Chapter 7
Small Pelagic Fishery

A Moore and M Stephan

FIGURE 7.1 Area fished in the Small Pelagic Fishery, 2012–13
### TABLE 7.1 Status of the Small Pelagic Fishery

<table>
<thead>
<tr>
<th>Biological status</th>
<th>Fishing mortality</th>
<th>2012</th>
<th>2013</th>
<th>Fishing mortality</th>
<th>2012</th>
<th>2013</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian sardine (Sardinops sagax)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been below the RBC. Historical catches have been low relative to estimated biomass.</td>
<td></td>
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<tr>
<td>Blue mackerel, east (Scomber australasicus)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been below the RBC. Historical catches have been low relative to estimated biomass.</td>
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<tr>
<td>Blue mackerel, west (Scomber australasicus)</td>
<td></td>
<td></td>
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<td>Recent catches have been below the RBC. Historical catches have been low relative to estimated biomass.</td>
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<tr>
<td>Jack mackerel, east (Trachurus declivis)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been below the RBC. Recent catches have been low relative to estimated biomass.</td>
<td></td>
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</tr>
<tr>
<td>Jack mackerel, west (Trachurus declivis)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been below the RBC. Historical catches have been low relative to estimated biomass.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redbait, east (Emmelichthys nitidus)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been below the RBC. Historical catches have been low relative to estimated biomass.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redbait, west (Emmelichthys nitidus)</td>
<td></td>
<td></td>
<td></td>
<td>Recent catches have been low. No biomass estimate available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Economic status**: Estimates of NER are not available but 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

Area fished
The Small Pelagic Fishery (SPF) extends from southern Queensland to southern Western Australia (Figure 7.1).

Fishing methods and key species
Historically, purse seining was the primary fishing method, but this was replaced by midwater trawling between 2003 and 2008. The fishery has since reverted to being primarily a purse-seine fishery. The key species are Australian sardine (*Sardinops sagax*), blue mackerel (*Scomber australasicus*), jack mackerel (*Trachurus declivis*) and redbait (*Emmelichthys nitidus*).

In addition to the targeted species, a number of byproduct species are caught, including yellowtail scad (*Trachurus novaezelandiae*), skipjack tuna (*Katsuwonus pelamis*), silver trevally (*Pseudocaranx georgianus*) and barracouta (*Thyrsites atun*).

Management methods
All of the east and west pelagic stocks are multijurisdictional (state and Commonwealth). South Australia manages the western stock of Australian sardine, and the Commonwealth manages the eastern stock, under Offshore Constitutional Settlement arrangements.

The SPF harvest strategy uses a three-tier system, applied separately to the target stocks in the east and west; the chosen management tier depends on availability of information. This tier system is designed to allow greater levels of catch when there is better research information on stock status. Tier 1, with the highest level of information (from daily egg production method [DEPM] surveys), provides for the largest potential recommended biological catch (RBC). Tier 3, with relatively poor information, provides the smallest RBC.

Biomass that supports maximum economic yield (B_{MEY}) is difficult to estimate for small pelagic species because of the high interannual variability in biomass typical of these species. Because of the importance of these species as forage fish for larger fish and marine mammals, maximum exploitation rates of 20 to 25 per cent of current biomass are internationally recommended to ensure that a high proportion of fish remain in the ecosystem (Pikitch et al. 2012; Smith et al. 2011). As a result, the SPF Tier 1 harvest control rules use a maximum exploitation rate of 20 per cent of estimated spawning biomass from a recent DEPM survey as the basis for setting RBCs, which is more conservative than the internationally recommended 20 to 25 per cent of current biomass. If further DEPM surveys are not conducted, the RBC is reduced from 20 to 10 per cent over a period of five years from the year the spawning biomass estimate was last determined using the DEPM surveys. This reduction is to account for increasing uncertainty in stock status since the last survey. Testing through management strategy evaluation has indicated that this approach to setting harvest levels under Tier 1 is robust for SPF stocks, with most scenarios maintaining 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 are also usually considered to be underestimates, because the surveys collect eggs from limited parts of the known spawning area of the stock.
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If a further DEPM survey has not been conducted within five years of the last survey, the resource is managed under Tier 2 harvest control rules. Under Tier 2, maximum RBCs are based on approximately 7.5 per cent of the estimated spawning biomass. For Tier 3, the maximum RBC has been set at 500 t for each stock, reflecting a high level of uncertainty and precaution when information is lacking. Once the RBC has been derived, an allowance for current state catches is deducted before the total allowable catches (TACs) for Commonwealth fishers are set.

