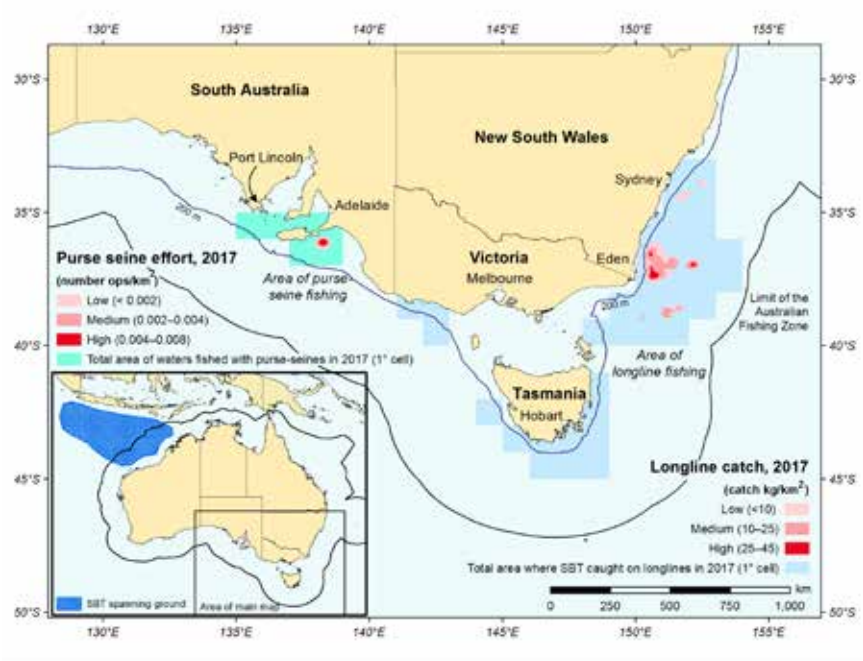
Chapter 23
Southern Bluefin Tuna Fishery

H Patterson, S Nicol and R Curtotti

FIGURE 23.1 Purse-seine effort and longline catch in the Southern Bluefin Tuna Fishery, 2017



Note: **SBT** Southern Bluefin Tuna.

TABLE 23.1 Status of the Southern Bluefin Tuna Fishery

Status	2016		2017		Comments a
Biological status	**Fishing mortality**	**Biomass**	**Fishing mortality**	**Biomass**	
Southern bluefin tuna (*Thunnus maccoyii*)					The estimate of spawning biomass is below 20% of unfished biomass. The global TAC, set in line with the management procedure, should allow rebuilding within the prescribed time frame.
Economic status	NER are expected to have remained positive, but deteriorating. The overfished status of the stock poses a risk to future NER. Economic status will improve as the stock is rebuilt under the management procedure.				

a The global assessment of southern bluefin tuna and the default limit reference point from the Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007) are used as the basis for status determination.
Notes: **NER** Net economic returns. **TAC** Total allowable catch.

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

Southern bluefin tuna
Trent Timmiss, AFMA

23.1 Description of the fishery

Area fished

The Southern Bluefin Tuna Fishery (SBTF) spans the Australian Fishing Zone. Southern bluefin tuna (*Thunnus maccoyii*) is targeted by fishing fleets from a number of nations, both on the high seas and within the Exclusive Economic Zones (EEZs) of Australia, New Zealand, Indonesia and South Africa. Young fish (1–4 years of age) move from the spawning ground in the north-east Indian Ocean into the Australian EEZ and southwards along the Western Australian coast (Figure 23.1). Surface-schooling juveniles are found seasonally in the continental-shelf region of southern Australia. Current evidence suggests that juveniles return to the Great Australian Bight in the austral summer, but there is some uncertainty about the proportion that returns (Basson et al. 2012). Most of the Australian catch is taken in the Great Australian Bight, with smaller amounts taken from the longline fisheries, mainly off south-eastern Australia.

