

7 Small Pelagic Fishery

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FIGURE 7.1 Area fished in the Small Pelagic Fishery, 2011

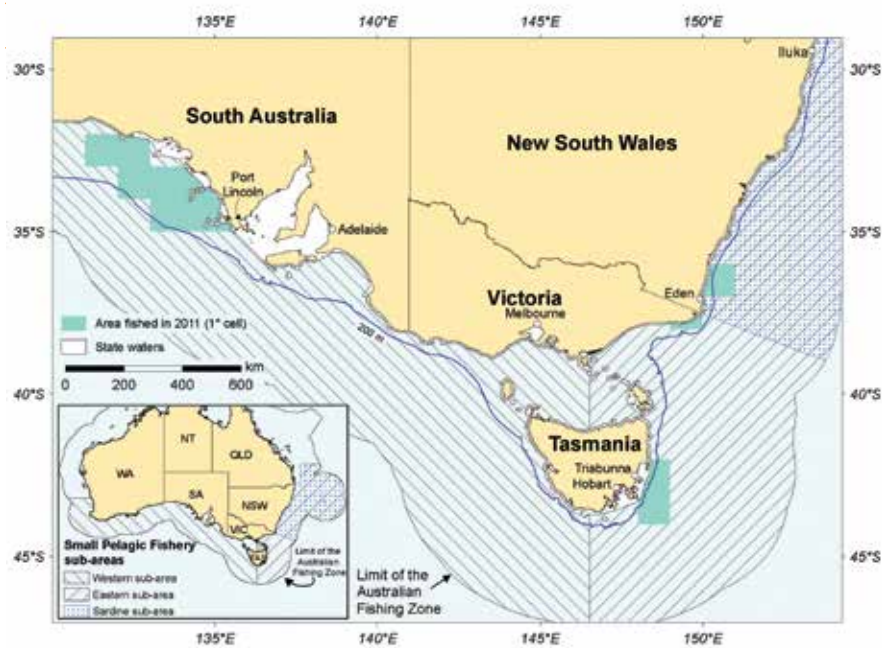


TABLE 7.1 Status of the Small Pelagic Fishery

Status	2010		2011		Comments
Biological status	Fishing mortality	Biomass	Fishing mortality	Biomass	
Australian sardine (<i>Sardinops sagax</i>)					Historical catches have been low relative to estimated biomass. Recent catches have been at or below the RBC.
Blue mackerel, east (<i>Scomber australasicus</i>)					Historical catches have been low relative to estimated biomass. Recent catches have been below the RBC.
Blue mackerel, west (<i>Scomber australasicus</i>)					Recent catches have been low relative to estimated biomass. Recent catches have been below the RBC.
Jack mackerel, east (<i>Trachurus declivis</i>)					Recent catches have been low relative to estimated biomass. Recent catches have been below the RBC.
Jack mackerel, west (<i>Trachurus declivis</i>)					Recent catches have been low relative to estimated biomass.
Redbait, east (<i>Emmelichthys nitidus</i>)					Historical catches have been low relative to estimated biomass. Recent catches have been below the RBC.
Redbait, west (<i>Emmelichthys nitidus</i>)					No biomass estimate. Recent catches have been low.
Economic status	Estimates of NER are not available.				NER are likely to be low given the low levels of effort and high latency in the fishery.

Notes: NER Net economic returns. RBC Recommended biological catch.

Fishing mortality

Not subject to overfishing

Subject to overfishing

Uncertain

Biomass

Not overfished

Overfished

Uncertain

7.1 Description of the fishery

The Small Pelagic Fishery (SPF) extends from southern Queensland to southern Western Australia (Figure 7.1). Small pelagic species are generally caught during targeted fishing for a single species and have been taken in significant volumes within both Commonwealth and adjacent state management jurisdictions. These species are also taken to a lesser extent in several other Commonwealth and state-managed fisheries, mainly the trawl sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF), the Eastern Tuna and Billfish Fishery (where they are caught for bait), the Western Tuna and Billfish Fishery, and the New South Wales Ocean Hauling Fishery. Historically, purse seining was the primary fishing method, but this was replaced by midwater trawling between 2003 and 2008. The fishery is now primarily a purse-seine fishery. Catch has decreased since 2003–04; this appears to be market driven, rather than a result of any decline in resource abundance.