Some age and length data have been collected for small pelagic species caught in this fishery, but current low catches have resulted in low sample sizes, which are of limited use for updating assessments. For this reason, these data need to be interpreted carefully if they are to be used for stock status determination. The small pelagic species are caught by various state jurisdictions and, where data are available, total catch from these fisheries is considered when estimating total fishing mortality. However, not all sources of catch are quantified, and limited data availability or confidentiality make reporting total catches of some stocks difficult. The statistics provided in Table 7.2 are for the Commonwealth fishery.

Fishing effort

Fishing effort in most of the fishery remains very low, particularly in the Commonwealth component of the fishery. The majority of effort and catch occurs in the Australian sardine fishery, predominantly within the Victorian and New South Wales state fisheries.

Catch

Small pelagic species are generally caught during targeted fishing for a single species. They have historically been taken in significant volumes within both Commonwealth and adjacent state-managed jurisdictions. These species are also caught in small quantities in other Commonwealth and state-managed fisheries, mainly the trawl sectors of the Southern and Eastern Scalefish and Shark Fishery, the Eastern Tuna and Billfish Fishery, the Western Tuna and Billfish Fishery (where they are caught for bait), and the New South Wales Ocean Hauling Fishery. Catch across the fishery has decreased steadily since 2003–04, driven mainly by economical and logistical limitations, rather than any decline in resource abundance. Total catch in 2012–13 was 16 t.
### TABLE 7.2 Main features and statistics for the SPF

<table>
<thead>
<tr>
<th>Stock</th>
<th>2011–12 fishing season</th>
<th>2012–13 fishing season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TAC (t)</td>
<td>Catch (t)</td>
</tr>
<tr>
<td>Australian sardine</td>
<td>400</td>
<td>23</td>
</tr>
<tr>
<td>Blue mackerel, east</td>
<td>2 500</td>
<td>0</td>
</tr>
<tr>
<td>Blue mackerel, west</td>
<td>4 200</td>
<td>130</td>
</tr>
<tr>
<td>Jack mackerel, east</td>
<td>4 600</td>
<td>0</td>
</tr>
<tr>
<td>Jack mackerel, west</td>
<td>5 000</td>
<td>0</td>
</tr>
<tr>
<td>Redbait, east</td>
<td>8 600</td>
<td>0</td>
</tr>
<tr>
<td>Redbait, west</td>
<td>5 000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total fishery</strong></td>
<td><strong>30 300</strong></td>
<td><strong>153</strong></td>
</tr>
</tbody>
</table>

**Fishery-level statistics**

<table>
<thead>
<tr>
<th>Effort</th>
<th>Purse-seine: 135 search hours</th>
<th>Midwater trawl: 0 shots</th>
<th>Purse-seine: 65 search hours</th>
<th>Midwater trawl: 0 shots</th>
<th>Jig: 3 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active vessels</td>
<td>Purse-seine: 3</td>
<td>Midwater trawl: 0 shots</td>
<td>Purse-seine: 2</td>
<td>Midwater trawl: 0</td>
<td></td>
</tr>
<tr>
<td>Observer coverage</td>
<td>Purse-seine: 0 shots (0%)</td>
<td>Midwater trawl: 0 hours (0%)</td>
<td>Purse-seine: 4 shots (14%)</td>
<td>Midwater trawl: 0 hours (0%)</td>
<td></td>
</tr>
<tr>
<td>Fishing methods</td>
<td>Purse-seine, midwater trawl, jigging (no longer permitted)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary landing ports</td>
<td>Triabunna (Tasmania); Port Lincoln (South Australia); Eden, Iluka (New South Wales)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management methods</td>
<td>Input controls: limited entry, gear restrictions</td>
<td>Output controls: TACs, with ITQs implemented from 1 May 2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary markets</td>
<td>Domestic: fishmeal, bait and human consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management plan</td>
<td>Small Pelagic Fishery Management Plan 2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a Fishery statistics are provided by fishing season, unless otherwise indicated. Fishing season is 1 May to 30 April. Real-value statistics are by financial year. ABARES plan to use 2014–15 fishing season data in next year’s report.

