

PIRSA

Consultation Paper: Management scenarios for snapper in South Australia

Primary Industries and Regions SA

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All enquiries

PIRSA.Feedback@sa.gov.au
Primary Industries and Regions SA (PIRSA)
Level 14, 25 Grenfell Street
GPO Box 1671, Adelaide SA 5001
T 08 8226 0900

You can provide feedback on the two management scenarios at www.YourSAy.sa.gov.au/snapper before 11:55pm 30 August 2019.

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Summary

South Australia faces a serious challenge in relation to the future management of snapper in this state.

Fish stocks are constantly changing and require continual monitoring and management. The *Fisheries Management Act 2007* provides the overarching legislative framework to ensure the sustainable management and harvest of South Australia's aquatic resources.

The decline of the snapper fishery in Spencer Gulf and Gulf St Vincent has been noted anecdotally by the charter, recreational and commercial fishers for a number of years. These anecdotal accounts are supported by the latest science.

The purpose of this paper is to provide up to date information on the South Australian snapper fishery and to seek feedback from the public on two management scenarios to reverse the long term decline of snapper stocks.

The two management scenarios outlined in this paper have been developed in response to information in the most recent scientific stock assessment report prepared by the South Australian Research and Development Institute (SARDI)¹ and in response to more recently updated biomass estimates for snapper stocks in both gulfs.

The latest SARDI stock assessment report, published in November 2018, identified further deterioration in the sustainability of the snapper stock in the West Coast/Spencer Gulf, which has been assigned a stock status classification of 'depleted'. This was the first time snapper has been classified as 'depleted' in South Australia. The Gulf St Vincent and South East stocks were assigned a stock status classification of 'sustainable', however there are indications of increased pressure on the Gulf St Vincent stock which also need to be managed.

When a fish stock is classified as 'depleted', it means the biomass has been reduced through catch and/or non-fishing (environmental) effects, such that recruitment of young fish into the fishable stock is impaired. In such a situation, current management is not adequate to recover the stock, or adequate management measures have been put in place but not yet resulted in measurable improvements. Essentially, a fish stock classified as 'depleted' is an overfished stock.

Under the relevant recreational and commercial management plans, in these circumstances consideration should be given to closing the fishing for 'depleted' stocks for a predetermined time or developing suitable alternative approaches to provide for stock recovery.

Furthermore, the *South Australian Fisheries Harvest Strategy Policy* specifies that when a fish stock is classified as 'overfished' a stock recovery strategy must be implemented to rebuild the stock towards a sustainable level within specified timeframes.

In November 2018, when snapper was classified as 'depleted' in the West Coast/Spencer Gulf, the recreational, charter and commercial sectors were invited to a series of consultation meetings and agreed to initial measures to assist the protection and recovery of snapper stocks. These initial measures were implemented in December 2018, which involved additional spatial closures and changes to charter fishery bag and boat limits. At this time, it was agreed further management measures would be necessary to strengthen snapper management arrangements before the 2019/2020 summer snapper spawning period.

In June 2019, SARDI provided additional updated scientific information on snapper spawning biomass estimates from scientific surveys undertaken in December 2018. This new information indicates the 2018

snapper spawning biomass was 22.9% lower in Spencer Gulf, and 86.8% lower in Gulf St Vincent, than it was five years ago.

This latest scientific information further emphasised the need for urgent action to be taken to protect snapper stocks in South Australia.

The aim of the proposed management scenarios outlined in this paper is to introduce the second stage of strengthened management arrangements for snapper before the 2019/2020 summer snapper spawning season. These proposed management scenarios seek to promote the recovery of the West Coast/Spencer Gulf and Gulf St Vincent stocks, and maintain the South East stocks as sustainable, consistent with legislative and regulatory obligations.²

You can provide feedback on the two below scenarios at www.YourSAy.sa.gov.au/snapper before 11:55pm 30 August 2019.

NOTE: Both Western Australia and Queensland are currently facing similar snapper management challenges as they also have depleted snapper stocks. Both states are also investigating management changes to address snapper stock declines.

Management scenario A

A statewide snapper closure would apply to all state waters from 1 October 2019 to 28 February 2023. This closure would cover four summer snapper spawning periods.

During the closure the government would work with all fishing sectors to:

- a) Refine the estimates of snapper biomass and monitor the status and recovery of stocks
- b) Invest in new research to strengthen the recreational fishing data
- c) Invest in new research to strengthen the science on the post-release survival of snapper after catch and release
- d) Reform the commercial marine scalefish fishing sector
- e) Bring all sectors together with fisheries managers to strengthen the consultative management process through a Management Advisory Committee
- f) Work with the Commonwealth to ensure by-catch by other fisheries is managed appropriately
- g) Invest in new research to establish a reliable cost-effective method for monitoring the annual strength of juvenile fish numbers entering our snapper stocks
- h) Develop an updated snapper stock recovery strategy based on the best available science and include reference point triggers to guide reopening the fishery
- i) Convene a national snapper workshop in Adelaide in 2019 to bring together fisheries management, science and industry experts from around Australia and New Zealand to discuss the most effective ways to conduct scientific stock assessment and manage snapper stocks.

Management scenario B

A total snapper closure would apply to the waters in the West Coast/Spencer Gulf and Gulf St Vincent regions (depicted in red in Figure 1 below) from 1 October 2019 to 28 February 2023. An annual seasonal snapper closure (from each October to the end of each February) would apply to the waters in the South East region (depicted in green) until 28 February 2023.

