

Southern Garfish (2020)

Hyporhamphus melanochir



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia South Coast	Sustainable	Catch
Western Australia	Western Australia West Coast	Recovering	Catch
Victoria	Victoria	Sustainable	Catch, effort, CPUE trends
Tasmania	Tasmania	Depleted	Catch, effort, CPUE trends, age composition
South Australia	Northern Gulf St. Vincent	Depleted	Catch, effort, CPUE, harvest fraction, biomass, egg production
South Australia	Northern Spencer Gulf	Recovering	Catch, effort, CPUE, harvest fraction, biomass, egg production
South Australia	South Australia West Coast	Sustainable	Catch, effort, CPUE trends
South Australia	South-East	Sustainable	Catch, effort, CPUE trends
South Australia	Southern Gulf St. Vincent	Sustainable	Catch, effort, CPUE trends
South Australia	Southern Spencer Gulf	Sustainable	Catch, effort, CPUE

STOCK STRUCTURE

Southern Garfish has a wide distribution in Australia, extending from Lancelin in Western

Australia, along the southern coast of mainland Australia and up the east coast to Eden in southern New South Wales, as well as the surrounding waters of Tasmania [Gomon et al. 2008].

There has been no research into the stock structure of Western Australian populations of Southern Garfish. However, given the limited dispersal typically displayed by Southern Garfish, and the large spatial separation between the west and south coasts of Western Australia, it is highly likely that the west and south coast support separate biological stocks of this species [Ye et al. 2002, Steer et al. 2009].

In Victoria, there has been no research into the stock structure for populations of Southern Garfish and they are assumed to constitute a single jurisdictional stock.

In Tasmania, differences in size and age composition between the north coast and the east coast indicate that there may be multiple biological stocks; however, no firm evidence exists at present, and current stock assessments assume a single state-wide biological stock [Moore et al. 2018].

A multidisciplinary otolith-based study (otolith chemistry and morphometrics) identified at least five biological stocks in South Australia: West Coast, Northern Spencer Gulf, Southern Spencer Gulf, Northern Gulf St. Vincent and Southern Gulf St. Vincent [Steer et al. 2009]. Given the level of spatial separation of Southern Garfish observed between the gulfs, it was assumed that Southern Garfish from the south east also comprised a separate biological stock.

Here, assessment of stock status is presented at the biological stock level—Western Australia West Coast and Western Australia South Coast; South Australia West Coast (Western Australia); Southern Spencer Gulf, Northern Spencer Gulf, Southern Gulf St. Vincent, Northern Gulf St. Vincent and South East (South Australia); Tasmania; and at the jurisdictional level—Victoria.

STOCK STATUS

Northern Gulf St. Vincent

Southern Garfish is a primary species in South Australia's commercial multispecies, multi-gear and multi-sectoral Marine Scalefish Fishery. The most recent fishery assessment of Southern Garfish stock status was completed in 2020 and integrated catch and effort data from the commercial sector to the end of December 2018; state-wide estimates of recreational catch data; and population demographic information (sex, age, and length composition) [Steer et al. 2020]. The Southern Garfish integrated stock assessment model was last run for Northern Gulf St. Vincent in 2018 using data until December 2017 [Steer et al. 2018].

The annual total commercial catch of Southern Garfish in Northern Gulf St. Vincent declined from a peak of 221 t in 2000 to the lowest level on record in 2016 (53 t) before increasing to 68 t in 2017 and 73 t in 2018. Total hauling net effort declined to its lowest level in 2018, where fishers expended 1 720 days catching Southern Garfish, representing a 28.3 per cent decline since 2011. Targeted nominal catch rates within the hauling net sector have increased by 53 per cent since 2015 to 53 kg per fisher-day in 2018, returning to relatively moderate levels, but considerably less than the peak catch rate of 110 kg per fisher-day in 2000. The recent trend in hauling net effort was a result of management arrangements that were implemented to reduce fishing activity during the peak winter season [Steer et al. 2018].