In addition to the targeted species, a number of byproduct species are taken, including skipjack tuna (*Katsuwonus pelamis*), silver trevally (*Pseudocaranx georgianus*) and barracouta (*Thyrsites atun*). Yellowtail scad (*Trachurus novaezelandiae*) are also caught in the fishery but are not a key target species. The catch of yellowtail scad in 2010–11 was limited by a total allowable catch (TAC) of 200 t.

The SPF harvest strategy has a three-tier system that is applied to the target stocks separately for east and west, depending on availability of information. The western stock of Australian sardine is managed by South Australia and the Commonwealth manages the eastern stock. This tier system is intended to allow greater levels of catch when there is a better knowledge of stock condition provided by research. In principle, Tier 1, with the highest level of information (from daily egg production model [DEPM] surveys), will result in the largest potential recommended biological catch (RBC). Tier 3, with relatively poor information, will result in the smallest RBC.

Biomass that supports maximum economic yield (B_{MEY}) is not considered to be an appropriate reference point for small pelagic species because of the high interannual variability in biomass typical of these species and their ecological importance. Internationally, exploitation rates of around 20–25 per cent of current biomass are considered appropriate for low trophic-level species, as they are key prey species for larger fish and marine mammals (Smith et al. 2011). The SPF Tier 1 harvest control rules uses exploitation rates of between 10 and 20 per cent of estimated spawning biomass from a DEPM survey as the basis for setting RBCs. The RBC is reduced from 20 to 10 per cent over a period of five years from the first year biomass is estimated, based on the most recent DEPM survey. Testing through management strategy evaluation (MSE) has indicated that this Tier 1 approach to setting harvest levels is robust for SPF stocks (Giannini et al. 2010). Most scenarios maintained stock sizes well above 20 per cent of unfished biomass levels ($0.2B_0$; Giannini et al. 2010). The estimates of spawning biomass provided by DEPM surveys used in this fishery are also likely to be under-estimates as the surveys have collected eggs from only parts of the known spawning area of the stock. The maximum RBC from the Tier 2 and Tier 3 harvest control rules are set at a specified quantity (absolute tonnage). A maximum RBC for Tier 2 has been defined for each stock, with quantities varying from 3000 to 6000 t, based on approximately 7.5 per cent of the best spawning biomass estimate. For Tier 3, the maximum RBC has been set at 500 t for each stock. Once the RBC has been derived, an allowance for state catches is deducted before the TACs for Commonwealth fishers are set.

Some age and length data have been collected for small pelagic species caught in this fishery, but ad hoc and inconsistent sampling across the geographic range of the stocks make these data of limited use. For this reason, these data are generally not used in status determination.

TABLE 7.2 Main features and statistics for the SPF

Fishery statistics a		2009–10 fishing season		2010–11 fishing season		
Stock	TAC (t)	Catch (t)	Real value (2009–10)	TAC (t)	Catch (t)	Real value (2010–11)
Australian sardine	1 600	636	Confidential	500	115	Confidential
Blue mackerel, east	3 400	129		3 400	0	
Blue mackerel, west	5 600	966		5 600	400	
Jack mackerel, east	4 700	156		4 700	7	
Jack mackerel, west	5 000	111		5 000	0	
Redbait, east	10 300	407		10 300	13	
Redbait, west	5 000	120		5 000	0	
Total	35 600	2 525	Confidential	30 300	535	Confidential

Fishery level statistics

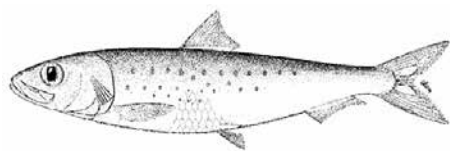
Effort	Purse seine: 517 search hours Midwater trawl: 29 shots (164 trawl hours)	Purse seine: 205 search hours Midwater trawl: 3 shots (30 trawl hours)
Fishing permits	71	70
Active vessels	Purse seine: 3 Midwater trawl: 2	Purse seine: 4 Midwater trawl: 1
Observer coverage	Purse seine: 14 shots (12%) Midwater trawl: zero hours (0%)	Purse seine: zero shots (0%) Midwater trawl: zero hours (0%)
Fishing methods	Purse seine, midwater trawl	
Primary landing ports	Triabunna, Port Lincoln, Eden, Iluka	
Management methods	Input controls: limited entry, gear restrictions Output controls: TACs and ITQs	
Primary markets	Domestic: fishmeal, bait and human consumption	
Management plan	<i>Small Pelagic Fishery management plan 2009</i> (AFMA 2009)	

a Fishery statistics are provided by fishing season unless otherwise indicated. Fishing season is 1 July – 30 June. Real value statistics are by financial year.

