Chapter 6
Small Pelagic Fishery

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FIGURE 6.1 Area fished in the Small Pelagic Fishery, 2021–22 fishing season

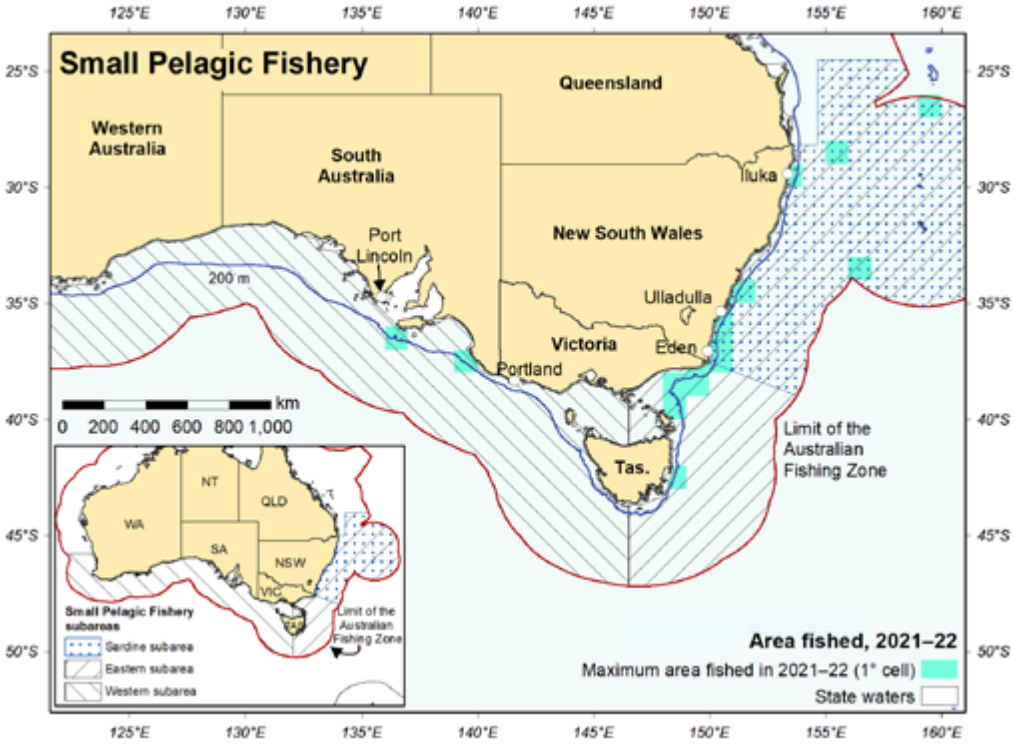


TABLE 6.1 Status of the Small Pelagic Fishery

Biological status					
Stock	2020		2021		Comments
	Fishing mortality	Biomass	Fishing mortality	Biomass	
Australian sardine (*Sardinops sagax*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Blue mackerel, east (*Scomber australasicus*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Blue mackerel, west (*Scomber australasicus*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Jack mackerel, east (*Trachurus declivis*)					Recent catches have been below the RBC. Recent historical catches have been low and are not likely to have reduced biomass below the LRP.
Jack mackerel, west (*Trachurus declivis*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Redbait, east (*Emmelichthys nitidus*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Redbait, west (*Emmelichthys nitidus*)					Recent catches have been below the RBC. Historical catches have been low and are not likely to have reduced biomass below the LRP.
Economic status					
Increasing TAC over the past decade, combined with lower TAC latency in recent years, indicates that the fishery is likely to be generating positive NER. ITQs and a tier-based approach to setting TACs appear appropriate.					

Notes: **ITQ** Individual transferable quota. **LRP** Limit reference point. **NER** Net economic returns. **RBC** Recommended biological catch. **TAC** Total allowable catch.

Fishing mortality	Not subject to overfishing	Subject to overfishing	Uncertain
Biomass	Not overfished	Overfished	Uncertain

6.1 Description of the fishery

Area fished, fishing methods and key species

The Small Pelagic Fishery (SPF) extends from southern Queensland to southern Western Australia (Figure 6.1). The fishery has 3 subareas (east, west and sardine), with separate total allowable catches (TACs) for each of the 7 stocks.

The fishery includes purse-seine and midwater trawl fishing vessels. The key target species in the east and west subareas are blue mackerel (*Scomber australasicus*), jack mackerel (*Trachurus declivis*) and redbait (*Emmelichthys nitidus*), which in recent years have mainly been taken by midwater trawling. Australian sardine (*Sardinops sagax*) is predominately taken by purse-seine vessels in the sardine subarea. In 2021–22, retained catch in the SPF for species other than those assessed in the chapter for status accounted for approximately 0.5% of the total catch. These species were yellowtail scad (*Trachurus novaezelandiae*) and maray (*Etrumeus teres*), both caught with purse-seine vessels.

Management methods

Most small pelagic stocks are multijurisdictional (that is, managed by both the Australian and state governments) under Offshore Constitutional Settlement arrangements. The exceptions are the south-western and southern stocks of Australian sardine, which are managed by Western Australia and South Australia. Since the sardine subarea (off eastern Australia) is the only area of the SPF where SPF vessels take Australian sardine, the sardine subarea is assessed and managed as a single management unit (AFMA 2022).