The primary measure for biomass is modelled estimates of fishable biomass and egg production [Steer et al. 2018]. The annual fishable biomass and egg production for Northern Gulf St. Vincent have remained relatively stable since 2014 at approximately 200 t and 11 per cent of unfished levels, respectively. The above evidence indicates that the biomass of this stock is likely to be depleted and that recruitment is likely to be impaired.

The primary measure for fishing mortality is modelled estimates of harvest

fraction [Steer et al. 2018]. High exploitation rates have been evident for the Northern Gulf St. Vincent stock and these peaked at 91 per cent in 2002. Since then, the annual harvest fraction has declined by approximately 3 per cent per year, dropping to a record low of 39 per cent in 2016. The above evidence indicates that current fishing mortality has been reduced by management to a level that should allow the stock to recover from its recruitment impaired state; however, measurable improvements are yet to be detected.

On the basis of the evidence provided above, the Northern Gulf St. Vincent biological stock is classified as a **depleted stock**.

Northern Spencer Gulf

The most recent fishery assessment of Southern Garfish stock status was completed in 2020 and integrated catch and effort data from the commercial sector to the end of December 2018, state-wide estimates of recreational catch data; and population demographic information (sex, age, and length composition) [Steer et al. 2020]. The Southern Garfish integrated stock assessment model was last run for Northern Spencer Gulf in 2018 using data until December 2017 [Steer et al. 2018].

Historically, Northern Spencer Gulf has been the most productive region for Southern Garfish in South Australia and, in 2018, contributed 48 per cent of the state-wide catch. Annual catch in this region has been relatively stable over the past three years averaging approximately 86 t, but these catches were the lowest on record, having declined from a peak of 271 t in 1990. Annual total hauling net effort declined to its lowest level in 2013, when fishers expended 2 119 days catching Southern Garfish. Effort then increased to 2 520 fisher-days in 2015 and has since remained above 2 400 fisher-days. Targeted catch rates in the dominant hauling net sector had declined from a peak of 130 kg.fisherday⁻¹ in 2012 to 52 kg.fisherday⁻¹ in 2018, which is 40 per cent of the historical maximum.

The primary measure for biomass is modelled estimates of fishable biomass [Steer et al. 2018]. Fishable biomass has increased since 2003, at a rate of approximately 4 t.year⁻¹ (1.5 per cent), most likely in response to substantially declining exploitation rates. There was little change in fishable biomass from 2014 until 2016, remaining at approximately 280 t.year⁻¹. Annual egg production has increased since 2005, reaching 11 per cent of unfished levels over the last decade. The above evidence indicates that the biomass of this stock is likely to be depleted and that recruitment is likely to be impaired. However, for the period since 2003, increased catch rates and the harvestable biomass indicator indicate stock improvement.

The primary measure for fishing mortality is modelled estimates of harvest fraction [Steer et al. 2018]. Over the past 15 years the annual estimates of harvest fraction have declined at a rate of approximately 2 per cent per year to substantially lower values in 2016 (49.3 per cent) and 2017 (54.8 per cent). In addition, the continual increases in the minimum hauling net mesh size from 30 mm to 32mm in 2012, to 34 mm in 2015, and to 35 mm in 2017 were specifically implemented to promote the recovery of the resource by reducing the mortality of small Southern Garfish.

The above evidence indicates that the biomass of this stock is likely to be depleted and recruitment is likely to be impaired, but for the period from 2014 onwards these indicators suggest a recovering stock. The above evidence also indicates that the current level of fishing mortality should allow the stock recover from its recruitment impaired state.

On the basis of the evidence provided above, the Northern Spencer Gulf biological stock is classified as a **recovering stock**.

