuna prices resulted in a tripling in revenue associated with bigeye tuna from $87 000 a boat to $262 000 a boat. This drove a 32 per cent increase in revenue per vessel, from $583 000 a boat in 2006-07 to $771 000 in 2007-08. The increase in revenue per boat over the full period (2005-06 to 2007-08) was 49 per cent.

Costs per vessel

At the boat level, all cost categories have increased in real terms since 2005-06 (figure 28). Per boat labour costs are estimated to have increased by 51 per cent, from $128 000 a boat to $192 000 a boat (2008-09 dollars). This is in line with the 51 per cent increase in revenue per boat given that vessel operators generally pay crew a fixed share of fishing receipts. Fuel costs per boat are expected to have increased by 27 per cent between 2005-06 and 2007-08. This is because of relatively higher fuel prices in 2007-08 (12 per cent higher relative to 2005-06 in real terms) and higher estimates of fuel use. Repairs and maintenance costs are expected to have increased by 32 per cent over the same period.

The combined effect of these increases was a 25 per cent increase in total costs per boat from $631 000 to $790 000 a boat. This is substantially less than the estimated 35 per cent increase in revenue and the 41 per cent increase in boat level effort shown for the same period, leading to the increase in NER per boat.

The increasing average effort per vessel (figure 28) suggests that either, on average, vessels remaining in the fishery have lifted their effort levels since 2005-06 or that the buyback has removed relatively less active vessels from the fishery, or some combination of these factors. In any case, the fall in total hook numbers has been less than the reduction in vessel numbers, limiting the overall reduction of effort in the fishery.

Conclusions and longer term prospects

The results presented above provide an overview of how fishery level and boat level profitability have changed following the buyback. Some key results include:

- NER have improved substantially relative to pre-buyback but are estimated to still be negative.
- The improvement in NER has been driven by falls in fishery level costs given sizable declines in inputs used, as confirmed by substantial declines in the aggregated index of fishery level input use between 2005-06 and 2006-07.
- Increases in albacore catch in 2006-07 and increases in both the catch (driven by higher CPUE for this species) and price of bigeye tuna in 2007-08 have meant that revenues have been maintained at rates similar to before the buyback.
- A positive trend in the fishery level output to input ratio already existed prior to the buyback, but was augmented considerably following the buyback.
- For the average boat in the fishery, catch and revenues have risen substantially while costs have also increased but to a lesser degree.

Overall, economic performance in the fishery has improved, although NER remaining negative is still a concern. However, it is expected that profitability should improve if stocks are able to rebuild and operators are able to adapt and trade entitlements. In any case, the changes in NER presented here can still be used to address the objective of the analysis; that is, to determine to what degree improvements in profitability are directly related to the buyback and, overall, whether the buyback has had a positive impact.

It is obvious that the buyback would have resulted in improved NER in the short term given that the fishery has exhibited characteristics of an open access fishery for some time. As a result, substantial effort reductions should have moved the fishery closer to effort levels associated with the maximum economic yield (MEY). This effect has been partially mitigated by the removal of latent effort from the fishery. The removal of operators has not been associated with a proportional reduction in hooks, although the overall reduction has still been considerable.

The improvement in profitability has been captured in the analysis by the large reduction in costs and may continue to improve if stock biomass and catch rates improve. However, given the internationally shared characteristic of this fishery, this outcome is not a certainty. To what degree such improvements have occurred because of overall efficiency improvements resulting from the removal of less efficient vessels, which is a potential outcome of using a

tender process, cannot be determined here but could be assessed using more sophisticated approaches that incorporate a longer time series of data.

It appears short-term improvements in NER have also been partly driven by factors that are not necessarily linked to the effects of the buyback; namely, improved catch rates and higher prices for bigeye tuna. Whether the increased catch rates of bigeye tuna have been driven by recent reductions in effort, changes in targeting practices or, alternatively, inter-annual stock variability cannot be assessed here.

Any improvements that have resulted directly from the buyback have come at a cost. While this analysis is not a cost–benefit analysis, it should be noted that, in the two rounds of the buyback approximately $36.2 million (in 2008-09 dollars) was expended on the purchase of entitlements in the ETBF (ANAO 2009). It is important that ongoing management arrangements in the fishery 'lock in' the benefits achieved through the buyback so that the benefits from this expenditure are as large as possible.

AFMA is taking steps to ensure these benefits are maintained. The recent introduction of a TAE system based on total hooks set in the fishery has the capacity to negate the problem posed by inactive entitlements once economic performance improves, assuming the TAE is set appropriately. The implementation of a TAE system is an interim arrangement, while AFMA moves the fishery toward output controls in the form of ITQs.

The introduction of ITQs will allow catches of individual species to be controlled, which will prevent a repeat of the localised depletion of broadbilled swordfish that occurred in the late 1990s, and will also promote autonomous adjustment with catch entitlements moving to the most efficient operators. A key focus of management for the future will be adjusting TACs over time to move the fishery toward MEY.

6 Southern and eastern scalefish and shark fishery

The southern and eastern scalefish and shark fishery (SESSF) extends from southern Queensland around Tasmania and west to Cape Leeuwin in Western Australia. It incorporates four sectors which overlap spatially and share multiple species. These sectors are the:

- Commonwealth trawl sector (CTS)
- gillnet, hook and trap sector (GHTS)
- Great Australian Bight trawl sector
- east coast deepwater trawl sector.

These sectors were previously managed as separate fisheries but were amalgamated to form sectors of the SESSF following the implementation of the Southern and Eastern Scalefish and Shark Fishery Management Plan 2003. The GHTS is subject to complex jurisdictional management arrangements that exist between the Australian Government and the South Australian and Tasmanian Governments, in the South Australian and Tasmanian coastal waters sectors, while in the CTS a complex arrangement still exists between the Australian Government and the New South Wales Government.

The SESSF is managed with a mix of output and input controls. The primary management control used in the SESSF are output controls in the form of global total allowable catches (TACs) over the catch of key species in the fishery that are allocated as individual transferrable quotas (ITQs). TACs in the fishery are global in the sense that one species' TAC limits the catch of that species taken by all sectors of the fishery. Currently, 34 species groups are managed under these arrangements (AFMA 2009). In 2005, a harvest strategy framework was developed to guide TAC setting in the fishery. A variety of complementary input controls are also used in the fishery. Boat concessions regulate which sector and/or method a vessel can use while other controls impose area and seasonal closures and gear restrictions.

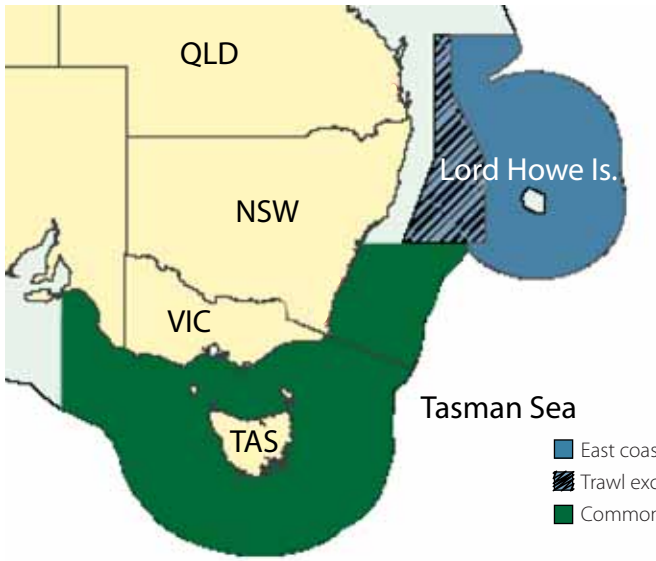
The evaluations undertaken in this chapter focus only on the CTS and the GHTS of the SESSF. The east coast deepwater trawl sector, although targeted in the buyback, is not evaluated because little economic information exists for this sector and it accounted for less than 1 per cent of the SESSF's gross value in 2007-08. Eight concessions out of 18 were purchased from this sector in the buyback. The Great Australian Bight trawl sector is not evaluated as this sector had no concessions bought out in the buyback. The evaluation that follows first focuses on the CTS, then the GHTS.

The Commonwealth trawl sector of the SESSF

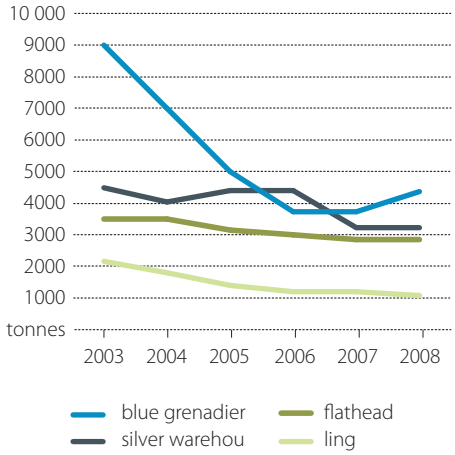
Overview

The Commonwealth trawl sector (CTS) is the largest sector in terms of catch and value in the SESSF. The fishery is located in waters between Sandy Cape in southern Queensland and Cape Jervis in South Australia (map 3). Otter trawling is the dominant fishing method used in the fishery although a small fleet of Danish seine vessels also operates in the fishery. More than 100 species of finfish and invertebrates are captured in the sector, although only 20 species are targeted (Smith and Wayte 2004). The five key species that account for the majority of catch are blue grenadier, tiger flathead, orange roughy, silver warehou and ling.

map 3 Location of the Commonwealth trawl sector



29 Total allowable catch for key species in the Commonwealth trawl sector, 2003 to 2008



Note: A 12 month equivalent TAC is shown for 2007 given that the 2007 season was a 16 month season for which TACs were adjusted.

Management arrangements

Figure 29 shows the adjustments made to TACs for key species in the CTS over the five years from 2003 to 2008. TACs have been reduced for all key species over the full period. The reductions in percentage terms range from a 19 per cent reduction for flathead between 2003 and 2008, to a 51 per cent reduction for blue grenadier. TACs were reduced by 28 per cent and 50 per cent for silver warehou and ling, respectively, over the same period. In recent years, these TAC reductions conform to the harvest strategy framework implemented for the fishery and are aimed at rebuilding stock biomasses for these species in order to improve the profitability and sustainability of the fishery.

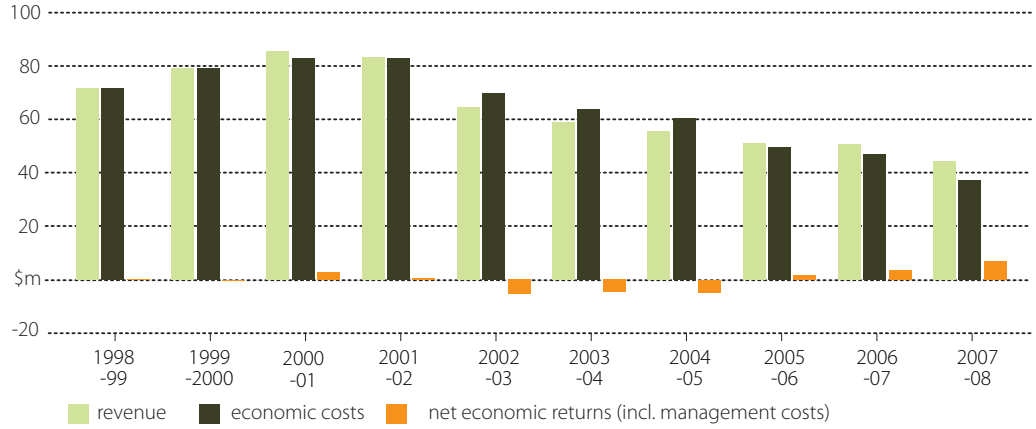
The large TAC reductions in recent years are consistent with a move toward MEY. Using a bioeconomic model of the CTS, Kompas and Che (2006) showed that 2004 TACs for key species in the CTS would have to be progressively reduced to move the fishery toward MEY and that the benefits from reducing catches in the short term would be realised through higher catch rates in the future. That is, such TAC reductions can allow stocks to rebuild so catch rates are higher, fishing costs are lower and NER, on average, are higher.