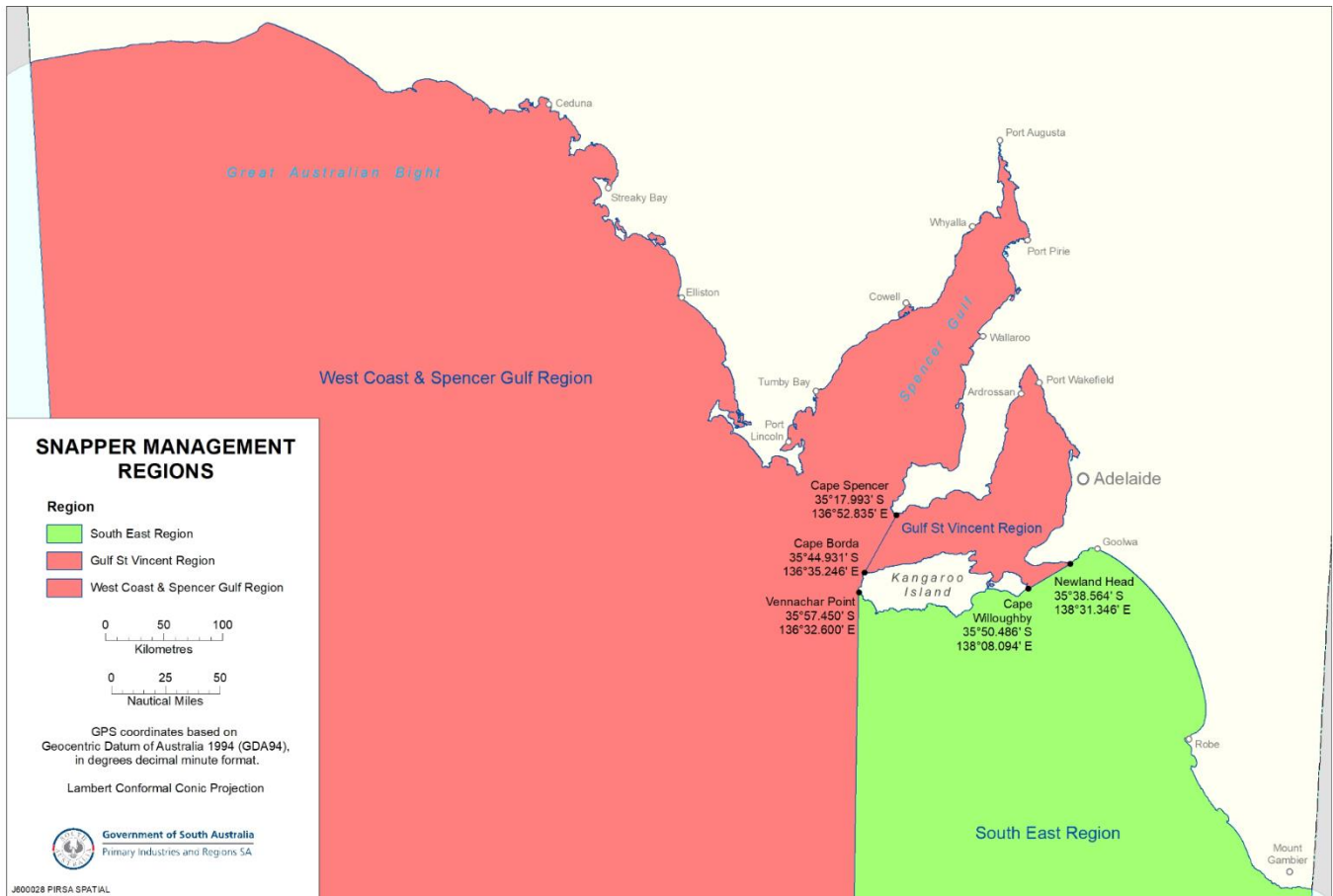


Figure 1. Map showing management scenario B.

The South East region (depicted in green in Figure 1) would have an annual seasonal snapper closure until 28 February 2023 (applying from the start of each October until the end of each February). During the rest of the time, the area would be open to commercial, charter and recreational fishing subject to a total allowable catch, which when caught would result in the fishery being closed. During this period of time increased management restrictions and strict compliance and monitoring activities will be undertaken to ensure any shift in fishing effort is controlled and does not jeopardise the health of the South East (Western Victoria) snapper stocks, which are currently classified as sustainable. Scientific information indicates that the spawning grounds for the South East snapper stock are in Port Philip Bay, Victoria, and this stock is separate from snapper stocks in Spencer Gulf and Gulf St Vincent.

PIRSA would set a Total Allowable Catch (TAC) for commercial, recreational and Aboriginal traditional fishery based on a scientific assessment of the maximum sustainable yield from this stock.

From the TAC, as dictated in relevant management plans, the proportional catch shares taken by each fishing sector would be maintained: commercial 81%, recreational 18% and Aboriginal traditional 1%.

Therefore, under these arrangements, fishing for snapper would be permitted in the South East waters of the state, depicted in Figure 1, for the period commencing on 1 March each year and ceasing at the

end of September each year (for the years 2020, 2021 and 2022). During the fishing period the following restrictions would apply:

Commercial fishing restrictions:

- PIRSA would set a Total Allowable Commercial Catch (TACC) for the South East snapper stock, noting that any catches taken subsequent to the release of this discussion paper will not be taken into account in any future allocation processes. When the TACC is caught, the commercial fishery will be closed.
- Further consultation with the commercial fishing sector would be undertaken to determine how the TACC would be managed, including whether there should be an allocation of the TACC amongst fishers.
- Commercial restrictions would be reviewed to implement commercial Marine Scalefish Fishery reform once the reform is finalised.

Charter and recreational fishing restrictions:

- PIRSA would set a Total Allowable Recreational Catch (TARC) for the South East snapper stock. When the TARC is caught, the recreational fishery will be closed
- A system to trial the use of snapper recreational harvest tags would be developed for the South East snapper stock and the number of tags would be limited to ensure the total recreational catch is constrained to within the TARC. During the trial, the recreational catch of snapper in the South East would no longer be managed by current bag and boat limits, but would be managed through the tag system.
- Further consultation with the charter and recreational fishing sectors will be undertaken to develop an equitable method for allocation of tags between charter and the wider recreational sector.
- Before a recreational fisher can target snapper, they would be required to have a recreational harvest tag, and all legal sized snapper caught would have to be tagged with a recreational harvest tag, immediately upon capture.
- Explore methods to limit the scope for catch and release fishing and high-grading of snapper.
- The recreational sector will be required to use release weights when releasing snapper.

During the closure the government would work with all fishing sectors to undertake research and management projects a) to i) as set out above in management scenario A.

Objectives for management of the snapper fishery

This consultation paper is seeking feedback on two proposed management scenarios which aim to achieve mandated statutory management objectives and goals,³ specifically to:

- Ensure the West Coast/Spencer Gulf stock returns to a 'sustainable' stock classification.
- Maintain a 'sustainable' stock classification for the Gulf St Vincent and South East stocks.
- Reduce the total catch of snapper across all sectors to a level that will promote stock recovery.
- Maintain the proportional catch shares taken by each fishing sector: commercial 81%, recreational 18% and Aboriginal traditional 1%.⁴
- Minimise impacts of fishing activity on the ecosystem.
- Return the snapper fishery to a level at which it provides:
 - quality recreational fishing opportunities
 - an increase in economic return from the commercial fishery
 - an increase in sustainably caught snapper for the seafood consumer.

The snapper fishery

As with all South Australian fisheries, the snapper stocks are owned by the state and managed by the government on behalf of the community. The South Australian Government manages fish stocks to ensure they are biologically sustainable and any economic and regional benefit arising from their exploitation is maximised for the benefit of the whole South Australian community. This includes recreational fishers, charter fishers, Aboriginal fishers, seafood consumers, commercial fishers and the public. Snapper has been subject to previous management reviews and changes, see appendix 4 for the management history chronology.

Biology

Snapper is a large, long-lived species, which is distributed throughout the Indo-Pacific region including Australia, where its extensive distribution includes the coastal waters of the southern two-thirds of the Australian mainland and northern Tasmania.⁵

Snapper live on the seafloor and live in a diversity of habitats from shallow bays and estuaries to the edge of the continental shelf to a depth of at least 200 metres.⁶ Snapper live up to 36 years and can grow to a length of one metre. It takes 3-4 years for snapper to reach legal size of 38cm.

