

# Southern Garfish (2016)

*Hyporhamphus melanochir*



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## STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	South Coast (Western Australia)	SCEMF, WL (SC)	Undefined	Trends in catch and effort
Western Australia	West Coast (Western Australia)	CSFNMf, WL (WC), WCEMF	Overfished	Fishing mortality, age composition, trends in catch and effort
Victoria	Victoria	CIF, PPBF	Sustainable	Catch, effort, <u>CPUE</u> trends
Tasmania	Scalefish Fishery	SF	Transitional-depleting	Catch, effort, <u>CPUE</u> trends
South Australia	Northern Gulf St. Vincent	MSF, SZRLF	Overfished	Harvest fraction, biomass, egg production, age structure
South Australia	Northern Spencer Gulf	MSF	Transitional-recovering	Harvest fraction, biomass, egg production, age structure
South Australia	South-East	MSF, SZRLF	Undefined	Limited data
South Australia	Southern Gulf St. Vincent	MSF, SZRLF	Sustainable	Trends in catch and effort, age structure
South Australia	Southern Spencer Gulf	MSF	Sustainable	Trends in catch and effort, age structure
South Australia	West Coast (South Australia)	MSF	Undefined	Limited data

MSF Marine Scalefish Fishery (SA), SZRLF Southern Zone Rock Lobster Fishery (SA), SF Scalefish Fishery (TAS), CIF Corner Inlet Fishery (VIC), PPBF Port Phillip Bay Fishery (VIC), CSFNMf, WL (WC) Cockburn Sound Crab Managed Fishery, Open access in the West Coast (WA), SCEMF South Coast Estuarine Managed Fishery (WA),

WCEMF West Coast Estuarine Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA)

## 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[1].

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 likely that the west and south coast support separate biological stocks of this species[2,3]. The majority of West coast landings are from Cockburn Sound, and the majority of South coast landings are from Wilson Inlet. Southern Garfish spawn within Wilson Inlet, maintaining a self-sustaining population within this estuary, which is usually separated from the ocean by a sand bar, and the two main fisheries almost certainly target separate stocks.

In Victoria, there has been no research into the stock structure for populations of Southern Garfish. 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[4].

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[2]. Given the level of spatial separation of Southern Garfish observed within 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—West coast and South coast (Western Australia); Scalefish Fishery (Tasmania); West Coast, Southern Spencer Gulf, Northern Spencer Gulf, Southern Gulf St. Vincent, Northern Gulf St. Vincent and South East (South Australia); and at the jurisdictional level—Victoria.

## STOCK STATUS

**Northern Gulf St. Vincent** Northern Gulf St. Vincent (NGSV) is the second most productive region in South Australia, accounting for 35 per cent of the commercial Southern Garfish catch. Historically, the performance of this fishery has followed a similar pattern to the Northern Spencer Gulf (NSG) because they share similar environments, have experienced comparable fishing pressure and were subject to comparable management strategies. Like NSG, hauling net effort in the NGSV has only marginally decreased (3.8 per cent) since 2011, failing to meet the management objective of reducing total hauling net effort by at least 13 per cent by 2014. Recent total catch has remained relatively stable, but is still the third lowest on record. Unlike the NSG, targeted catch rates have declined by 18 per cent over the past year to 50 kg per fisher day.

High exploitation rates have been a dominant feature for this stock, peaking at 90 per cent in 2006. Since, then the annual harvest fraction has steadily declined to 57.6 per cent by 2014. Although this reduction in exploitation rate is

encouraging, the overall performance of this stock remains concerning as rates of recruitment and estimates of fishable biomass are the lowest on record, both well below their respective trigger reference points. Fishable biomass is estimated to have decreased steadily over the past 6 years to 200.8 t in 2014, with the recent 3-year average being 24.9 per cent lower than the historical average. Recruitment levels have also declined to 32.7 per cent below the average of the previous 5 years. This decline is reflected in the age structure which has shown a reduction in the relative proportion of 2 year olds over the past three assessment cycles. Estimated egg production remains low, but stable, at 10 per cent of unfished levels. The stock is considered to be recruitment overfished. Following management changes, the current level of fishing pressure is expected to allow the stock to recover from its recruitment overfished state; however, measurable improvements in biomass are yet to be detected.