Fishing methods

Since 1992, most of the Australian catch has been taken by purse seine, targeting juvenile southern bluefin tuna (2–5 years of age) in the Great Australian Bight. This catch is transferred to aquaculture farming operations off the coast of Port Lincoln in South Australia, where the fish are grown to a larger size to achieve higher market prices. Australian domestic longliners operating along the east coast catch some southern bluefin tuna, and recreational fishing for the species has increased in recent years. Throughout the rest of its range, southern bluefin tuna is targeted by pelagic longliners from other fishing nations.

Management methods

The Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007) is not prescribed for fisheries managed jointly under international management arrangements, such as the SBTF, which is managed under the 1994 Convention for the Conservation of Southern Bluefin Tuna. In 2011, the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) adopted a management procedure (the Bali Procedure), which is analogous to a harvest strategy, and this has been used to set the global total allowable catch (TAC) since 2012. The management procedure aims to achieve rebuilding of the southern bluefin tuna stock to 20 per cent of its initial unfished biomass (the interim rebuilding target) by 2035, with 70 per cent probability. The global TAC is allocated to members and cooperating non-members as agreed by the CCSBT under the 2011 CCSBT Resolution on the Allocation of the Global Total Allowable Catch. The Australian Fisheries Management Authority sets the TAC for the SBTF in accordance with Australia's allocation.

The CCSBT has noted that levels of unaccounted mortality may be substantial in the global fishery. A high level of unaccounted mortality may constitute exceptional circumstances because it was not taken into consideration when the management procedure was developed. The Commission has agreed to a definition of attributable mortality, and members have agreed to manage all sources of mortality within their national allocations. The Commission is also working to better account for non-member catch.

TABLE 23.2 Main features and statistics for the SBTF

Fishery statistics a	2015–16 fishing season			2016–17 fishing season		
Fishery/sector	**TAC (t)**	**Catch (t)**	**Real value (2015–16)**	**TAC (t)**	**Catch (t)**	**Real value (2016–17)**
Purse seine	5,703 **b**	4,900	$31.09 million	5,697 **c**	4,684	$31.40 million
Pelagic longline	**–**	733 **d**	$5.36 million	–	650	$7.17 million
Total fishery	**5,703**	**5,633**	**$36.45 million**	**5,697**	**5,334**	**$38.57 million**
Fishery-level statistics						
Effort **e**	Purse seine: 906 search-hours; 127 shots			Purse seine: 852 search-hours; 112 shots		
Fishing permits	89 SFR owners initially allocated			85 SFR owners initially allocated		
Active vessels	Purse seine: 6 Longline: 19			Purse seine: 6 Longline: 16		
Observer coverage **f**	Purse seine: 25 shots (18.9%) Longline: 8.7% in ETBF; 10.2% in WTBF			Purse seine: 20 shots (18.3%) Longline: 10.2% (of hooks) in ETBF; 11.7% (of hooks) in WTBF		
Fishing methods	Purse seine, pelagic longline (southern bluefin tuna is a byproduct in the longline fishery), minor line (troll and poling)					
Primary landing ports	Port Lincoln (South Australia)					
Management methods	Output controls: TAC, ITQs, area restrictions to control incidental catches in the longline fishery					
Primary markets	International: Japan—fresh, frozen					
Management plan	Southern Bluefin Tuna Fishery Management Plan 1995					

a Fishery statistics are provided by fishing season, unless otherwise indicated. Season is 1 December – 30 November. Real-value statistics are by financial year. **b** Australia carried forward ~38 t of undercatch to the 2015–16 TAC. **c** Australia carried forward ~32 t of undercatch to the 2016–17 TAC. The TAC set by the Australian Fisheries Management Authority Commission was 5,665 t. **d** Includes some minor-line catch. **e** Effort only for where southern bluefin tuna was caught. **f** Longline observer coverage is provided by calendar year, and includes hooks observed only by the electronic monitoring system.
Notes: **ETBF** Eastern Tuna and Billfish Fishery. **ITQ** Individual transferable quota. **SFR** Statutory fishing right. **TAC** Total allowable catch. **WTBF** Western Tuna and Billfish Fishery. – Not applicable.