South

The most recent fishery assessment of Southern Garfish stock status was

Australia West Coast completed in 2020 [Steer et al. 2020]. The primary measures for biomass and fishing mortality are catch, effort and catch rate. Small catches of Southern Garfish are landed by the commercial sector on the West Coast. Since 2005, total catch has been $< 10 \text{ t.yr}^{-1}$, which is < 2 per cent of the state-wide total annual catch. The implementation of commercial netting restrictions in this region has contributed to the continuous reduction in hauling net effort since the late 1950s [Steer et al. 2020]. Targeted catch rates by approximately 5 to 15 dab net fishers have remained high ($> 42 \text{ kg.fisherday.yr}^{-1}$) since 2015, reflecting a relatively high abundance of Southern Garfish in the region. The targeted dab net catch rate in 2018 was $62 \text{ kg.fisherday.yr}^{-1}$. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the South Australia West Coast biological stock is classified as a **sustainable stock**.

South-East The most recent fishery assessment of Southern Garfish stock status was completed in 2020 [Steer et al. 2020]. The primary measure for biomass and fishing mortality is catch and catch rates. Few Southern Garfish are landed by the commercial sector in the South East. During the 2000s, total catch has generally been $< 1.0 \text{ t.yr}^{-1}$, rarely exceeding 0.3 per cent of the annual state-wide catch of Southern Garfish [Steer et al 2020]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the South East biological stock is classified as a **sustainable stock**.

Southern Gulf St. Vincent Southern Garfish are a primary species in South Australia's commercial multispecies, multi-gear and multi-sectoral Marine Scalefish Fishery (MSF). The most recent fishery assessment of Southern Garfish stock status was completed in 2020 [Steer et al. 2020].

The primary measures for biomass and fishing mortality are catch, effort and catch rate. The history of this regional fishery is characterised by relatively low levels of fishing activity and commercial catch. Prior to 1993, the commercial catch of Southern Garfish from southern Gulf St. Vincent was equally shared between the hauling net and dab net sectors. Since then, the hauling net sector has declined, with a steady reduction in fishing effort. In 2006, dab nets became the dominant gear type. Hauling nets were removed from this region by implementation of a voluntary net buy-back scheme and spatial netting closures in 2005. Prior to this management restructure, the commercial catch of Southern Garfish from this region rarely exceeded 10 per cent of the state-wide harvest, which was reduced to < 5 per cent by these measures. Since 2005, total catch from this region has generally been $< 13 \text{ t.yr}^{-1}$. Over the last three years targeted dab net effort has declined to the lowest levels on record; while associated catch rates have remained relatively strong. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Southern Gulf St. Vincent biological stock is classified as a **sustainable stock**.

Southern The most recent fishery assessment of Southern Garfish stock status was

Spencer Gulf

completed in 2020 [Steer et al. 2020]. The primary measures for biomass and fishing mortality are catch, effort and catch rate. Large areas of Southern Spencer Gulf have been closed to commercial hauling net fishing since 2005, and as a result the relative contribution of this region to the state-wide catch has decreased from approximately 10 per cent up to 2005 to 3 per cent over the past nine years. The hauling net sector historically accounted for approximately 30 per cent of the total catch of this stock, which peaked at 71 t in 1998. However, it has been considerably eroded through spatial restrictions imposed in 2005 to become almost exclusively fished by the dab net sector. Total catch of Southern Garfish in this region has not exceeded 15 t since 2009. Targeted dab net effort remained relatively stable at approximately 120 fisher-days from 2011 to 2014, before increasing above 210 fisher-days in 2015, 2016 and 2017. Targeted dab net CPUE has fluctuated between 56 kg.fisherday⁻¹ and 39 kg.fisherday⁻¹ over the last ten years. However, the mean CPUE during this period has remained stable with no discernible trend. In 2018, targeted dab net CPUE was 42 kg.fisherday⁻¹. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Southern Spencer Gulf biological stock is classified as a **sustainable stock**.