Since the 1980s, research into snapper population biology has been undertaken, which has identified the timing of reproductive activity. The Northern Spencer Gulf has the best information. It is known that 'pre-spawn development' occurs during October and early November.⁷ During October, the average estimates of reproduction indices for the two sexes are marginally elevated. Furthermore, research indicates that maturation commences during October, but spawning does not commence until late November (see Figure 2.)⁸ The numbers of fish in the aggregations and the proportions of fish that are spawning increase through November, then peak in December, before they decline throughout January.⁹

Consequently, the number of eggs spawned also peaks during December and declines through January.¹⁰ Further studies have indicated that the timing of reproduction varies between regions, generally occurring a few weeks later in the southern gulfs compared to the northern parts.¹¹ Spring is also a time of considerable movement activity by snapper in South Australia.¹² Whilst some movement relates to an increase in activity following the sedentary winter months, in some regions it may coincide with the initiation of spawning aggregations.

Although snapper aggregate to spawn every year, similar to many fish species, there is no relationship between spawning stock size and the number of additional juvenile fish which are added to the population each year. This is because the survivability of eggs and larvae is mainly dependent on environmental factors such as temperature, salinity and food availability. This means that snapper aggregations can have a successful spawning event but the eggs and larvae may not survive to add new juvenile fish to the population if the environmental conditions are not suitable.

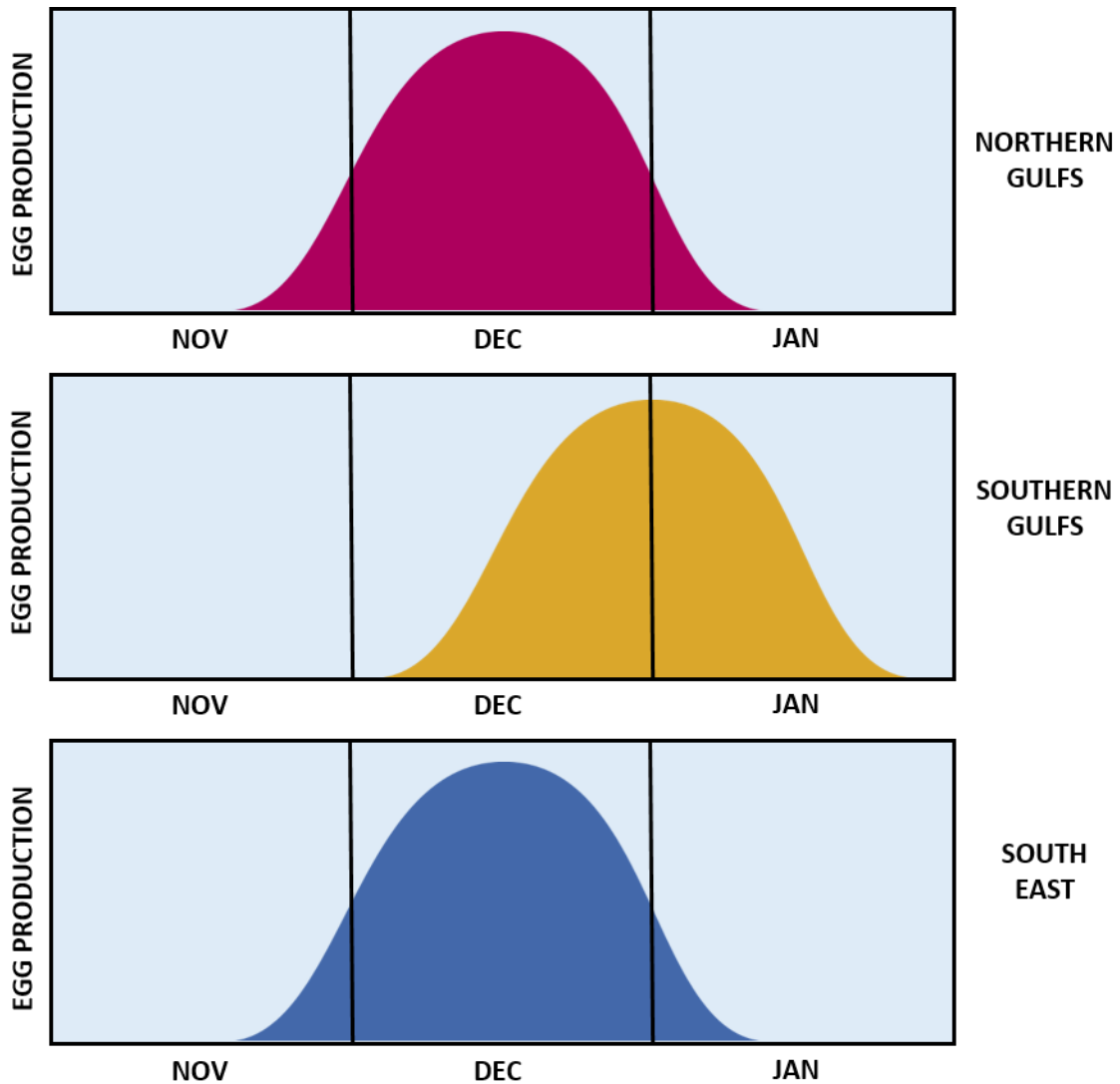
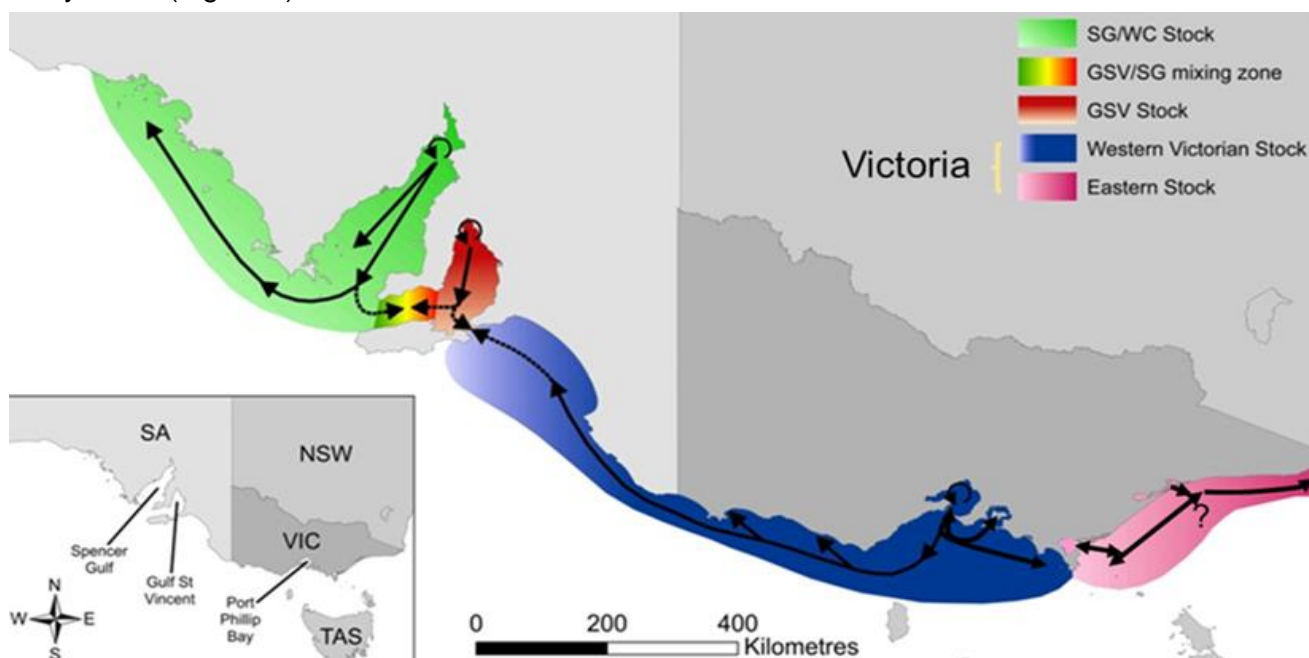


Figure 2. Schematic diagram showing the timing of egg production by snapper in the northern and southern parts of the gulfs and the South East.