Fishing effort

Most of the Australian catch and effort is by purse-seine vessels in the Great Australian Bight and waters off South Australia. The number of vessels in the purse-seine fishery has been fairly stable, ranging from five to eight since the 1994–95 fishing season. Since 2011, the catch has been taken more in the east of the Bight, closer to Port Lincoln, resulting in shorter towing distances to bring the fish to the aquaculture grow-out cages.

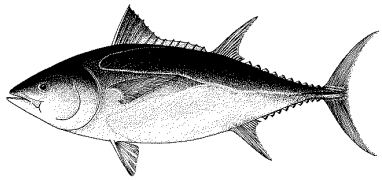
The number of longline vessels fishing for southern bluefin tuna off the east coast of Australia has been more variable over time. Effort in the longline sector is largely dependent on available quota.

Catch

The reported global catch of southern bluefin tuna has declined since the peak catches in the early 1960s, but has been fairly stable since the mid 2000s. The Australian catch and TAC were stable from 1990 to 2009 and were then reduced as part of a global reduction in catch. Since adoption of the management procedure, the global TAC has increased.

23.2 Biological status

Southern bluefin tuna (*Thunnus maccoyii*)



Line drawing: FAO

Stock structure

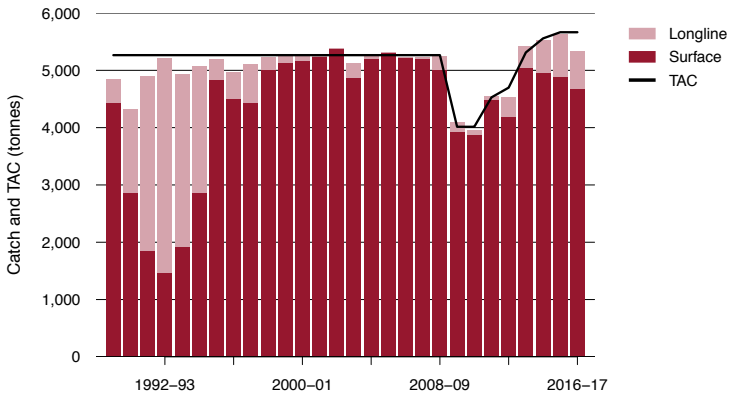
Southern bluefin tuna constitutes a single, highly migratory stock that spawns in the north-east Indian Ocean (off north-western Australia, south of Indonesia; Figure 23.1) and migrates throughout the temperate southern oceans.

Catch history

Troll catches of southern bluefin tuna off the east coast of Australia were reported as early as the 1920s, but significant commercial fishing for southern bluefin tuna commenced in the early 1950s with the establishment of a pole-and-live-bait fishery off New South Wales, South Australia and, later (1970), Western Australia. Purse-seine gear overtook pole as the main fishing method, and catches peaked at 21,500 t in 1982. Australia's catch of southern bluefin tuna was relatively stable from 1989 to 2009, when the global TAC and Australia's TAC were reduced because of the poor state of the biological stock (Figure 23.2). However, the TAC has been slowly increasing with the implementation of the management procedure in 2011. Reported global catch peaked in the early 1960s at more than 80,000 t before declining steadily until around 2007 (Figure 23.3).