On the basis of the evidence provided above, the Northern Gulf St. Vincent (South Australia) biological stock is classified as an **overfished stock**.

### **Northern Spencer Gulf**

Historically, Northern Spencer Gulf (NSG) has been the most productive region for Southern Garfish in South Australia and, in 2014, contributed 55 per cent of the state-wide catch. Annual catch in this region has been relatively stable over the past 3 years, averaging approximately 145 t per year. Targeted catch rates in the dominant hauling net sector have remained high, with each fisher harvesting an average of 94.8 kg per day in 2014. This is a slight (6.3 per cent) decline from the 2013 estimate, but is still the third highest catch rate on record. Despite a management objective to reduce total hauling net effort by at least 13 per cent following the 2011 assessment[5], effort levels in NSG decreased by a marginal 0.5 per cent, and this was largely negated by a 17 per cent increase in targeted hauling net effort.

Modelled estimates of exploitation rate and egg production constitute the primary performance indicators in this fishery. Over the past decade both indicators have improved, with harvest fractions declining at a rate of three per cent per year to 53.5 per cent and egg production compared to unfished egg production gradually increasing by 0.4 per cent per year to 12.9 per cent. According to these indicators the NSG stock has demonstrated sustained improvement since 2003. This recovery started from a fairly depleted stock and has occurred despite effort not declining as intended under the harvest strategy. Fishable biomass has steadily increased since 2003 in response to declining exploitation rates, and the stock size is estimated to be 18.3 per cent of unfished biomass. Although still 1.7 per cent below the default limit reference level of 20 per cent, this is the highest level since 2001.

Recruitment has also increased to a level above the prescribed trigger reference point, exceeding 10 per cent above the average of the previous 5 years. Although improving, current rates of recruitment are still 50 per cent less than those observed pre-1999. The population composition has remained virtually identical over the last three stock assessment cycles (2008, 2011 and 2014)[5], with 2 year old Southern Garfish continuing to dominate samples. This stability in the population structure confirms consistent levels of recruitment within the stock. Long-term management measures have resulted in a reduction in the exploitation rate below the target of 60 per cent by 2014; sustained increases in egg production and fishable biomass; and improved recruitment. Further management measures (increases in mesh size, minimum size limits and

seasonal closures) have been implemented to further promote stock recovery.

On the basis of the evidence provided above, the Northern Spencer Gulf (South Australia) biological stock is classified as a **transitional–recovering stock**.

**Scalefish Fishery** In 1995–2005, commercial catches of Southern Garfish were stable and typically ranged between 80–100 t. Over the past decade, catches have fluctuated between 40 and 60 t and fell to 24 t in 2015[4]. The initial decline in catches coincided with a reduction in average size and truncation of 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. However, catch rates in 2014–15 have again declined substantially to levels similar to the late-2000s when the stock was considered to be in a depleted state[4]. The above evidence indicates that the current level of fishing pressure is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the Scalefish Fishery (Tasmania) biological stock is classified as a **transitional–depleting stock**.

**South Coast (Western Australia)** In the past 5 years (2011–15), 76 per cent of South coast commercial landings of Southern Garfish were from Wilson Inlet. The current assessment of the Wilson Inlet stock is based on commercial catch and catch rate trends.

Since 2003, the annual catch in Wilson Inlet was relatively stable, and the catch rate has increased slightly, suggesting that the biomass has remained stable and that this stock is unlikely to be recruitment overfished. However, the catch rate may not be a reliable index of abundance due to the multispecies nature of this fishery, which prevents targeted effort from being quantified. There is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, the South coast (Western Australia) biological stock is classified as an **undefined stock**.

**South-East** Very few Southern Garfish are landed by the commercial sector in the south-east of South Australia; the state-wide contribution rarely exceeds 0.3 per cent. Consequently, there is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, the South East (South Australia) biological stock is classified as an **undefined stock**.

**Southern Gulf St. Vincent** 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 as a result of a steady reduction in

fishing effort and, in 2006, dab nets became the dominant gear type. Hauling nets were removed from his region by a voluntary net buy-back scheme, coupled with spatial netting closures introduced in 2005. Prior to this management restructure, the commercial Southern Garfish catch from this region rarely exceeded 10 per cent of the state-wide harvest and after its implementation, this decreased to less than five per cent. The history of this regional fishery and its current status is almost identical to the Southern Spencer Gulf; it is characterised by relatively low levels of fishing activity and commercial catch, extensive netting closures and a population structure that consists of relatively old (aged 3+ years) Southern Garfish. The above evidence indicates that the biomass of this stock is unlikely to be recruitment overfished.