Notes: ITQ Individual transferable quota. TAC Total allowable catch.
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7.2 Biological status

Australian sardine (*Sardinops sagax*)

Stock structure

Stock structure of Australian sardine in Australia is not well defined. Two studies have indicated genetic structuring through the range of sardines in Australia (Dixon et al. 1993). These studies sampled at different locations and provided different population structures. A weight-of-evidence approach was used by Izzo et al. (2012) to review all available information on population subdivision in sardines, which suggested the following stock divisions: 1) southern Queensland and northern New South Wales, 2) southern New South Wales, 3) east and west Tasmania and Victoria, 4) South Australia, 5) south-west Western Australia; and 6) west Western Australia. However, these boundaries are far from conclusive, and additional sampling and analysis are required to clearly discriminate biological stocks. Currently, Australian sardines are managed as separate stocks east and west of Bass Strait. The western stock is managed by South Australia. The east-coast stock is assessed as a single stock.

Catch history

Combined landed catch from Commonwealth and state fisheries (other than that taken in South Australia) peaked in 2008–09 at 4787 t. The total sardine catch decreased from 2148 t in 2011–12 to its lowest level since 2001–02 of 1097 t in 2012–13. Most sardine catch (99 per cent) on the east coast in 2012–13 was taken in New South Wales and Victorian waters, an increase from 63 per cent in 2003–04.
Commonwealth landings in the SPF decreased from 23 t in 2011–12 to 16 t in 2012–13 (Figure 7.2). Unlike the Commonwealth fishery, state catches are not constrained by catch limits. State catch has increased markedly since the early 2000s, contributing to the recent reductions of the Commonwealth TAC. If state catches continue to increase under current arrangements, total catches could exceed the RBC.

**FIGURE 7.2** Commonwealth Australian sardine catch and TAC in the SPF, 1992–93 to 2012–13

![Graph showing catch and TAC from 1992-93 to 2012-13](image)

Note: TAC Total allowable catch.

**Stock assessment**

No DEPM survey was conducted for the eastern stock of Australian sardine in 2012–13. The last DEPM survey was conducted in 2004 and estimated the spawning biomass for Australian sardine off eastern Australia to be 28 809 t (range 9161 to 58 673 t) (Ward & Rodgers 2007). At the time, the Small Pelagic Fishery Resource Assessment Group (SPFRAG) considered this to be an underestimate because the survey did not cover the entire spawning area, and revised the estimate to 40 000 t, based on the proportion of unsurveyed area. The RBC in 2012–13 was set using the Tier 2 harvest control rules (using 7.5 per cent of this 2004 biomass estimate), which resulted in an RBC of 3000 t (AFMA 2012). A substantial quantity of sardine is caught in state fisheries, and the Australian Fisheries Management Authority (AFMA) Commission set the Commonwealth TAC at 200 t for 2012–13 after expected state catch had been deducted.

The peak sardine catch (state plus Commonwealth) of 4787 t in 2008–09 was approximately 16 per cent of the spawning biomass estimated by the 2004 DEPM survey and 12 per cent of the revised estimate (40 000 t). The SPFRAG heard industry concerns in 2012 about the lack of availability of larger, commercial-sized sardines off southern New South Wales—industry suggested that this was linked to oceanographic conditions (AFMA 2013). Available length-frequency and age data appeared to show a decrease in larger fish sampled in 2012–13, although sample sizes were small. However, large sardines have since become available to the fishery again (AFMA 2014).
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Stock status determination
Peak catches of sardine in 2008–09 were only 16 per cent of the 2004 estimate of spawning biomass and 12 per cent of the revised estimate (40 000 t), and subsequent catches have been substantially below this level. Because of the age of the estimate of spawning biomass (~10 years), Commonwealth catch is currently constrained under the harvest strategy at or below 7.5 per cent of spawning biomass estimates. Based on the catch history as a proportion of spawning biomass, Australian sardine is classified as not overfished. As total catch in 2012–13 was below the RBC, the stock is classified as not subject to overfishing.