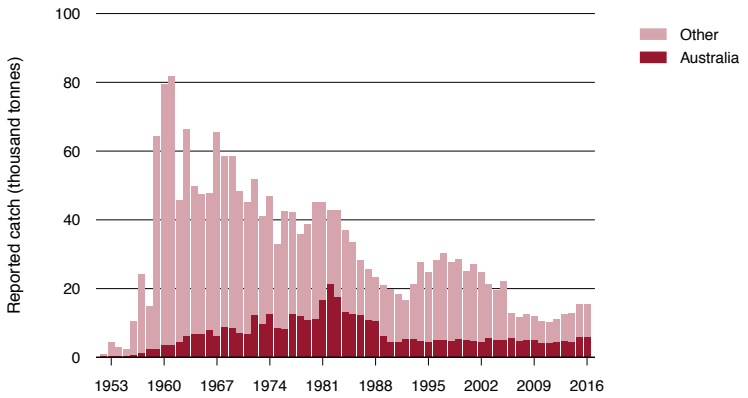
Recreational angling for southern bluefin tuna in Australia has been popular among game fishers for many years, and activity among the general recreational fishing sector has increased in recent years (for example, Rowsell et al. 2008). At present, the data available on the recreational catch of southern bluefin tuna are limited, and no total estimate of the national recreational catch is available. Several state surveys have taken place; however, the error associated with these surveys has been estimated to be as high as 47 per cent (Giri & Hall 2015). In 2015, a report on methods to estimate recreational catch of southern bluefin tuna was released (Moore et al. 2015). A national survey, based on this methodology, is planned to begin in December 2018.

FIGURE 23.2 Southern bluefin tuna catch and TAC (Australia), 1989–90 to 2016–17



Note: **TAC** Total allowable catch.
Source: Australian Fisheries Management Authority

FIGURE 23.3 Southern bluefin tuna catch (global), 1952–2016



Note: Total global catches exceeded reported global catches between 1995 and 2005; some scientists estimate that unreported catches surpassed 178,000 t during this period (Polacheck & Davies 2008).
Source: Commission for the Conservation of Southern Bluefin Tuna

Stock assessment

The management procedure specifies that a full quantitative stock assessment should be undertaken every three years. In 2017, a revised CCSBT operating model (the quantitative model that is used to assess the spawning biomass of southern bluefin tuna, based on a variety of data sources) was used to run various scenarios to determine the impact of fishing on the stock (CCSBT 2017). The updated assessment incorporated the new half-sibling pair data from the close-kin genetic study, as well as parent–offspring pair data, which add to the data included in the previous assessment (Bravington, Grewe & Davies 2014). The 2011 assessment reported the estimated biomass of southern bluefin tuna 10 years and older (B10+) as a proxy for spawning biomass, whereas the 2014 assessment provided a revised estimate of spawning biomass that includes younger fish. The 2017 assessment used a new estimation of total reproductive output instead of B10+, although B10+ is still provided for comparison because the interim rebuilding target is defined in terms of B10+.

The 2017 assessment examined a range of sensitivities, including scenarios for unaccounted catch mortalities. The CCSBT Extended Scientific Committee noted that it was constrained by the lack of information and data on sources of unaccounted mortalities, and so the 'added catch' sensitivity used in 2014 could be a plausible scenario. However, in contrast to the 2014 assessment, the unaccounted mortality scenarios did not reduce the probability of the stock recovering to 20 per cent by 2035 below the prescribed 70 per cent probability.

The reference set of operating models (or base case) for the assessment indicated that the spawning stock biomass remains below the interim target of 20 per cent of the unfished level. Spawning stock biomass (using the total reproductive output method) was estimated at 13 per cent of the initial unfished level (80 per cent confidence interval [CI] 11–17 per cent) and below the level needed to produce the maximum sustainable yield (MSY; CCSBT 2017). The spawning stock biomass of the B10+ group was estimated to be 11 per cent of unfished levels (80 per cent CI 9–13 per cent); the 2014 estimate was 7 per cent of unfished levels (CCSBT 2014). The ratio of current fishing mortality to the level associated with MSY (F_{MSY}) was 0.50 (range 0.38–0.66).

Stock status determination

The current mean estimate for spawning stock biomass of southern bluefin tuna is 13 per cent of unfished levels. As a result, the stock remains classified as **overfished**.