Historical economic performance

Figure 30 shows fishery level revenues, costs and NER in the CTS in real terms since 1998-99. In the period prior to the buyback, revenues are shown to have declined in every year since a peak of $85.6 million in 2000-01 (in 2008-09 dollars). In 2005-06, revenues were $51.1 million, which represented a 40 per cent decline since 2000-01. Costs also fell by 40 per cent between 2000-01 and 2005-06, but for most of the period, revenues fell faster than costs. This resulted in zero to negative NER for the majority of the period. Average NER over the period was -$1.2 million but did fluctuate, ranging from -$5.4 million in 2002-03 to $2.8 million in 2000-01 (Vieira et al. 2008).

Elliston et al. (2004) suggested that low NER in the CTS can be partly explained by inappropriate setting of TACs in the fishery. Historically, TACs for many of the key species in the CTS have been set at non-binding rates. This indicates that operators fish to a point where the expected net return from catching an additional unit of a given species is zero, which is a point associated with the open access equilibrium (as illustrated in figure 1). Under such a scenario, fishery economic performance improvements can be achieved by tightening TAC limits.

30 Real revenue, costs and net economic returns for the Commonwealth trawl sector, 1998-99 to 2007-08 2008-09 dollars



Note: Economic costs includes total recovered and non-recovered management costs, the opportunity cost of capital, depreciation, the value of owner and family labour and excludes interest and leasing costs and management fees appearing in the accounts of operators.

Effort removed through the buyback

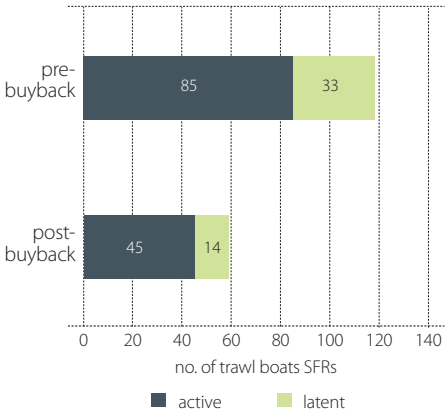
The Securing Our Fishing Future buyback resulted in 59 boat SFRs being purchased from the CTS, which was 50 per cent of boat SFRs in the sector. Of the 59 boat SFRs purchased, 40 were attached to boats that fished actively in the sector in 2005-06 (table 13). The total logbook catch of these 40 boats was almost 8500 tonnes in 2005-06 or 42 per cent of the sector's total catch. Ten of these 40 vessels accounted for 75 per cent of the 8500 tonnes. The average catch of these 40 boats in the same year was 212 tonnes, which was slightly less than the average catch of 238 tonnes a boat for the entire sector.

13 Catch of boats removed in the buyback, Commonwealth trawl sector, 2003-04 to 2005-06

		2003-04	2004-05	2005-06
Active boats in fishery **a**	no.	97	91	81
Active boats bought out	no.	39	39	40
Total fishery catch	tonnes	28 038	24 466	20 246
Total catch of boats from which concessions were purchased	tonnes	9 375	9 775	8 469
Average catch of boats from which concessions were purchased	tonnes	240.4	250.6	211.7
% of fishery catch purchased	%	33	40	42

a Number of active boats as in the Australian Fisheries Surveys Report.
Source: Adapted from Galeano and McQueen (2007).

31 Capacity reduction in the Commonwealth trawl sector

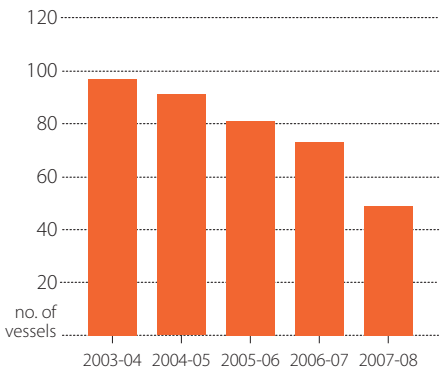


Note: Boat activity in the Australian Fisheries Surveys Report is defined differently to SFR activity.
Source: Adapted from Galeano and McQueen (2007).

Prior to the buyback, there were 118 trawl boat SFRs in the sector, of which 33 (28 per cent) were latent, as shown in figure 31. Based on fishery participation in 2005-06, 40 active concessions and 19 latent concessions were purchased through the buyback. Of the 59 remaining concessions, 45 were active and 14 were latent. In the 2007-08 financial year, there were 49 active trawl boats in the sector, indicating that, since the buyback, some of the previously latent boat SFRs in the sector have been activated.

Since 2003-04, the number of vessels operating in the sector has declined by 49 per cent from 97 active vessels to 49 in 2007-08 (figure 32). However, most of this decline occurred in years associated with the buyback. Boat numbers fell from 81 in 2005-06 to 73 boats in 2006-07 (the year the buyback took place) before falling by 33 per cent to 49 boats in 2007-08. This figure indicates that although the sector was slowly adjusting to persistent low profits, the buyback has quickened the adjustment process.

32 Change in fleet size in the Commonwealth trawl sector, 2003-04 to 2007-08



Post-buyback economic performance: sector level

Net economic returns

ABARE survey based estimates of fishery level NER are available for the CTS for 2005-06 (the last year prior to the buyback) and 2006-07 (the year in which the buyback was undertaken). To allow the short-term effect of the buyback to be better assessed, non-survey based preliminary estimates of NER for the fishery have been calculated for 2007-08. The approach to obtaining preliminary estimates is similar to the approach used in Vieira and Perks (2009).

NER, including management costs, in the CTS are estimated to have more than tripled between 2005-06 and 2007-08, from $1.6 million to $7.1 million (table 14). Although total revenues declined over the period by 13 per cent, this was outweighed by a 30 per cent decline in total operating costs.

14 Real revenue, costs and net economic returns for the Commonwealth trawl sector, 2005-06 to 2007-08 2008-09 dollars

		financial year			
		2005-06	2006-07	2007-08	change
Catch	t	19 937	16 328	15 211	–24%
Cash receipts	$m	51.1	50.7	44.3	–13%
less Operating costs					
Fuel	$m	12.2	9.4	8.2	–33%
Labour (incl. owner and family labour)	$m	14.7	13.6	12.3	–16%
Repairs and maintenance	$m	3.9	4.1	2.9	–25%
Other costs	$m	18.2	17.6	11.0	–39%
Total operating costs	$m	48.9	44.7	34.4	–30%
plus Interest, leasing, management fees	$m	4.6	4.2	3.0	–36%
less Capital costs					
Opportunity cost of capital	$m	1.1	1.1	0.8	–29%
Depreciation	$m	1.6	1.5	1.1	–28%
Net economic returns (excl. management)	$m	4.1	7.6	11.0	165%
less Management costs	$m	2.6	4.0	3.8	50%
Net economic returns	$m	1.6	3.6	7.1	352%

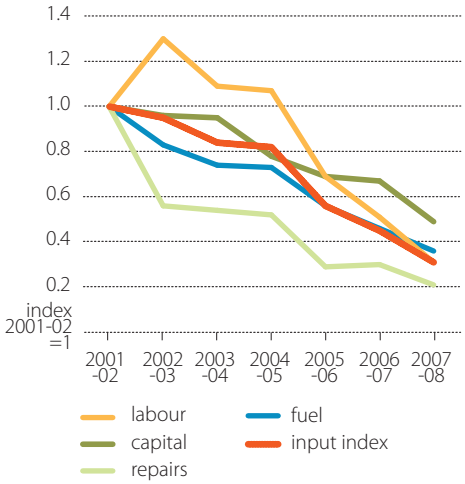
Note: Estimates for 2007-08 are non-survey based extrapolation estimates. Discrepancies because of rounding.

Declines in all cost components, except management costs, drove the fall in economic costs between 2005-06 and 2007-08. Management costs increased by 50 per cent over the same period. Fuel, labour and repairs and maintenance costs account for a major proportion of costs (68 per cent in 2007-08) and fell substantially over the period. Fuel costs in the CTS decreased by 33 per cent from $12.2 million in 2005-06 to $8.2 million in 2007-08, despite the rising trend in fuel prices. Lower fuel use at the fishery level, particularly in 2007-08 is attributable to the reduction in boat numbers. A 16 per cent decrease in labour costs over this same period is largely attributable to the 13 per cent decrease in cash receipts, as crew and skippers are generally paid some proportion of cash receipts. Repairs and maintenance costs are estimated to have declined by 25 per cent.

Other costs also account for a large proportion of operating costs (32 per cent in 2007-08) and therefore were also a key driver of the observed reductions in costs. Other costs decreased by 39 per cent, from $18.2 million to $11 million over the three years since 2005-06. This cost component includes some costs that are dependent on catch, such as packing materials, ice and cool storage. As a result, this decrease can be linked to the fall in fishery level catch (24 per cent between 2005-06 and 2007-08) and vessel numbers. Capital costs, which include the opportunity cost of capital and depreciation decreased by 29 per cent between 2005-06 and 2007-08, from $2.7 million to $2 million.

33 Aggregate input index and input quantity indexes for the Commonwealth trawl sector, 2001-02 to 2007-08

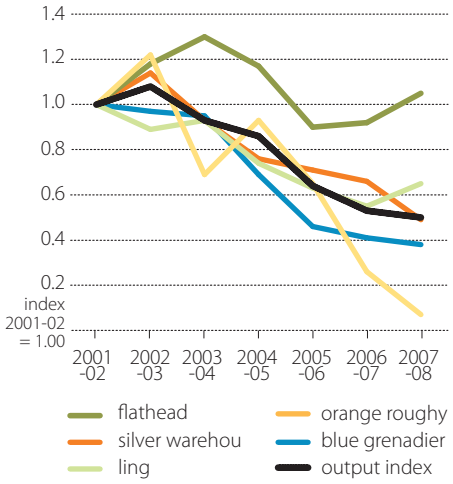
2001-02 base year



Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

34 Aggregate output index and output quantity indexes for the Commonwealth trawl sector, 2001-02 to 2007-08

2001-02 base year



Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

Output and input use

In recent years there have been considerable decreases in input use and output in the CTS. Since 2001-02, estimates of fuel use have fallen from slightly more than 12 million litres to just less than 6 million litres and measures of effective labour have fallen by two-thirds. Output of target species has also fallen, from more than 20 000 tonnes to just less than 10 000 tonnes. Output to input ratios illustrate, over time, how key inputs have been used to harvest catch. The analysis presented here for the CTS was undertaken using historical survey data as well as non-survey based estimates of key input costs and outputs for 2007-08.