Notes: TAC Total allowable catch. ITQ Individual transferable quotas.

7.2 Biological status

7.2.1 Australian sardine



Line drawing: FAO

Stock assessment

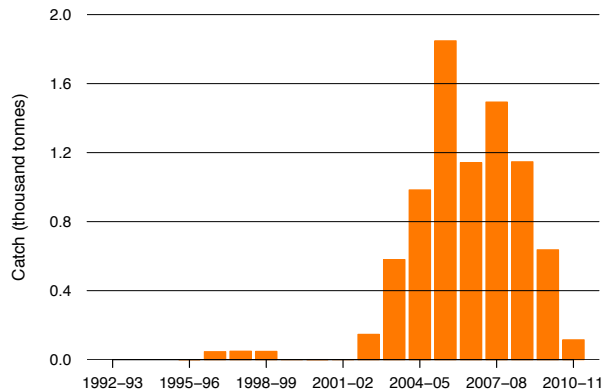
No DEPM survey was conducted for the eastern stock of Australian sardine in 2010–11. The most recent DEPM survey (2004) estimated the spawning biomass for Australian sardine off eastern Australia to be 28 809 t (range 9161–58 673 t) (Ward & Rodgers 2007).

The RBC in 2010–11 was set using the Tier 1 harvest control rules, resulting in an RBC of 3000 t, based on 10 per cent of the biomass estimate derived from the 2004 DEPM survey. The Australian Fisheries Management Authority (AFMA) Commission set the Commonwealth TAC at 500 t.

Total landings peaked in 2008–09 at 4787 t, which is approximately 16 per cent of the spawning biomass estimated by the 2004 DEPM survey. In 2010–11, the total catch, including state catches was 3271 t, slightly above the RBC of 3000. Commonwealth landings in the SPF decreased in 2010–11 to 115 t from 636 t in the previous year (Figure 7.2).

Most sardine catch (97 per cent) on the east coast in 2010–11 was taken in New South Wales and Victorian waters, up from 63 per cent in 2004. Unlike the Commonwealth, catch in these jurisdictions is not constrained by catch limits and continues to increase. The RBC is agreed for the entire stock and state catches are deducted when the Commonwealth TAC is set. The Commonwealth TAC has decreased from 2800 t in 2008–09 to 500 t in 2010–11 (despite an RBC of 3000 t in 2010–11). It is conceivable that if state catches continue to increase they may exceed the RBC, resulting in a zero TAC for the Commonwealth fishery.

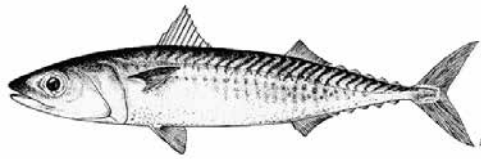
FIGURE 7.2 Commonwealth Australian sardine catch, in the SPF, 1992–93 to 2010–11



Stock status determination

The total catch from the SPF and states peaked (2008–09) at approximately 16 per cent of the estimated spawning biomass; most catches in other years were substantially below this level. Commonwealth catch is constrained by the harvest strategy to be at or below 20 per cent of spawning biomass estimates. Based on the catch history as a proportion of biomass, Australian sardine is classified as **not overfished**. Total catch in 2010–11 was slightly above the RBC; however, this is unlikely to be a concern for this stock given the conservative nature of the RBC (10 per cent of estimated biomass) for the year. As a result, the stock is classified as **not subject to overfishing**.

7.2.2 Blue mackerel, east



Line drawing: FAO

Stock assessment

No DEPM survey was conducted for blue mackerel (east) in 2010–11. The most recent DEPM survey for blue mackerel (east) was in 2004 (Ward & Rogers 2007), giving an estimated spawning biomass of 23 009 t (range 7565–116 395 t). However, the Resource Assessment Group considered that the spatial coverage of the survey area (see Section 7.1) would underestimate biomass, and increased the spawning biomass estimate to 40 000 t. The RBC for 2010–11 was set using Tier 1 harvest control rules, resulting in an RBC of 4000 t. After making allowance for state catches, the Commonwealth TAC was set at 3400 t.