Stocks in the SPF are managed under a harvest strategy that has been revised several times in recent years. The review of the 2014 harvest strategy (AFMA 2014) included ecosystem and population modelling (Smith et al. 2015). Recommendations from the review were incorporated into the current harvest strategy (AFMA 2017b), which adopts a target reference point of 50% of the unfished biomass ($0.5B_0$) and a limit reference point of $0.2B_0$.

The harvest strategy has 3 tiers, with static exploitation rates for each tier and stock. Different tiers reflect the time since the estimate of spawning biomass was obtained using the daily egg production method (DEPM). Tier 1 allows for the highest exploitation rates (Table 6.2). A tier 1 recommended biological catch (RBC) can be set for a maximum of 5 years. If there is no updated survey, the harvest strategy steps down to tier 2. Tier 2 has reduced exploitation rates in acknowledgement of the increasing uncertainty about how well the DEPM-based biomass estimate reflects current biomass. Similarly, the harvest strategy steps down from tier 2 to tier 3 after a further 5 or 10 years (depending on the species), which further reduces the exploitation rate. There is no time limit for a species to remain at tier 3. Table 6.2 includes the most recent egg survey for each stock.

TABLE 6.2 SPF harvest strategy tier levels and DEPM-based estimates of spawning biomass used for setting the 2021–22 TAC

Stock	Tier 1		Tier 2		Tier 3	Year of egg survey
	Maximum exploitation rate (%)	Maximum time at rate (seasons)	Maximum exploitation rate (%)	Maximum time at rate (seasons)	Maximum exploitation rate (%)	
Australian sardine	20	5	10	5	5	2019
Blue mackerel, east	15	5	7.5	5	3.75	2019
Blue mackerel, west	15	5	7.5	5	3.75	2005
Jack mackerel, east	12	5	6	10	3	2019
Jack mackerel, west	12	5	6	10	3	2017
Redbait, east	10	5	5	10	2.5	2006 **a**
Redbait, west	10	5	5	10	2.5	2017

a Results from an egg survey in 2021 were used to set the TAC for 2022–23.

Notes: **DEPM** Daily egg production method. **TAC** Total allowable catch.

Biomass is difficult to estimate for small pelagic species that can exhibit high interannual variability and hyperstability in catch rates. The DEPM provides estimates of spawning biomass that can have large confidence intervals (CIs); however, recent studies show that these can be reduced over time as knowledge of the stock increases (Ward et al. 2021). In this chapter, spawning biomass estimates are generally presented with 95% CIs.

Fishing activity

Small pelagic fish are generally caught during targeted fishing for a single species. They are also caught in small quantities in other Commonwealth- and state-managed fisheries, including the Southern and Eastern Scalefish and Shark Fishery, the Eastern Tuna and Billfish Fishery, the Western Tuna and Billfish Fishery, and the New South Wales Ocean Hauling Fishery.

Most historical fishing effort – that is, before 2015 – occurred off the east coast of Tasmania. Purse-seine effort peaked at 1,093 search-hours in 2005–06. Search effort declined to 45 hours in 2013–14, increasing to 401 search-hours in 2021–22 (Figure 6.2; Table 6.3). Trawl effort in the SPF increased in 2015–16 when a factory-freezer trawler operated. This vessel left the fishery in late 2016 (AFMA 2016), resulting in effort (number of shots) falling approximately 40%. A different midwater trawler entered the fishery in 2017 (AFMA 2017a), increasing effort levels between 2016–17 and 2018–19. Midwater trawl effort more than doubled to 451 shots in the 2019–20 fishing season and then increased again in 2020–21 (694 shots) (Figure 6.2). There were 400 midwater trawl shots in the 2021–22 fishing season (Figure 6.2; Table 6.3).

Catch in the SPF increased from around 6,000 t in 1984–85 to a peak of almost 42,000 t in 1986–87. Average catches of around 12,000 t per year were also taken in the early 1990s, comprising mostly redbait. Relatively low catches between 2010 and 2015 are likely to have reflected a lack of markets and fish availability near processing facilities, rather than low levels of overall abundance. The operation of a factory-freezer trawler in the 2014–15, 2015–16 and 2016–17 fishing seasons led to increased catches, reaching a peak of around 12,000 t in 2015–16 (Figure 6.2). After this trawler left the fishery during the 2016–17 season (AFMA 2016), total catch decreased. Catches increased when another midwater trawler operation began in the east subarea in 2016–17 and reached 19,392 t in 2021–22 (Figure 6.2), comprising mostly blue mackerel, jack mackerel and redbait.

FIGURE 6.2 Total catch and fishing effort for the SPF, 2001–02 season to 2021–22 season