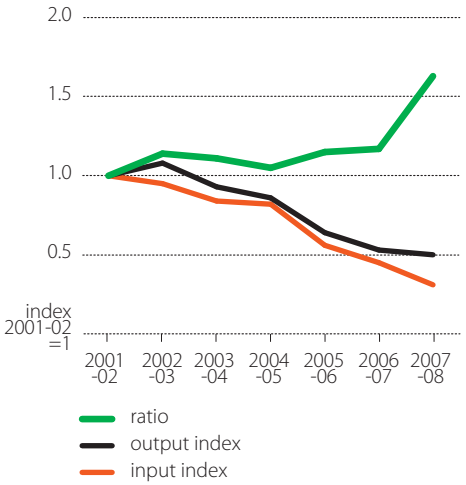
Aggregate input use in the CTS has generally followed a downward trend since 2001-02 in line with ongoing declines in active vessels in the fishery (figure 33). All key input categories have declined over the same period.

Between 2006-07 and 2007-08, a 32 per cent decline in the aggregated input index can be linked to the 33 per cent reduction in boat numbers that resulted from the buyback. This decline in input use decomposes into a 22 per cent decrease in the fuel quantity index, a 39 per cent decrease in the labour quantity index, a 29 per cent decrease in repairs and maintenance quantity index and a 26 per cent decline in the capital quantity index. Although the observed decrease in aggregate input use appears substantial, it is similar to recent declines. For example, in 2005-06 a 34 per cent annual decline in the aggregated input index occurred.

Changes in an aggregated output index are shown in figure 34. The period between 2001-02 and 2002-03 is associated with increasing outputs. However, year on year declines in the aggregated index occur in all years that follow 2002-03. The largest decline occurred between 2004-05 and 2005-06 when a 26 per cent decline in aggregate output use was driven by falls in the quantity indexes of all species.

35 Output to input ratio for the Commonwealth trawl sector, 2001-02 to 2007-08

2001-02 base year

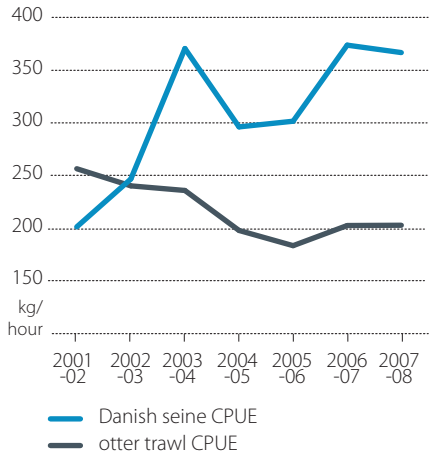


Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

Although aggregated output did decline between 2006-07 and 2007-08, the rate of decline slowed considerably, falling by only 6 per cent. This was the smallest decrease since the downward trend in output started in 2002-03. Increases in the quantity indexes of flathead (14 per cent) and ling (18 per cent) were contributing factors. This suggests that, despite the large reduction in active vessels in the fishery following the buyback, output has been relatively less affected.

The combined effect of these changes in input use and output is an increasing trend in the output to input ratio. Between 2001-02 and 2006-07, the ratio increased by 17 per cent (figure 35). This compares with a 39 per cent increase in the output to input ratio between 2006-07 and 2007-08. This was the result of a 32 per cent decline in aggregated input use being associated with a relatively minor decline in aggregated output of only 5 per cent. The observed increase in the output to input ratio in 2007-08 follows five years of relatively little variability in the ratio. Assuming these changes have not been driven by other external factors, the observed change in 2007-08 suggests that the buyback has potentially had a positive impact and that the key inputs analysed were being used more effectively in the year immediately following the buyback.

36 Catch per trawl hour in the Commonwealth trawl sector, 2001-02 to 2007-08

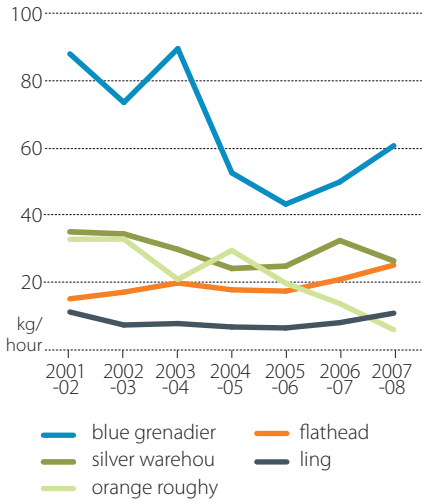


Catch per unit effort

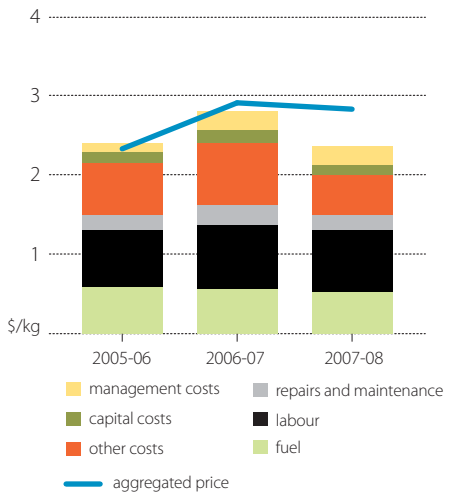
Analysis of estimates of catch per unit effort (CPUE) allows potential effects on economic performance from changes in catch rates in the CTS to be identified. Given that two types of method are used in the sector (otter trawling and Danish seining), indicators of CPUE must be broken down by method. Between 2002-03 and 2007-08, otter trawling accounted for 93 per cent of the sector's annual catch on average and remained similar in the buyback period (95 per cent in 2006-07 and 91 per cent in 2007-08). Consequently, changes in otter trawl CPUE will have a relatively greater effect on the sector's overall performance.

Following the buyback in 2007-08, CPUE remained stable for both methods (figure 36). Danish Seine CPUE decreased from 374 kilograms an hour to

37 Otter trawl catch per unit effort by species in the Commonwealth trawl sector, 2001-02 to 2007-08



38 Real costs per kilogram of catch by cost category and average price per kilogram of catch (based on survey data) in the Commonwealth trawl sector, 2005-06 to 2007-08
2008-09 dollars



367 kilograms an hour, which was a 2 per cent decrease. This compares with a relatively stable CPUE for otter trawling.

Given that otter trawling accounts for the majority of catch, analysis of CPUE by species for this method can provide further insights into the drivers of change in aggregated catch rates. Blue grenadier, flathead and silver warehou accounted for 56 per cent of the total otter trawl catch in 2007-08 and more than 54 per cent of GVP for the entire sector. Between 2005-06 and 2007-08, increases in CPUE occurred for all three species: blue grenadier by 40 per cent, flathead by 41 per cent and silver warehou by 6 per cent (figure 37). Increased catch rates of these three key species partly explain the increased profitability in the sector in 2006-07 and 2007-08.

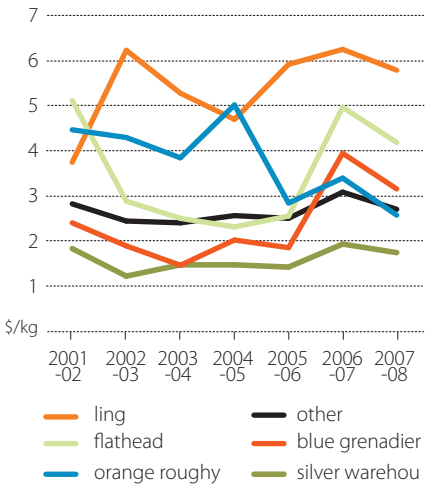
Costs per unit of catch

Total costs per kilogram of catch in 2007-08 decreased by 16 per cent, from $2.80 a kilogram in 2006-07 to $2.36 a kilogram in 2007-08. This represents a return to a cost per kilogram similar to that which prevailed in 2005-06 of $2.40 a kilogram. The cost declines between 2006-07 and 2007-08 were driven by reductions in capital costs (25 per cent), repairs and maintenance (21 per cent) and other costs (35 per cent). Fuel costs per unit of catch also declined by 7 per cent despite a 17 per cent increase in the real off-road price of diesel. However, the key change in 2007-08 was that, relative to 2005-06, the average per kilogram price received for catch was higher and resulted in a higher net return per kilogram of catch (figure 38).

Fish prices

Beach prices for several target species targeted in the CTS have fluctuated considerably over the period between 2001-02 and 2007-08 (figure 39). Catches in the CTS are predominantly sold as fresh product on the Australian domestic market. Given the relative lack of substitutable imports, exchange rate fluctuations tend to have a minimal effect on CTS fish prices.

39 Real beach prices for key species targeted in the Commonwealth trawl sector, 2001-02 to 2007-08
2008-09 dollars



Between 2002-03 and 2007-08, the real price of blue grenadier and flathead increased by 66 per cent and 45 per cent, respectively. In contrast, the real price of orange roughy fell by 40 per cent. Prices for other key species have remained relatively stable.

Prices declined slightly for all key species between 2006-07 and 2007-08, with declines ranging from 7 per cent for ling to 24 per cent for orange roughy. Most importantly, decreases in the real price of blue grenadier (20 per cent) and flathead (16 per cent) would have had a significant negative impact on sector profitability in 2007-08, as these species comprise almost one-half of the sector's catch by weight. In aggregate, average prices in the CTS declined by 12 per cent in 2007-08. However, these price declines in 2007-08 followed substantial price increases in 2006-07. In aggregate, average prices in the CTS increased by 48 per cent between 2005-06 and 2006-07, following price increases of 112 per cent and 94 per cent for blue grenadier and flathead, respectively.

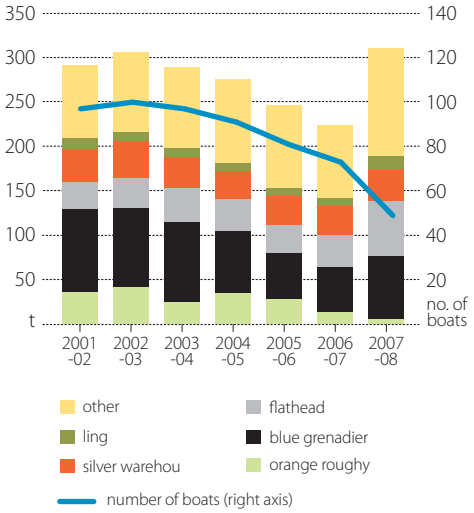
Post-buyback economic performance: boat level

Net economic returns

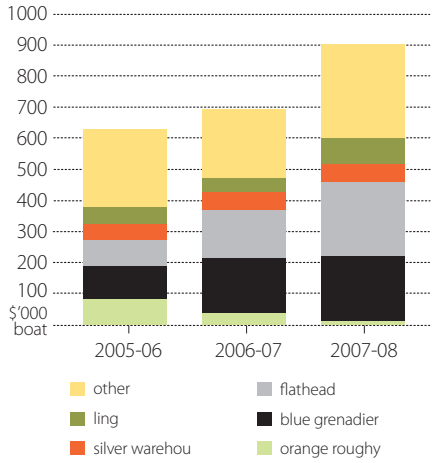
Real NER, excluding management costs, per vessel are estimated to have first increased from $51 000 a boat in 2005-06 to $104 000 a boat in 2006-07 before more than doubling to $224 000 a boat in 2007-08. These NER estimates exclude management costs because these costs include both management costs recovered from industry and non-recovered management costs that are paid for by AFMA. This latter component does not affect the economic performance of individual operators so it would be inaccurate to include it in an estimate of vessel level NER.

It is important to note that between 2005-06 and 2007-08, fishery level management costs increased by 50 per cent despite a 40 per cent reduction in boat numbers. Management costs are recovered from industry on the basis of fishing concession holdings, not the amount of activity against these holdings. Consequently, management costs charged to active fishing concessions are reduced by the presence of latent concessions. As the buyback removed latent effort from the fishery, management costs per active vessel increased by 147 per cent from $32 000 in 2005-06 to $78 000 in 2007-08.