Total landings peaked in 2002–03 at 1029 t, which is approximately 4 per cent of the spawning biomass estimated by the 2004 DEPM survey. Total landings (including state catches) in 2010–11 were 310 t, which is approximately 1 per cent of the spawning biomass estimate and 8 per cent of the RBC (Figure 7.3). There was no Commonwealth catch and effort in 2010–11. Fishing effort has been decreasing since 2007–08, the number of vessel days decreased from 3532 in 2007–08 to 1172 in 2010–11.

Stock status determination

The peak harvest from this stock was less than 4 per cent of the mean biomass estimate (Ward et al. 2011). An exploitation rate this low in any given year is unlikely to have substantially reduced biomass in the stock. As a result, blue mackerel (east) is classified as **not overfished**. There was no Commonwealth catch or effort in 2010–11 and the state-landed catch was a small proportion of the RBC. As a result, blue mackerel (east) is classified as **not subject to overfishing**.

7.2.3 Blue mackerel, west

Stock assessment

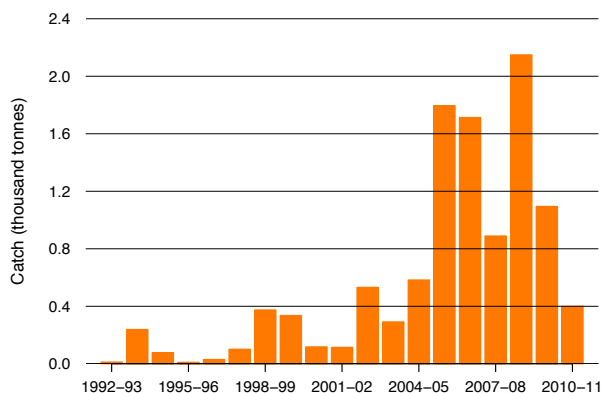
No DEPM survey was conducted for blue mackerel (west) in 2010–11. The most recent DEPM survey was in 2005 (Ward & Rogers 2007), giving an estimated spawning biomass of 56 228 t (range 10 993–293 456 t). The RBC in 2010–11 was set using Tier 1 harvest control rules, resulting in an RBC of 5600 t. There were no state catches for this species, and the Commonwealth TAC was set at 5600 t.

Total landings peaked in 2008–09 at 1977 t, which is approximately 3 per cent of the spawning biomass estimated by the 2005 DEPM survey. Total landings in 2010–11 were 400 t, which is approximately 1 per cent of the spawning biomass estimate and approximately 7 per cent of the RBC (Figure 7.3). Commonwealth landings constituted the majority of total landings in the west. Fishing effort in the west has been highly variable, decreasing from 162 days in 2008–09 to 39 days in 2010–11.

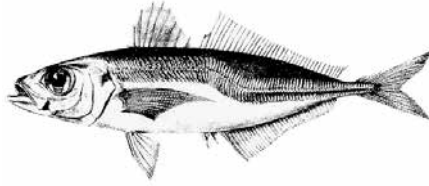
Stock status determination

The peak harvest from this stock was approximately 3 per cent of the 2005 spawning biomass estimate. An exploitation rate this low in any given year is unlikely to have substantially reduced the stock biomass. As a result, blue mackerel (west) is classified as **not overfished**. The total landed catch in the west in 2010–11 was a small proportion of the RBC. As a result, blue mackerel (west) is classified as **not subject to overfishing**.

FIGURE 7.3 Commonwealth blue mackerel catch, 1992–93 to 2010–11



7.2.4 Jack mackerel, east



Line drawing: FAO

Stock assessment

A DEPM-derived estimate of spawning biomass has been conducted for jack mackerel (*Trachurus declivis*) in south-eastern Australia, giving an estimate of 141 950 t (range 114 900–169 000 t) (Neira 2011, based on 2002 survey data). However, the assessment had not been completed before the 2010–11 fishing season. As a result, the RBC for the 2010–11 season was set using Tier 2 harvest control rules, resulting in an RBC of 5000 t. After consideration of state catches, the Commonwealth TAC was set at 4700 t.