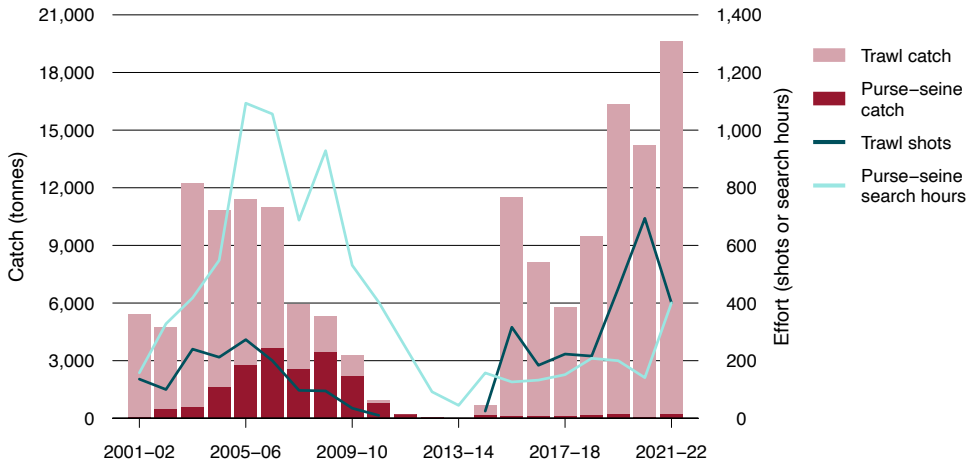


TABLE 6.3 Main features and statistics for the SPF

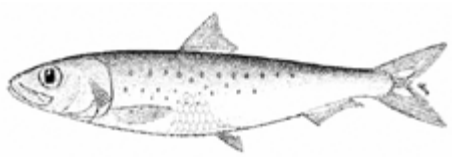
Fishery statistics a	2020–21 fishing season			2021–22 fishing season		
Stock	**TAC (t)**	**Catch (t)**	**GVP (2020–21)**	**TAC (t)**	**Catch (t)**	**GVP (2021–22)**
Australian sardine	9,190	86	Confidential	7,980	112	Confidential
Blue mackerel, east	11,970	6,215	Confidential	11,440	10,051	Confidential
Blue mackerel, west	3,240	0	Confidential	3,210	0	Confidential
Jack mackerel, east	18,580	5,454	Confidential	18,630	6,729	Confidential
Jack mackerel, west	4,170	0	Confidential	4,180	0	Confidential
Redbait, east	3,424	2,011	Confidential	3,440	1,890	Confidential
Redbait, west	6,640	0	Confidential	6,680	0	Confidential
Total	**57,214**	**13,766**	**Confidential**	**55,560**	**18,782**	**Confidential**
Other spp.	n/a	21	Confidential	n/a	96	Confidential
Total fishery	**n/a**	**13,787**	**Confidential**	**n/a**	**18,878**	**Confidential**
Fishery-level statistics						
Effort	Purse seine: 141 search-hours Midwater trawl: 694 shots			Purse seine: 401 search-hours Midwater trawl: 400 shots		
Fishing permits	33 entities held quota SFRs in 2020–21			33 entities held quota SFRs in 2021–22		
Active vessels	Purse seine: 3 Midwater trawl: 1			Purse seine: 4 Midwater trawl: 2		
Observer coverage	Purse seine: 2.5% Midwater trawl: e-monitoring 10%; onboard observers 7%			Purse seine: 2.68% Midwater trawl: e-monitoring 10%; onboard observers 3.7%		
Fishing methods	Purse seine, midwater trawl					
Primary landing ports	Eden, Ulladulla (New South Wales)					
Management methods	Input controls: limited entry, gear restrictions Output controls: TACs, with ITQs implemented from 1 May 2012					
Primary markets	Domestic: fishmeal, bait and human consumption International: human consumption					
Management plan	Small Pelagic Fishery Management Plan 2009					

a Fishery statistics are provided by fishing season, unless otherwise indicated. Fishing season is 1 May to 30 April. Value statistics are by financial year and are not available for 2021–22.

Notes: **GVP** Gross value of production. **ITQ** Individual transferable quota. **n/a** Not applicable. **SFR** Statutory fishing right. **TAC** Total allowable catch.

6.2 Biological status

Australian sardine (*Sardinops sagax*)



Line drawing: FAO

Stock structure

Several studies have found evidence of stock structuring of Australian sardine across southern Australia (Dixon, Worland & Chan 1993; Izzo, Gillanders & Ward 2012; Yardin et al. 1998); however, the boundaries were not conclusively defined. Izzo et al. (2017), using an integrated assessment that included genetic, morphological, otolith, growth, reproductive and fishery data, found evidence for at least 4 isolated stocks (south-west coast of Western Australia, Great Australian Bight and Spencer Gulf,

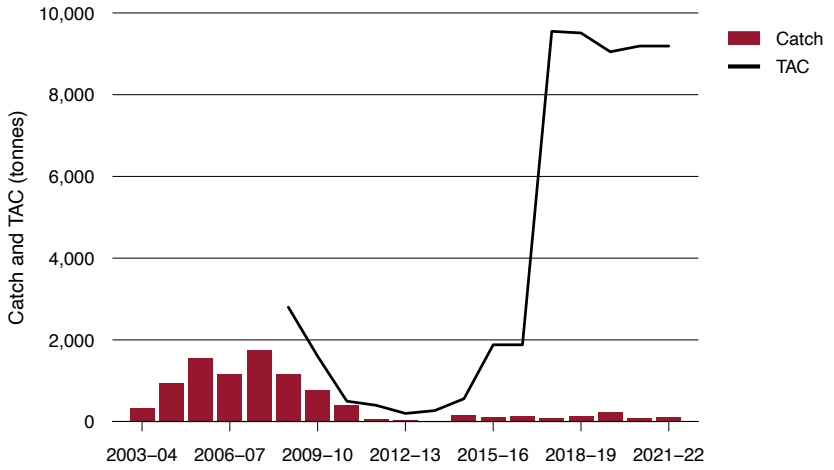
Bass Strait and Port Phillip Bay [off Victoria and Tasmania], and eastern Australia). Since the sardine subarea (off eastern Australia; Figure 6.1) is the only area of the SPF in which Australian sardine is fished by the Commonwealth, it is assessed and managed as a single east coast stock. A single stock in the sardine subarea is also assumed for status determination purposes.

