Chapter 12
Shark Gillnet and Shark Hook sectors

J Woodhams and R Curtotti

FIGURE 12.1 Fishing intensity in (a) the Shark Gillnet Sector and (b) the Shark Hook Sector of the Southern and Eastern Scalefish and Shark Fishery, 2020–21 fishing season

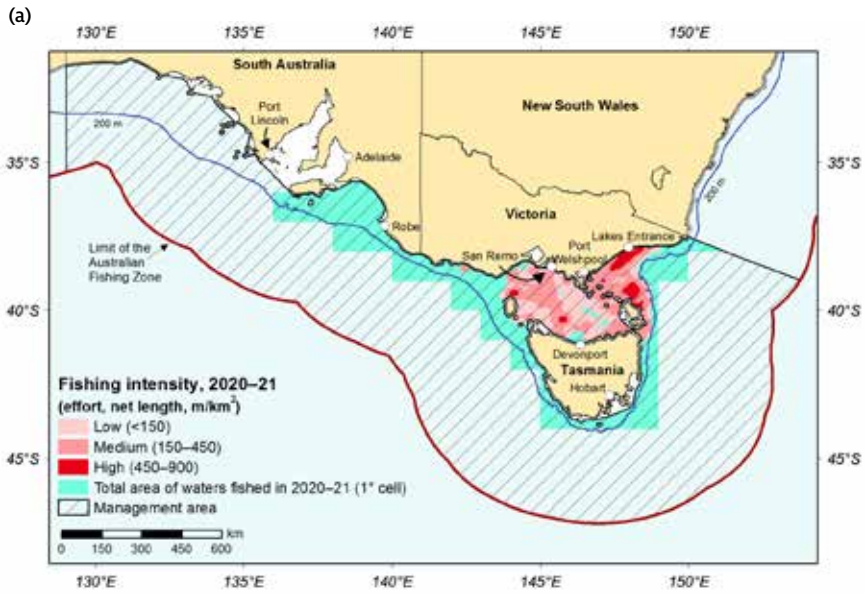
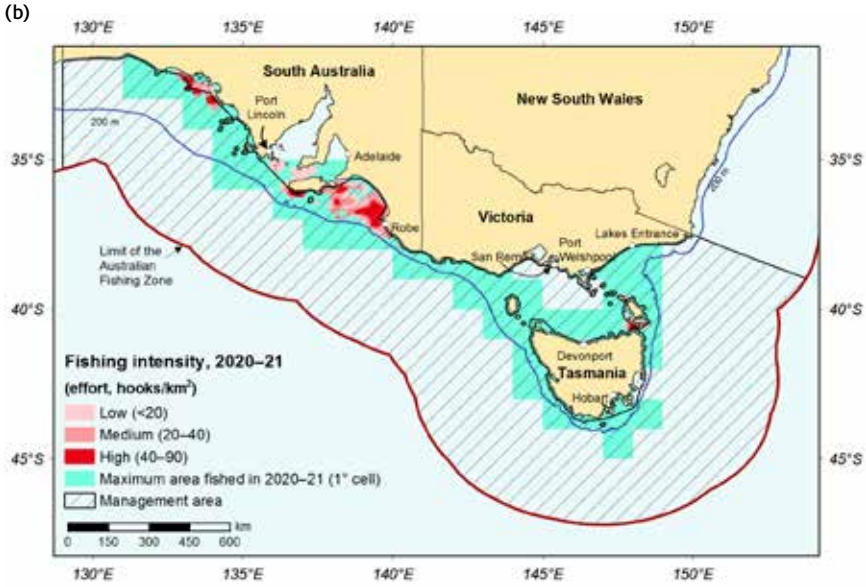
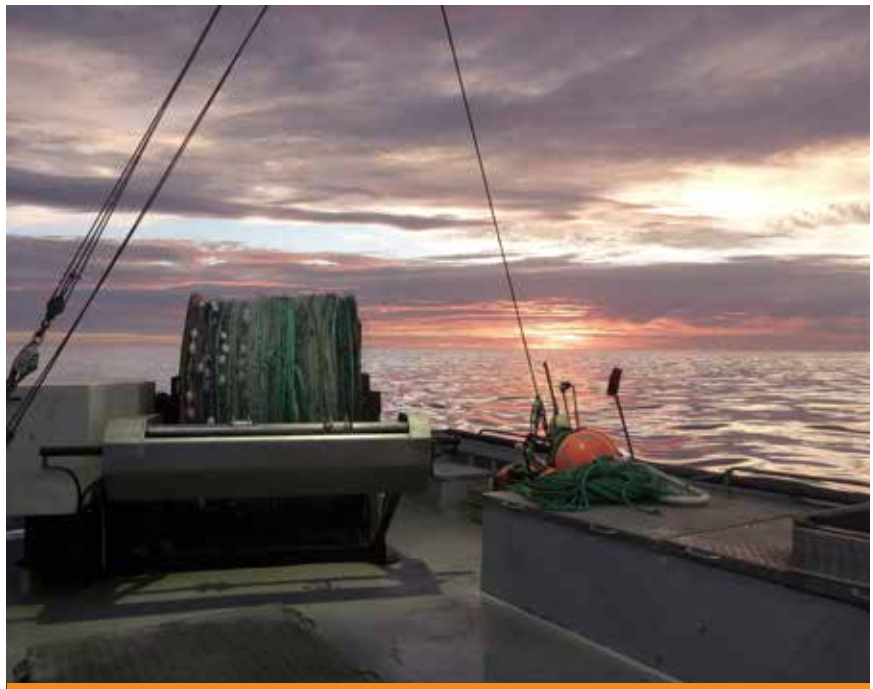


FIGURE 12.1 Fishing intensity in (a) the Shark Gillnet Sector and (b) the Shark Hook Sector of the Southern and Eastern Scalefish and Shark Fishery, 2020–21 fishing season continued

(b)





Gillnet boat at sunset
Mike Gerner, AFMA

TABLE 12.1 Status of the Shark Gillnet and Shark Hook sectors

Biological status					
Stock	2019		2020		Comments
	Fishing mortality	Biomass	Fishing mortality	Biomass	
Elephantfish (*Callorhinchus milii*)					Recent catches are unlikely to drive the stock into an overfished state. Stock is unlikely to be below the LRP.
Gummy shark (*Mustelus antarcticus*)					Recent catches are unlikely to drive the stock into an overfished state. Estimates of pup production are at, or above, the TRP.
Sawsharks (*Pristiophorus cirratus*, *P. nudipinnis*)					Recent catch is below the RBC. Recent catch-per-unit-effort is above the TRP.
School shark (*Galeorhinus galeus*)					Uncertain if fishing mortality in 2020–21 will allow recovery within the specified time frame. Biomass is likely to be below the LRP.
Economic status a					
Most recent estimates of NER for 2018–19 are positive and have been on an increasing trend since 2013–14. Gummy shark stock is close to or above B_{MEY} target. Biomass of school shark requires significant rebuilding. Individual transferable quotas have helped to facilitate improved productivity.					

a NER refer to the entire Gillnet, Hook and Trap Sector; therefore, this figure includes scalefish. Shark species account for around 65% of total Gillnet, Hook and Trap Sector gross value of production.
Notes: B_{MEY} Biomass at maximum economic yield. **LRP** Limit reference point. **NER** Net economic returns. **RBC** Recommended biological catch. **TRP** Target reference point.

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

12.1 Description of the fishery

Area fished, fishing methods and key species

The Shark Gillnet and Shark Hook sectors (SGSHS) are part of the Gillnet, Hook and Trap Sector (GHTS) of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Most fishing in the SGSHS using nets occurs in Bass Strait, while most fishing using hooks occurs off South Australia (Figure 12.1).