The jack mackerel purse-seine fishery developed off Tasmania in the mid-1980s, with catches of more than 40 000 t. Catches then declined, and large interannual fluctuations in abundance resulted in purse-seine operations ceasing in 2000 (Kailola et al. 1993; Ward et al. 2011).

Total landings in 2010–11 were 7 t, with Commonwealth-registered vessels contributing the majority of the catch (Figure 7.4). This represents less than 0.005 per cent of the spawning biomass estimate based on the 2002 survey data and approximately 0.1 per cent of the RBC. Fishing effort has also been declining since 1998–99, with just 10 fishing days in 2010–11. The low catch is likely due to low effort, driven by economic factors.

Length-frequency data for *Trachurus* spp. collected off eastern Tasmania (1984–85 to 2009–10) show a shift in modal length towards smaller fish in 2009–10. This is reflected in the age data, with recent landings dominated by 2–3-year-old fish; historically, the fishery was dominated by 4–5-year-olds (Ward et al. 2011). This shift in age structure may be a sampling anomaly or the result of changes in fishing patterns, recruitment variability or the removal of older, larger fish.

Stock status determination

The peak harvest from this stock over the past 14 years has been less than 7 per cent of the spawning biomass estimate based on the 2002 DEPM survey. An exploitation rate this low in any given year is unlikely to have substantially reduced biomass in the stock. As a result, jack mackerel (east) is classified as **not overfished**. The total landed catch in the east in 2010–11 was a small proportion of the estimate of spawning biomass and the RBC. As a result, jack mackerel (east) is classified as **not subject to overfishing**.

7.2.5 Jack mackerel, west

Stock assessment

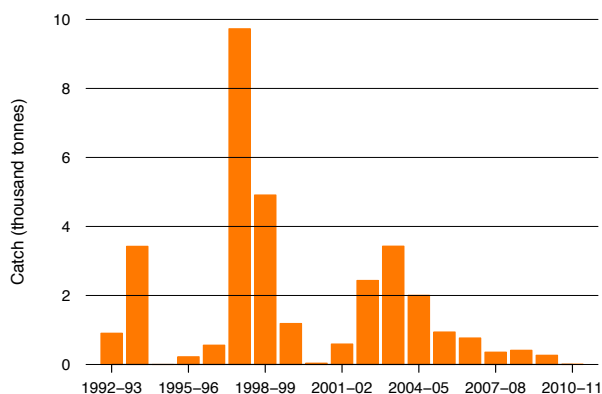
No DEPM survey or estimate of spawning biomass has been conducted for jack mackerel (*T. declivis*) in the west. Tier 2 harvest control rules were used to set an RBC of 5000 t in 2010–11. After consideration of state catches, the Commonwealth TAC was set at 5000 t.

Aerial surveys in the 1980s suggest a biomass off western Tasmania of at least 80 000 t. Total landings peaked at 463 t in 2006–07 (Figure 7.4). Total reported landings of jack mackerel in the west for 2010–11 was 27 kg. Effort in the west has decreased from a peak of 72 fishing days in 2006–07 to 3 fishing days in 2010–11.

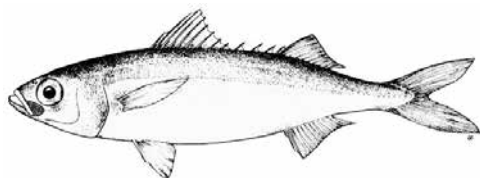
Stock status determination

Although there is no recent estimate of biomass for jack mackerel in the west, historical aerial surveys suggested a large biomass off western Tasmania in the 1980's. Catches since the late 1990s for this stock have been low, and are unlikely to have substantially reduced biomass. As a result, this stock is classified as **not overfished**. Removals in recent years have been very low, with 27 kg reported in 2010–11. As a result, jack mackerel (west) is classified as **not subject to overfishing**.

FIGURE 7.4 Commonwealth jack mackerel catch, 1992–93 to 2010–11



7.2.6 Redbait, east



Line drawing: FAO

Stock assessment

No DEPM survey was conducted for redbait (east) in 2010–11. The most recent DEPM surveys were conducted in 2005 and 2006 (Neira et al. 2008), giving estimates of spawning biomass of 86 990 t in 2005 and 50 782 t in 2006.