The South Australian snapper population involves three individual biological stocks with separate nursery areas (Figure 3):¹³



- The South East (Western Victorian) stock is a cross-jurisdictional stock that extends westward from Wilsons Promontory, Victoria, into the south east of South Australia. The primary nursery area is in Port Phillip Bay.
- The West Coast/Spencer Gulf stock. The primary nursery area is the Northern Spencer Gulf.
- The Gulf St Vincent stock. The primary nursery area is the Northern Gulf St Vincent.

Figure 3. South Australian regional snapper stocks

2017 snapper stock assessment information

The latest stock assessment for snapper was produced by SARDI in November 2018 ‘Assessment of the South Australian Marine Scalefish Fishery in 2017’.¹⁴ Key findings from this report include:

- The West Coast/Spencer Gulf stock was classified as ‘depleted’
 - based on the low estimates of catch, effort and catch per unit effort (CPUE) and independent estimates of fishable biomass indicated that the biomass is ‘depleted’. The number of juvenile snapper being added to the population is highly variable from year to year, however there has not been a strong year class of juvenile snapper added to the population in the Spencer Gulf since 1999.
- The Gulf St Vincent stock was classified as ‘sustainable’
 - based on the strong performance of the fishery in Northern Gulf St Vincent from about 2008 onwards indicated a substantial increase in biomass. This high biomass related to strong numbers of fish entering the population over several years throughout the 2000s which followed several strong year classes from the late 1990s.¹⁵ Although the commercial fishery statistics decreased over recent years, consistent with a decline in the biomass, the estimates of the performance indicators in 2017 were still high compared

with historical values. Based on this information, the assessment made at the time was the stock was unlikely to be depleted and the number of additional juvenile fish entering the population was unlikely to be impaired.

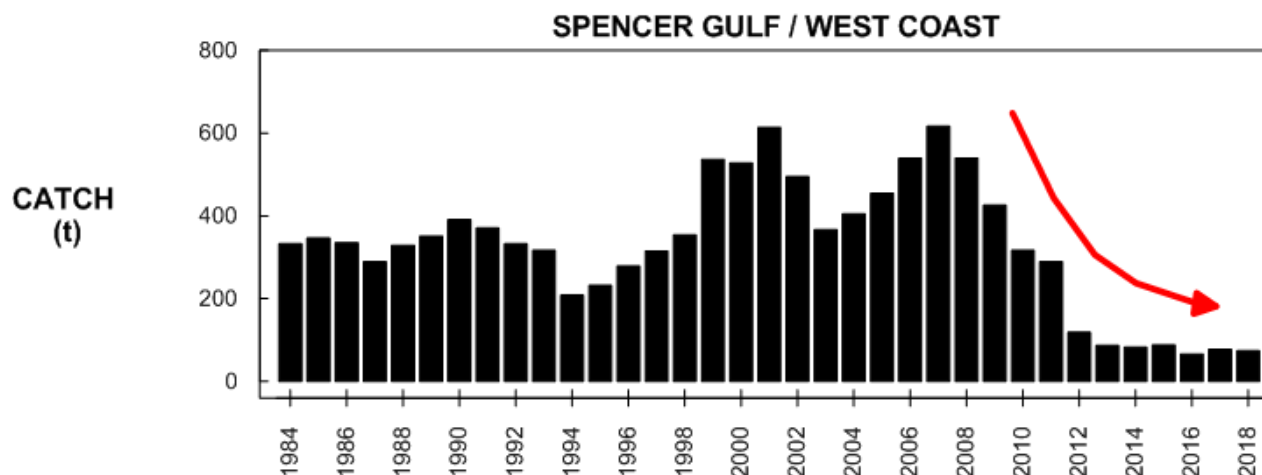


Figure 4. Annual commercial fishery catch in West Coast/Spencer Gulf by tonne

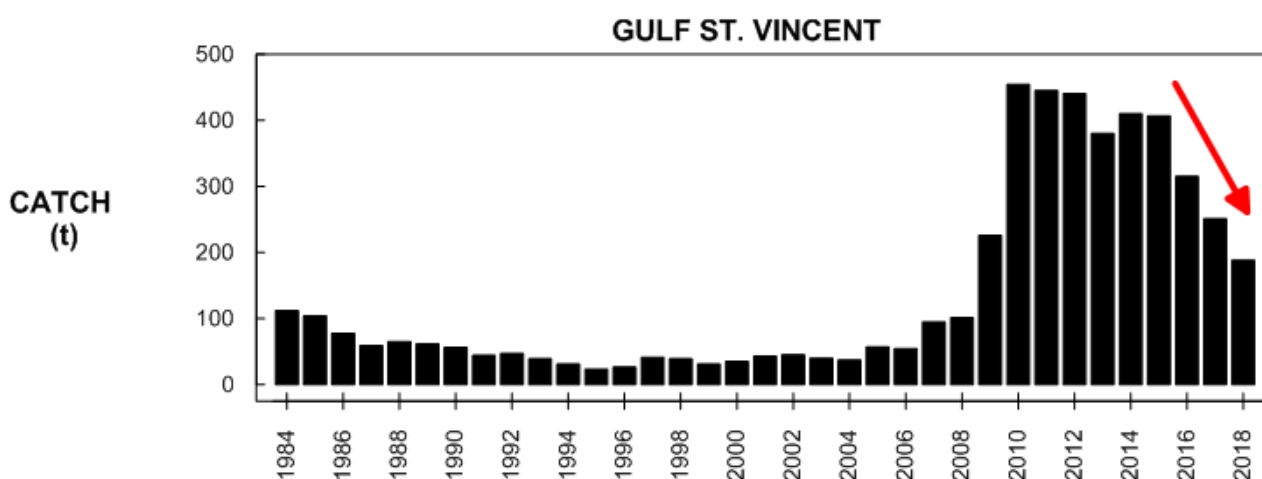


Figure 5. Annual commercial fishery catch in Gulf St Vincent by tonne

- The South East (Western Victoria) stock was classified as ‘sustainable’ based on the strong performance in Port Phillip Bay and recent above-average recruitment of snapper to that nursery area.¹⁶ These results suggested that the stock was not overfished and the current level of fishery performance suggested it was not likely to become overfished.

2018 snapper biomass information

A Daily Egg Production Method Survey (DEPM) survey was undertaken in December 2018 in Gulf St Vincent and Spencer Gulf and compared with the estimates in the same locations from 2013 and 2014.