The SGSHS uses demersal gillnet and longline to target gummy shark (*Mustelus antarcticus*). Sawsharks (*Pristiophorus cirratus* and *P. nudipinnis*) and elephantfish (*Callorhinchus milii*) are caught as byproducts of fishing for gummy sharks. Other important byproduct species (by weight) are snapper (*Chrysophrys auratus*), whiskery shark (*Furgaleus macki*), broadnose sevengill shark (*Notorynchus cepedianus*), bronze whaler (*Carcharhinus brachyurus*), draughtboard shark (*Cephaloscyllium laticeps*) and blue morwong (*Nemadactylus valenciennesi*).

School shark (*Galeorhinus galeus*) was historically the primary target species in the fishery, but biomass was reduced below the limit reference point (LRP) around 1990. The Australian Fisheries Management Authority (AFMA) implemented a rebuilding strategy for school shark in 2008, and the stock was listed as conservation-dependent under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2009. Although overfished, school shark is still the second most economically important stock in the fishery. School shark has been subject to catch limits and other measures to reduce catch for some time. Recent measures include the implementation of a catch ratio of 20% school shark to gummy shark – whereby a quota holder must hold 5 times more gummy shark quota than their school shark catch (introduced for the 2011–12 season) – and the requirement that all live-caught school shark be released (introduced for the 2014–15 season).

Management methods

The fishery is managed using a combination of input controls (gear restrictions and closed areas) and output controls (individual transferable quotas and limits on the proportion of school shark to gummy shark catch). Gummy shark, elephantfish and sawsharks are managed under the SESSF harvest strategy framework (AFMA 2019), summarised in Chapter 8. School shark is managed under a rebuilding strategy and subject to an incidental catch limit, and other measures to reduce targeting and catches to support recovery. Spatial closures are implemented across the fishery to protect school shark breeding populations, pupping and nursery areas, and school and gummy shark habitat, and to promote the recovery of upper-slope dogfish stocks.

Gear and area closures have been implemented (primarily off South Australia) to reduce the risk of interactions with Australian sea lions (*Neophoca cinerea*) and dolphins. These have changed the fishing areas and targeting behaviour of fishers, and influenced the catch of target species. These and other key wildlife bycatch issues are discussed further in Chapter 8.

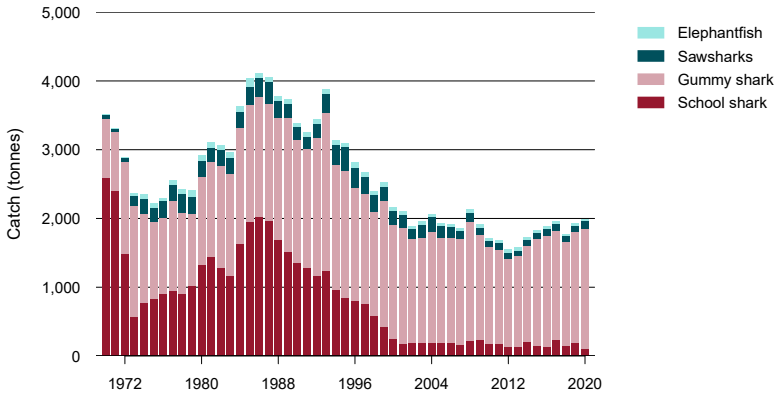
From 1 July 2015, electronic monitoring (e-monitoring) has been mandatory for all full-time vessels in the SGSHS. The management aim is to review at least 10% of all recorded hauls to verify the accuracy of logbooks. In addition, 100% of video footage is reviewed for gillnet boats operating off South Australia's Australian Sea Lion Management Zones to monitor interactions with protected species. The deployment of physical observers ceased with the commencement of e-monitoring. This meant that there was no longer an avenue to collect biological data to support stock assessments, and alternative arrangements had to be made. AFMA implemented an industry-coordinated data collection program in October 2018, to collect biological data needed to support stock assessments. AFMA is also investigating the use of e-monitoring to collect data previously collected by observers (for example, fish lengths). Physical observers were deployed again for a brief period between September 2017 and July 2018.

Fishing activity

Fishing for sharks in the waters off southern Australia began in the 1920s, using longlines. During the 1970s and 1980s, the sector mainly targeted school shark (Figure 12.2). Adoption of monofilament gillnets and concern about mercury content in large school sharks, coupled with declining school shark catches, resulted in gummy shark becoming the principal target species from around 1986 (Figures 12.2 and 12.3). This transition occurred in the early 1970s in Bass Strait, and later in the waters off South Australia and Tasmania. Additional information on catch and catch history is provided below for each of the key stocks.

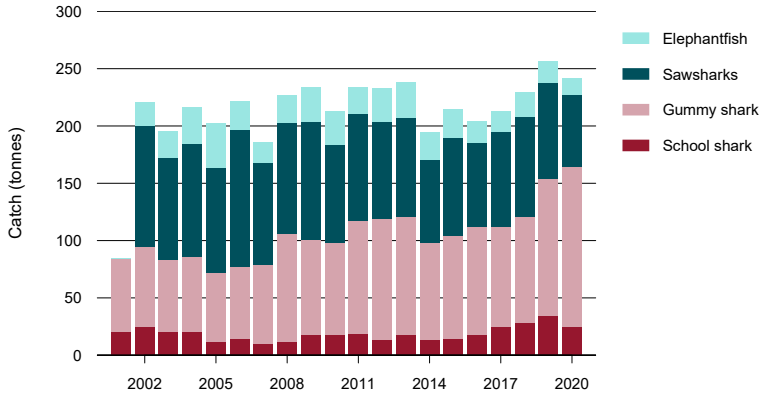
Before spatial closures, which have been progressively implemented since 2003, effort in the SGSHS was spread across the waters off South Australia and eastern Victoria. However, the spatial closures outlined above have resulted in gillnet effort being concentrated off Victoria more recently (Figure 12.1). Effort in the gillnet sector peaked in 1987 at 99,000 km of gillnet hauled but has decreased to around one-third of this level in recent years (27,782 km of gillnet hauled in 2020–21) (Figure 12.4). Hook effort increased from around 2 million hooks in the 2018–19 season to 2.9 million hooks in the 2019–20 season and 2.88 million hooks in the 2020–21 season.

FIGURE 12.2 Annual landings in the SGSHS, by species, 1970 to 2020



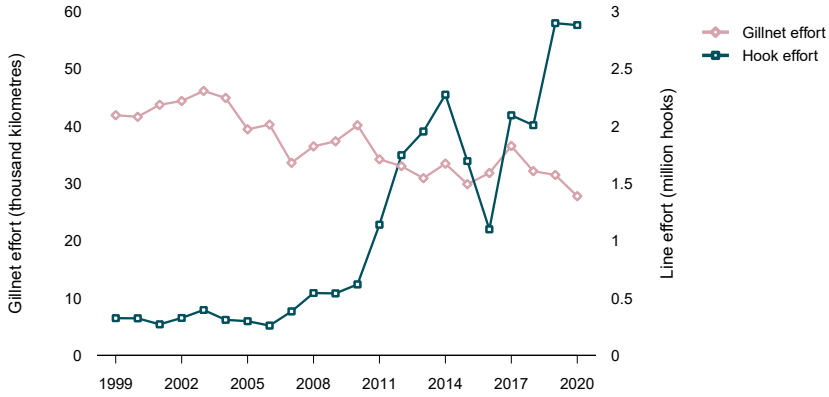
Note: **SGSHS** Shark Gillnet and Shark Hook sectors
Source: Multiple sources (1970 to 2015); AFMA catch disposal records (2016 to 2020)