Catch history

State catches of Australian sardine, principally in NSW waters, comprise most of the total catch of the stock. State catches are not constrained by catch limits.

Total sardine catch[1] in the sardine subarea peaked in 2007–08 at approximately 3,800 t, before declining to 16 t in 2013–14 – its lowest level since 2001–02. Since 2014–15, total catch has ranged between 442 t (2017–18) and 739 t (2019–20). The total sardine catch for 2021–22 was 525 t, comprising 112 t of Commonwealth catch and 413 t from New South Wales. Commonwealth sardine catch between 2003–04 and 2021–22 is reported in Figure 6.3.

FIGURE 6.3 Commonwealth Australian sardine catch and TAC in the SPF, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

A spawning biomass of 42,724 t (95% CI 15,487–69,962 t) was estimated using the DEPM from an egg survey in 2019 (AFMA 2020; Ward, Grammer & Ivey 2021).

The Small Pelagic Fishery Resource Assessment Group (SPFRAG) used the 2019 DEPM-based biomass estimate to recommend a 2021–22 RBC of 8,454 t, using the tier 1 exploitation rate (20%) from the 2017 harvest strategy (AFMA 2019). This was the first season that the tier 1 exploitation rate was used to set an RBC for Australian sardine. After factoring in state catches, the Australian Fisheries Management Authority (AFMA) Commission agreed to a TAC of 7,980 t.

Stock status determination

Recent catches have been below the RBC calculated using a management strategy evaluation (MSE)–tested harvest strategy and are a small proportion of the most recent estimate of biomass. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the Australian sardine stock is classified as **not overfished** and **not subject to overfishing**.

1 Total sardine catch comprises Commonwealth and New South Wales catch, except when New South Wales catch is confidential.

Blue mackerel, east (*Scomber australasicus*)

Line drawing: FAO

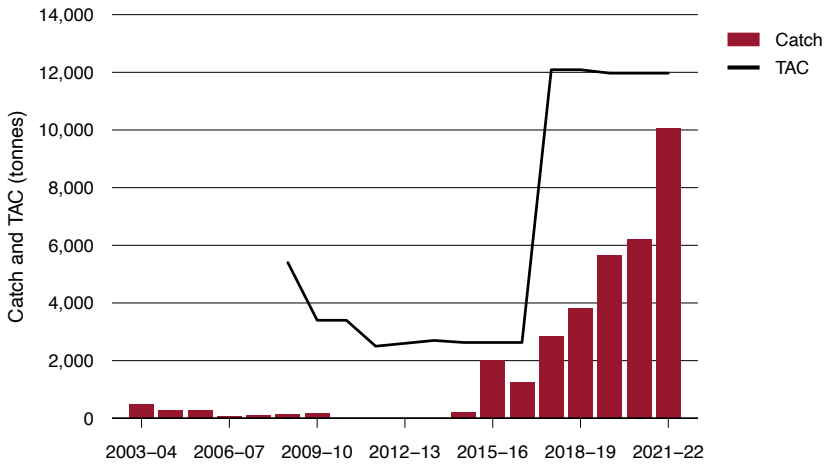
Stock structure

The stock structure of blue mackerel is uncertain. Genetic analysis of samples from southern Queensland, Western Australia and New Zealand indicates population subdivisions. 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. 2012). No finer-scale analyses of blue mackerel have been undertaken to further define stock structure. Blue mackerel within the SPF is assessed and managed as separate stocks in the eastern and western subareas (Figure 6.1). Two separate stocks (eastern and western) are assumed for status determination purposes.

Catch history

Most of the historical eastern blue mackerel catch was taken in state fisheries. However, Commonwealth catches have exceeded state catches since 2015–16. The total catch (state and Commonwealth, excluding Victorian catches, which were confidential) for 2020–21 was 6,668 t, comprising 6,215 t from the Commonwealth (Figure 6.4), 447 t from New South Wales, 4.5 t from South Australia and 1.5 t from Tasmania. In 2021–22, Commonwealth catch increased to 10,051 t (Figure 6.4) and New South Wales catch decreased to 134 t. Other state catches for the season are not yet available.

FIGURE 6.4 Commonwealth eastern blue mackerel catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

A spawning biomass of ~80,000 t (95% CI 33,320–143,209 t) was estimated using the DEPM from an egg survey in 2019 (AFMA 2020; Ward, Grammer & Ivey 2021).

The SPFRAG used the 2019 DEPM-based biomass estimate to recommend a 2021–22 RBC of 12,000 t, using the tier 1 exploitation rate (15%) from the 2017 harvest strategy (AFMA 2019). This was the first season that the tier 1 exploitation rate was used to set an RBC for eastern blue mackerel. After factoring in state catches, the AFMA Commission agreed to a TAC of 11,440 t.

Stock status determination

Recent catches have been below the RBC calculated using an MSE-tested harvest strategy and are a small proportion of the most recent estimate of biomass. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the eastern blue mackerel stock is classified as **not overfished** and **not subject to overfishing**.