Tasmania

Between 1995 and 2005 commercial catches of Southern Garfish in Tasmanian waters were relatively stable and ranged between 80–100 t per annum. A sharp decline to 31 t in 2007 coincided with a reduction in average size and truncation of older age classes in the catch, which may have resulted from heavy fishing pressure and/or a period of poor recruitment. As a result, seasonal closures were introduced in 2009 to protect spawning fish. By 2012, there was evidence of an increase in the size of Southern Garfish landed, a greater range of age classes present and increasing catch per unit effort, which collectively was interpreted to indicate stock recovery over that period. Catches fluctuated between 40 and 60 t up until 2013 after which they again trended downwards, with 7.4 t taken in 2018–19, the lowest catch on record [Krueck et al. 2020]. Record low catches and catch rates indicate that the stock is likely to be depleted. The vulnerability of this species to overfishing suggests that even the current low levels of fishing pressure may be too high to allow the stock to recover.

The above evidence indicates that the biomass of this stock is likely to be depleted and that recruitment is likely to be impaired. The above evidence also indicates that current fishing mortality levels are expected to prevent the stock recovering from a recruitment impaired state.

On the basis of the evidence provided above, the Tasmania biological stock is classified as a **depleted stock**.

Victoria

An assessment in 2019 concluded that Southern Garfish are predominantly caught by seine in Corner Inlet-Nooramunga (CI) with a switch to more mesh netting in Corner Inlet and a substantial decline in the number of fishers in Port Phillip Bay (PPB) due to buy-outs [Conron et al. 2020]. As a result, landings have declined through time [VFA 2020] and it is also likely that Southern Garfish are now discarded by seine fishers in PPB as they are fishing within a mixed species quota management system and Southern Garfish are less valuable than the main target species. Catches have however, increased over the last two years in Corner Inlet-Nooramunga, due to increased CPUE [Conron et al. 2020].

The status of the stock was evaluated using CPUE from CI for commercial haul seine harvests due to the issues with retention rates in PPB outlined above. The performance of the CPUE biomass proxies were assessed in relation to specified reference level and limit points using a default reference period (1979–2015)

and commercial catch and effort data. Recreational fishery catch estimates were not available. CPUE appears to follow a cyclical pattern in which a single year of high catch rate is followed by 2–7 years of low catch rate. This is somewhat surprising given the species has relatively low fecundity and is therefore unlikely to show a boom-and-bust population strategy characteristic of short-lived highly fecund species. Standardisation was useful in eliminating some of the variation around this cycling and indicated that there was a general decline in CPUE from 1978–1996 before a stabilisation around the reference period average that has persisted [Conron et al. 2020].

There has been decreasing fishing effort using gear types to which Southern Garfish are vulnerable. These decreases in effort are probably unrelated to southern garfish abundance, as a relatively stable temporal CPUE trend indicates that the stock is performing adequately, and is unlikely to be recruitment impaired. CPUE trend is stable and the last two years of CPUE are above the reference period average in the main fishery of Corner Inlet-Nooramunga.

The above evidence indicates that the stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, Southern Garfish in Victoria is classified as a **sustainable stock**.

**Western
Australia
South Coast**

The current assessment of the Western Australia South Coast stock is primarily based on estimates of biomass and fishing mortality from a data-limited Catch-MSY assessment model, compared periodically to reference levels relating to estimates of Maximum Sustainable Yield (MSY). The estimated biomass expected to achieve MSY (BMSY) is considered as the Threshold reference level for the stock, and 50 per cent BMSY is set as the limit reference level. The target level is considered as any stock levels above BMSY.

Annual commercial catches of Southern Garfish taken in the South Coast Bioregion since 1976 have fluctuated between around 5 and 35t. The highest catch occurred in the early 1990's, whilst the lowest catch occurred around 2000. Overall, there has been a slight downward trend in catch over the time series. The estimated fishing mortality experienced by the stock in 2019 was 0.01 year⁻¹, with the 95 per cent CLs ranging from 0.02 to 0.05 year⁻¹. As the upper 95 per cent CL of this performance indicator is well below the level of FMSY (0.17 year⁻¹), the stock is unlikely to deplete to a level at which recruitment could be impaired if the current catch level is maintained.