FIGURE 12.3 Annual landings in the CTS, by species, 2001 to 2020



Note: **CTS** Commonwealth Trawl Sector.
Source: AFMA catch disposal records

FIGURE 12.4 Annual gillnet and hook effort, 1999 to 2020



Source: AFMA logbooks

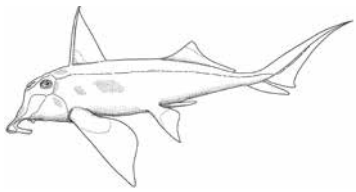
TABLE 12.2 Main features and statistics for the SGSHS

Fishery statistics a	2019–20 fishing season			2020–21 fishing season	
Stock	**TAC (t)**	**Catch (t) (GHTS, CTS + GABTS)**	**GVP (2019–20) (GHTS, CTS)**	**TAC (t)**	**Catch (t) (GHTS, CTS + GABTS)**
Elephantfish	114	47 (31, 16)	$0.06 million ($0.03 million, $0.03 million)	114	37 (26, 11)
Gummy shark	1,785	1,781 (1,590, 191)	$17.60 million ($16.48 million, $1.12 million)	1,775	1,874 (1,695, 179)
Sawsharks	430	189 (102, 86)	$0.48 million ($0.31 million, $0.17 million)	432	172 (94, 78)
School shark	189 b	184 (149, 35)	$1.53 million ($1.40 million, $0.13 million)	195 b	184 (155, 30)
Total	**2,518**	**2,201 (1,872, 328)**	**$19.67 million ($18.22 million, $1.45 million)**	**2,516**	**2,268 (1,970, 297)**
Fishery-level statistics					
Effort	Gillnet: 31,483 km of net hauled Hook: 2,898,759 hooks set			Gillnet: 27,782 km of net hauled Hook: 2,881,959 hooks set	
Fishing permits c	Gillnet: 61 Hook: 13			Gillnet: 61 Hook: 13	
Active vessels	Gillnet: 35 Hook: 37			Gillnet: 31 Hook: 38	
Observer coverage d	Gillnet: 10% Hook: 10%			Gillnet: 10% Hook: 10%	
Fishing methods	Demersal gillnet, demersal longline, dropline, mechanised handline, auto-longline				
Primary landing ports	Adelaide, Port Lincoln, Robe (South Australia); Devonport, Hobart (Tasmania); Lakes Entrance, San Remo, Port Welshpool (Victoria)				
Management methods	Input controls: gear restrictions, closed areas Output controls: ITQs, school shark / gummy shark catch ratio restriction, size limits, trip limits				
Primary markets	Domestic: Melbourne, Adelaide and Sydney – fresh and frozen				
Management plan	Southern and Eastern Scalefish and Shark Fishery Management Plan 2003				

a Fishery statistics are provided by fishing season, unless otherwise indicated. Undercatch and overcatch provisions are provided for in the harvest strategy for this fishery, and this mechanism explains catches in excess of the agreed TAC. Fishing season is 1 May to 30 April. Value statistics are by financial year and were not available for the 2020–21 financial year at the time of publication. Components of catch may not sum to totals due to rounding. **b** Incidental catch allowance. **c** In the GHTS, additional permit types limit gear use and access to state waters. **d** Numbers of hooks observed relate only to the Shark Hook Sector. Since 1 July 2015, e-monitoring has been mandatory for all full-time vessels in the SGSHS. Video footage of at least 10% of all recorded hauls is reviewed to verify the accuracy of logbooks. In addition, gillnet boats operating off South Australia's Australian Sea Lion Management Zones are subject to 100% review of video footage for interactions with protected species.
Notes: **CTS** Commonwealth Trawl Sector. **GABTS** Great Australian Bight Trawl Sector. **GHTS** Gillnet, Hook and Trap Sector. **GVP** Gross value of production. **ITQ** Individual transferable quota. **TAC** Total allowable catch (for the entire SESSF).

12.2 Biological status

Elephantfish (*Callorhinchus milii*)



Line drawing: Karina Hansen

Stock structure

Stock structure of elephantfish is not known, and populations are considered to constitute a single stock for management purposes.

Catch history

Elephantfish is a small component of landed catch of the 4 stocks assessed in this chapter. Catch of elephantfish in the SGSHS increased during the 1970s and peaked at almost 120 t in 1985 (for catch since 1997, see Figure 12.5a). Catch has since declined and has been relatively stable at around 40–60 t in recent seasons (Figure 12.5b). Combined catch (from catch disposal records – CDRs) from the GHTS, the Commonwealth Trawl Sector (CTS) and the Great Australian Bight Trawl Sector (GABTS) in 2020–21 was 37 t (Figure 12.5b; Table 12.2).

Discards of elephantfish reported in logbooks make up a significant component of the total reported catch. In 2020–21, reported discards were 20.6 t; they were 24.4 t in 2019–20, 20.3 t in 2018–19 and 16.5 t in 2017–18. However, the extent to which reported discards reflect actual discards is not clear. The life-state information recorded for logbook discards is mostly 'unknown' or with no detail provided. Post-release survival of discards is uncertain, meaning that the fishing mortality associated with discarded catch is also uncertain.

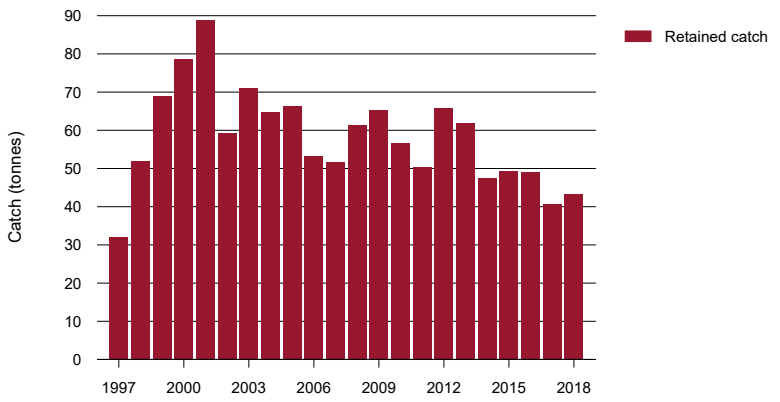
Althaus, Burch & Thomson (2020) estimated the total catch in 2019 to be 177.5 t, comprising 125.6 t of discards[1] and 51.9 t of commercial catch (SESSF 49.6 t and state catch 2.4 t). The weighted average state catches and discards for 2016 to 2019 were 2.4 t and 120.9 t, respectively (Althaus, Burch & Thomson 2020).

Recreational and Indigenous catches of elephantfish are unknown in New South Wales, Tasmania and Victoria (Woodhams et al. 2020a).

For the 2020–21 fishing season, the total of catch and discards (using the 4-year weighted average) is estimated to be 160.3 t.

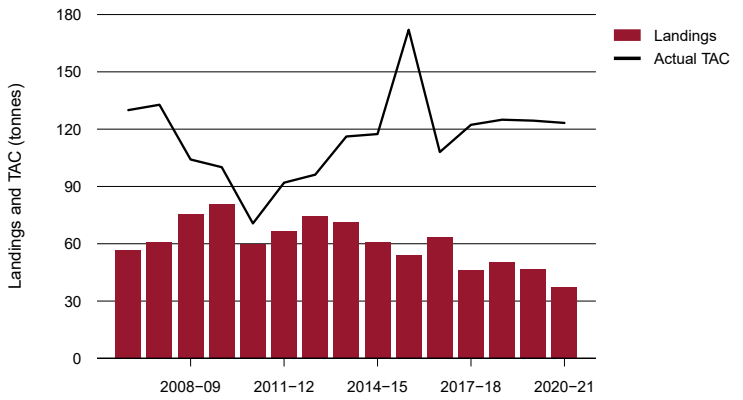
1 This discard estimate is not considered reliable because, since the removal of observers on GHTS vessels, the discard proportion is estimated almost entirely from the trawl sector.