The average of the two biomass estimates (68 886 t) was used to set an RBC of 10 300 t (15 per cent of the average spawning biomass estimate), and the TAC for the east was set at 10 300 t. Total landings peaked in 2003–04 at 6667 t, which is approximately 10 per cent of the estimated spawning biomass. Total landings in 2010–11 were 13 t, which is 0.1 per cent of the RBC and 0.01 per cent of the spawning biomass estimate. Commonwealth landings constituted the total catch in the east. Fishing effort has decreased from a peak in 2003–04 of 118 fishing days to 2 fishing days in 2010–11.

Stock status determination

The peak harvest from this stock was around 10 per cent of the spawning biomass estimate based on the 2005 and 2006 DEPM surveys. An exploitation rate this low in any given year is unlikely to have substantially reduced biomass in the stock. As a result, redbait (east) is classified as **not overfished**.

The total landed catch in the east in 2010–11 was a small proportion of the estimate of spawning biomass and the RBC. As a result, redbait (east) is classified as **not subject to overfishing**.

7.2.7 Redbait, west

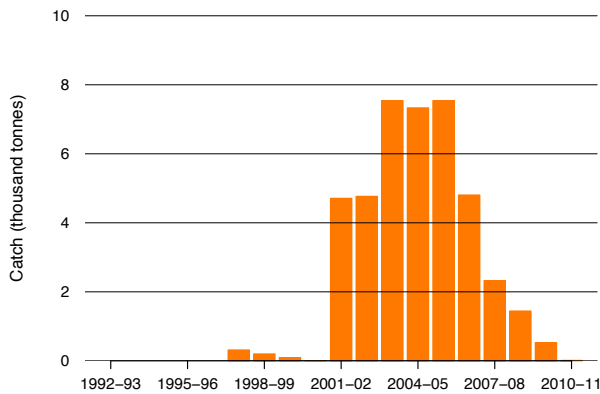
Stock assessment

No DEPM survey or estimate of spawning biomass has been undertaken for redbait in the west. The 2010–11 RBC in the west was set under Tier 2 harvest control rules at 5000 t, with a TAC of 5000 t. Total landings peaked in 2005–06 at 3430 t. There were no reported landings of redbait (west) in 2010–11, and all catch before this was taken by Commonwealth vessels (Figure 7.5). Fishing effort has decreased from a peak in 2005–06 of 82 fishing days to no fishing in 2010–11.

Stock status determination

Catch in recent years has been below the RBC and TAC; however, these limits are not derived as proportions of estimated spawning biomass. The impact of historical catches on the stock is unknown because of the lack of an assessment or data on the biomass. As a result, this stock is classified as **uncertain** with regard to the level of biomass. Landings have been low in recent years and there was no fishing effort for redbait west in 2010–11. As a result, redbait (west) is classified as **not subject to overfishing**.

FIGURE 7.5 Commonwealth redbait catch, 1992–93 to 2010–11



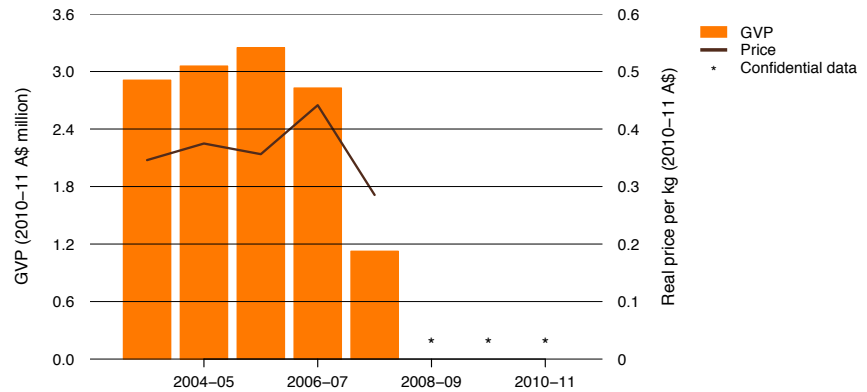
7.3 Economic status

7.3.1 Key economic trends

The gross value of production (GVP) in the SPF was \$1.16 million in 2007–08 (2010–11 dollars). For more recent years, the GVP is confidential, since only five or fewer vessels operated in the fishery (Figure 7.6). The GVP was 65 per cent lower in 2007–08 than in 2005–06 (\$3.35 million), as a result of a rapid decline in prices and production.