The point estimate for relative stock biomass in 2019 was high at 0.82 of the unfished level (95 per cent CLs = 0.64–1.0). As the current value of this performance indicator is above the threshold, the stock is considered not to be depleted to a level at which recruitment could be impaired.

On the basis of the evidence provided above, Western Australia South Coast stock is classified as a **sustainable stock**.

**Western
Australia
West Coast**

The previous assessment in 2016 indicated that spawning biomass was below the limit reference level (i.e. 20 per cent of unfished level) (Smith et al. 2016). This zone was closed to commercial and recreational fishing for Southern Garfish, and monitoring is being undertaken to assess signs of recovery.

The current assessment of the Western Australia West Coast biological stock is primarily based on estimates of biomass and fishing mortality from a data-limited Catch-MSY assessment model [Martell and Froese 2013], compared periodically to reference levels relating to estimates of Maximum Sustainable Yield (MSY). The estimated biomass expected to achieve MSY (BMSY) is

considered as the Threshold reference level for the stock, and 50 per cent BMSY is set as the limit reference level. The target level is considered as any stock levels above BMSY.

Annual catches of Southern Garfish from the Western Australia West Coast biological stock taken by commercial fisheries since 1976, increased from the beginning of the time series, peaking in the late 1990s. Catch has declined since then to all-time lows in recent years. The estimated fishing mortality (F) experienced by the stock in 2019 was 0.01 year⁻¹, with the 95 per cent CLs ranging from 0 to 0.02 year⁻¹. As the upper 95 per cent CL of this performance indicator is well below the level of FMSY (0.11 year⁻¹), the stock is unlikely to continue to deplete to a level at which recruitment will be impaired if this F is maintained.

The point estimate for relative stock biomass in 2019 was 0.4 of the unfished level (95 per cent CLs = 0.13–0.67). The current value of this performance indicator has increased since 2017, and is above the limit BRP. However it is still below the threshold BRP. Thus, although growing, the stock may still be depleted to a level at which there is an increased risk of recruitment impairment.

On the basis of the evidence provided above, the Western Australia West Coast biological stock is classified as a **recovering stock**.

BIOLOGY

Southern Garfish biology [Ye et al. 2002, Smith et al. 2017]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Southern Garfish	South Australia: 10 years, 380 mm TL Tasmania: 9.5 years, 460 mm TL Western Australia: 12 years, 430 mm TL	Western Australia: 12 months, 230 mm TL South Australia: 18 months, 190 mm TL Victoria: 19 months, 210 mm TL Tasmania: 22 months, 200 mm TL

DISTRIBUTION



Distribution of reported commercial catch of Southern Garfish

TABLES

Fishing methods				
	South Australia	Tasmania	Victoria	Western Australia
Charter				
Rod and reel				✓
Commercial				
Beach Seine				✓
Dab Net	✓			
Dip Net		✓		
Gillnet				✓
Haul Seine		✓		✓
Line				✓
Net			✓	
Seine Nets	✓			
Unspecified	✓	✓	✓	
Recreational				
Beach Seine		✓		
Dab Net	✓	✓		
Hook and Line	✓	✓	✓	✓
Net			✓	

Management Methods				
	South Australia	Tasmania	Victoria	Western Australia
Commercial				
Effort limits	✓		✓	
Gear restrictions	✓	✓	✓	✓
Licence			✓	
Limited entry	✓	✓	✓	✓
Size limit	✓	✓		
Spatial closures	✓	✓	✓	✓
Temporal closures	✓	✓		
Vessel restrictions				✓
Recreational				
Bag and possession limits				✓
Bag limits	✓	✓	✓	✓

Gear restrictions	✓		✓	
Licence		✓	✓	
Licence (boat-based sector)				✓
Size limit	✓	✓		
Spatial closures			✓	

Catch	South Australia	Tasmania	Victoria	Western Australia
Charter				Negligible
Commercial	267.208 t	7.00456 t	58.7959 t	6.7275 t
Indigenous	Unknown	Unknown	Unknown (No catch under permit)	
Recreational	79 t (2013–14 survey) [Giri and Hall 2015]	0.3 t (in 2017–18 survey)	21 t (2006–07)	Insufficient data