Blue mackerel, west (*Scomber australasicus*)

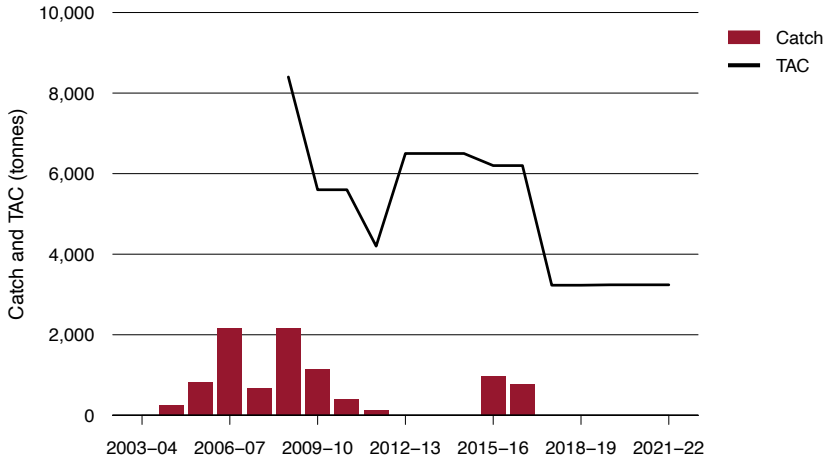
Stock structure

See 'Blue mackerel, east (*Scomber australasicus*)'.

Catch history

Very little western blue mackerel was caught before 2004–05. Total Commonwealth-landed catch was variable up to 2008–09 when it peaked at 2,164 t, decreasing steadily thereafter. Catch was negligible between 2011–12 and 2014–15 in both the Commonwealth and state fisheries. No Commonwealth catch was reported in 2017–18 or 2018–19. Commonwealth catch was 9 t in 2019–20, but no Commonwealth catch was reported in 2020–21 or 2021–22 (Figure 6.5). State catches have been either negligible or confidential in recent years.

FIGURE 6.5 Commonwealth western blue mackerel catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

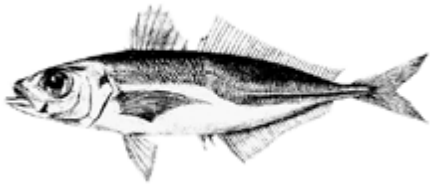
An egg survey for western blue mackerel was completed in 2005, and a spawning biomass of 56,228 t (95% CI 10,993–293,456 t) was estimated using the DEPM (Ward & Rogers 2007). However, the SPFRAG considered this to be too low (due to presence of eggs and larvae west of the survey area) and adjusted the estimate to 86,500 t (AFMA 2017c).

Tier 3 of the 2017 harvest strategy (an exploitation rate of 50% of tier 2) was used to recommend a 2021–22 RBC of 3,243 t. This was the fifth season that the tier 3 exploitation rate was used to set an RBC for western blue mackerel. After factoring in state catches, the AFMA Commission agreed to a TAC of 3,210 t.

Stock status determination

Recent catches have been below the RBC calculated using an MSE-tested harvest strategy and are a small proportion of the most recent estimate of biomass. Although the 2005 biomass estimate is dated, the level of fishing mortality in any year since is unlikely to have substantially reduced spawning biomass. On this basis, the western blue mackerel stock is classified as **not overfished** and **not subject to overfishing**.

Jack mackerel, east (*Trachurus declivis*)



Line drawing: FAO

Stock structure

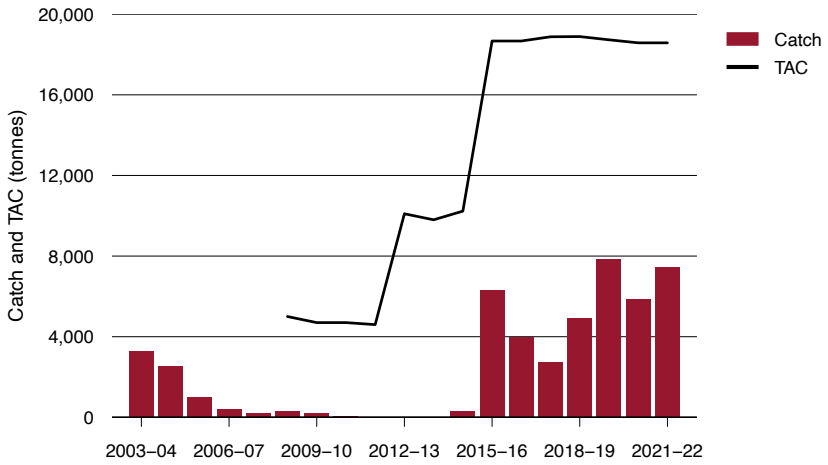
The stock structure of jack mackerel is unclear. Richardson (1982) found evidence of population subdivision between Western Australia, including the Great Australia Bight, and eastern Australia. However, DEPM surveys suggest that jack mackerel spawns throughout Bass Strait and that separation of eastern and western stocks may occur around the Bonney Coast (AFMA 2017c). Richardson (1982) also found evidence of multiple populations in a single sample among east coast samples, suggesting some additional structuring. Smolenski, Ovenden & White (1994) also found evidence of structuring between New South Wales and south-eastern Tasmania, although the differences were not temporally consistent. These studies suggest that further investigation of stock structure in jack mackerel is warranted. Currently, jack mackerel in the SPF is assessed and managed as separate stocks in the eastern and western subareas (Figure 6.1). Two separate stocks (eastern and western) are assumed for status determination purposes.