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

### **Southern Spencer Gulf**

Large areas of Southern Spencer Gulf have been closed to hauling net fishing, with the most recent closure being implemented in 2005. Consequently, the hauling net sector has been effectively removed from this region and it has become predominantly fished commercially by dab netters. The relative contribution of this region to the state-wide catch has consequently decreased to less than five per cent. The commercial catch of Southern Garfish from this region was 9.3 t in 2014. Fishing effort and catch rates in the dab net sector have remained relatively stable since the 2005 management restructure. Given the relatively small size of this regional fishery it is generally difficult to sample meaningful quantities of Southern Garfish to ascertain trends in the local population size and age composition. Opportunistic biological samples collected in 2013–14 indicated that the commercial resource consists of greater proportions of larger and older (greater than 3+ years) Southern Garfish in comparison to the Northern Spencer Gulf stock. Although the spatial resolution of the current fishery assessment model is too coarse to assess the key biological performance indicators for this Southern Spencer Gulf region, the relatively low levels of fishing activity and commercial catch, extensive netting closures and a population structure consisting of older (aged 3+ years) Southern Garfish, indicates that this stock is at a level sufficient to ensure that future levels of recruitment are adequate. The above evidence indicates that the biomass of this stock is unlikely to be recruitment overfished.

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

### **Victoria**

In Victoria, Southern Garfish are predominantly landed in the Corner Inlet and Port Phillip Bay Fisheries using haul seines. Catch rates (haul seines) in the Corner Inlet Fishery declined from 1979–90 to a historical low in 1996–97. Over the period 2001–02 to 2004–05, catch rates appeared to stabilise to be variable around the long-term average[9]. In 2014–15, catch rates dropped to well below the long-term average, following a declining trend in the 5-year average catch rate since 2004–05. Catch rates for the Port Phillip Bay Fishery have been declining since 2011–12 and by 2014–15 were at about half the long-term average[10].

The majority of the recreational catch of Southern Garfish comes from Port Phillip Bay. In 2000–01, it was estimated that 25 tonnes (t) was taken by the Victorian recreational fishery, constituting 3.4 per cent of the state-wide recreational catch (all species) in marine waters. Recreational catch rates of

Southern Garfish by anglers in Port Phillip Bay have declined slightly since 2004–05[10].

The above evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment overfished.

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

**West Coast (South Australia)** A negligible amount of Southern Garfish is landed by the commercial sector on the west coast of South Australia, with the contribution to the state-wide catch rarely exceeding two per cent. Consequently, there is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, the West coast (South Australia) biological stock is classified as an **undefined stock**.

**West Coast (Western Australia)** Cockburn Sound is the main fishery for Southern Garfish in the West Coast Bioregion. About 80 per cent of commercial landings and an estimated 50 per cent of recreational landings of this species in the WCB are taken in Cockburn Sound. The current assessment of the Cockburn Sound stock is based on commercial and recreational catch rate trends, age structure from historic (1998–99) and recent (2010–11) years, fishing mortality and spawning potential ratio.

Catch rates in Cockburn Sound have followed a declining trend since the late-1990s, which accelerated after 2011 following an unprecedented oceanic heatwave event along the west coast[6,7]. The current catch is less than 10 per cent of 1990s level. The stock appears to have suffered poor recruitment during the heatwave. Catch rates were at historically low levels in 2015. The age structure is heavily truncated and older fish are absent from the population[ 8]. The modal age of Southern Garfish declined, from 2 years in 1998–99 to 1 year in 2010–11 and the proportion of fish aged greater than 2 years fell from 30 per cent to less than five per cent over the period. The spawning potential ratio suggested that the spawning stock was around 20 per cent of the unfished level in 2010–11. The assessment indicates that the Cockburn Sound stock has been declining since the late-1990s, mainly due to overexploitation. The stock level is currently extremely low and this depleted state of the stock made it vulnerable to collapse after poor recruitment during the 2011 heatwave event. The above evidence indicates that the stock is likely to be recruitment overfished. A management strategy is currently being developed to help this stock recover.