Blue mackerel, east (Scomber australasicus)

Stock structure
The stock structure of blue mackerel is unclear. Initial genetic analysis of samples from southern Queensland, Western Australia and New Zealand suggested population subdivision. Genetic differences were detected between Western Australia and Queensland, and between Western Australia and New Zealand, but not between Queensland and New Zealand (Schmarr et al. 2007, 2012). There have been no finer-scale analyses of blue mackerel to further delineate population subdivision. Blue mackerel within the SPF are assessed and managed as separate stocks east and west of Bass Strait, in the Eastern and Western sub-areas (Figure 7.1).

Catch history
The combined landed catch from Commonwealth and state fisheries for the period 1997–98 to 2006–07 ranged from 540 t to 1000 t per year. Since 2007–08, catches have been substantially lower. The total catch in the east for 2012–13 was 454 t. Most of the blue mackerel catch is taken in state fisheries; the Commonwealth catch was only 1.1 t in 2012–13, well below the TAC (Figure 7.3).

Stock assessment
The most recent DEPM survey for blue mackerel (east) was conducted in 2004 (Ward & Rogers 2007). This gave an estimated spawning biomass of 23 009 t (range 7565 to 116 395 t). However, the SPFRAG considered this to be an underestimate because the survey did not cover the entire spawning area, and revised the estimate to 40 000 t. The RBC for 2012–13 was set using Tier 2 harvest control rules (using 7.5 per cent of the 2004 spawning biomass estimate), which resulted in an RBC of 3000 t (AFMA 2012). After making allowance for state catches, the Commonwealth TAC for 2012–13 was set at 2600 t.
Total blue mackerel (east) landings (state and Commonwealth) peaked in 2002–03 at 1029 t, which is approximately 4 per cent of the spawning biomass estimated by the 2004 DEPM survey (23 000 t) and less than 1 per cent of the revised estimate (40 000 t). Total landings (state and Commonwealth) in 2012–13 were about 1 per cent of the spawning biomass estimate and 15 per cent of the RBC, with Commonwealth catches continuing to remain well below the TAC.

**FIGURE 7.3** Commonwealth eastern blue mackerel catch and TAC, 1992–93 to 2012–13

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch (t)</th>
<th>TAC (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992–93</td>
<td>0</td>
<td>6000</td>
</tr>
<tr>
<td>1996–97</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>2000–01</td>
<td>0</td>
<td>4000</td>
</tr>
<tr>
<td>2004–05</td>
<td>0</td>
<td>3000</td>
</tr>
<tr>
<td>2008–09</td>
<td>0</td>
<td>2000</td>
</tr>
<tr>
<td>2012–13</td>
<td>0</td>
<td>1000</td>
</tr>
</tbody>
</table>

Note: TAC Total allowable catch.

**Stock status determination**

The peak harvest from this stock was less than 1 per cent of the 2004 spawning biomass estimate. This low exploitation rate is highly unlikely to have reduced spawning biomass. As a result, blue mackerel (east) is classified as **not overfished**. As total catch in 2012–13 was below the RBC, blue mackerel (east) is classified as **not subject to overfishing**.

**Blue mackerel, west (Scomber australasicus)**

**Stock structure**

See blue mackerel (east).

**Catch history**

Very little blue mackerel (west) was caught before 2004–05. Total Commonwealth landed catches increased substantially in 2005–06, peaking in 2008–09 at 1977 t and decreasing steadily thereafter. Total landings (state and Commonwealth) in 2012–13 were less than 4 t, well below the TAC (Figure 7.4).
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FIGURE 7.4 Commonwealth western blue mackerel catch and TAC, 1992–93 to 2012–13

Note: TAC Total allowable catch.

**Stock assessment**

No DEPM survey was conducted for blue mackerel (west) in 2012–13. The last DEPM survey, conducted in 2005 (Ward & Rogers 2007), gave an estimated spawning biomass of 56 228 t (range 10 993 to 293 456 t). The RBC in 2012–13 was set using Tier 2 harvest control rules (using 7.5 per cent of the 2005 spawning biomass estimate), which resulted in an RBC of 6500 t (AFMA 2012). The Commonwealth TAC for 2012–13 was set at 6500 t for the 2012–13 season.

Total landings peaked in 2008–09 at 1977 t; this is approximately 3 per cent of the spawning biomass estimated by the 2005 DEPM survey. Available age and length-frequency data show no trends of concern, although sampling levels remain low.