Catch history

The jack mackerel purse-seine fishery was established off Tasmania in the mid-1980s, with initial catches exceeding 40,000 t (Kailola et al. 1993). Catches then declined due to an absence of surface schools, and purse-seine vessels ceased operating in 2000 (Grammer, Ward & Durante 2022).

Commonwealth catch increased to 9,873 t in 1997–98, fluctuated markedly to 2003–04 and then declined as a result of decreasing effort in the fishery. Commonwealth catch has fluctuated in recent years, reaching 6,316 t in 2015–16, decreasing to 4,942 in 2018–19 and increasing again to 7,808 t in 2019–20 (Figure 6.6). State catches have been negligible in recent years. Commonwealth catch for 2021–22 was 6,729 t (Figure 6.6); New South Wales catch was 2.8 t. Other state catches are not yet available or are confidential.

FIGURE 6.6 Commonwealth eastern jack mackerel catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

A spawning biomass of 156,292 t (95% CI 49,120–263,496 t) was estimated using the DEPM from an egg survey in January and February 2019 (AFMA 2020; Ward et al. 2020).

The SPFRAG used the 2019 DEPM-based biomass estimate to recommend a 2021–22 RBC of 18,755 t, using the tier 1 exploitation rate (12%) from the 2017 harvest strategy (AFMA 2019). This was the second season that the tier 1 exploitation rate was used to set an RBC for eastern jack mackerel. After factoring in state catches, the AFMA Commission agreed to a TAC of 18,630 t.

Stock status determination

Recent catches have been below the RBC calculated using an MSE-tested harvest strategy. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the eastern jack mackerel stock is classified as **not overfished** and **not subject to overfishing**.

Jack mackerel, west (*Trachurus declivis*)

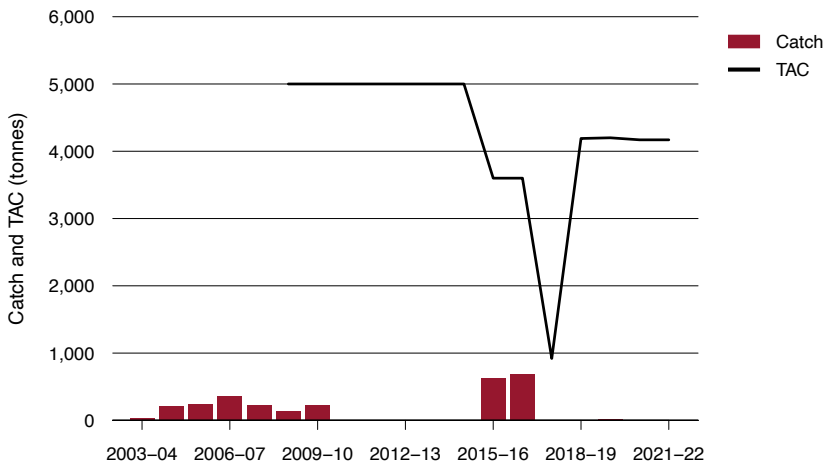
Stock structure

See 'Jack mackerel, east (*Trachurus declivis*)'.

Catch history

Total catch (Commonwealth and state) for western jack mackerel did not exceed 250 t before 2005–06. Commonwealth catch was zero or negligible from 2011–12 to 2014–15, increasing to 634 t in 2015–16 and 686 t in 2016–17. No Commonwealth catch was reported for 2017–18 or 2018–19 (Figure 6.7). Commonwealth catch was 12 t for 2019–20, and no Commonwealth catch was reported for 2020–21 or 2021–22. State catches are not available for 2021–22 and have been confidential for the preceding 5 years.

FIGURE 6.7 Commonwealth western jack mackerel catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

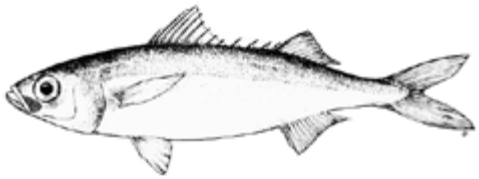
An egg survey for western jack mackerel between December 2016 and February 2017 was used to estimate biomass using the DEPM (Ward et al. 2018). Biomass was estimated in a core area and an extended area (in Bass Strait) based on opportunistic sampling. Because the extended area showed extensive spawning in Bass Strait, it was included in the biomass estimate, but with a caveat that this contribution was underestimated because the area was not extensively sampled. Biomass was estimated at 34,978 t (AFMA 2017c; Ward et al. 2018).

The SPFRAG recommended a 2021–22 RBC of 4,197 t, using the initial biomass estimate and the tier 1 exploitation rate from the 2017 harvest strategy (AFMA 2019). This was the fourth season that the tier 1 exploitation rate was used to set an RBC for western jack mackerel. After factoring in state catches, the AFMA Commission agreed to a TAC of 4,180 t.

Stock status determination

In years when catches have been taken, they have been below the RBC calculated using an MSE-tested harvest strategy and are a small proportion of the most recent estimate of biomass. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the western jack mackerel stock is classified as **not overfished** and **not subject to overfishing**.