FIGURE 12.5a Elephantfish catch in the SGSHS, 1997 to 2018



Source: Sporcic 2020

FIGURE 12.5b Annual elephantfish landings and TAC in the SGSHS, 2006–07 season to 2020–21 season



Notes: **TAC** Total allowable catch. Actual TAC includes carryover of undercatch or overcatch from the previous season.
Source: AFMA catch disposal records

Stock assessment

Elephantfish was managed as a tier 4 stock under the SESSF harvest strategy framework until 2017. The tier 4 harvest strategy uses standardised catch-per-unit-effort (CPUE) as an index of abundance for the stock and as a proxy for biomass. At its February 2018 meeting, the Shark Resource Assessment Group (SharkRAG) considered that both tier 4 analyses presented (that is, including or excluding discards) were unsuitable for providing advice on the recommended biological catch (RBC) (AFMA 2020a), because of the lack of a time series of robust discard data, difficulties in factoring discard data into the tier 4 analyses and uncertainty in estimates of recreational catch. SharkRAG felt that both tier 4 analyses would produce prohibitively low total allowable catches (TACs), driven by assumptions about discards and recreational catch, whereas the CPUE itself suggested little cause for concern (AFMA 2018a).

In 2018, SharkRAG recommended rolling over the TAC from the previous season (114 t) to the 2019–20 season (AFMA 2018a). In 2019, the Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group (SESSFRAG) recommended setting the 2020–21 TAC for elephantfish using a weight-of-evidence approach, based on a review of recent catches and the outcomes of the most recent ecological risk assessment (ERA) (Sporcic, Bulman & Fuller 2021).

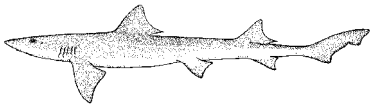
At its January 2020 meeting, SharkRAG discussed the issues underlying the generation of an RBC using the tier 4 analyses and recommended rolling over the TAC from the previous season (114 t) to the 2020–21 fishing season (as well as for the subsequent 2 seasons; 2021–22 and 2022–23). In making its recommendation, SharkRAG noted the low-risk rating of the stock from the recent ERA (AFMA 2020b; Sporcic, Bulman & Fuller 2021). However, SharkRAG also expressed concerns about its ability to provide robust recommendations on the RBC for the stock as a result of limited reliable information.

CPUE standardisations were undertaken for the stock in 2020 using updated methods and data (Sporcic 2020). However, estimates of discards and recreational catches remain uncertain, and no updated CPUE or tier 4 analysis was accepted for the stock. Although SharkRAG has expressed concern about having limited information to support RBC advice, it has expressed little concern about the state of the stock or the sustainability of current catches.

Stock status determination

Recent catches have been stable, and the most recent ERA outcome for the stock indicated that the species was at low risk from fishing. None of the available lines of evidence indicate that the biomass of this stock is likely to have been reduced to below the LRP or that current catches are likely to drive the stock into an overfished state. On this basis, the stock is classified as **not overfished** and **not subject to overfishing**.

Gummy shark (*Mustelus antarcticus*)



Line drawing: Karina Hansen

Stock structure

The most recent research on stock structure for gummy shark indicates that there are most likely 2 stocks in Australian waters: one in southern Australia, extending from Bunbury in Western Australia to Jervis Bay in New South Wales, and another in eastern Australia, extending from Newcastle to the Clarence River in New South Wales (White & Last 2008). The southern Australian biological stock is split into 4 populations for modelling purposes: the continental shelf of Bass Strait, Tasmania, South Australia and Western Australia. The first 3 are assessed together by the Commonwealth (Thomson 2020) and are reported here. The fourth is assessed and reported separately by Western Australia (Braccini, McAuley & Rowland 2013).

Catch history

Catch of gummy shark in the SGSHS increased after 1970, initially as byproduct in the school shark fishery, and then increasingly as a target as school shark catches decreased from 1986 (Figure 12.6a). Catch in the SGSHS reached a peak of around 2,300 t in 1993. Combined catch (from CDRs) of gummy shark for the GHTS, the CTS and the GABTS in 2020–21 was 1,874 t, up from 1,780 t in 2019–20 and 1,682 t in 2018–19 (Figure 12.6b).[2]

Discards of gummy shark reported in logbooks in 2020–21 were 10.7 t; they were 11.7 t in 2019–20, 13.8 t in 2018–19 and 11.1 t in 2017–18. However, the extent to which reported discards reflect actual discards is not clear. Multiple life states were recorded by fishers in logbooks for discards, with most recorded as 'unknown' or with no detail provided. Post-release survival of discards is uncertain, meaning that the fishing mortality associated with discarded catch is also uncertain.

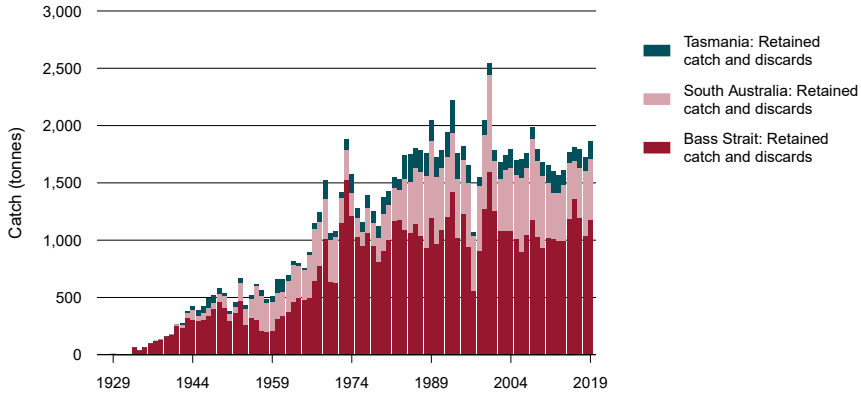
Althaus, Burch & Thomson (2020) estimated the total catch in 2019 to be 2,022 t, comprising 75.3 t[3] of discards and 1,946.7 t of commercial catch (SESSF 1,809.3 t and state catch 137.5 t).[4] The weighted average state catches and discards for 2016 to 2019 were 132.2 t and 73.7 t, respectively (Althaus, Burch & Thomson 2020).

2 Undercatch and overcatch provisions are provided for in the harvest strategy for this fishery, and this mechanism explains catches in excess of the agreed TAC.
3 This discard estimate is not considered reliable because, since the removal of observers on GHTS vessels, the discard proportion is estimated almost entirely from the trawl sector.
4 A further 315 t of gummy shark was also reported in Western Australia, but this is understood to be a separate stock.

State recreational catch is unknown for New South Wales, Tasmania and Victoria (Woodhams et al. 2020b). In South Australia, 37 t was reported in 2013–14. In Western Australia, 1,693 individuals were reported as caught in 2017–18, with 922 individuals retained (Woodhams et al. 2020b). Indigenous catch is unknown in New South Wales, South Australia, Tasmania, Victoria and Western Australia (Woodhams et al. 2020b). Althaus (2020) provides a summary of available data on recreational catches between 1991 and 2015.

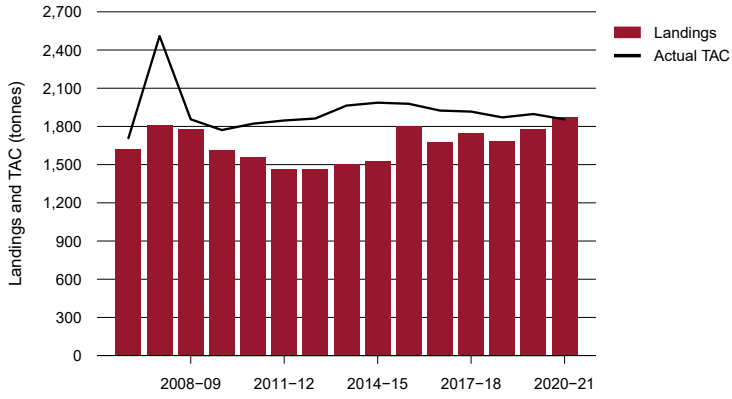
For the 2020–21 fishing season, the total of catch and discards (using the 4-year weighted average) is estimated to be 2,079.9 t.