In 2007–08, management costs were high relative to GVP, at \$0.66 million (2010–11 dollars) or 57 per cent of GVP. This indicates that net economic returns (NER) were low, even before fishing costs are considered. Management costs have fallen since then, to \$0.38 million in 2010–11. The number of vessels and the level of catch have also fallen, indicating that NER are likely to be low or negative.

Seventy permits were available in 2010–11, but there were only five active vessels, and 98 per cent of the TAC remained uncaught. Similarly, 90 per cent of the TAC remained uncaught in 2009–10, and only 5 out of 71 permits were active. These high levels of latent effort confirm the likelihood of low NER, with fishers appearing to have little incentive to exercise their fishing rights. The closure of a major processing factory in December 2010 is likely to have contributed to reducing profit expectations in the fishery (Magnet 2010).

FIGURE 7.6 Real GVP for the SPF, 2003–04 to 2010–11

Note: GVP Gross value of production.

7.3.2 Management arrangements

There were 70 SPF fishing permits and 4 informally managed fishery fishing permits (which have now received allocations for SPF statutory fishing rights) in the 2010–11 fishing season. Only 18 boats were nominated to these permits.

7.3.3 Performance against economic objective

A biomass-based MEY target is not a suitable reference point for the SPF because of the high interannual variability in biomass levels and role of species in the ecosystem (AFMA 2009; Smith et al. 2011). The absence of a MEY target makes it difficult to determine how effectively the fishery's harvest strategy is promoting maximum NER to the Australian community.

Latent effort in the fishery seems to have primarily reflected low beach prices received, but also uncertainty about stock availability. If economic conditions and catch rates improve, this latent effort could be activated to generate NER. Incorporating economic parameters into the MSE (Giannini et al. 2010) could allow the fishery's harvest strategy to be further developed to be more consistent with the intent of the Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007).

7.4 Environmental status

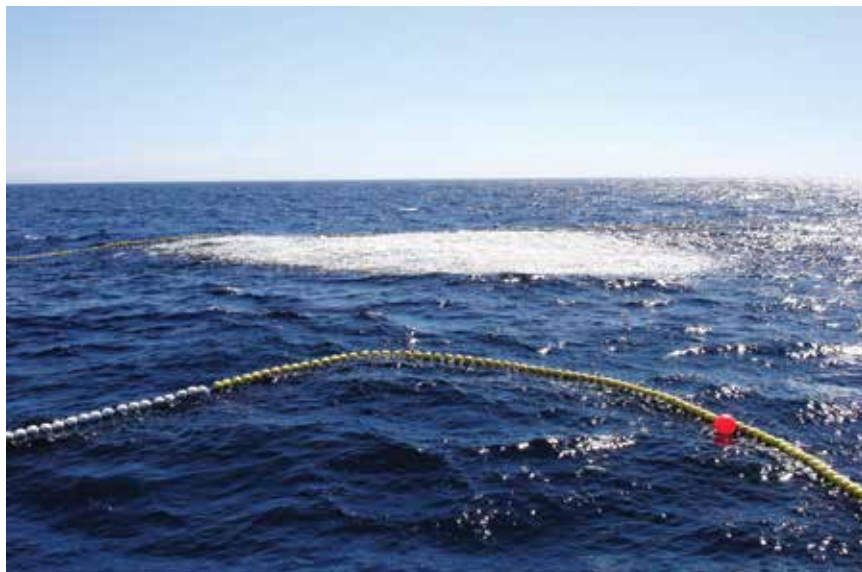
The management plan for the SPF was accredited under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* on 3 September 2012. A number of conditions were placed on the accreditation, particularly related to large scale midwater trawl operations. These primarily relate to the mitigation of interactions with protected species. Further details can be found on the website of the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Ecological risk assessments have been undertaken separately for midwater trawl and purse-seine fishing methods. For purse seine, 235 species were assessed at Level 2, and 108 of these species were assessed as high risk. Of these, 29 remained high risk after applying AFMA's residual risk guidelines (AFMA 2010). The ecological risk management plan identifies 3 seal species, and 26 whale and dolphin species at high risk and high priority within the SPF. For midwater trawl, 235 species were assessed at Level 2, with 26 species assessed at high risk. No finfish species were regarded as high risk in either purse-seine or midwater trawl operations.