40 Average catch per vessel in the Commonwealth trawl sector, 2001-02 to 2007-08



41 Real revenue by species per vessel in the Commonwealth trawl sector, 2005-06 to 2007-08 2008-09 dollars



Note: Total revenue here is consistent with fishery level revenue as calculated for NER. The break-up of revenue by species is calculated according to the proportions of fishery level GVP that each species group accounts for.

The Securing Our Fishing Future package provided funding to subsidise the management costs recovered from remaining operators following the buyback, to minimise the negative impact of having fewer vessels bearing unchanged total management costs. The provision of this subsidy concluded in 2008-09 (AFMA 2009b). AFMA is currently undertaking a business efficiency review (AFMA 2009c), with one of its objectives being the reduction of management costs.

Catch per vessel

The decline in fleet size between 2006-07 and 2007-08 occurred with a 39 per cent increase in boat level catches (figure 40). In absolute terms, boat numbers fell from 73 to 49 vessels and catch increased from 224 tonnes a boat to 310 tonnes a boat. At the same time, TAC settings have remained relatively stable. This increase in average catch per vessel follows a gradual 27 per cent decline in average boat level catch over the period 2002-03 to 2006-07, which also occurred with a steady decline in active vessels in the fishery. Higher boat level catches combined with lower CPUE in 2007-08 occurred as a result of an increase in effort per boat.

When catches are decomposed to the species level, it is seen that the key drivers of the increase in 2007-08 were increased boat level catches of flathead (70 per cent), blue grenadier (39 per cent) and other species (48 per cent).

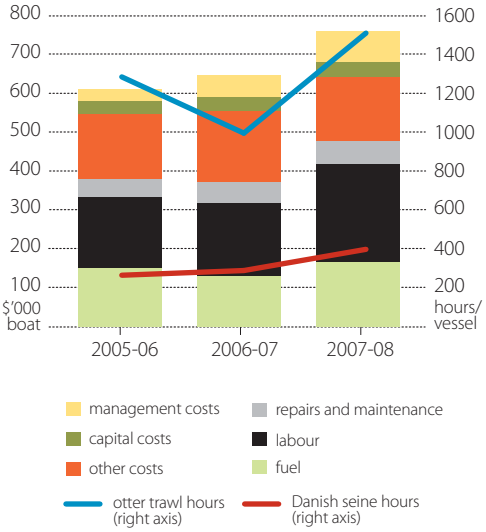
Revenue per vessel

Despite falls in real beach prices for most species landed in the fishery in 2007-08, the large increases in catch per vessel resulted in a 30 per cent increase in revenue per vessel from $695 000 in 2006-07 to $905 000 per vessel in 2007-08 (figure 41). This followed an increase of 10 per cent between 2005-06 and 2006-07.

The increase in average revenue per boat between 2006-07 and 2007-08 was associated

with increases in revenue derived from all key species categories, with the exception of orange roughy for which associated revenue declined by 68 per cent. The largest increases and main drivers of the overall increase in average revenue per boat were ling (73 per cent increase in average boat level revenue), tiger flathead (52 per cent) and other species (38 per cent).

42 Real costs per vessel by cost category for the Commonwealth trawl sector and hours trawled per vessel by method, 2005-06 to 2007-08 2008-09 dollars



Costs per vessel

Boat level costs have increased from 2005-06 to 2007-08 (figure 42), although most of this increase occurred in the year following the buyback (2007-08). These changes are consistent with observed increases in effort per vessel over the same period. The main driver of the increase in 2007-08 was a 35 per cent increase in labour costs resulting from higher catch receipts per vessel, because crew are generally paid a proportion of catch revenue. The second key driver was fuel costs, which increased by 29 per cent in 2007-08, as a result of an increase in fuel use (as indicated by the increase in effort per boat between 2006-07 and 2007-08) and a 17 per cent increase in the real off-road price of diesel. Management costs (both recovered and non-recovered) also increased by 43 per cent although were not a key driver of the overall increase as these costs only account for a relatively small proportion of total costs (10 per cent in 2007-08).

Conclusions and longer term prospects

The results presented in this chapter for the CTS of the SESSF reveal how sector and boat level economic returns have varied following the buyback. Some key results include:

- Sector level NER have improved considerably relative to pre-buyback as sector level costs have fallen faster than sector level revenues, driven by rapid reductions in the resources invested in the fishery. However, it should be noted that NER had already started increasing as early as 2005-06.
- This result is confirmed by increases in the fishery level output to input ratio. Sizeable declines in input use by fewer active vessels in the fishery have outweighed smaller declines in output production. The observed increase in the output to input ratio in 2007-08 follows five years of relatively little variability in the ratio.
- Increases in otter trawl CPUE for several key species has had a positive impact on sector level profitability. It is unlikely that this is because of the buyback and may be the result of previous management actions and/or other factors, such as environmental variability.
- Fish prices declined slightly in 2007-08 (12 per cent in aggregate), although this followed large increases in prices in 2006-07 (48 per cent in aggregate).

- For the average boat in the fishery, catches and revenues per vessel increased considerably following the buyback, as catches had previously been following a downward trend. Costs per vessel also increased in line with increased effort per vessel, but not as rapidly as revenues, which resulted in a large improvement in vessel level NER in 2007-08.

The structural adjustment package has hastened autonomous adjustment in the CTS. Fishers had been gradually exiting the fishery in response to low profits prior to the buyback. However, the buyback increased the rate at which vessels exited: vessel numbers declined from 81 vessels in 2005-06 to 49 vessels in 2007-08. By removing a large proportion of the CTS's capacity, the buyback has been an important factor behind the large increase in NER in 2007-08.

It is likely that AFMA's management of the CTS, particularly through its previous setting of TACs, has allowed stocks to rebuild. This would have also contributed to the improved profitability of the sector in the post-buyback period. The improvements in otter trawl CPUE for several species that have been observed may be evidence of this.

Given that large increases in NER from levels that were previously close to zero have been observed together with large reductions in effort in the fishery, it can be concluded that the fishery has moved closer to effort levels associated with maximum economic yield (MEY). It is now important for AFMA to set appropriate TACs to ensure this situation is maintained and to move the fishery further toward biomass and harvests associated with MEY. The Commonwealth Fisheries Harvest Strategy Policy represents a step in the right direction in this regard. Further autonomous adjustment and profitability improvements will also be realised as quota rights are traded from less profitable operators to relatively more profitable operators.

This analysis focuses on the contribution of the buyback to changes in profitability in the target fisheries. It shows that there has been an improvement in the profitability of the CTS, as measured by NER. While this analysis is not a cost–benefit analysis, it should be noted that, in the two rounds of the buyback approximately $47.6 million (in 2008-09 dollars) was expended on the purchase of entitlements in the SESSF (ANAO 2009). It is important that ongoing management arrangements in the fishery 'lock in' the benefits achieved through the buyback so that the benefits from this expenditure are as large as possible.

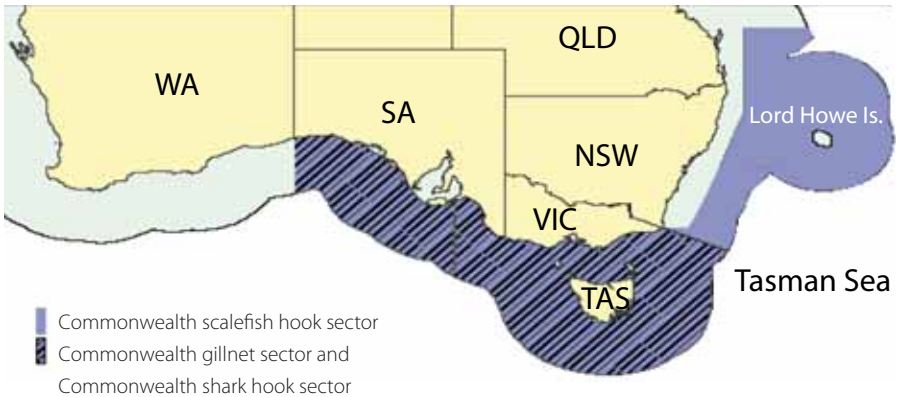
The gillnet, hook and trap sector of the SESSF

Overview

The gillnet, hook and trap sector (GHTS) extends from southern Queensland southward and around to the border of South Australia and Western Australia. It also includes waters around Tasmania (map 4). It can be divided into three subsectors: a scalefish hook sector, a shark hook sector and a gillnet sector.

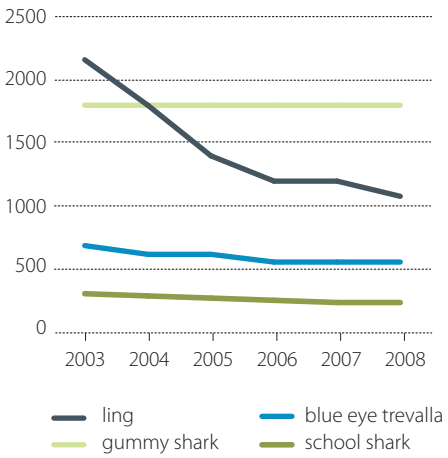
Key species caught in the GHTS are gummy shark (61 per cent of catch in 2007-08), blue eye trevalla (11 per cent), ling (8 per cent) and school shark (8 per cent). The main fishing methods

map 4 Location of the gillnet, hook and trap sector



used in the sector are gillnetting and demersal longlining (also known as bottom longlining), and automatic longlining. Automatic longlining is a relatively new method that is similar to demersal longlining but involves automated baiting of hooks.

43 Total allowable catches for key species in the gillnet, hook and trap sector, 2003 to 2008



Note: A 12 month equivalent TAC is shown for 2007 given that the 2007 season was a 16 month season for which TACs were adjusted.

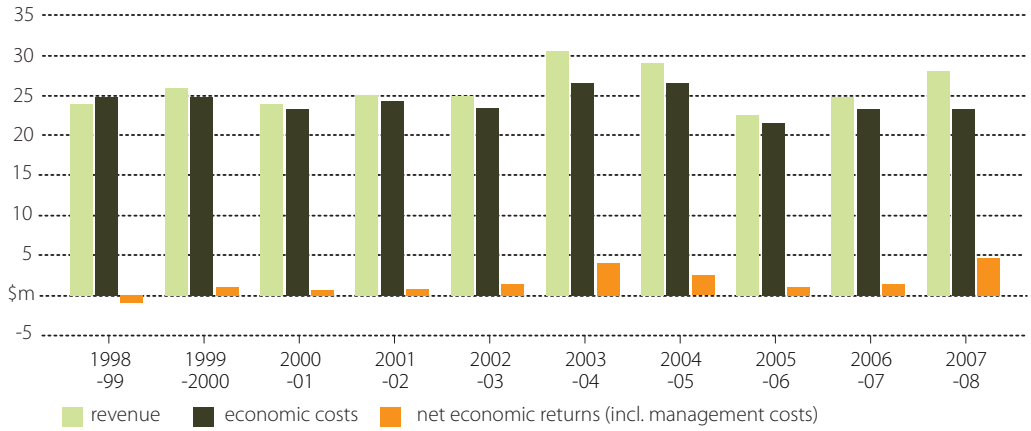
Management arrangements

Total allowable catches (TACs) for all key species in the GHTS have been reduced to some degree over the five year period to 2008, with the exception of gummy shark, which has been maintained at 1800 tonnes (figure 43). The biggest reduction has occurred for pink ling. The TAC for this species has been cut by 50 per cent, from 2160 tonnes in 2003 to 1080 tonnes in 2008. This reduction is intended to halt the depletion of pink ling stocks. It is estimated a further TAC reduction to 800 tonnes in 2009 will allow stocks to rebuild to targets (Morrison et al. 2009). Cuts of 22 per cent and 19 per cent have occurred for school shark and blue eye trevalla, respectively, over the same period. TACs for these species are generally binding in most recent years.