FIGURE 12.6a Annual gummy shark catch in the SGSHS, 1927 to 2019



Source: Thomson 2020

FIGURE 12.6b Annual gummy shark landings and TAC in the SGSHS, 2006–07 season to 2020–21 season



Notes: **TAC** Total allowable catch. Actual TAC includes carryover of undercatch or overcatch from the previous season.
Source: AFMA catch disposal records

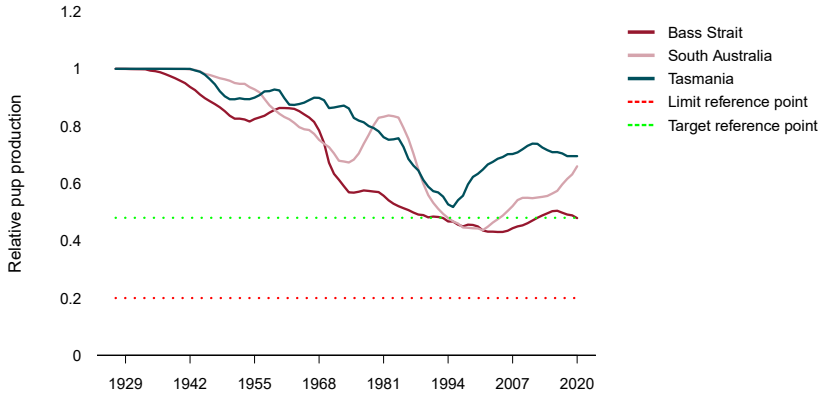
Stock assessment

The most recent stock assessment for gummy shark was published in 2020 (Thomson 2020). As in previous assessments, the 2020 assessment uses estimated pup production as a proxy for biomass because of the expected close relationship between pup production and female spawning biomass.

Bass Strait, South Australian and Tasmanian regions are treated as separate stocks in the model, with no movement of animals between these populations.

Pup depletion in 2020 is estimated to be above the 20% LRP for all 3 stocks (Figure 12.7). Depletion is estimated to be 66% (range across sensitivities 66–107%) in South Australia and 69% (range across sensitivities 62–86%) in Tasmania. For Bass Strait, the base-case model estimated depletion at 48%, with the range across all sensitivities being 32–53%. The combined RBC (across the 3 stocks) for 2020 was 1,899 t, and the estimated long-term RBC for the stock was 1,757 t (Thomson 2020).

FIGURE 12.7 Estimated pup production as a proportion of unfished level of pup production for gummy shark in Bass Strait, South Australia and Tasmania, 1927 to 2020

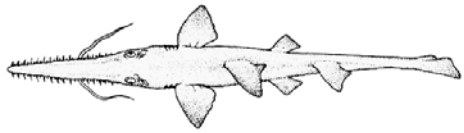


Source: Thomson 2020

Stock status determination

The 2020 stock assessment estimated pup production in the most recent year (2020) to be at or above the target reference point (TRP) for each of the 3 stocks modelled. Recent catches are in accordance with the harvest strategy and unlikely to drive the stock into an overfished state. On this basis, gummy shark in the SGSHS is classified as **not overfished** and **not subject to overfishing**.

Sawshark (*Pristiophorus cirratus, P. nudipinnis*)



Line drawing: FAO

Stock structure

Three species of sawshark (common sawshark – *P. cirratus*, southern sawshark – *P. nudipinnis*, and eastern sawshark – *P. peroniensis*) are caught in southern Australian waters. Little is known about the stock structure or movements of sawshark. Two species dominate reported sawshark catches in this sector: common sawshark and southern sawshark. For assessment purposes, all sawsharks found south of the Victoria – New South Wales border are assumed to be common or southern sawshark, and those found north of that border are assumed to be eastern sawshark (AFMA 2014b). Around 90% of the total sawshark catch from southern Australia is understood to be taken from Bass Strait (AFMA 2011). All sawshark catch in the SESSF is managed under a single TAC, and status is reported for a single multispecies stock.

Catch history

Catch of sawshark in the SGSHS increased in the early 1970s to around 200 t by 1974, and then fluctuated between about 170 and 350 t per year until the early 2000s (Figure 12.8a). Combined catch (from CDRs) for the GHTS, the CTS and the GABTS in 2020–21 was 170 t, down from 189 t in 2019–20 (Figure 12.8b; Table 12.2).

Discards of sawshark reported in logbooks in 2020–21 were 2.6 t, down slightly from 2.8 t in 2019–20; they were 2.8 t in 2018–19 and 0.4 t in 2017–18. The bulk of the discarded catch in 2020–21 was recorded as 'dead' and 'unknown'. Post-release survival of discards is uncertain, and the extent to which reported discards reflect actual discards is not clear.

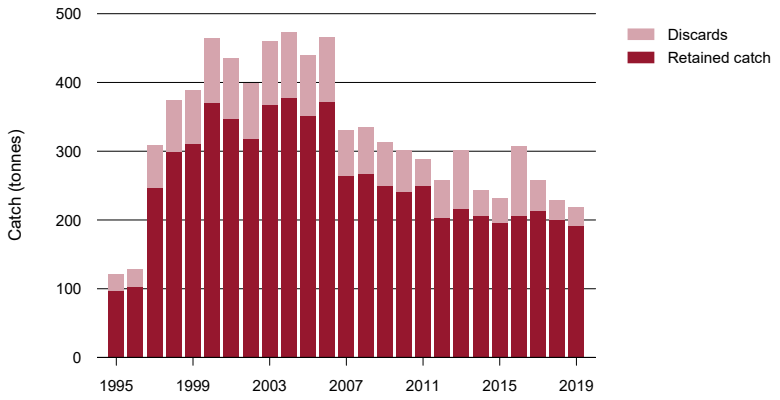
Althaus, Burch & Thomson (2020) estimated a total catch in 2019 of 218 t, comprising 26.8 t of discards[5] and 191.2 t of commercial catch (SESSF 180.4 t and state catch 10.9 t). The weighted average state catches and discards for 2016 to 2019 were 11.7 t and 34.4 t, respectively (Althaus, Burch & Thomson 2020).

Recreational and Indigenous catches of sawsharks are unknown in New South Wales, South Australia, Tasmania and Western Australia (Woodhams et al. 2020c). Althaus (2020) provides a summary of available data on recreational catches between 1991 and 2015.

For the 2020–21 fishing season, the total of catch and discards (using the 4-year weighted average) is estimated to be 216.1 t.

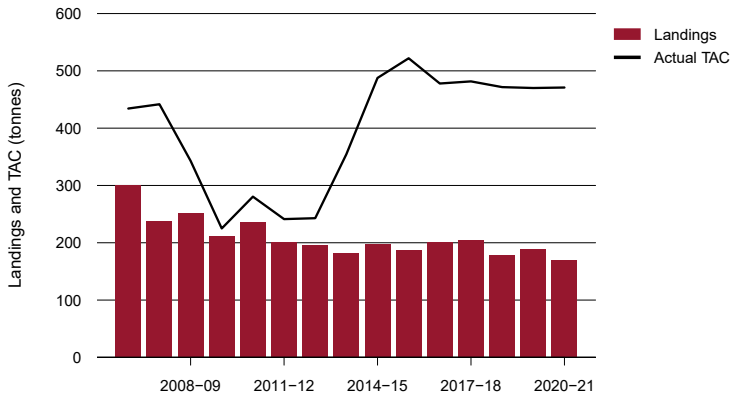
5 This discard estimate is not considered reliable because, since the removal of observers on GHTS vessels, the discard proportion is estimated almost entirely from the trawl sector.