**Stock status determination**

The peak harvest from this stock was approximately 3 per cent of the 2005 spawning biomass estimate. This low exploitation rate is highly unlikely to have reduced the stock biomass. As a result, blue mackerel (west) is classified as **not overfished**. As there was almost no landed catch in 2012–13, blue mackerel (west) is classified as **not subject to overfishing**.
Jack mackerel, east (*Trachurus declivis*)

**Stock structure**

The stock structure of jack mackerel is unclear. A study by Richardson (1982) found evidence of population subdivision between Western Australia and New South Wales, and structuring throughout the range—this latter finding warrants further investigation. Results from Smolenski et al. (1994) and Bulman et al. (2008) also provided evidence for structuring. Jack mackerel within the SPF are assessed and managed as separate stocks east and west of Bass Strait, in the Eastern and Western sub-areas.

**Catch history**

The jack mackerel purse-seine fishery developed off Tasmania in the mid-1980s, with initial catches exceeding 40,000 t. Catches then declined substantially. Commonwealth catch increased to 9599 t in 1997–98, fluctuated markedly to 2003–04 and declined thereafter (Figure 7.5); this contributed to the cessation of purse-seine operations in 2000 (Kailola et al. 1993; Ward et al. 2011). Commonwealth catch of jack mackerel (east) in 2012–13 was less than 1 t (Figure 7.5).

**FIGURE 7.5** Commonwealth eastern jack mackerel catch and TAC, 1992–93 to 2012–13

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch (tonnes)</th>
<th>TAC (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992–93</td>
<td>2000</td>
<td>10000</td>
</tr>
<tr>
<td>1996–97</td>
<td>12000</td>
<td>10000</td>
</tr>
<tr>
<td>2000–01</td>
<td>8000</td>
<td>8000</td>
</tr>
<tr>
<td>2004–05</td>
<td>4000</td>
<td>6000</td>
</tr>
<tr>
<td>2008–09</td>
<td>2000</td>
<td>4000</td>
</tr>
<tr>
<td>2012–13</td>
<td>100</td>
<td>1000</td>
</tr>
</tbody>
</table>

Note: **TAC** Total allowable catch.
Stock assessment
The most recent DEPM-derived estimate of spawning biomass for jack mackerel in south-eastern Australia is 141,950 t (range 114,900 to 169,000 t) (Neira 2011, based on 2002 survey data). This estimate is consistent with jack mackerel biomass ranges estimated using ecosystem modelling (Fulton 2012). The RBC for the 2012–13 season was set using Tier 2 harvest control rules (using 7.5 per cent of the 2011 estimate), which resulted in an RBC of 10,600 t (AFMA 2012). This is predominantly a Commonwealth fishery; after deduction of expected state catches, the 2012–13 Commonwealth TAC was set at 10,100 t.

Length-frequency data for Trachurus spp. collected off eastern Tasmania (1984–85 to 2009–10) show a shift in modal size towards smaller and younger fish in 2009–10. Recent landings have been dominated by 2–3-year-old fish, whereas historical catches were dominated by 4–5-year-olds (Ward et al. 2011). Possible explanations for this shift in length composition include the removal of older, larger fish, good recruitment of young fish, or biased sampling as a result of the small number of samples in recent years.

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 estimated from the 2002 DEPM survey, with catches in most years being far lower than this. This low exploitation rate is unlikely to have reduced spawning biomass. As a result, jack mackerel (east) is classified as not overfished. As there was almost no landed catch in 2012–13, jack mackerel (east) is classified as not subject to overfishing.
Jack mackerel, west (*Trachurus declivis*)

**Stock structure**

See jack mackerel (east).

**Catch history**

Total landings for jack mackerel (west) did not exceed 300 t before 2005–06. Catch increased in 2005–06 to 338 t, and peaked in 2006–07 at 463 t. There has been very little catch since 2009–10. Commonwealth catch of jack mackerel (west) in 2012–13 was less than 1 t, well below the TAC (Figure 7.6).

**FIGURE 7.6** Commonwealth western jack mackerel catch and TAC, 1992–93 to 2012–13

Note: TAC Total allowable catch.