Historical economic performance

Unlike other Commonwealth fisheries surveyed by ABARE, net economic returns (NER) in the GHTS were generally positive in the years leading up to the buyback (figure 44). Between 1999-2000 and 2005-06, the average NER to the sector was $1.3 million. At its peak, NER was $4.1 million in 2003-04. These positive NER can be linked to the setting of TACs that are binding (McLoughlin and Wood 2009).

44 Real revenue, costs and net economic returns for the gillnet, hook and trap sector, 1998-99 to 2007-08 2008-09 dollars



Note: Economic costs includes total recovered and non-recovered management costs, the opportunity cost of capital, depreciation, the value of owner and family labour and excludes interest and leasing costs and management fees appearing in the accounts of operators.

Effort removed through the buyback

The Securing Our Fishing Future buyback resulted in the purchase of 26 gillnet boat statutory fishing rights (SFRs), 63 scalefish hook boat SFRs and 17 shark boat SFRs from the GHTS (figure 45). When compared with the number of SFR entitlements available before the buyback, these numbers equate to 30 per cent of gillnet boat SFRs, 52 per cent of shark hook boat SFRs and 57 per cent of scalefish hook boat SFRs. In addition, eight of the 20 existing trap or automatic-longline permits were also purchased.

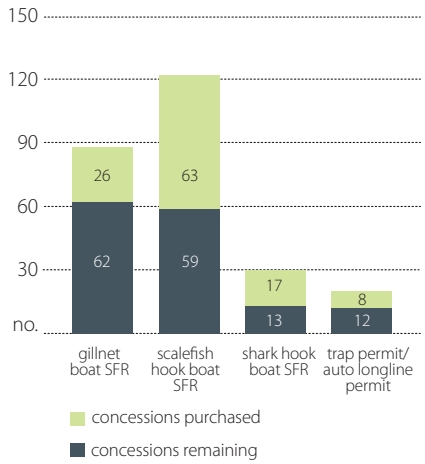
Of the 114 boat SFRs/permits that were purchased from the GHTS, only 17 boat SFRs and nine coastal water permits (allowing a vessel to fish in a coastal area using one or a variety of methods depending on the permit type) were tendered by active boats. In total, 19 active boats (in 2005-06) had permits purchased in the buyback. However, this does not necessarily mean that all 19 boats exited the fishery.

Many GHTS operators hold multiple boat SFRs or permits. As a result, it is possible for an operator to sell a concession without actually exiting the fishery. Analysis of AFMA logbook data shows that, of the 19 operators that tendered SFRs or permits in the buyback and who fished in the GHTS in 2005-06, four still fished in the sector in 2007-08; after the close of the buyback.

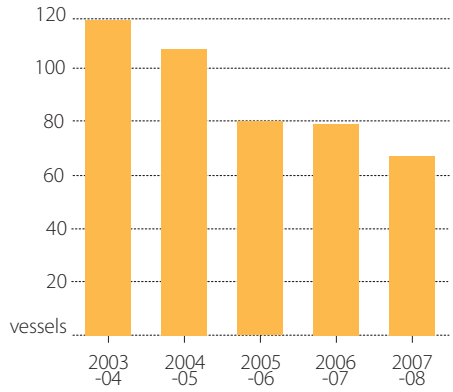
The 19 boats that tendered licenses and permits in the buyback caught approximately 15 per cent of the total catch in the fishery in 2005-06. The average catch of these boats prior to the buyback was similar to the average catch per boat across the fleet. In 2005-06, the 19 boats that participated in the buyback caught, on average, 37 tonnes. Across the fleet, the average catch per boat was 42 tonnes (table 15).

Active boat numbers in the GHTS decreased by 15 per cent, from 79 boats in 2006-07 to 67 boats in 2007-08, which was a net reduction of 12 boats (figure 46). When compared with earlier reductions, this fall in vessel numbers seems less sizable. In 2005-06, for example, vessel participation dropped by 25 per cent from 107 vessels to 80 vessels.

45 Buyback results for boat SFRs and permits in the gillnet, hook and trap sector



46 Vessel numbers in the gillnet, hook and trap sector, 2003-04 to 2007-08



Note: Boat activity in the Australian Fisheries Surveys Report is defined differently to SFR activity.

15 Catch of boats removed in the buyback, gillnet, hook and trap sector, 2003-04 to 2005-06

		2003-04	2004-05	2005-06
Active boats in fishery **a**	no.	118	107	80
Active boats bought out	no.	25	24	19
Total fishery catch	tonnes	4 926	5 041	4 502
Total catch of boats from which concessions were purchased	tonnes	756	965	704
Average catch of boats from which concessions were purchased	tonnes	30.3	40.2	37.0
% of fishery catch purchased	%	15%	19%	16%

a Number of active boats as in Australian Fisheries Surveys Report. *Source*: Adapted from Galeano and McQueen (2007).

Post-buyback economic performance: sector level

Net economic returns

ABARE survey based estimates of fishery level NER are available for the GHTS for 2005-06 (the last year prior to the buyback) and 2006-07 (the year in which the buyback was undertaken). To allow the short-term effect of the buyback to be better assessed, non-survey based preliminary estimates of NER have been calculated for the sector in 2007-08. The approach to obtaining preliminary estimates is similar to the approach used in Vieira and Perks (2009).

Estimates of NER, including management costs, in the GHTS have increased substantially between 2005-06 and 2007-08, from $1 million to $5 million (in 2008-09 dollars), which was an increase of 384 per cent (table 16). Driving these changes was a 25 per cent increase in fishing receipts between 2005-06 and 2007-08, which occurred at the same time as a 15 per cent increase in total operating costs.

16 Real revenue, costs and net economic returns for the gillnet, hook and trap sector, 2005-06 to 2007-08 2008-09 dollars

		financial year			
		2005-06	2006-07	2007-08	change
Catch	t	4 502	4 250	4 785	6%
Cash receipts	$m	22.3	24.8	28.0	25%
less Operating costs					
Fuel	$m	2.3	2.4	2.2	–4%
Labour (incl. owner and family labour)	$m	8.3	8.9	9.9	20%
Repairs and maintenance	$m	2.5	3.3	2.9	18%
Other costs	$m	8.8	9.1	10.1	15%
Total operating costs	$m	21.8	23.8	25.2	15%
plus Interest, leasing and management fees	$m	5.1	5.2	6.4	26%
less Capital costs					
Opportunity cost of capital	$m	1.0	0.8	0.7	–27%
Depreciation	$m	1.5	1.4	1.2	–14%
Net economic returns (excl. management costs)	$m	3.1	4.0	7.2	133%
less Management costs	$m	2.1	2.5	2.2	8%
Net economic returns	$m	1.0	1.5	5.0	384%

Note: Estimates for 2007-08 are non-survey based extrapolation estimates. Discrepancies because of rounding.

Unlike in other fisheries targeted in the buyback, operating costs are estimated to have increased by 15 per cent between 2005-06 and 2007-08. This can be linked to an increase in automatic longlining activity in the sector, a method associated with higher costs relative to

other methods used in the sector. Average effort per gillnetting vessel also increased over the same period. This could also have increased costs if it was driven by increases in absolute effort expended by boats in the sector rather than the removal of boats that were associated with lower effort, which would increase average effort per vessel but not fishery level costs.

This increase in costs consisted mainly of rises in labour, repairs and maintenance and other costs. Labour costs increased by 20 per cent, from $8.3 million to $9.9 million, and can be linked to the increase in receipts since crew are generally paid a proportion of receipts. Repairs and maintenance costs rose by 18 per cent between 2005-06 and 2007-08 to reach $2.9 million. Other costs increased by 15 per cent over the same period to reach $10.1 million. This increase can be linked to increased catches in the sector given that some components of other costs are dependent on catch, such as freight, marketing and packaging expenses (table 16).

Unlike all other operating cost categories, fishery level fuel costs are estimated to have remained relatively stable between 2005-06 and 2007-08. Fuel costs increased by 7 per cent between 2005-06 and 2006-07 before decreasing by 10 per cent in 2007-08, which resulted in a 4 per cent fall over the full three year period. The fall in 2007-08 occurred despite a 21 per cent increase in the off-road price of diesel in real terms and was the result of declines in both active vessels and fuel use per vessel.

Capital costs fell by 19 per cent between 2005-06 and 2007-08 following a 27 per cent decline in the opportunity cost of capital from $1 million to $700 000 and a 14 per cent decline in depreciation costs from $1.5 million to $1.2 million. These decreases are strongly linked to the reduction in boat numbers and reflect the changes in the stock of capital deployed in the sector.

Total management costs in the fishery increased between 2005-06 and 2007-08, despite the reduction in vessel numbers. These costs increased from $2.1 million in 2005-06 to $2.5 million in 2006-07 before falling back slightly to $2.2 million in 2007-08.

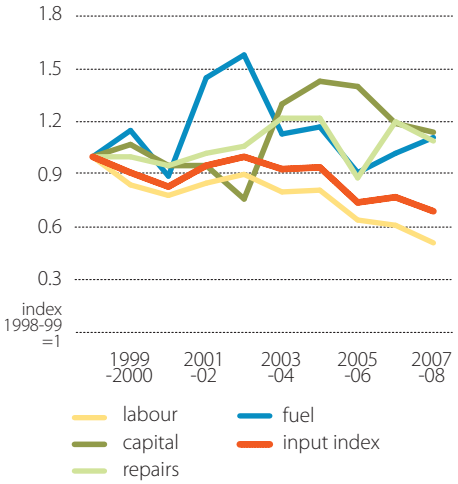
Output and input use

Changes in input use in the GHTS between 1998-99 and 2007-08 have varied across inputs. While labour inputs have almost halved over the period, the quantities of all other key inputs (fuel, capital and repairs) used are relatively higher than in 1998-99. Output, which is restricted by TACs and affected by environmental factors, has increased by more than 700 tonnes since 1998-99. The relationship between key inputs and output, and the way in which they affect each other over time, can provide further insights into economic performance in the GHTS. The analysis presented here was undertaken using historical survey data and non-survey based estimates for 2007-08.

An index of sector level input use for the GHTS shows some degree of fluctuation prior to 2002-03, driven by changes in fuel and labour use (figure 47). Since 2002-03, boat numbers in the sector have declined and have led to a decrease in labour (43 per cent) and fuel use (30 per cent). Use of inputs associated with capital and repairs have increased over the same period. Driven primarily by the reductions in labour use, as well as fuel use, the aggregated input index has decreased by 31 per cent since 2002-03.