Redbait, east (*Emmelichthys nitidus*)



Line drawing: FAO

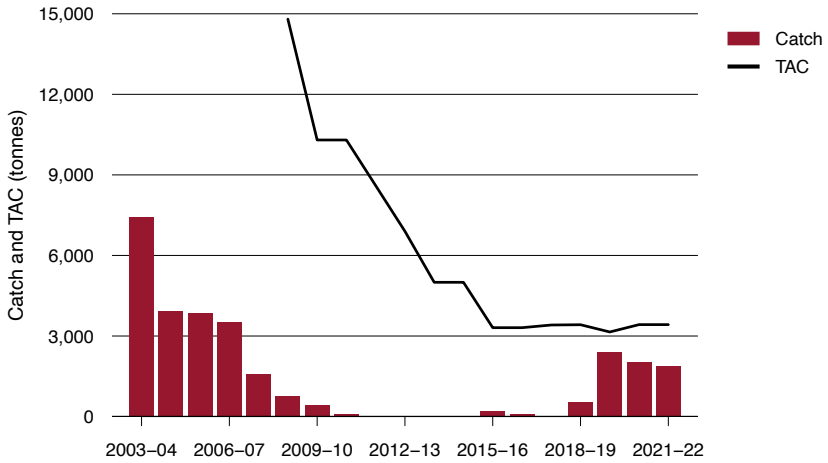
Stock structure

The stock structure of redbait in Australia has not been studied. Redbait within the SPF is assessed and managed as separate stocks in the eastern and western subareas (Figure 6.1). Two separate stocks (eastern and western) are assumed for status determination purposes.

Catch history

The redbait fishery started in the early 1980s. Total landings (Commonwealth and state) were less than 2,000 t per year between 1984–85 and 2000–01, but increased in 2001–02 and peaked at 7,450 t in 2003–04. Annual catches decreased steadily thereafter. Commonwealth catch for 2021–22 was 1,890 t, down from 2,011 t in 2020–21 (Figure 6.8). State catches have been negligible or confidential in recent years and are not available for 2021–22.

FIGURE 6.8 Commonwealth eastern redbait catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

Egg surveys for eastern redbait in 2005 and 2006 (Neira et al. 2008) provided spawning biomass estimates (using DEPM) of 86,990 t (coefficient of variation [CV] 0.37) and 50,782 t (CV 0.19), respectively. The average of these 2 estimates (68,886 t) was used to generate an RBC of 3,444 t for 2021–22, using the tier 2 decision rule (AFMA 2019). This was the 10th season that tier 2 was used to set an RBC for eastern red bait. After factoring in state catches, the AFMA Commission agreed to a TAC of 3,440 t. A new egg survey was completed in 2020, and a spawning biomass of ~54,000 t was

estimated using the DEPM (Grammer et al. 2022). The Small Pelagic Fishery Scientific Panel used the 2021 DEPM estimate to recommend an RBC for 2022–23.

Stock status determination

Recent catches have been below the RBC calculated using an MSE-tested harvest strategy and are a small proportion of the most recent estimate of biomass. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the eastern redbait stock is classified as **not overfished** and **not subject to overfishing**.

Redbait, west (*Emmelichthys nitidus*)

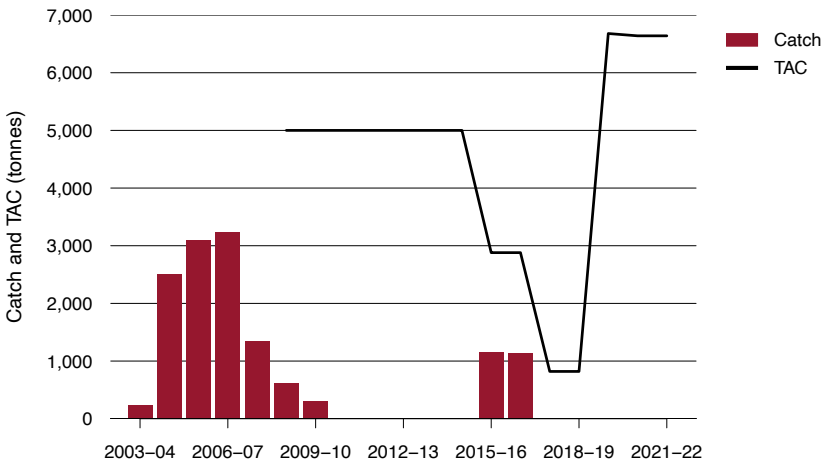
Stock structure

See 'Redbait, east (*Emmelichthys nitidus*)'.

Catch history

No catches of western redbait were reported before 2001–02. Commonwealth catches increased from 1,100 t in 2001–02 to a peak of 3,228 t in 2006–07, and decreased steadily thereafter, with no reported catch between 2010–11 and 2014–15. Commonwealth catches were taken again in 2015–16 (1,157 t) and 2016–17 (1,140 t), but no catch was reported in 2017–18 or 2018–19 (Figure 6.9). Commonwealth catch was 9 t in 2019–20. No Commonwealth catch was reported for 2020–21 or 2021–22. No state catches have been reported in recent years.

FIGURE 6.9 Commonwealth western redbait catch and TAC, 2003–04 season to 2021–22 season



Note: **TAC** Total allowable catch.

Stock assessment

An egg survey for western red bait was completed in 2017, and a spawning biomass of 66,787 t (95% CI 28,797–190,392 t) was estimated using the DEPM (Ward et al. 2019). The SPFRAG, using the tier 1 exploitation rate (10%) from the 2017 harvest strategy (AFMA 2019), recommended a 2021–22 RBC of 6,678 t. This was the third season that the tier 1 exploitation rate was used to set an RBC for western red bait. After factoring in state catches, the AFMA Commission agreed to a TAC of 6,680 t.