Key findings from this latest science:

- In the Spencer Gulf the estimated spawning biomass is 192 (+/- 63) tonne, which is 22.9% lower than the 249 (+/- 67) tonne estimate in 2013.
- In Gulf St Vincent, the estimated spawning biomass is 343 (+/- 130) tonne, which is 86.8% lower than the 2,590 (+/- 1,088) tonne estimate in 2014.

- Egg density was generally low in Spencer Gulf.
- Egg density was consistently low in Southern Gulf St Vincent with higher densities recorded in Northern Gulf St Vincent particularly in two hot spots on the eastern and western sides of the gulf.

As with all scientific methods, there is a degree of uncertainty associated with the updated DEPM spawning biomass estimates and these will be improved over time through refinements to the method and sampling strategy. However, the overall weight of scientific evidence available for snapper supports the conclusion that stocks have significantly declined and require further management intervention.

Sharing the fishery

Snapper is harvested by the recreational fishing (including the Charter Boat Fishery), commercial fishing and the Aboriginal traditional fishing sectors. It is an iconic and highly valued species and its eating quality is renowned across Australia.

The *Fisheries Management Act 2007* provides that a fishery management plan must specify the share of the fishery to be allocated to each fishing sector, based on the existing shares at the time the first management plan is requested. *The Management Plan for the Commercial Marine Scalefish Fishery* has formally allocated the snapper resource between the three fishing sectors based on the best available data on the catch shares for each sector at the time the Management Plan was developed, as follows¹⁷:

- Commercial 81%
- Recreational 18%
- Aboriginal traditional 1%.¹⁸

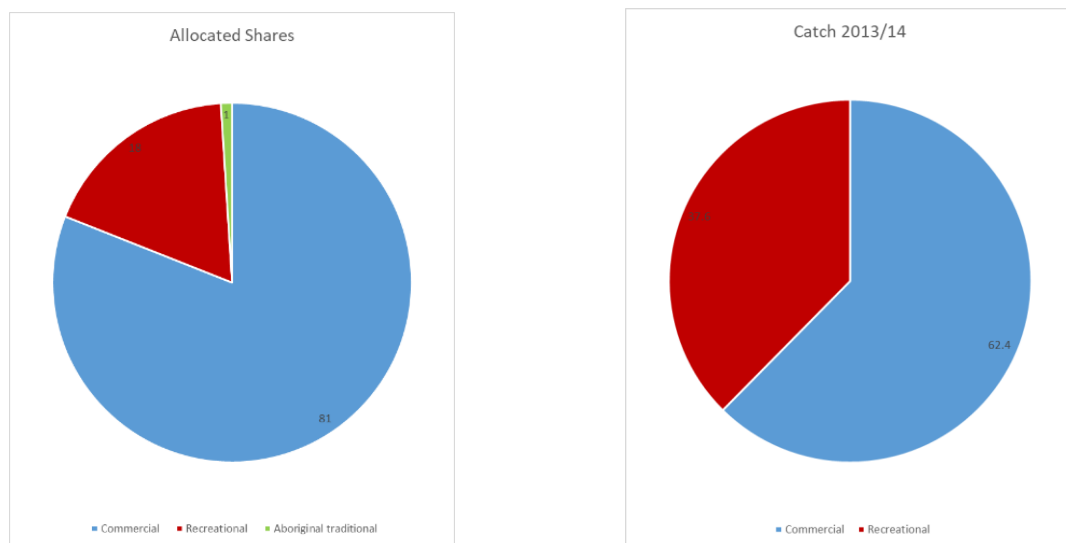


Figure 6. (Left pie chart) Allocation of fishable snapper stocks between the commercial, recreational and Aboriginal traditional fishers. (Right pie chart) Actual catch in 2013/14 as recorded by the commercial sector and estimated through the 2013/14 recreational fishing survey.

Commercial fishery

As a highly sought after fish species by seafood consumers, snapper is a primary target species of the commercial Marine Scalefish Fishery. Snapper is caught using rods and line, handlines and longlines.

Three other commercial fisheries in South Australia have access to snapper; the northern zone and southern zone rock lobster fisheries and the Lakes and Coorong Fishery. Commonwealth fishers also have an allowance to catch snapper as bycatch. In 2018, the Commonwealth Australian Fisheries Management Authority implemented complementary snapper closure arrangements to align with the state snapper fishery closure.¹⁹

The (state) commercial Marine Scalefish Fishery is largely managed through the use of input controls, which aims to limit the total effort that can be directed into the fishery and therefore the overall harvest capacity of fishers. Limited entry is the main input control with the total number of licences currently limited to 303 licences and no new licences are permitted. One of the other main input controls in the fishery is the owner operator provision, where the holder of the licence is the principle operator of the licence, and there is a restriction on the number of agents that may fish from a licence. There is also an ongoing commercial licence amalgamation scheme, where there is a requirement for new commercial entrants to amalgamate two licences to enter the Marine Scalefish Fishery. The licence amalgamation scheme is industry funded and has achieved long-term reduction of fishing effort through licence reduction in the Marine Scalefish Fishery.

In 2017, the total statewide commercial catch of snapper was 339 tonnes, a 67% reduction since record catches of 1,035 tonnes in 2010. The Gulf St Vincent region currently accounts for 74% or 251.4 tonne of the total commercial statewide catch, 23% or 77.9 tonnes in West Coast/Spencer Gulf and 3% or 9.2 tonnes in the South East.²⁰ Historically, handlines were the most significant gear type, and their catches largely accounted for the cyclical variation in total catch until 2008. Handlines continue to be the dominant gear type in the West Coast/Spencer Gulf. However, longline catch increased marginally between 2005 and 2008, before increasing considerably in the Gulf St Vincent until 2010 when it became the dominant gear type in Gulf St Vincent. Both longline and handline catches and effort have declined since 2011.

In 2017, PIRSA introduced new regulations to restrict the temporary transfer (leasing) of commercial marine scalefish licences to only once in every five years, to halt the leasing of licences and encourage longer-term commitment and resource stewardship by licence holders. In 2013, PIRSA introduced a daily commercial catch limit for snapper for all commercial licence holders (currently 200 kg in Spencer Gulf, 350 kg in Gulf St Vincent and 350 kg in the South East), halved the number of hooks that may be used by longline operators in the gulfs to 200 and extended the seasonal statewide snapper closure and introduced spatial closures.

The commercial and recreational sector have the same minimum size limit for snapper, see appendix 2 for further information on current snapper management arrangements. Furthermore, snapper are not permitted to be taken by nets or traps.

The Marshall Liberal Government is committed to reform the commercial Marine Scalefish Fishery. The state government has recently established a 'Commercial Marine Scalefish Fisheries Reform Advisory Committee' to guide the development and implementation of a reform package for the South Australian commercial Marine Scalefish Fishery. The Advisory Committee will undertake broad industry engagement to explore potential reforms including:

- introducing zones
- fleet rationalisation
- introduction of a modernised fisheries management system, including exploring a quota management system.

The Advisory Committee will provide formal advice of industry's preferred reform to the Minister for Primary Industries and Regional Development by the end of 2019.

Recreational fishery

The recreational fishery is regulated through size, bag and boat limits, and restrictions on fishing gear. Legal minimum lengths in South Australia are set so most fish will have the chance to reach a reproductive size and spawn at least once. Size limits for snapper are designed to provide a level of protection to allow for an adequate proportion of small and large fish to survive from being caught and to spawn. This allows the replenishment of stocks for the species.