47 Aggregate input index and input quantity indexes for the gillnet, hook and trap sector, 1998-99 to 2007-08

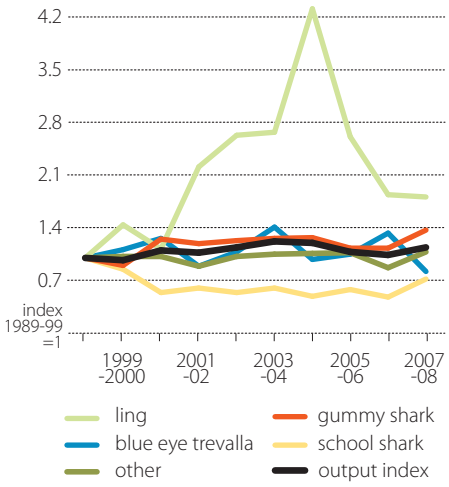
1998-99 base year



Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

48 Aggregate output index and output quantity indexes for the gillnet, hook and trap sector, 1998-99 to 2007-08

1998-99 base year



Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

Following the buyback, there was a 10 per cent decrease in the aggregated input index between 2006-07 and 2007-08, largely because of a 16 per cent decline in the quantity of labour used. Decreases in the use of capital (4 per cent) and repairs and maintenance (9 per cent) also partly contributed. These declines are less than the 16 per cent decline in boat numbers that occurred between 2006-07 and 2007-08 and are also relatively slight when compared with input use declines in other fisheries targeted in the buyback. The index of fuel use increased by 9 per cent over the same period.

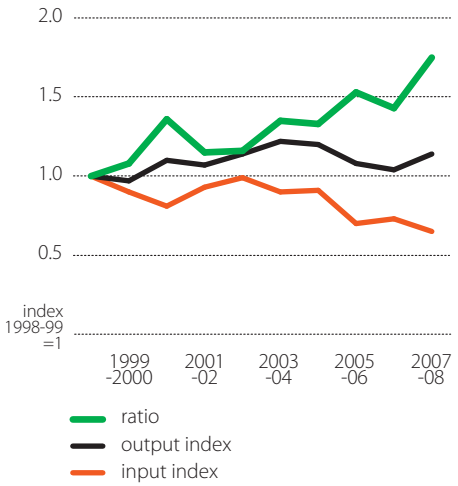
Over the period 1998-99 to 2003-04, the aggregated output index followed a positive trend, owing to increases in output of gummy shark, ling and blue eye trevalla (figure 48). However, this trend reversed after 2003-04, driven by declines in the same species. In 2007-08 (the year following the buyback), the downward trend halts with a 10 per cent increase in the aggregated output index. Key drivers of this change were a 21 per cent increase in gummy shark output and a 50 per cent increase in school shark output. At the same time, blue eye trevalla output decreased by 38 per cent.

The cumulative effect of the input and output indexes has resulted in a positive trend in the output to input ratio (figure 49). The ratio was already following a positive trend prior to the buyback in 2007-08, increasing by 36 per cent between 1998-99 and 2006-07 at an average rate of 5 per cent a year. However, in the post-buyback period, the increase in the output to input ratio became more pronounced. The aggregated input and output indexes diverged in 2007-08 and resulted in a 21 per cent increase in the output to input ratio. Assuming that external factors have remained relatively constant, this suggests that the buyback has had a positive impact on economic performance in the GHTS.

Catch per unit effort

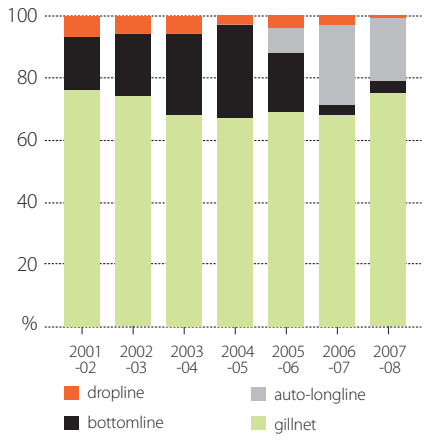
Analysis of catch per unit effort (CPUE) in the GHTS can provide an indication of how changes in catch

49 Output to input ratio for the gillnet, hook and trap sector, 1998-99 to 2007-08



Note: Estimates for 2007-08 are non-survey based extrapolation estimates.

50 Percentage of total catch by fishing method in the gillnet, hook and trap sector, 2001-02 to 2007-08

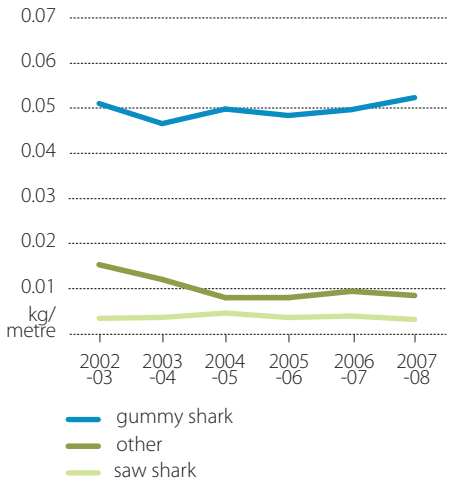


rates have affected economic performance. However, such analysis for the GHTS is more complicated because the sector uses multiple methods, predominantly gillnet, bottom-longline and automatic-longline. Effort measurement varies for each method and CPUE indicators need to be disaggregated as a result. The dominant fishing method in the sector in terms of catch is gillnet, which accounted for 75 per cent of catch in 2007-08 (figure 50). Discussion of CPUE focuses on this method as a result. Automatic-longline and bottom-longline were responsible for 20 per cent and 4 per cent of catch, respectively, in 2007-08. Automatic-longline CPUE is also discussed for the three years that the method has been used.

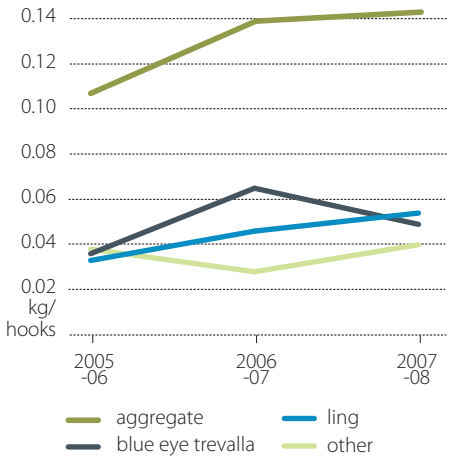
CPUE trends in the gillnet sector of the GHTS are largely driven by catch rates of gummy shark given its relative share of gillnet catch. In years prior to the buyback, gummy shark CPUE remained relatively stable. However, after minor increases in 2005-06 (3 per cent) and 2006-07 (5 per cent), gillnet CPUE of gummy shark jumped by 31 per cent (figure 51). Such a dramatic improvement in CPUE in 2007-08 is likely to have increased economic returns from the fishery.

Two species dominate catches taken via automatic-longline: pink ling and blue eye trevalla. CPUE for ling increased in both 2006-07 (39 per cent) and 2007-08 (17 per cent). CPUE of blue eye also increased in 2006-07 (by 81 per cent) but declined in 2007-08. Overall, aggregate automatic-longline CPUE increased in both years, by 30 per cent in 2006-07 and 3 per cent in 2007-08. Given that in 2007-08 ling comprised a slightly larger proportion of automatic-longline catch and its price increased to slightly higher than that of blue eye trevalla, the increase in ling CPUE in the same year may have had a slight positive effect on economic performance in the GHTS (figure 52).

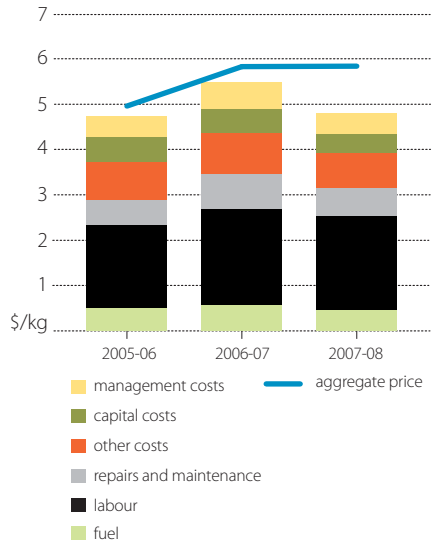
51 Gillnet catch per unit effort by key species group in the gillnet, hook and trap sector, 2002-03 to 2007-08



52 Automatic-longline catch per unit effort in the gillnet, hook and trap sector by key species group, 2005-06 to 2007-08



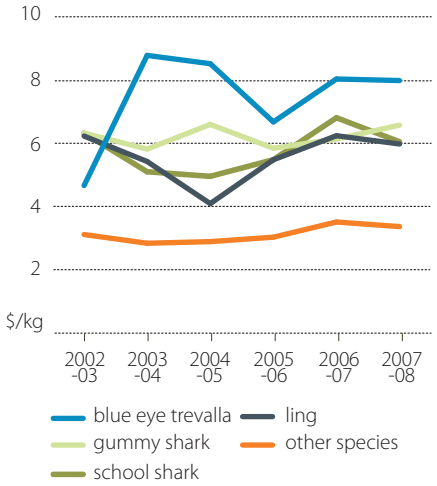
53 Real costs per kilogram of catch by cost category and average price per kilogram of catch (based on survey data) in the gillnet, hook and trap sector, 2005-06 to 2007-08 2008-09 dollars



Costs per unit of catch

Costs per kilogram of catch decreased by 12 per cent in 2007-08 when compared with 2006-07 (figure 53). This decrease is consistent with the observed increases in CPUE discussed above. The largest declines in proportional terms occurred for repairs and maintenance, which fell by 22 per cent, and fuel costs (21 per cent). A 15 per cent decline in other costs was also a key driver of the overall decline in costs per unit of catch given the relative size of this cost component. Labour costs only declined by 1 per cent. The improved profitability per unit of catch is indicated by the increased difference between costs per unit of catch and the aggregate price.

54 Real beach prices for key species targeted in the gillnet, hook and trap sector, 2002-03 to 2007-08 2008-09 dollars



Fish prices

Beach prices for target species targeted in the GHTS have been relatively constant over time (figure 54). Since much of the production of the GHTS is sold within Australia, price changes are largely driven by domestic demand. Given this, and the relative lack of import competition, prices of keys species in the GHTS are largely protected from adverse fluctuations in the exchange rate.

Following the conclusion of the buyback, prices for blue eye trevalla fell by 1 per cent, ling fell by 4 per cent and school shark fell by 11 per cent. However, prices for gummy shark increased by 15 per cent in 2007-08. Given that gummy shark represents the bulk of catch, the effect of the gummy shark price rise negated the price falls observed for other species. As a result, the average price per kilogram of catch in the sector remained relatively stable in 2007-08.

Post-buyback economic performance: boat level

Net economic returns

At the boat level, NER (excluding management costs) increased by 178 per cent between 2005-06 and 2007-08, following a 32 per cent increase from $39 000 in 2005-06 to $51 000 in 2006-07 and a 111 per cent increase in 2007-08 to $107 000.

These estimates of NER exclude management costs as these costs include management costs recovered from industry and non-recovered management costs that are covered by AFMA. As this latter component of management costs does not affect individual operators it would be inaccurate to account for it in vessel level economic performance.