Stock status determination

Recent catches have been below the RBC calculated using an MSE-tested harvest strategy. This level of fishing mortality is unlikely to have substantially reduced spawning biomass. On this basis, the western red bait stock is classified as **not overfished** and **not subject to overfishing**.

6.3 Economic status

Key economic trends

Due to the low number of operators, recent gross value of production for the fishery is confidential; the most recent available estimate is $1.5 million (2021–22 dollars) for 2007–08. Midwater trawl vessels take most of the total catch in the SPF, with the majority being the relatively low-value jack mackerel and blue mackerel species. Since 2014–15 (when a factory-freezer trawler entered the fishery, subsequently leaving during the 2016–17 season), higher effort has corresponded with higher total catch, suggesting that operators expect more profitable conditions. The percentage of total uncaught TAC across all stocks remains high (averaging 81% since 2014–15) but has decreased in recent years.

Performance against economic objective

Estimates of net economic returns for the SPF are not available, and other indicators to assess the economic performance of the fishery are limited. TAC for the fishery has increased over the past decade, offering opportunities to fishers. This, combined with lower TAC latency in recent years, indicates that operators are expecting higher returns. With limited concerns around stock levels and the setting of TAC levels under individual transferable quota (ITQ) arrangements, the current tier-based approach for managing the fishery remains appropriate. If fishing effort does increase in the future, because of a change in market conditions, then ITQs and conservative management settings should provide an incentive for fishers to catch their share in the most efficient way, while ensuring a sustainable fishery.

6.4 Environmental status

EPBC Act approvals

The SPF was accredited under part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 26 June 2020. The SPF also has export approval under part 13A of the Act until 21 October 2023. Two conditions were placed on the export approval: that, before fishing, midwater trawl vessels have mitigation devices in place for dolphins, seals and seabirds; and that new midwater trawl vessels carry 1 observer for the first 10 trips, with additional observers or monitoring to be implemented after scientific assessment. Minimum levels for observer coverage in the SPF are 10% of days fished for purse-seine vessels and 20% of days fished for midwater trawl vessels (AFMA 2021).

Ecological risk assessments

Purse-seine subfishery

A scale, intensity, consequence analysis (SICA) for the purse-seine subfishery of the SPF in 2007 identified that one or more species within the target, byproduct and bycatch and threatened, endangered and protected (TEP) species categories may be at moderate or higher risk from the direct impact of fishing (Daley et al. 2007), requiring either direct management of identified risks or further risk assessment. Communities were also assessed in 2007. Results indicate this component may be at moderate or higher risk from the direct impact of fishing.

In 2007, a productivity susceptibility analysis (PSA) considered 5 target, 9 byproduct, 3 bycatch and 218 TEP species (Daley et al. 2007). Of these, 108 TEP species were categorised as at high risk from the level of fishing effort considered, with the remainder at medium (33 species) and low (94 species) risk. In 2010, a residual risk assessment of the high-risk species, which takes into account the mitigating effect of management measures, suggested that 29 marine mammal species may remain at high risk (AFMA 2010).

In 2009, a base sustainability assessment for fishing effects (SAFE) found that, of the 83 species assessed, no species had an estimated fishing mortality rate (F) either at or higher than the minimum F required to drive the stock below the maximum sustainable mortality level (F_{MSM}) (Zhou, Fuller & Smith 2009).

Midwater trawl subfishery

A SICA for the midwater trawl subfishery of the SPF in 2017 identified that no species were at moderate or higher risk from the direct impact of fishing (Bulman et al. 2017), meaning no further risk assessment was required. Habitats and communities were also assessed in 2017, all of which were found to be at low risk from the direct impact of fishing. No further risk assessments were undertaken for the subfishery.

Ecological risk management

In managing the ecological risks identified for its fisheries, AFMA implements ecological risk management (ERM) strategies for species identified as being at high risk. Fishery-specific ERM strategies can be found on the AFMA website.

Threatened, endangered and protected species interactions

In accordance with accreditation under the EPBC Act (see Chapter 1), AFMA publishes and reports quarterly on interactions with protected species on behalf of Commonwealth fishing operators to the Department of Climate Change, Energy, the Environment and Water (DCCEEW). During 2021, 62 interactions with protected species were reported in the SPF: 8 New Zealand fur seals (*Arctocephalus forsteri*; all dead); 9 Australian fur seas (*A. pusillus*; all dead); 15 unidentified seals (1 alive and 14 dead); 14 common dolphins (*Delphinus delphinus*; 1 alive and 13 dead); 3 unidentified dolphins (all dead); 1 unidentified petrel, prion or shearwater (alive); 1 unidentified albatross (alive); 4 shortfin mako (*Isurus oxyrinchus*; 2 alive, 1 dead and 1 released in an unknown condition); 1 longfin mako (*Isurus paucus*; dead); 1 grey nurse shark (*Carcharias taurus*; alive); 1 porbeagle (*Lamna nasus*; dead); and 4 unidentified manta rays (*Mobula* spp.; all dead).

These reported interactions with protected species form part of the ongoing monitoring by DCCEEW of the performance of fisheries within their accreditation under the EPBC Act.

Purse-seine net
Mike Gerner, AFMA

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