FIGURE 12.8a Sawshark catch in the SGSHS, 1995 to 2019



Notes: Discard data are only available by calendar year and for 2007 to 2015.
Source: Sporcic 2020

FIGURE 12.8b Sawshark landings and TAC in the SGSHS, 2006–07 season to 2020–21 season



Notes: **TAC** Total allowable catch. Actual TAC includes carryover of undercatch or overcatch from the previous season.
Source: AFMA catch disposal records

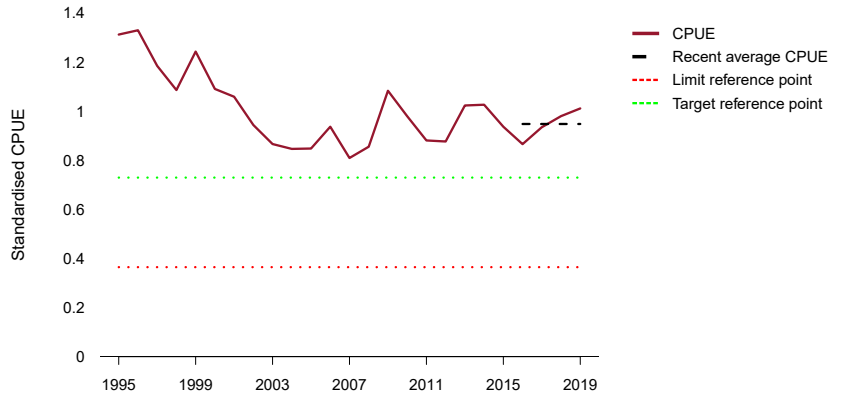
Stock assessment

Sawshark has been managed as a tier 4 stock under the SESSF harvest strategy framework since 2009. In 2014, SharkRAG recommended a decrease in the biomass TRP (B_{TARG}) for sawshark from 48% to 40% of unfished biomass to reflect the byproduct nature of the stock (AFMA 2014a).

Potential avoidance of this species by operators using gillnets suggests that the corresponding standardised CPUE may not adequately reflect stock abundance. As a result, SharkRAG recommended using standardised trawl CPUE as an index of abundance (AFMA 2015b) when applying the tier 4 harvest control rule. Two species (common sawshark and southern sawshark) and 2 species-group codes (*Pristiophorus* spp. and Pristiophoridae) comprise the catch data used in the tier 4 analyses for sawshark.

Sporcic (2020) undertook an updated CPUE standardisation (using trawl data) and tier 4 analysis in 2020, which indicated that recent average CPUE (2015 to 2019) was above the TRP (Figure 12.9). Sporcic (2020) estimated an RBC for 2020 of 653.4 t, an increase of 135 t from the previous RBC (in 2017). Noting the multispecies nature of the stock and the tier 4 analysis, SharkRAG, at its meeting in 2020, discussed the value of monitoring the species composition of the catch, to enable a response to any changes that would have implications for future assessment (AFMA 2020a). SharkRAG also discussed the value of collecting life history data for the species taken (AFMA 2020a).

FIGURE 12.9 Standardised CPUE index for sawshark in the CTS, 1995 to 2019 (trawl)

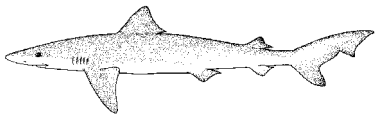


Note: **CPUE** Catch-per-unit-effort. **CTS** Commonwealth Trawl Sector.
Source: Sporcic 2020

Stock status determination

The recent average CPUE for sawshark was estimated to be above the TRP. On this basis, the stock is classified as **not overfished**. Recent catch (including for 2020–21) for the stock has been below both the RBC and the TAC. On this basis, the stock is classified as **not subject to overfishing**.

School shark (*Galeorhinus galeus*)



Line drawing: Karina Hansen

Stock structure

School shark has a broad distribution throughout temperate waters of the eastern North Atlantic, western South Atlantic, and north-eastern and south-eastern Pacific oceans, and temperate waters off South Africa, New Zealand and southern Australia. There is some uncertainty about the stock structure for school shark; however, a recent genetic study found no genetic differences between Australia and New Zealand (Hernández et al. 2015). Although a single biological stock in Australia has been assumed for assessment and management purposes, there is emerging information to suggest that multiple stocks may exist (or may have existed) in the SESSF (Thomson et al. 2019).

Catch history

Catch of school shark in the SGSHS peaked at more than 2,500 t in 1970 and then declined rapidly to around 700 t in 1973 (Figure 12.10a). Catch in the sector increased again to around 2,000 t in 1986 before declining steadily through the late 1980s and 1990s, stabilising at around 200 t per year from 2000 onwards.

Combined catch (from CDRs) for the GHTS, the CTS and the GABTS in 2020–21 was 184 t (the same as in 2019–20) (Figure 12.10b). Discards of school shark reported in logbooks in 2020–21 were 11.9 t, down slightly from 13.4 t reported in 2019–20 (10.9 t in 2018–19 and 7.7 t in 2017–18); most discards were recorded as either 'unknown' or with no specified life status. Post-release survival of discards is uncertain, and the extent to which reported discards reflect actual discards is not clear.

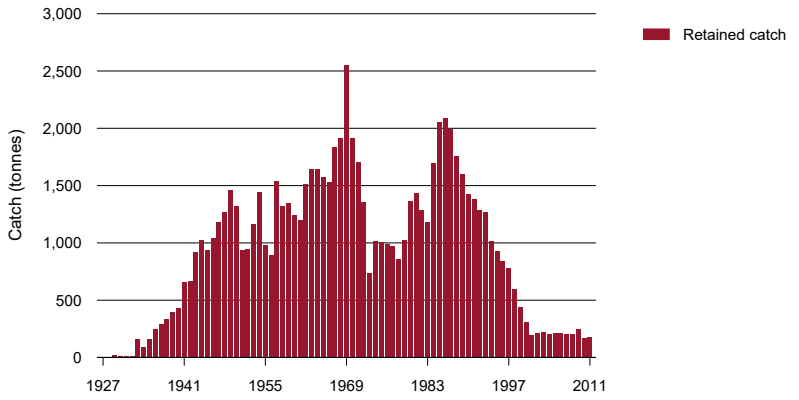
Althaus, Burch & Thomson (2020) estimated a total catch in 2019 of 304.9 t, comprising 46.1 t of discards and 258.8 t of commercial catch (SESSF 223.9 t and state catch 34.7 t).[6] The proportion of discarded catch was carried over from an estimate in 2014 when data from onboard observers were still available. The weighted average state catches and discards for 2016 to 2019 were 32.3 t and 43.5 t, respectively (Althaus, Burch & Thomson 2020).

Recreational and Indigenous catches of school shark are unknown in New South Wales, South Australia, Tasmania, Victoria and Western Australia (Woodhams et al. 2020d). Althaus (2020) provides a summary of available data on recreational catches between 1991 and 2015.

For the 2020–21 fishing season, the total of catch and discards (using the 4-year weighted average) is estimated to be 259.8 t.

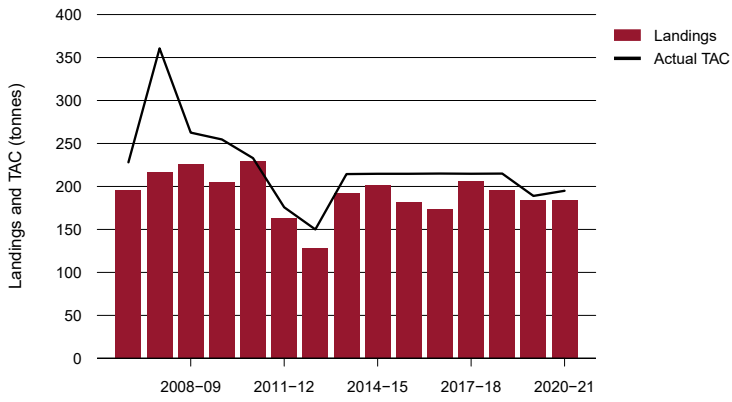
6 This discard estimate is not considered reliable because, since the removal of observers on GHTS vessels, the discard proportion is estimated almost entirely from the trawl sector.