Victoria – Indigenous (Management Methods) A person who identifies as Aboriginal or Torres Strait Islander is exempt from the need to obtain a Victorian recreational fishing licence, provided they comply with all other rules that apply to recreational fishers, including rules on equipment, catch limits, size limits and restricted areas. Traditional (non-commercial) fishing activities that are carried out by members of a traditional owner group entity under an agreement pursuant to Victoria's *Traditional Owner Settlement Act 2010* are also exempt from the need to hold a recreational fishing licence, subject to any conditions outlined in the agreement. Native title holders are also exempt from the need to obtain a recreational fishing licence under the provisions of the Commonwealth's *Native Title Act 1993*.

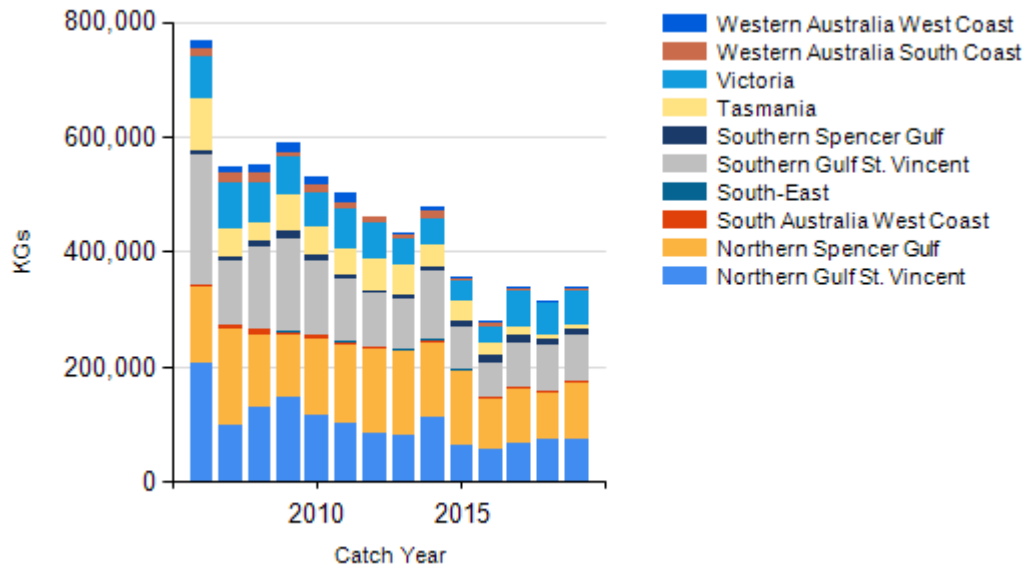
South Australia – Commercial (catch) Data for the Northern Zone Rock Lobster Fishery (South Australia) and the Southern Zone Rock Lobster Fishery (South Australia) have been combined because of confidentiality requirements.

Tasmania – Recreational (management methods) In Tasmania, a recreational licence is required for fishers using dropline or longline gear, along with nets, such as gillnet or beach seine.

Tasmania – Indigenous (management methods) In Tasmania, Indigenous people engaged in fishing activities in marine waters are exempt from holding recreational fishing licences, but must comply with all other fisheries rules as if they were licensed. Additionally, recreational bag and possession limits also apply. If using pots, rings, set lines or gillnets, aborigines must obtain a unique identifying code (UIC). The policy document Recognition of Aboriginal Fishing Activities for issuing a Unique Identifying Code (UIC) to a person for Aboriginal Fishing activity explains the steps to take in making an application for a UIC

Western Australia – Recreational (catch) Current shore-based recreational catch and effort in Western Australia is unknown. State-wide surveys of boat-based fishing are conducted regularly, most recently in 2015/16 [Ryan et al. 2017].

CATCH CHART



Commercial catch of Southern Garfish - note confidential catch not shown

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