**Stock assessment**

No DEPM survey or estimate of spawning biomass has been conducted for jack mackerel (west). Aerial surveys in the 1970s suggested a biomass off western Tasmania of at least 80 000 t (Williams 1981). In line with the current harvest strategy, a Tier 2 approach was used to set an RBC of 5000 t in 2012–13 (AFMA 2012). The RBC has been set at this level since 2008–09. There were negligible state catches, and the 2012–13 Commonwealth TAC was set at 5000 t for the 2012–13 season.

The peak total catch in 2006–07 was less than 1 per cent of the 1981 biomass estimate and 9 per cent of the RBC.

**Stock status determination**

Historical aerial surveys suggested a large biomass off western Tasmania (Williams 1981), and catches in recent decades are unlikely to have substantially reduced this biomass. As a result, jack mackerel (west) is classified as **not overfished**. As removals in recent years have been low, with almost no catch reported in 2012–13, jack mackerel (west) is classified as **not subject to overfishing**.
Redbait, east (*Emmelichthys nitidus*)

**Stock structure**
There have been no studies on stock structure for redbait in Australia. Redbait within the SPF are assessed and managed as separate stocks east and west of Bass Strait, in the Eastern and Western sub-areas (Figure 7.1).

**Catch history**
The redbait fishery started in the early 1980s. Total catches were less than 2000 t per year between 1984–85 and 2000–01, but increased substantially in 2001–02 and subsequent years, peaking at 6667 t in 2003–04. Annual catches have decreased steadily since then with less than 1 t being landed in 2012–13, well below the TAC (Figure 7.7).

**FIGURE 7.7** Commonwealth eastern redbait catch and TAC, 1992–93 to 2012–13

Note: TAC Total allowable catch.
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Stock assessment
The most recent DEPM surveys for redbait (east) were conducted in 2005 and 2006 (Neira et al. 2008), providing estimates of spawning biomass of 86 990 t in 2005 and 50 782 t in 2006. The average of these two spawning biomass estimates (68 886 t) was used to set an RBC of 6900 t for 2012–13 (using 7.5 per cent of the spawning biomass estimate) (AFMA 2012). There are no state catches of this stock, and the Commonwealth TAC was set at 6900 t for the 2012–13 season. Peak total landings in 2003–04 were about 10 per cent of this estimated spawning biomass. Less than 1 t was landed in 2012–13.

Stock status determination
The peak harvest from this stock was around 10 per cent of the spawning biomass estimate, and catches in recent years have been well below this level. This low exploitation rate is unlikely to have substantially reduced spawning biomass in the stock. As a result, redbait (east) is classified as not overfished. As there was very little reported catch in 2012–13, redbait (east) is classified as not subject to overfishing.

Redbait, west (*Emmelichthys nitidus*)

Stock structure
See redbait (east).

Catch history
No catches of redbait (west) were reported before 2001–02. Catches increased from 1100 t in 2001–02 to a peak of 3430 t in 2005–06, and decreased steadily thereafter, with no catch in the past three years (Figure 7.8). Fishing effort has decreased from a peak of 82 fishing days in 2005–06 to zero in 2012–13.

**FIGURE 7.8** Commonwealth western redbait catch and TAC, 1992–93 to 2012–13

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch (t)</th>
<th>TAC (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992−93</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1996−97</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2000−01</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2004−05</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2008−09</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012−13</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: TAC Total allowable catch.
Stock assessment

No DEPM survey or estimate of biomass has been undertaken for redbait (west). The SPFRA (AFMA 2012) based the 2012–13 RBC recommendation on the Tier 2 fixed catch level schedule, which recommended a maximum RBC of 5000 t under the harvest strategy. There are no estimates of state catch, which is likely to be negligible, and the Commonwealth TAC was set at 5000 t for the 2012–13 season.

Stock status determination

Because no estimates of biomass are available, redbait (west) is classified as uncertain with regard to the level of biomass. Catch since 2009 has been below 150 t and well below the RBC and TAC, landings have been low in recent years, and there was no fishing effort for redbait (west) in 2012–13. As a result, redbait (west) is classified as not subject to overfishing.