FIGURE 12.10a Annual school shark catch in the SGSHS, 1927 to 2011



Source: Thomson 2012

FIGURE 12.10b School shark landings and TAC in the SGSHS, 2006–07 season to 2020–21 season



Notes: **TAC** Total allowable catch. Actual TAC includes carryover of undercatch or overcatch from the previous season.
Source: AFMA catch disposal records

Stock assessment

Assessments for school shark indicate that the stock has been overfished since approximately 1990, and it has been classified as such since ABARES began status reporting in 1992. The most recent full stock assessment was undertaken in 2009 using data to 2008 (Thomson & Punt 2009). At that time, the base-case model estimated biomass to be at $0.12B_0$. The catch data from 1998 to 2008 used in the assessment comprised low (per vessel) catch levels, and the CPUE derived was considered unlikely to accurately reflect the underlying stock dynamics.

In 2012, the 2009 assessment was re-run with additional catch data for 2009 to 2012 (Thomson 2012), specifically to estimate recovery time frames for the stock under a range of future incidental catch levels and to investigate the impact of a proposed auto-longline shark fishery in South Australia. Under a zero-catch scenario, the stock was projected to rebuild to $0.2B_0$ within 23 years. At a constant catch of 250 t, the stock was projected to rebuild to $0.2B_0$ in 80 years, and a constant catch of 275 t was projected to collapse the stock. These projections were based on assumptions that the gear selectivity, and spatial and temporal distribution of catches remain similar to those in 2011. Uncertainties around these median projections were not provided by the assessment. The school shark rebuilding strategy was revised in 2015 using the outputs of these analyses. It specifies a maximum catch of 225 t, which would allow recovery to the $0.2B_0$ LRP in the specified recovery time frame (in this case, set at 3 times the estimated generation time or 66 years) (AFMA 2015a). Consistent with prescribed review time frames, the rebuilding strategy is currently under review again.

In 2018, a close-kin mark–recapture (CKMR) study and a population dynamics model that makes use of those data (termed a 'close-kin model' [CKM]) provided an estimate of current absolute abundance and recent population trend (2000 to 2017) from a single region and population (that is, assuming 1 mixed stock) (Thomson et al. 2019). In contrast to previous assessments, the CKM does not provide an estimate of biomass depletion compared with unfished biomass. The abundance of school shark (in numbers) estimated by the CKM (about 50,000 adults; Thomson et al. 2019) was lower than the 2012 assessment model projections (about 250,000 adults; Thomson 2012).

Thomson et al. (2019) undertook projections based on 4 constant exploitation scenarios (zero, 2016 rate, 2017 rate and mean exploitation rate for 2013 to 2017). All 4 exploitation rates resulted in a long-term upward trend in median population size. Of the 4 exploitation rate scenarios explored, SharkRAG agreed to base its advice regarding future incidental catch allowances (up to the 2021–22 fishing season) on 'the mean exploitation rate for 2013 to 2017', because this scenario provided for consistent recovery (AFMA 2018b).

The median trend for the stock response to the 2013 to 2017 mean exploitation rate was upwards; however, the confidence interval was wide enough to allow a downward trend in the stock, and Thomson et al. (2019) noted that there was no guarantee of the sustainability of these catches. Thomson et al. (2019) noted that the collection of close-kin samples for an additional 3 years is expected to greatly reduce the spread of these confidence intervals. The 2013 to 2017 exploitation rate resulted in total mortality recommendations of 256 t in 2019–20, 263 t in 2020–21 and 270 t in 2021–22.

The CKM considers the period 2000 to 2017, since this was the period over which the juveniles sampled would have been born. The approach is unable to evaluate biomass relative to an unfished state, as required under the School Shark Rebuilding Strategy (AFMA 2015a). As well, Thomson et al. (2019) proposed that there are likely to be a number of school shark stocks (that is, units that are reproductively isolated, at least to some degree, but almost certainly have (possibly completely) overlapping spatial distributions), some of which are severely depleted. As a result, significant uncertainty is associated with assessing the status of the school shark stock as it is currently defined (that is, a single SESSF stock). In aggregate, Thomson et al. (2019) expected the close-kin estimate to be unbiased by the presence of cryptic stocks.

In December 2018, SharkRAG supported continued close-kin sampling (for 3 years) and use of the CKM for estimating abundance of school shark (AFMA 2018b). SharkRAG also discussed the difficulties associated with updating the 2009 school shark assessment and including the recent close-kin information in an assessment update, and agreed to recommend not pursuing such an update.

In 2020, SharkRAG supported the engagement of a third party to review the results of the CKMR assessment for school shark. The review was undertaken by domestic and international experts in the CKMR method, statistics and shark biology, and a draft final report was delivered to AFMA in February 2021. The expert panel considered the CKMR to be a suitable method for making management decisions for the stock and made a number of recommendations to improve the analyses. These recommendations are expected to be considered in the lead-up to, and during, the update to the CKMR assessment scheduled for 2024.

At its meeting in March 2021, SharkRAG agreed that updating the CKMR assessment with 1 further year of catch data would not produce substantially different results (AFMA 2021). Instead, SharkRAG recommended that the métier analysis (undertaken by CSIRO) be used to determine the minimum take of school shark, and that the trawl CPUE could be used to inform the TAC until the CKMR assessment is updated (AFMA 2021).

Stock status determination

Since the recent CKM work does not provide an estimate of biomass depletion compared with unfished biomass, biomass status in 2020–21 is determined based on the most recent estimate of population depletion. Thomson & Punt (2009) estimated the biomass at $0.12B_0$. Projections undertaken in 2012 indicated that recovery to $0.2B_0$ would take 23 years under a zero-catch scenario (Thomson 2012). Catches have been greater than zero in the intervening period, and there are no reliable indications that biomass has recovered to above the LRP. On this basis, the stock remains classified as **overfished**.

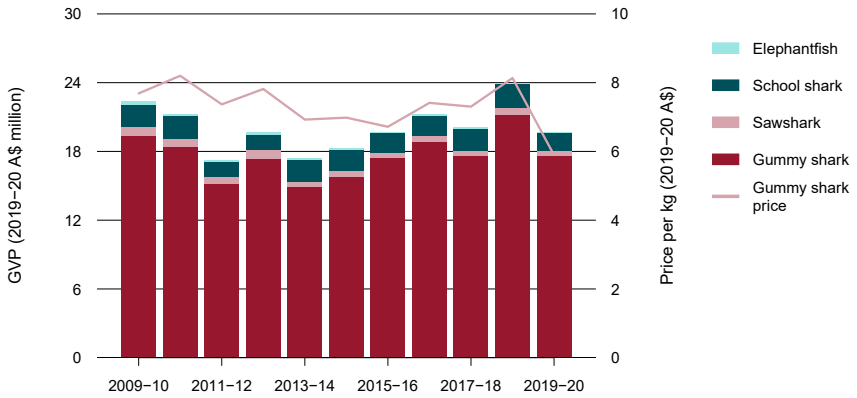
There is no reliable indicator of whether catch in 2020–21 will allow the stock to recover to the LRP within the required time frame as specified in the rebuilding strategy. On this basis, the fishing mortality status of the stock remains **uncertain**.