Total mortality (Z) was estimated to be 0.90 per year in 1998–99 and 1.57 per year in 2010–11, indicating a substantial increase in fishing pressure in Cockburn Sound, and a 50 per cent decline in survivorship. The rate of fishing mortality (F) in 2010–11 was estimated to be about twice the rate of rate of natural mortality (M). This level of fishing pressure is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the West coast (Western Australia) biological stock is classified as an **overfished stock**.

## BIOLOGY

Southern Garfish biology

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

## DISTRIBUTION



Distribution of reported commercial catch of Southern Garfish

## TABLES

Commercial Catch Methods	South Australia	Tasmania	Victoria	Western Australia
Beach Seine		✓		
Coastal, Estuary and River Set Nets			✓	
Dab Net	✓	✓		
Gillnet		✓		
Hand Line, Hand Reel or Powered Reels		✓		

Haul Seine	✓		✓	
Line			✓	
Mesh Net			✓	
Otter Trawl			✓	
Unspecified	✓		✓	
Unspecified - Seine			✓	
Various		✓		✓

<b>Fishing methods</b>				
	<b>South Australia</b>	<b>Tasmania</b>	<b>Victoria</b>	<b>Western Australia</b>
<b>Commercial</b>				
Beach Seine		✓		
Dab Net	✓	✓		
Hand Line, Hand Reel or Powered Reels		✓		
Haul Seine	✓		✓	
Mesh Net			✓	
Unspecified	✓			
Various		✓		✓
<b>Indigenous</b>				
Dab Net	✓			
Hand Line, Hand Reel or Powered Reels	✓			
<b>Recreational</b>				
Beach Seine		✓		
Dab Net	✓	✓	✓	
Hand Line, Hand Reel or Powered Reels	✓	✓	✓	✓

<b>Management Methods</b>				
	<b>South Australia</b>	<b>Tasmania</b>	<b>Victoria</b>	<b>Western Australia</b>
<b>Commercial</b>				
Effort limits	✓		✓	
Gear restrictions	✓	✓	✓	✓
Limited entry	✓	✓	✓	✓
Size limit	✓	✓		

Spatial closures	✓	✓	✓	✓
Temporal closures	✓	✓		
Vessel restrictions				✓
<b>Indigenous</b>				
Bag limits	✓		✓	✓
Size limit	✓		✓	
<b>Recreational</b>				
Bag limits	✓	✓	✓	✓
Gear restrictions	✓		✓	
Licence		✓	✓	✓
Size limit	✓	✓		

Active Vessels	South Australia	Tasmania	Victoria	Western Australia
	88 license in MSF, 4 license in SZRLF,	25 Vessel in SF,	16 Fisher in CIF, 20 Fisher in PPBF,	27 License in SCEMF, 11 License in WCEMF, 69 License in WL (SC), 15 License in WL (WC), 1 Vessel in CSFNMF,

**MSF** Marine Scalefish Fishery(SA)

**SZRLF** Southern Zone Rock Lobster Fishery(SA)

**SF** Scalefish Fishery(TAS)

**CIF** Corner Inlet Fishery(VIC)

**PPBF** Port Phillip Bay Fishery(VIC)

**CSFNMF** Cockburn Sound (Fish Net) Managed Fishery(WA)

**SCEMF** South Coast Estuarine Managed Fishery(WA)

**WCEMF** West Coast Estuarine Managed Fishery(WA)

**WL (SC)** Open Access in the South Coast(WA)

**WL (WC)** Open Access in the West Coast(WA)

Catch	South Australia	Tasmania	Victoria	Western Australia
<b>Commercial</b>	157.401t in MSF,	23.5331t in SF,	26.495t in CIF, 10.654t in PPBF,	2.373t in CSFNMF, WL (WC), 4.961t in SCEMF, 0.005t in WCEMF, 2 272t in WL

				(SC),
<b>Indigenous</b>	Unknown	Unknown	Unknown	Unknown
<b>Recreational</b>	79 t (2013/14 survey)	2 t (in 2012–13 survey)	21 t (2006–07)	<1 t (boat-based only)