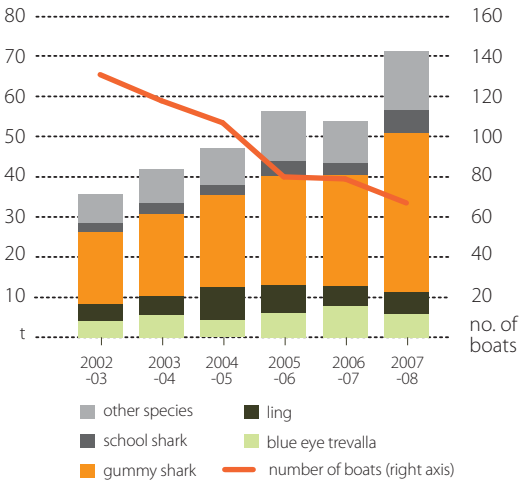
However, it should be noted that total management costs have increased by 8 per cent but boat numbers have fallen by 16 per cent between 2005-06 and 2007-08 and management costs per boat have increased considerably as a result. Management costs are recovered from industry on the basis of fishing concession holdings, not the amount of activity against these holdings. Consequently, management costs charged to active fishing concessions are reduced by the presence of latent concessions.

The Securing Our Fishing Future package provided funding to subsidise the management costs recovered from remaining operators following the buyback to minimise the negative impact of having fewer vessels bearing unchanged total management costs. The provision of this subsidy concluded in 2008-09 (AFMA 2009b). AFMA is currently undertaking a business efficiency review (AFMA 2009c), with one of its objectives being the reduction of management costs.

Catch per vessel

With the fall in boat numbers in the fishery to 67 vessels in 2007-08, the average catch per vessel has risen substantially to more than 70 tonnes a boat in 2007-08 (figure 55). This represents an increase of approximately 101 per cent since 2002-03 and an increase of 33 per cent between 2006-07 and 2007-08 following the buyback. This is the largest annual increase in catch per vessel in percentage terms over the period presented. This percentage increase in boat level catch is larger than the percentage increase in total fishery level catch, which increased by 13 per cent from 4250 tonnes in 2006-07 to 4785 tonnes in 2007-08.

55 Average catch per vessel and number of vessels in the gillnet, hook and trap sector, 2002-03 to 2007-08



At the species level, the largest proportional increase between 2006-07 and 2007-08 occurred for school shark catch, which increased by 75 per cent at the boat level. However, the main driver of the overall increase in total catch per boat was a 43 per cent increase in gummy shark catch at the boat level given that this species accounts for the largest proportion of total catch. These findings are consistent with changes in CPUE discussed previously, although it should be noted that some variance in catch may be attributable to changes in the fleet composition following the buyback, ultimately resulting in altered targeting practices.

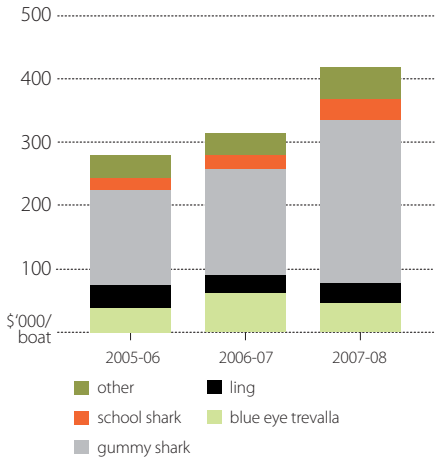
Revenue per vessel

Given the large increase in boat level catches in 2007-08 and that average aggregate prices fell by only 1 per cent in the same year, revenue per vessel has increased significantly in 2007-08 (figure 56). Gummy shark revenue at the boat level has increased by 70 per cent from 2005-06 to 2007-08. This is a key result considering that gummy shark contributed more than 60 per cent of adjusted boat level revenue in 2007-08. Over the same period, school shark revenue has also increased by 69 per cent. However, school shark contributed to only 8 per cent of boat level revenue.

Costs per vessel

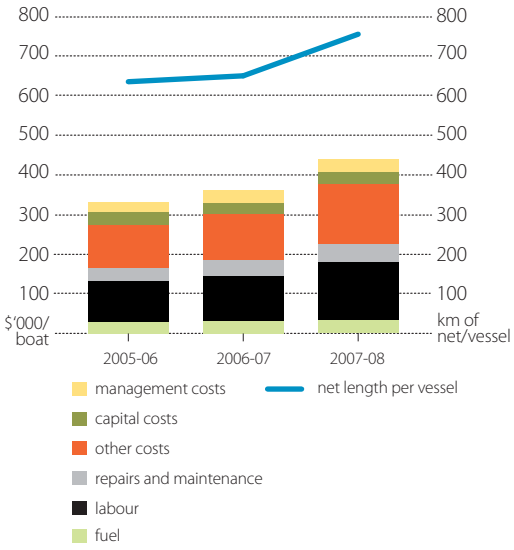
At the boat level, costs increased substantially between 2005-06 and 2007-08 (figure 57). This was consistent with changes in average effort per vessel. Average net length used per gillnet boat increased by 19 per cent over the same period because of the removal of vessels associated with lower effort through the buyback, and also because of increases in average effort expended by operators remaining in the fishery after the buyback. This is also likely to have been a factor that drove the observed increase in fishery level costs discussed previously.

56 Real revenue by species per vessel in the gillnet, hook and trap sector, 2005-06 to 2007-08 2008-09 dollars



Note: Total revenue here is consistent with fishery level revenue as calculated for NER. The break-up of revenue by species is calculated according to the proportions of fishery level GVP that each species group accounts for.

57 Real costs per vessel by cost category and effort per vessel for the gillnet, hook and trap sector, 2005-06 to 2007-08 2008-09 dollars



The increase in costs per vessel was largely the result of increases in both labour costs and other costs. Over the three years from 2005-06 to 2007-08, labour costs rose by 43 per cent while other costs increased by 37 per cent. These increases in labour costs and other costs can be attributed to the increased boat level catches. Labour costs are linked to receipts, given that crew are paid some proportion of receipts, while other costs include freight, marketing and other material costs which are partly dependent on catch.

Conclusions and longer term prospects

The results presented here for the GHTS reveal how profitability has varied in the year following the buyback and what the key drivers of these changes have been. Some key results include:

- Sector level NER have improved considerably relative to pre-buyback. NER in 2007-08 are estimated at $5 million while the pre-buyback average between 1998-99 and 2005-06 was $1.5 million.
- Unlike in other fisheries targeted in the buyback, sector level costs increased following the buyback given changes to the structure of the fleet. However, NER still improved as sector level revenues have increased by a larger amount than sector level costs.
- Analysis of output and input use suggests that the output to input ratio has increased following the buyback because of a decline in input use in 2007-08 and an increase in output (driven largely by higher catches of gummy shark).
- An increase in gillnet CPUE (the dominant fishing method in the sector) driven mainly by improved catch rates of gummy shark had a positive impact on profitability in the GHTS.
- Catches per vessel increased substantially in 2007-08. This can be attributed to multiple factors, one of these factors being the decline in vessel numbers.

It is estimated that the GHTS has benefited from a significant improvement in economic performance in the post-buyback period, as shown by the marked improvement in estimated NER. Through the reduction of capital deployed in the sector and the removal of latent effort, the fishery has moved closer to a point that maximises economic returns from the fishery.

Although fishers had been exiting the fishery in small numbers for several years, the reduction in vessel numbers (from 80 vessels in 2005-06 to 67 vessels in 2007-08) through the buyback has accelerated the adjustment. As a result, the sector has experienced increased profits.

At the boat level, the reduction in vessel numbers has ensured that the total catch has been shared among fewer fishers. This has resulted in large increases in catch per vessel. Costs per vessel have also increased, but not as rapidly as revenues. As a result, economic performance has improved, as illustrated by the substantial increases in estimated boat level net economic returns in 2007-08.

The extent to which previous management of the sector, particularly through the tightening of TACs, has resulted in increases in stocks will also have determined to what degree economic performance improved in the post-buyback period. The ITQ based management approach used in the GHTS provides the opportunity to capitalise on the benefits of the structural adjustment package. Specifically, if TACs continue to be set to approximate maximum economic yield (MEY), the benefits of the buyback will be maximised.

This analysis presented focuses on the contribution of the buyback to changes in profitability and suggests that profitability has improved in the GHTS. Although this analysis is not a cost–benefit analysis, in the two rounds of the buyback, approximately $47.6 million (in 2008-09 dollars) was expended on the purchase of entitlements in the SESSF (ANAO 2009). It is important that ongoing management arrangements in the fishery 'lock in' the benefits achieved through the buyback so that the benefits from this expenditure are as large as possible.

appendix A Output per unit input index

The output per unit input index is a ratio of input to output use. In the single output/single input case, estimating output per unit input is simple because defining the ratio of outputs to inputs is straightforward. But when there are many inputs and many outputs, a method must be devised for weighting the indexes together to form a single input index and a single output index.

There are various formulas for combining separate input or output indexes. The one used in this analysis is the Tornqvist formula. Each of the indexes is given a weight which depends on the input's or output's share of total cost or revenue. The weights are based on the simple average of the share of total costs or revenue in the prevailing and previous year.

An overall quantity index $Q_{t,\,t-1}$ showing inputs or outputs at period t relative to $t\text{-}1$ can be defined as:

$$Q_{t,t-1} = \prod_{i=1}^{n} \left[\frac{q_{i,t}}{q_{i,t-1}} \right]^{\frac{\omega_{i,t} + \omega_{i,t-1}}{2}}$$

where $q_{i,t}$ is the use of the ith input (or output) in period t and $\omega_{i,t}$ is the share of the ith input (or output) at period t. It is usually more straightforward to apply the equivalent expression in logarithmic form:

$$\ln Q_{t,t-1} = \frac{1}{2} \sum_{i=1}^{n} \left(\ln q_{i,t} - \ln q_{i,t-1} \right) \left(\omega_{i,t} + \omega_{i,t-1} \right)$$

When the year on year indexes have been calculated, they are chained together by multiplication to express the entire index relative to a particular base year.

For more information on productivity analysis see Coelli et al. (1998).

Acronyms and abbreviations

´ minutes of latitude or longitude (for example, 34° 20´ S)

° E , ° N, ° S , ° W degrees east, north, south, west of Greenwich

°C degrees Celsius

A

ABARE Australian Bureau of Agricultural and Resource Economics

AFMA Australian Fisheries Management Authority

B

BRS Bureau of Rural Sciences

BSCZSF Bass Strait central zone scallop fishery

C

CPUE Catch per unit effort

CTS Commonwealth trawl sector (of the SESSF)

D

DAFF Australian Government Department of Agriculture, Fisheries and Forestry

E

ETBF Eastern tuna and billfish fishery

E_{MEY} Effort level associated with maximum economic yield

E_{OAE} Effort level associated with open access equilibrium

G

GHTS Gillnet, hook and trap sector (of the SESSF)

GVP Gross value of production

H

HSP Harvest strategy policy

I

ITQ Individual transferable quota

K

kg kilogram

km kilometre

M

MEY Maximum economic yield

mm millimetre

MPA Marine protected area

MSY Maximum sustainable yield

N

NER Net economic returns

NORMAC Northern prawn fishery management advisory committee

NPF Northern prawn fishery

O

OAE Open access equilibrium

S

SESSF Southern and eastern scalefish and shark fishery

SFR Statutory fishing right

T

t tonnes (metric ton, 1000 kg)

TAC Total allowable catch

TAE Total allowable effort

Glossary

Allocated management costs

Costs of managing a fishery that are directly related to that fishery. Excludes overheads such as licensing, research, enforcement costs and surveillance. Allocated management costs have recoverable (industry funded) and non-recoverable (Australian Government funded) components.