The global TAC that was set for 2017 was based on the management procedure's recommendation, which should result in a level of fishing mortality that facilitates rebuilding of the stock. The reference case for the updated assessment indicates reduced fishing mortality. There remains substantial uncertainty about the level of unaccounted catch mortality. However, unlike in the previous assessment, the unaccounted mortality scenarios did not reduce the probability of the stock recovering by the designated time of 2035. In addition, the outlook for the stock appears more positive, with signs of increased recruitment in recent years and projections indicating that the stock may reach the interim rebuilding target before 2035. Although caution is warranted, and increased recruitment does not indicate increased stock biomass, the outlook for the stock has improved since the 2014 assessment. Given the decrease in the fishing mortality level noted in the assessment and the fact that the unaccounted mortality scenarios do not impede the recovery probability, the stock is classified as **not subject to overfishing**. However, future assessments may change the outlook for the stock and will need to be monitored, as will future estimates of unaccounted mortality.

23.3 Economic status

Key economic trends

Assessment of economic performance in the wild-catch sector is complicated by the vertical integration of the wild-catch and aquaculture sectors. As noted above, most southern bluefin tuna caught are transferred to aquaculture farms off Port Lincoln. The beach price paid for live fish at the point of transfer to these farms cannot be determined, because operators are generally involved in both wild-catch and aquaculture operations. Therefore, beach prices in the fishery are estimated with reference to export unit values and costs incurred during the aquaculture phase.

In 2016–17, the gross value of production (GVP) for the SBTF—the combined value of the catch at the point of transfer to farming pens and catch sold direct into global markets—was estimated as $38.6 million (Figure 23.4). This is 6 per cent higher (in real terms, 2016–17 dollars) than the value of production estimated for 2015–16. Most of the growth in GVP came from an increase in catch sold direct, predominantly caught by the Commonwealth Eastern Tuna and Billfish Fishery fleet using longline methods, which grew by 33 per cent to reach $7.2 million. In 2016–17, export unit prices rose by 9 per cent, to $15.22 per kilogram. The rise in export unit value in 2016–17 followed three years of consecutive declines; the export unit value remained well below the average level of $22.09 (in real terms, 2016–17 dollars) achieved in 2012–13.

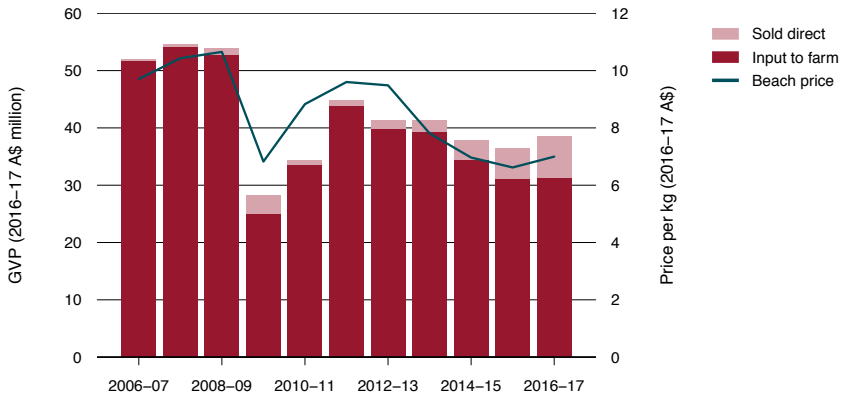
The estimated value of the SBTF catch declined substantially (by 48 per cent) in 2009–10, to $28 million, following a reduction in the estimated average unit beach price from $10.65 per kilogram in 2008–09 to $6.83 per kilogram in 2009–10 (in real terms, 2016–17 dollars), and a 19 per cent decline in the quantity of southern bluefin tuna caught in the fishery. Prices then recovered—the estimated average beach price was around $8.93 per kilogram from 2010–11 to 2013–14—and production quotas increased. Since 2013–14, prices have been lower, averaging $6.86 per kilogram for the three-year period 2014–15 to 2016–17, driving a fall in the average GVP during this period to $37.7 million, compared with $42.5 million for the previous three years.