12.3 Economic status

Key economic trends

The real gross value of production (GVP) in the SGSHS for the 4 shark species taken in the GHTS declined from a peak of $28.6 million in 2008–09 to $17.44 million in 2013–14 and then recovered to $19.67 million by 2019–20 (Figure 12.11). This recent recovery is primarily the result of higher volumes and prices of gummy shark catch. Gummy shark accounts for the majority of GVP in the SGSHS (89% in 2019–20).

FIGURE 12.11 Real GVP for the SGSHS, by key species, and real price for gummy shark, 2009–10 to 2019–20

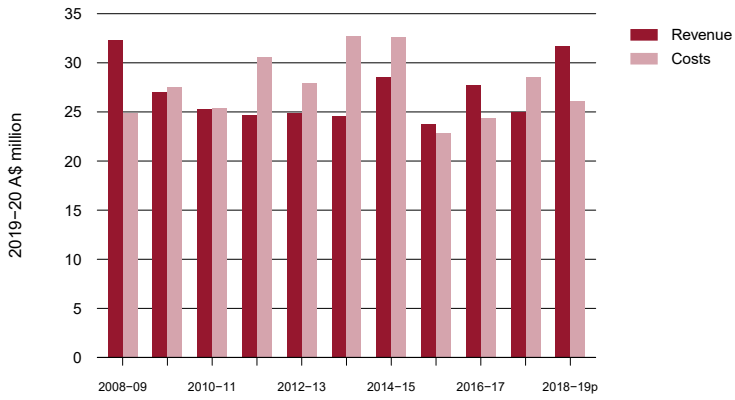


Notes: **GVP** Gross value of production. 'Real' indicates that value has been adjusted for inflation.

The 4 shark species that make up the SGSHS – gummy shark, school shark, sawshark and elephantfish –accounted for around 76% of the GHTS GVP in 2019–20, with scalefish species making up the remainder.

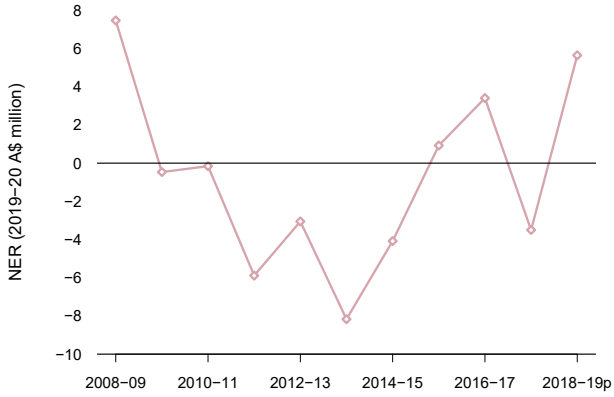
Survey-based estimates of revenue, costs and net economic returns (NER) in the GHTS are available for 2016–17, and preliminary estimates are available for 2017–18 and 2018–19 (Figures 12.12 and 12.13). In 2017–18, non-survey-based estimates indicate that NER became negative (–$3.4 million), potentially as a result of lower catch volume of gummy shark and higher unit fuel prices. In 2018–19, non-survey-based estimates showed a strong recovery, with NER estimated to have reached $5.6 million, largely driven by a significant increase in fishing revenue from higher catch volumes and lower overall fishing costs.

FIGURE 12.12 Real revenue and costs for the GHTS, 2008–09 to 2018–19



Notes: **GHTS** Gillnet, Hook and Trap Sector. Data for 2018–19 are preliminary.
Source: Mobsby forthcoming

FIGURE 12.13 Real NER for the GHTS, 2008–09 to 2018–19



Notes: **GHTS** Commonwealth Trawl Sector. **NER** Net economic returns. NER estimates for 2018–19 are preliminary non-survey-based estimates.
Source: Mobsby forthcoming

Significant spatial closures implemented in recent years have resulted in relocation of fishing intensity to other areas. Particularly affected were operators who had the full extent of their usual fishing grounds closed, and those who had to switch to use of hooks rather than gillnets in areas where gillnet closures are in place. Some South Australian gillnet fishers also operate in the South Australian Rock Lobster Fishery, which is considered to be profitable (Econsearch 2014) and could have supported some SGSHS operators affected by the closures. These changes would have reduced the profitability of gillnet operations in South Australia, contributing to the negative NER in the GHTS following the closures.

Performance against economic objective

Gummy shark is the primary driver of economic performance in the SGSHS, accounting for the majority of the GVP in 2019–20. The results of the 2020 stock assessment indicate that the biomass of gummy shark stocks are at or above the TRP that will help generate positive NER.

School shark is the second most valuable species in the sector, accounting for 8% of SGSHS GVP in 2019–20, despite being caught under an incidental catch allowance. School shark biomass remains below the LRP, and stock rebuilding measures are likely to be affecting sector profitability.

The challenge of reducing marine mammal interactions may also affect the degree to which economic performance can be improved in the short term. Recent closures to mitigate interactions are likely to have contributed to the observed negative NER for the GHTS from 2009–10 to 2014–15. In 2015–16 to 2016–17, NER were positive and linked to productivity growth, indicating that the industry is actively adjusting to new operating conditions.

12.4 Environmental status

The SESSF is accredited against parts 13 and 13A of the EPBC Act until 12 February 2022. Conditions associated with the accreditation relate to the impact of fishing on bycatch species, particularly Australian sea lions, dolphins, seals and seabirds. Further recommendations associated with the accreditation relate to requirements for ERA, and monitoring of bycatch and discarding.

The most recent ERA for the gillnet sector was published in 2021, using data for 2012 to 2016 (Sporcic, Bulman & Fuller 2021). A total of 233 species were assessed, 7 of which were assessed as high risk following a residual risk analysis. These were 2 marine mammals (Indian Ocean bottlenose dolphin – *Tursiops aduncus* and common bottlenose dolphin – *T. truncatus*) and 5 marine birds (Campbell albatross – *Thalassarche impavida*, shy albatross – *T. cauta*, wandering albatross – *Diomedea exulans*, blue petrel – *Halobaena caerulea*, and soft-plumaged petrel – *Pterodroma mollis*). An ERA for species taken using hooks in the SESSF is in progress.

In accordance with accreditation under the EPBC Act (see Chapter 1, 'Protected species interactions'), AFMA publishes and reports quarterly on interactions with protected species on behalf of Commonwealth fishing operators to the Department of Agriculture, Water and the Environment (DAWE). These are summarised below.

Reports for the GHTS in the 2020 calendar year indicate 405 interactions: 87 marine mammals, 230 seabirds and 88 sharks. The marine mammal interactions comprised 28 interactions with unclassified dolphins (3 alive; 25 dead), 4 with bottlenose dolphins – *T. truncatus* (all dead), 11 with common dolphins (all dead), 1 with a killer whale – *Orcinus orca* (alive), 7 with New Zealand fur seals – *Arctocephalus forsteri* (1 alive; 6 dead), 10 with Australian fur seals (all dead) and 26 with unclassified seals (5 alive; 21 dead). The seabirds caught included 160 unclassified shearwaters (1 alive; 159 dead), 6 unclassified albatrosses (2 alive; 4 dead), 8 shy albatrosses (5 alive; 3 dead), 3 unclassified cormorants (all dead), 2 cormorants reported as red cormorants but most likely pied cormorants – *Phalacrocorax varius* (both alive), 2 white-chinned petrels – *Procellaria aequinoctialis* (both dead) and 1 unclassified tern (dead). Measures to reduce interactions with Australian sea lions and dolphins are discussed in Chapter 8.

Logbooks reported that 57 shortfin mako sharks – *Isurus oxyrinchus* (1 alive; 55 dead; 1 in unknown condition), 13 longfin mako sharks – *I. paucus* (4 alive; 9 dead), 5 porbeagle sharks – *Lamna nasus* (all dead) and 13 white sharks – *Carcharodon carcharias* (10 alive; 3 dead) were caught during 2020.

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

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