Autonomous adjustment

Autonomous adjustment is an ongoing process in all fisheries. As technologies and prices change, the characteristics of the fishing fleet required to maximise the net economic returns from the fishery will also change and, as a result, fishery fleet behaviour has a tendency to change in line with market signals. Autonomous adjustment can also be accelerated by changes in the fishery management environment. For example, the primary role for government in structural adjustment is to establish a management regime that removes any incentives that lead to overcapacity, and that facilitates autonomous adjustment to occur in response to changing economic and biological conditions.

Beach price

A price per unit of fish that excludes payments for freight, marketing and processing as would be paid at the point of landing. Usually expressed as the weight of the fish when whole.

B_{MEY} (biomass at maximum economic yield)

Average biomass corresponding to maximum economic yield as estimated from the assessment model applied.

B_{MSY} (biomass at maximum sustainable yield)

Average biomass corresponding to maximum sustainable yield.

Buyback

Purchase of fishing boats and licences by the government.

Danish seining

A trawling method used by relatively small boats in shallow waters (up to about 200 metres). Lengths of aggregated ropes of up to 2800 metres are laid out on the sea floor in a diamond pattern with the boat at one end of the diamond and the net at the other. As the net is drawn in, the diamond becomes elongated allowing the fish to be herded into the path of the net (cf. purse seine).

Dropline

Fishing line with one or more hooks, held vertically in the water column with weights, generally used on the continental shelf and slope. Several droplines may be operated by a vessel, manually or mechanically.

Economic efficiency

A fishery is economically efficient when fishery level efficiency and vessel level efficiency are being achieved, and management costs are as low as they can be while still providing the necessary management. Fishery level and vessel level efficiency mean that effort is being restricted to the point where the difference between fishing revenue and cost is greatest, and fishers are applying that effort at least cost.

Economic profit

See Profit – economic.

Effort

Effort is a measure of the resources used to harvest a fishery's stocks. The measure of effort appropriate for a fishery depends on the methods used and the management arrangements. Common measures include the number of vessels, the number of hooks set and the number of fishing days or nights.

Effort creep

Effort creep is the tendency for fishing effort to increase beyond that intended by a targeted input control. It is caused by innovative fishers adapting their fishing techniques to legally circumvent controls, often by using an unregulated input in place of a regulated input. Effort creep compels managers to tighten controls regularly, leading to some gear being made redundant.

Effort restriction

Restriction of the permitted amount of fishing effort (for example, trawl hours) in a particular fishery. Used as a management tool.

Fishery level efficiency

Occurs when total catch or effort is restricted to maximise the net economic returns created by the fishery over time, accounting for the effect of current catches on future stocks, catches and fishing costs.

Fishing capacity

Total fishing effort that can be expended by a fleet operating in a fishery.

Fishing effort

Amount of fishing taking place, usually described in terms of gear type and the frequency or period of operations; for example, hook sets, trawl hours or searching hours.

Gear restriction

Restriction on the amount and/or type of fishing gear that can be used by fishers in a particular fishery. Used as a management tool.

Gillnet

Type of passive fishing gear consisting of panels of net held vertically in the water column, either in contact with the seabed or suspended from the sea surface, such that fish attempting to swim through the net are entangled. The mesh size of the net determines the size range of fish caught, as smaller fish can swim through the meshes and larger fish are not enmeshed.

Gross value of production (GVP)

A value found by multiplying the volume of catch by the beach price per unit. In the case of a multispecies fishery, the fishery's GVP is the sum of the GVP of each species. GVP is not a good indicator of economic performance because it does not consider costs.

Harvest strategy

Document stating how catch and/or effort restrictions in a fishery will be adjusted from year to year depending on the size of the stock, the economic or social conditions of the fishery, conditions of other interdependent stocks, and uncertainty of biological knowledge. Well-managed fisheries have an unambiguous (explicit and quantitative) harvest strategy, robust to the unpredictable biological fluctuations to which the stock may be subject.

Headrope (headline)

In a trawl net, the length of rope or wire to which the top wings and cover netting are attached.

Individual transferable effort (ITE)

Shares of a total allowable effort that are allocated to individuals. They can be traded, permanently or temporarily. Analogous to individual transferable quotas in a fishery managed with a total allowable catch. Usually issued at the start of a fishing season.

Individual transferable quota (ITQ)

Management tool by which portions of a total allowable catch are allocated to fishers (individuals or companies). Fishers have rights over the quota but can trade quota with others. See also Quota.

Input controls

Management measures that place restraints on who fishes (licence limitations), where they fish (closed areas), when they fish (closed seasons) or how they fish (gear restrictions).

Latent effort

Fishing capacity that is authorised for use but not currently being used. Depending on how a fishery is managed, latent effort might appear as unused boat SFRs, gear SFRs, quota SFRs, permits or nights. It is an important and low cost indicator of fishers' views about the profitability of a fishery. High latent effort suggest that low profits in the fishery do not justify fishing. It is likely that fisheries in which latent effort exists are close to the open access equilibrium. Apart from being an indicator of efficiency, latent effort can also be detrimental to the fish stock and to any chances the fishery may have of being profitable in the future. For example, a significant increase in the market price of a fishery's product is likely to entice inactive effort into the fishery. If enough inactive effort is triggered, the fish stock could be jeopardised. At the least, profits are likely to be dissipated as soon as they arise.

Logbook

Official record of catch and effort data made by fishers. In many fisheries, a licence condition makes the return of logbooks mandatory.

Longline

Fishing gear in which short lines ('droppers') carrying hooks are attached to a longer main line at regular intervals. Pelagic longlines are suspended horizontally at a predetermined depth with the help of surface floats. The main lines can be as long as 100 kilometres and have several thousand hooks. Droppers on demersal longlines (set at the seabed with weights) are usually more closely spaced.

Maximum economic yield (MEY)

The sustainable catch or effort for a commercial fishery that allows net economic returns to be maximised. For most practical discount rates and fishing costs, MEY will imply that the equilibrium stock of fish is larger than that associated with MSY. In this sense, MEY is more environmentally conservative than MSY and should, in principle, help protect the fishery from unfavourable environmental effects that may diminish the fish population.

Maximum sustainable yield (MSY)

The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. MSY defined in this way makes no allowance for environmental variability and studies have demonstrated that fishing at the level of MSY is often not sustainable (cf. long-term potential yield).

Net economic returns

A fishery's net economic return over a particular period is equal to fishing revenue less fishing costs. Fishing costs include the usual accounting costs of fuel, labour and repairs and maintenance, as well as various economic costs such as the opportunity costs of labour and capital. Opportunity costs refer to the return that could have been earned on inputs had they been put to their next best alternative use. The concept of net economic returns is closely related to economic efficiency. Only in an economically efficient fishery will net economic returns be maximised.

Open-access fishery

Fishery in which there is no limit on the number of operators or vessels (cf. limited-entry fishery). Such a fishery is liable to suffer the 'tragedy of the commons'. Under open access, a fishery operates with a harvest and effort that results in total revenue equalling costs, with no economic profits being generated. The fishing effort employed at this point exceeds that which would achieve MEY.

Opportunity cost

The compensation a resource forgoes by being employed in its present use and not in the next best alternative. For example, the opportunity cost incurred by the skipper of a fishing vessel is the amount he or she would have received in some alternative occupation. The opportunity cost of owning a fishing vessel might be the interest that could be earned if the vessel was sold and the capital invested elsewhere. These costs are not usually reflected in a firm's financial accounts but are important costs nonetheless.

Otter trawl

Demersal trawl operated by a single vessel in which the net is held open horizontally by angle-towed otter boards (large rectangular boards of timber or steel) and vertically by a combination of floats on the headrope and weights on the ground line. Attached between the head and ground ropes and the towing warps, the otter boards are spread apart by the hydrodynamic forces acting on them when the net is towed.

Output controls

Management measures that place restraints on what is caught, including total allowable catch, quota, size limits and species. In Commonwealth fisheries they take the form of total allowable catches.

Output per unit input indices

An output per unit input index shows whether more or less output is being produced over time with a unit of input. The index is calculated by combining changes in total output (fish) to changes in total inputs such as fuel, labour and capital.

Profit – accounting

The difference between total revenue and explicit costs. Explicit costs refers to costs such as wages, fuel, repairs, maintenance and depreciation of physical capital (e.g. vessels). Where costs exceed total revenue, it is an accounting loss. Unlike economic profit, it does not include opportunity cost. See profit – economic.

Profit – economic

The difference between total revenue and explicit and opportunity costs (see Opportunity cost). Explicit costs refer to costs such as wages, fuel, repairs and depreciation of physical capital (e.g. vessels). Economic profit differs from accounting profit in that opportunity cost is not considered in accounting profit. See profit – accounting.

Profit – decompositions

Profit decomposition studies are an extension of productivity index studies and provide more detailed information regarding the inputs and outputs. A profit index decomposition approach enables decomposition of profit into its components: productivity, the prices of outputs and inputs, and vessel capital. This method offers important advantages over traditional measures of productivity in fisheries because it provides individual firm-level measures and quantifies the contribution of productivity, inputs, and outputs to relative profits.

Quota

Amount of catch allocated to a fishery as a whole (total allowable catch) or to an individual fisher or company (individual transferable quota).

Quota species

Species for which catch quotas have been allocated.

Real terms/real prices

Real prices are historical or future prices adjusted to reflect changes to the purchasing power of money (most commonly measured by the consumer price index). Such prices may also be expressed as being in real terms. Commonly, a year is indicated alongside a real price. This indicates the reference year against which prices in other years are compared. Prices quoted in real terms allow for meaningful comparison over time.

Statutory fishing rights (SFRs)

Rights to participate in a limited-entry fishery. An SFR can take many forms, including the right to access a particular fishery or area of a fishery, the right to take a particular quantity of a particular type of fish, or the right to use a particular type or quantity of fishing equipment.

Sustainable yield

Catch that can be removed over an indefinite period without reducing the biomass of the stock. This could be either a constant yield from year to year, or a yield that fluctuates in response to changes in abundance.

Total allowable catch (TAC)

For a fishery, a catch limit set as an output control on fishing (see also Output controls). Where resource sharing arrangements are in place between commercial and recreational fishers, the term total allowable commercial catch (TACC) will apply.

TAC, agreed

TACs for individual quota species are set annually by the AFMA Commission and are indicated in the species summaries as the 'agreed TAC'.

TAC, actual

The actual TAC for a species (indicated by 'actual TAC') including carryover or debits.

Total allowable effort (TAE)

An upper limit on the amount of effort that can be applied in the fishery.

Tragedy of the commons

A situation where users of a shared resource expand their use of the resource past the point that would be optimal if there was a sole owner because the cost of beyond optimal use is distributed across all users.

Vessel level efficiency

Vessel level efficiency requires that revenues be maximised and catching costs be minimised for a given quantity of catch. The choice of management regime will have a substantial bearing on whether vessel level efficiency is achieved as it largely defines the incentive structure that fishers operate within.

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AusAID

Australian Fisheries Management Authority

Australian Government Department of Climate Change

Australian Government Department of the Environment, Water , Heritage and the Arts

Australian Government Department of Resources, Energy and Tourism

CRC Plant Biosecurity

CSIRO (Commonwealth Scientific and Industrial Research Organisation)

Dairy Australia

Department of Primary Industries, Victoria

DN Harris and Associates

European Commission

Fisheries Research and Development Corporation

Fisheries Resources Research Fund

Forest and Wood Products Australia

Grains Research and Development Corporation

Grape and Wine Research and Development Corporation

Horticulture Australia

International Food Policy Research Institute

Land and Water Australia

Meat and Livestock Australia

National Australia Bank

OECD

Rural Industries Research and Development Corporation

The Treasury