Southern bluefin tuna school
Jarrad James, AFMA

The SBTF typically has very little quota latency within a fishing season, indicating that net economic returns (NER) are likely to be positive. However, in 2016–17, GVP increased, indicating that the NER of the fishery may have increased in 2016–17.

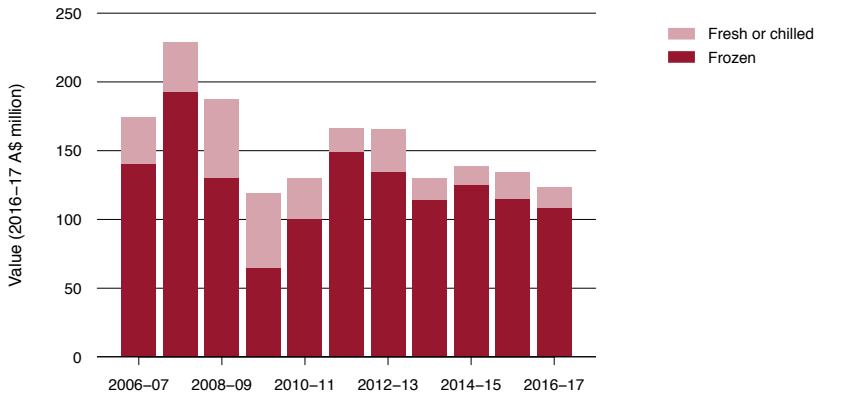
The value of farmed southern bluefin tuna exports in 2016–17 (after ranching) was $123 million, a decrease of $11 million from the value achieved in 2015–16 ($134 million). Most of the farmed southern bluefin tuna is exported, mainly to Japan. In 2016–17, export returns were lower (Figure 23.5), following a decline of 15 per cent, to 8,102 t, in volumes exported.

FIGURE 23.4 Real GVP of southern bluefin tuna production, 2006–07 to 2016–17



Note: **GVP** Gross value of production.

FIGURE 23.5 Real value of southern bluefin tuna exports, by processing method, 2006–07 to 2016–17



Management arrangements

The Australian TAC is allocated to holders of statutory fishing rights in the fishery through individual transferable quotas (ITQs). The ITQs give fishers flexibility to use input combinations that result in the most efficient operation. Theoretically, transferability of ITQs between fishers also allows the catch to be taken by the most efficient operators in the fishery, since quota is expected to gravitate to the most efficient operators. However, other factors are often considered by quota holders when deciding to lease or sell quota, sometimes resulting in quota not being allocated to the most efficient user. This may limit quota transaction activity between the purse-seine operators and longline operators in some years.

Performance against economic objective

The SBTF is a high-value fishery, and analysis of recent economic trends suggests that the fishery remains profitable. However, given the biological status of the southern bluefin tuna stock, it is likely that a proportion of historical profits have been generated by unsustainable global harvest levels. Furthermore, the low biomass level of the stock poses a risk to the future flow of NER from this fishery. Rebuilding of the southern bluefin tuna stock under the current management arrangements would be considered an improvement in the fishery's economic status. The management procedure is a significant step in the right direction. Because the procedure was only recently introduced, it is too early to assess its impact on economic performance.

23.4 Environmental status

The SBTF has approval for export until 13 December 2019. Conditions placed on the export approval include increasing confidence in the estimates of purse-seine catches, and that the management arrangements start accounting for Australia's attributable catch, including recreational and Indigenous catch, by 2018.

A level 3 ecological risk assessment (Sustainability Assessment for Fishing Effects) of 83 non-target species (6 chondrichthyans and 77 teleosts) to determine the impact of southern bluefin tuna fishing on these species assessed the risk as low (Zhou, Fuller & Smith 2009). The priority of the ecological risk management report is to respond to interactions with protected species (AFMA 2009).

No interactions with protected species were reported for the SBTF in 2017. Interactions with sharks and other protected species using longline gear are discussed in Chapters 21 and 24.

23.5 References

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