MSF Marine Scalefish Fishery (SA), SZRLF Southern Zone Rock Lobster Fishery (SA), SF Scalefish Fishery (TAS), CIF Corner Inlet Fishery (VIC), PPBF Port Phillip Bay Fishery (VIC), CSFNMF, WL (WC) Cockburn Sound Crab Managed Fishery, Open access in the West Coast (WA), SCEMF South Coast Estuarine Managed Fishery (WA), WCEMF West Coast Estuarine Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA),

**a Victoria – Indigenous** In Victoria, regulations for managing recreational fishing are also applied to fishing activities by Indigenous people. Recognised Traditional Owners (groups that hold native title or have agreements under the Traditional Owner Settlement Act 2010 [Vic]) are exempt (subject to conditions) from the requirement to hold a recreational fishing licence, and can apply for permits under the Fisheries Act 1995 (Vic) that authorise customary fishing (for example, different catch and size limits or equipment). The Indigenous category in Table 3 refers to customary fishing undertaken by recognised Traditional Owners. In 2015, there were no applications for customary fishing permits to access Southern Garfish.

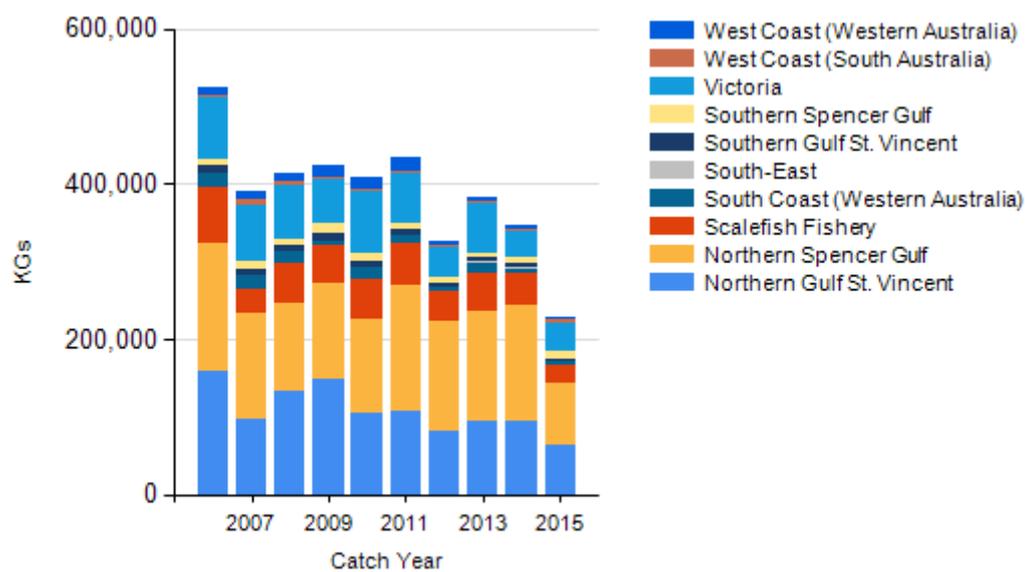
**b Victoria – Indigenous (management methods)** Subject to the defence that applies under Section 211 of the Native Title Act 1993 (Cth), and the exemption from a requirement to hold a Victorian recreational fishing licence, the non-commercial take by indigenous fishers is covered by the same arrangements as that for recreational fishing.

**c 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.

**d 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.

**e 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 .

## CATCH CHART



Commercial catch of Southern Garfish - note confidential catch not shown

### EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

- There is no indication that the hauling nets used to target Southern Garfish adversely interrupt the normal ecological processes of fish and invertebrates that occupy shallow seagrass habitats[12].
- These nets are typically lightweight, and consist of a ‘pocket’ end and lateral ‘wings’. The wings, which generally have a smaller mesh size than the pocket, are specifically designed to herd fish inhabiting surface waters into the pocket of the net, rather than enmesh them throughout the entire water column. Fish that accumulate within the pocket are manually brailled out with a handheld net, and are released or retained at the discretion of the fisher. The design and performance of these hauling nets ensures that post-release mortality of incidental bycatch is reduced, as non-targeted species can be released alive and in relatively good condition[13].

### ENVIRONMENTAL EFFECTS on Southern Garfish

- The impact of environmental factors on Southern Garfish stocks is unknown.
- Southern Garfish are strongly associated with seagrass habitat at all life history stages. Degradation/loss of seagrass habitat is likely to negatively impact on local Southern Garfish stocks.

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