Recreational daily bag limits are also a management measure for protecting and maintaining fish stocks, as this restricts the number of fish taken by fishers. Bag limits also serve to provide equitable fishing opportunities between recreational fishers. Boat limits are also implemented to limit the harvest per boat trip and are usually regulated at three times the bag limit. Restrictions apply to the specification and number of hand lines, rods, and line that may be used by recreational fishers. For more information see appendix 2.

Possession limits restrict the quantity or total weight of fish that recreational fishers can catch and keep. Possession limits are a useful regulatory tool that prevents recreational fishers taking and stockpiling large quantities of fish.

The 2013/14 recreational fishing survey estimated the total recreational sector participation to be 277,000 recreational fishers. The 2013/14 survey estimated that the total numbers of snapper taken by recreational fishers increased by 14% from 384,000 fish in 2007/08 to 437,300 fish in 2013/14.²¹ Release rates decreased from 74% in 2007/08 to 53% in 2013/14.²² The estimated recreational harvest increased by 18.6% from 97,010 fish or 177.5 tonne in 2007/08 to 207,800 fish or 332 tonne. The recreational harvest in 2013/14 comprised of 37.6% of the total statewide harvested weight.²³ The dominant gear type used by the recreational sector to target and take snapper is rod and handline.

The 2013/14 recreational fishing survey showed the majority (93%) of snapper caught by recreational fishers is taken within Spencer Gulf and Gulf St Vincent. The 2013/14 recreational fishing survey showed the proportion of the total regional catch taken by the recreational sector was 46% in Spencer Gulf, 47% in Gulf St Vincent, 6% in the West Coast and 1% in the South East.

The recreational fishery includes those recreational fishers who utilise charter services to target snapper. Charter boat fishing offers recreational fishers an increased probability of success through the guidance of an experienced operator, often using sophisticated fish location technology and a fishing platform that can access good fishing grounds.

Unlike the remainder of the recreational catch, the charter sector are required to report their catch to PIRSA, so the government has strong data in this area. In 2016/17, clients on board a charter boat caught 14,946 snapper (approximately 43.6 tonnes).²⁴ In 2017/18 13,127 snapper were caught (approximately 39.8 tonnes).²⁵

Aboriginal traditional fishery

The Aboriginal traditional fishery is allocated 1% of the snapper catch. However, this is a nominal allocation as very little is known about the actual catch.

Initial management action – based on 2018 scientific assessment

On the basis of the SARDI 2018 snapper stock assessment the government held workshops with the commercial, recreational and charter sectors in November 2018 and in December 2018. At these meetings additional management arrangements were developed. The following additional management arrangements were implemented, effective midday 15 December 2018:

- Spatial closures in Spencer Gulf applied for 12 months, prohibiting all fishing activity and prohibiting the possession of snapper inside the closure areas. These sites are consistent with previous years and include the Estelle Star, Jurassic Park, Santa Anna and Illusion.
- An additional spatial closure was implemented in Spencer Gulf at Point Lowly for 12 months, which includes no fishing for snapper, but allows for the possession of snapper to enable fishers to transit to the Point Lowly boat ramp and for other fishing activities.
- The spatial closure in Gulf St Vincent were amended to remove the Ardrossan closure, and implement two additional closures that encompass part of Tapley Shoal and an area off Sellicks Beach, which included no possession of snapper but allows for other fishing activities, from midday on 15 December 2018 to 31 March 2019.
- For the Charter Boat Fishery, reduced daily catch limits statewide from 5 (38-60 cm fish) and 2 (>60 cm fish), to 3 and 1 respectively. The boat limit was also removed so this is an individual passenger limit. These changes were already under consideration at the time as part of the Charter Boat Fishery Management Plan review.

All other recreational, commercial and charter boat limits continued to apply (see appendix 2 for further information).

Seeking feedback - proposed management scenarios

When the above interim management arrangements were finalised, it was determined that further management measures would be necessary to strengthen snapper management for all relevant fishing sectors (commercial, recreational and charter) before 2019/20 summer. The recent biomass estimates provided by SARDI and the overall weight of scientific evidence have reinforced this need.

The state government consulted with the charter, commercial and recreational sector about the latest biomass estimates as the estimates were released and each sector was invited to provide initial comment on proposed measures. This initial feedback was considered in drafting the proposed management scenarios contained in this paper. More considered feedback from these sectors is welcomed in light of the specific management scenarios being put forward in this consultation paper

It should be noted that while each management scenario would have short-term impacts on businesses and regional tourism, without suitable management action there will be further decline in snapper stocks. A further decline would have much greater impact to the snapper stocks, the businesses and regional tourism activities that benefit from snapper.

Management scenario A

The statewide seasonal snapper closure would be extended from 1 October 2019 to 28 February 2023. This closure would cover four summer snapper spawning periods.

During the closure the government would work with all fishing sectors to:

- a) **Refine the scientific estimates of biomass and monitor the status and recovery of stocks** – invest in the science (which was cut under the previous government), to undertake annual snapper stock assessments for 2019- 2023 using the Daily Egg Production Method (DEPM) and latest scientific methods.
- b) **Invest in new research to strengthen the recreational fishing data** – Assessing the relative contribution of the statewide catch by the recreational fishing sector is the most significant data gap in managing snapper. The recreational sector total harvest has traditionally been determined through landline telephone/diary surveys that are undertaken on a five-year cycle. With changes in telecommunications, these methods are imprecise and can have flow-on uncertainties and ramifications in the assessment of snapper species. A SARDI-led national research project will develop a new national recreational fishing survey method, using the latest technology to create a more accurate recreational fishing survey and consequently more accurate recreational fishing catch data to improve fishing management in the future.
- c) **Invest in new research to strengthen the science on the post release survival of snapper after catch and release** – A new research project will use tagging to quantify release rates, movement, survival, test techniques to minimise barotrauma and develop a code of conduct for the release of snapper. This project will enable selected charter and commercial fishers to catch, tag and release snapper. PIRSA and SARDI will work with the respective industry association bodies to involve selected fishers in this new research project.
- d) **Reform the commercial marine scalefish fishing sector** – The commercial Marine Scalefish Fishery reform process is currently underway, with the industry developing their preferred reform package. Formal advice will be provided to the Minister by the end of 2019 as to industry's preferred reform package.
- e) **Bring all sectors together with fisheries managers and scientists to strengthen the consultative management process through a Management Advisory Committee** – While the fishery is closed, a co-management committee for marine scalefish fish stocks, which includes commercial, charter, recreational and Aboriginal traditional fishers, will be formed to guide future decision-making. This committee would provide recommendations on future management measures for all sectors based on the latest science.
- f) **Work with the Commonwealth to ensure by-catch by other fisheries is managed appropriately**
- g) **Invest in new research to establish a reliable cost-effective method for monitoring the annual strength of juvenile fish numbers entering our snapper stocks** – The objectives of this project are to understand snapper recruitment dynamics, test various sampling methods and undertake recruitment surveys in Spencer Gulf and Gulf St Vincent.
- h) **Develop an updated snapper stock recovery strategy based on the best available science that includes reference point triggers to guide reopening the fishery** – During the closure develop a stock recovery strategy which will be informed by research which

includes Daily Egg Production Method (DEPM) surveys to estimate biomass, pre-recruitment survey research and post-release survival and tagging research. The stock recovery strategy will include development of a formal harvest strategy.