7.3 Economic status

Key economic trends

The gross value of production (GVP) in the SPF was estimated to be $1.2 million in 2007–08 (2012–13 dollars). This was 65 per cent lower than in 2005–06 ($3.5 million), primarily as a result of a rapid decline in prices and production (Figure 7.9). The GVP has been confidential for the years since 2007–08 because only five or fewer vessels have operated in the fishery. However, it is likely that GVP has not improved, given progressive declines in production since 2007–08.

In 2007–08, attributed management costs were about 57 per cent of GVP. This indicates that net economic returns (NER) were likely to have been low in that year, even before fishing costs are considered. Management costs decreased by 5 per cent between 2011–12 and 2012–13 (from $0.33 million to $0.32 million). The number of vessels and the level of catch have also declined, indicating that NER are likely to be low or negative.

Of the combined small pelagic TACs available in 2011–12, 99 per cent remained uncaught, with only five active vessels. In 2012–13 there were only two active vessels, and 99.9 per cent of the TAC remained uncaught. These high levels of latent effort indicate low interest and probably low profitability in the sector, with fishers appearing to have little incentive to exercise their fishing rights; as a result, NER are likely to be low. The closure of a major processing factory in December 2010 contributed to reduced profit expectations in the fishery.

Quota holders applied to deploy a factory trawler, Abel Tasman (previously FV Margiris), into the fishery in 2012–13. However, the vessel was prevented from entering the fishery following amendments to environmental legislation to allow more time for examination of the environmental impacts of the proposed fishing operation (AMCS 2013; Burke 2013). An expert panel was convened under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) to consider the environmental impacts of the operation. The panel is expected to report in October 2014.
Management arrangements

In addition to TAC-based management, fishing permits are used to limit the number of vessels in the fishery. Seventy SPF fishing permits were issued for the 2012–13 fishing season.

Performance against economic objective

A meaningful biomass target to provide maximum economic yield is difficult to determine for the SPF because of the high interannual variability in biomass levels and the important role of the target species as forage fish in the ecosystem (Small Pelagic Fishery Management Plan 2009; Smith et al. 2011). The absence of an explicit economic target makes it difficult to determine how effectively the fishery’s harvest strategy is delivering maximum NER to the Australian community. However, it is clear from the low catches, high levels of latent effort and high levels of unfished TAC that this fishery is not optimising NER.

If economic conditions, processing facilities and catches improve, latent effort could be activated to generate increased NER. Incorporating economic parameters into the management strategy evaluation (Giannini et al. 2010) could provide improved information that would allow the fishery’s harvest strategy to be made more consistent with the Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007).

7.4 Environmental status

The management plan for the SPF was most recently accredited under part 13 of the EPBC Act on 28 November 2012. Two conditions were placed on the accreditation, relating to requirements for mitigation of interactions with protected species and the requirement for new midwater trawl vessels in the fishery to have observer coverage for the first 10 trips.
Ecological risk assessments have been undertaken separately for midwater trawl and purse-seine fishing methods used in this fishery. For purse-seine, 235 species were assessed at Level 2, and 108 of these were assessed as being at high risk (Daley et al. 2007). Of these, 29 remained at 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 as being at high risk within the SPF. For midwater trawl, 235 species were assessed at Level 2, and 26 of these were assessed as being at high risk (Daley et al. 2007). No finfish species were assessed as being at high risk from either purse-seine or midwater trawl operations.

Interactions with marine mammals are a key environmental concern for the midwater trawl fishery. A study commissioned by AFMA (January 2005 – 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. The observed mortality rate was 0.12 seals per shot, using bottom-opening seal excluder devices (Lyle & Willcox 2008). The study concluded that effective, upward-opening seal excluder devices are needed when this type of gear is used. No dolphin interactions were recorded during the study.

In response to these results, AFMA now requires all midwater trawlers to have an AFMA-approved Vessel Management Plan incorporating an AFMA-approved upward-opening seal excluder device before commencing fishing. The Commonwealth SPF Industry Purse-Seine Code of Practice (SPF Industry 2008) requires fishers to avoid interactions with threatened or otherwise protected species, where possible; implement mitigation measures, where necessary; release all captured threatened, endangered or protected (TEP) species alive and in good condition; and report all interactions with TEP species.

AFMA publishes quarterly reports of logbook interactions with TEP species on its website. One non-lethal petrel/shearwater interaction was reported in the SPF during 2012–13.

### 7.5 Literature cited


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