Interactions with marine mammals (fur seals and cetaceans) are a key environmental concern for the midwater trawl fishery. A study commissioned by AFMA (January 2005 to February 2006) to quantify the nature and extent of interactions and to evaluate potential mitigation strategies found that fur seals entered the net in more than 50 per cent of midwater trawl operations during the study, with a observed mortality rate of 0.12 seals per shot using bottom-opening seal excluder devices (Lyle & Willcox 2008). In contrast, no dolphin interactions were recorded during the study. The study indicates that effective seal excluder devices are needed when this type of gear is used.

AFMA formed the Cetacean Mitigation Working Group in 2004 to help develop long-term management strategies to mitigate risks to cetaceans. The Commonwealth SPF Purse Seine Code of Practice requires fishers to avoid interactions with threatened, endangered and protected (TEP) species (where possible), implement mitigation measures (where necessary), release all TEP species captured alive and in good condition, and report all interactions with TEP species, both of which are now legislated.

AFMA publishes quarterly reports of logbook interactions with TEP species on its website. None were reported in the SPF during the 2011 season.



Purse-seine operators targeting mackerel
Mike Gerner AFMA

7.5 Literature cited

- AFMA (Australian Fisheries Management Authority) 2009, *Small Pelagic Fishery management plan 2009*, Federal Register of Legislative Instruments F2010L00081, AFMA, Canberra.
- 2010, *Residual Risk Assessment of the Level 2 ecological risk assessment species results report for the Small Pelagic Fishery, purse seine*, AFMA, Canberra.
- DAFF (Australian Government Department of Agriculture, Fisheries and Forestry) 2007, *Commonwealth Fisheries Harvest Strategy: policy and guidelines*, DAFF, Canberra.
- Giannini, F, Hobsbawn, PI, Begg, GA & Chambers, M 2010, *Management strategy evaluation (MSE) of the harvest strategy for the Small Pelagic Fishery*, FRDC project 2008/064, BRS & FRDC, Canberra.
- Kailola, PJ, Williams, MJ, Stewart, PC, Reichelt, RE, McNee, A & Grieve, C 1993, *Australian fisheries resources*, BRS & FRDC, Canberra.
- Lyle, JM & Willcox, ST 2008, *Dolphin and seal interactions with mid-water trawling in the Small Pelagic Fishery, including an assessment of bycatch mitigation strategies*, Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Hobart.
- Magnet, 2010, *We're gutted*, <<http://www.edenmagnet.com.au>>, 9 December 2010.
- Neira, FJ 2011, *Application of daily egg production to estimate biomass of jack mackerel, Trachurus declivis—a key fish species in the pelagic ecosystem of south-eastern Australia*, final report to the Winifred Violet Scott Charitable Trust, Fisheries, Aquaculture and Coasts Centre, Institute for Marine and Antarctic Studies, University of Tasmania.
- , Lyle, JM, Ewing, GP, Keane, JP & Tracey, SR 2008, *Evaluation of egg production as a method of estimating spawning biomass of redbait off the east coast of Tasmania*, final report, FRDC project 2004/039, Tasmanian Aquaculture and Fisheries Institute, Hobart.
- Smith, A, Brown, C, Bulman, C, Fulton, E, Johnson, P, Kaplan, I, Lozano-Montes, H, Mackinson, S, Marzloff, M, Shannon, L, Shin, Y & Tam, J 2011, 'Impacts of fishing low-trophic level species on marine ecosystems', *Science*, vol. 333, pp. 1147–50.
- Ward, TM & Rogers, PJ 2007, *Evaluating the application of egg-based stock assessment methods for blue mackerel, Scomber australasicus, in southern Australia*, final report to the FRDC, Canberra.
- , Lyle, J, Keane, JP, Begg, G, Hobsbawn, P, Ivey, AR, Sakabe, R & Steer, MA 2011, *Commonwealth Small Pelagic Fishery: status report 2010*, report to AFMA, Canberra.