- i) **Convene a national snapper workshop** in Adelaide in 2019 to bring together fisheries management, science and industry experts from around Australia and New Zealand to discuss the most effective ways to conduct scientific stock assessment and management of snapper stocks.

Likely benefits of the management scenario A	Potential impacts and other considerations
Maximum protection for the snapper stock while longer term management arrangements are established, including implementation of the commercial marine scalefish reform process and accounting for recreational catch.	Impacts on recreational fishing holidays/regional tourism across the state, including charter fishing activities.
Provides additional protection for spawning aggregations during the spawning period.	Impacts on regional towns where snapper is important for recreational fishing tourism.
Is likely to improve the number of juvenile snapper reaching maturity, which would ultimately lead to increased production in the fishery.	Impacts commercial and charter fishers who have built a reliance on snapper.
Eliminates fishing pressure by all sectors.	Commercial fishers may increase effort on the other primary species during the closure period.
Equally applies to the recreational, charter boat and commercial sectors.	Eliminates supply of South Australian snapper to consumers.
A closure is easy to communicate and comply with.	
Allows for planned research to be conducted, to inform ongoing management	

Management scenario B

A total snapper closure would apply to the waters in the West Coast/Spencer Gulf and Gulf St Vincent regions (depicted in red in Figure 7 below) from 1 October 2019 to 28 February 2023. An annual seasonal snapper closure (from each October to the end of each February) would apply to the waters in the South East region (depicted in green) until 28 February 2023.

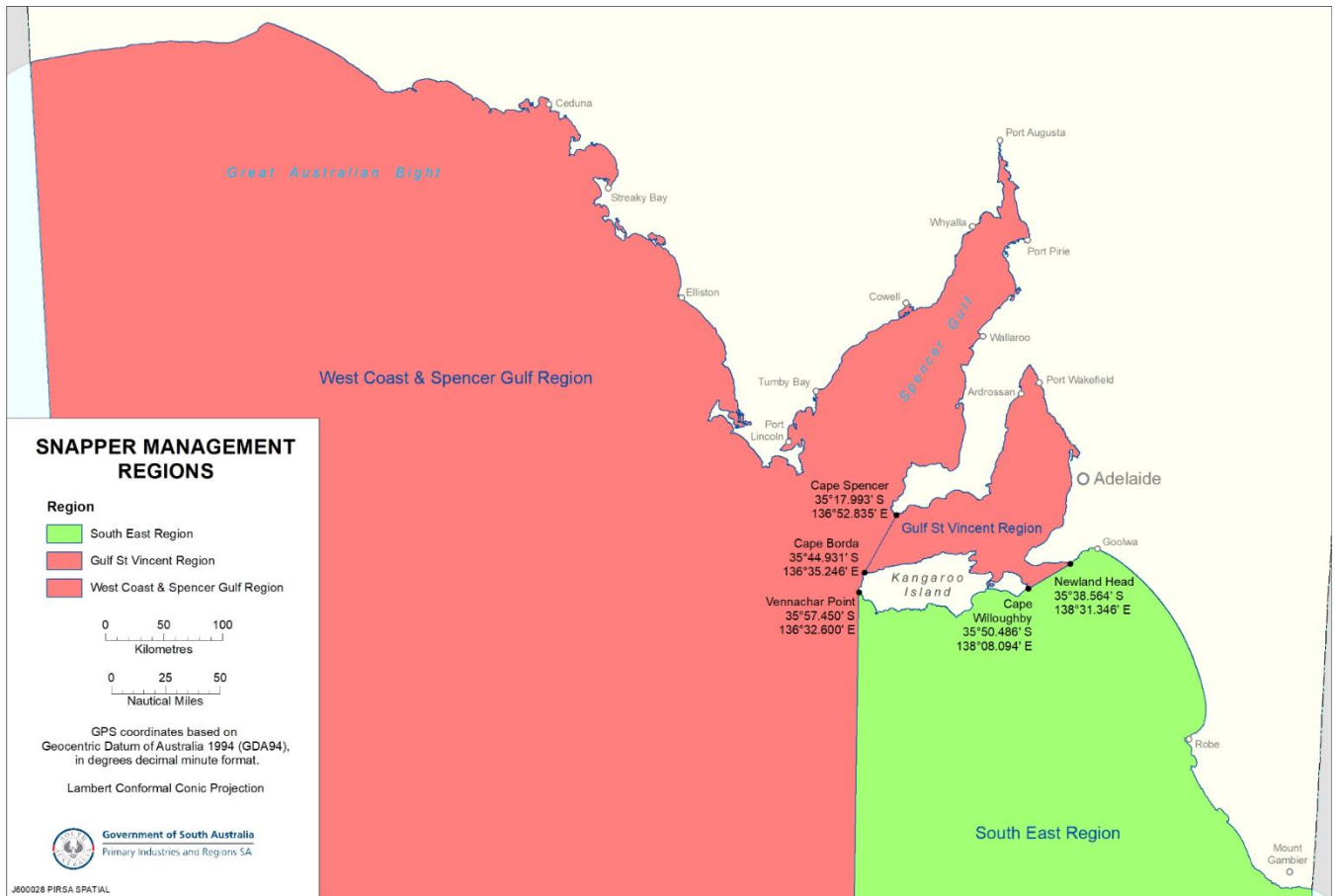


Figure 7. Map showing management scenario B.

The South East region (depicted in green in Figure 7) would have an annual seasonal snapper closure until 28 February 2023 (applying from the start of each October until the end of each February). During the rest of the time, the area would be open to commercial, charter and recreational fishing subject to a total allowable catch, which when caught would result in the fishery being closed. During this period of time increased management restrictions and strict compliance and monitoring activities will be undertaken to ensure any shift in fishing effort is controlled and does not jeopardise the health of the South East (Western Victoria) snapper stocks, which are currently classified as sustainable. Scientific information indicates that the spawning grounds for the South East snapper stock are in Port Philip Bay, Victoria, and this stock is separate from snapper stocks in the Spencer Gulf and Gulf St Vincent.

PIRSA would set a Total Allowable Catch (TAC) for commercial, recreational and Aboriginal traditional fishery based on a scientific assessment of the maximum sustainable yield from this stock.

From the TAC, as dictated in relevant management plans, the proportional catch shares taken by each fishing sector would be maintained: commercial 81%, recreational 18% and Aboriginal traditional 1%.

Therefore, under these arrangements, fishing for snapper would be permitted in the South East waters of the state, depicted in Figure 7, for the period commencing on 1 March each year and ceasing at the

end of September each year (for the years 2020, 2021 and 2022). During the fishing period the following restrictions would apply:

Commercial fishing restrictions:

- PIRSA would set a Total Allowable Commercial Catch (TACC) for the South East snapper stock noting that any catches taken subsequent to the release of this discussion paper will not be taken into account in any future allocation processes. When the TACC is caught, the commercial fishery will be closed.
- Further consultation with the commercial fishing sector would be undertaken to determine how the TACC would be managed, including whether there should be an allocation of the TACC amongst fishers.
- Commercial restrictions would be reviewed to implement commercial Marine Scalefish Fishery reform once the reform is finalised.

Charter and recreational fishing restrictions:

- PIRSA would set a Total Allowable Recreational Catch (TARC) for the South East snapper stock. When the TARC is caught, the recreational fishery will be closed
- A system to trial the use of snapper recreational harvest tags would be developed for the South East snapper stock and the number of tags would be limited to ensure the total recreational catch is constrained to within the TARC. During the trial, the recreational catch of snapper in the South East would no longer be managed by current bag and boat limits, but would be managed through the tag system.
- Further consultation with the charter and recreational fishing sectors will be undertaken to develop an equitable method for allocation of tags between charter and the wider recreational sector.
- Before a recreational fisher can target snapper, they would be required to have a recreational harvest tag, and all legal sized snapper caught would have to be tagged with a recreational harvest tag, immediately upon capture.
- Explore methods to limit the scope for catch and release fishing and high-grading of snapper.
- The recreational sector will be required to use release weights when releasing snapper.

During the closure the government would work with all fishing sectors to undertake research and management projects a) to i) as set out above in management scenario A.

Likely benefits of the management scenario B	Potential impacts and other considerations
Allows some fishing to occur of ‘sustainable’ snapper stocks whilst remainder of the stocks are provided maximum protection while longer term management arrangements are established, including implementation of the commercial marine scalefish reform process and recreational catch survey project.	Impacts on recreational fishing holidays/regional tourism for the majority of the state during holidays, which are peak recreating holiday periods, including charter fishing activities.

Will enable growth in South East charter operations and recreational fishing opportunities	Impacts on regional towns on the West Coast, Spencer Gulf and Gulf St Vincent where snapper is important for recreational fishing tourism.
Closure in the South East during spawning period provides protection for aggregations during this period.	Impacts commercial and charter fishers on the West Coast, Spencer Gulf and Gulf St Vincent who have built a reliance on snapper during the spring and summer periods.
Is likely to improve the number of juvenile snapper reaching maturity in the gulfs, which would ultimately lead to increased production in the fishery.	Commercial fishers may increase effort on the other primary species during the closure period.
Equally applies to the recreational, charter boat and commercial sectors.	Eliminates supply of South Australian snapper to consumers during summer period
Allows for planned research to be conducted, to inform ongoing management	The partial closure will be more difficult to communicate with the public than scenario A.
South East snapper fishers will achieve a higher price for their product.	Cost of snapper will increase for the seafood consumer

How to provide feedback

Feedback on this management options paper can be provided at www.YourSAy.sa.gov.au/snapper before 11:55pm 30 August 2019.

Appendix 1: South Australia snapper fishery profile

Recreational harvest:

177.5 tonnes (including Charter Boat Fishery of 90.5 tonnes) in 2007/08 (19% of total catch)

332.5 tonnes (including Charter Boat Fishery of 59 tonnes) in 2013/14 (37.6% of total catch)

Commercial harvest:

742.7 tonnes in 2007/08 (81% of total catch)

550 tonnes in 2013/14 (62.4% of total catch)

Aboriginal harvest:

No estimates of catch available

No of recreational fishers:

2013/14 recreational fishing survey: ~277,000

Commercial gross value of production (GVP):

Snapper GVP of \$3.7 million in 2016/17

Overall Marine Scalefish GVP of \$22.8 million in 2016/17

No of commercial licences:

303 Marine Scalefish Fishery licences, 279 other SA commercial fishing licences and Commonwealth licences with access to snapper

Gear:

Hand lines, rod and line, long line

Area of fishery:

South Australian coastal marine waters

Allocated shares:

Commercial 81% (Marine Scalefish Fishery 79%, Southern Zone Rock Lobster Fishery 1.45%, Northern Zone Rock Lobster Fishery 0.55%, Lakes and Coorong Fishery 0.03%)

Recreational 18% (Recreational 8%, Charter 10%)

Aboriginal 1%

Appendix 2: Current snapper management arrangements

- Minimum legal length: 38 cm
- An annual statewide snapper closure: 1 November to 15 December
- There are currently seven snapper spatial closures:
 - the spatial fishing closures in Spencer Gulf prohibit all fishing activity and prohibits the possession of snapper inside the closure areas for 12 months, effective from 15 December 2018. These sites include the Estelle Star, Jurassic Park, Santa Anna and Illusion. The Point Lowly spatial closure includes no fishing for snapper, but allows for the possession of snapper to enable to transit to the Point Lowly boat ramp and for other fishing activities.
 - the spatial closures in Gulf St Vincent encompass part of Tapley Shoal and an area off Sellicks Beach, which includes no possession of snapper but allows for other fishing activities, from midday on 15 December 2018 to 31 March 2019.
- Rod and hand line
 - each person can use 1 of the following combinations of rods and hand lines:
 - up to 2 rods or up to 2 hand lines or 1 of each.
 - each line can have 1 of the following:
 - up to 3 hooks attached or up to 5 hooks joined eye to shank or threaded together.

Commercial Fishing Arrangements

- In the West Coast/Spencer Gulf region a maximum daily commercial catch limit of 200 kg and a total possession limit of 400 kg per vessel per fishing trip.
- In the Gulf St Vincent region a maximum daily commercial catch limit of 350 kg and a total possession limit of 700 kg per vessel per fishing trip.
- In the South East region a maximum daily commercial catch limit of 350 kg and a possession limit of 1050 kg per vessel per fishing trip.
- A prohibition on:
 - the use of longlines to take snapper during Gazetted public holiday weekends.
 - taking snapper by net and traps
 - transferring snapper to any other vessel whilst at sea
 - landing snapper outside the region it was caught
- Maximum limit of 200 hooks by longline operators inside the gulfs and 400 hooks outside the gulfs.
- Prior reporting requirements.

Recreational Fishing Arrangements

- Daily boat limit when 3 or more people on board:
 - snapper 38 to 60 cm: 15
 - snapper over 60 cm: 6
- Personal daily bag limit:
 - snapper 38 to 60 cm: 5
 - snapper over 60 cm: 2

Charter Boat Fishery Arrangements

- Personal daily limit
 - snapper 38 to 60 cm: 3
 - snapper over 60 cm: 1

Appendix 3: Reference list

Fowler AJ (2016) The influence of fish movement on regional fishery production and stock structure for South Australia's snapper (*Chrysophrys auratus*) fishery. FRDC Project 2012/020. Final Report.

Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.

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Hamer P, Conron, S (2016) snapper stock assessment 2016, Fisheries Victoria Science Report Series 10, Fisheries Victoria, Queenscliff.

Jones K (2009) South Australian Recreational Fishing Survey. PIRSA Fisheries, Adelaide, 84 pp. South Australian Fisheries Management Series Paper No. 54.

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Steer MA, McGarvey R, Oxley A, Fowler AJ, Grammer G, Ward TM, Westlake E, Matthews D, Matthews J (2017). Developing a fishery independent estimate of biomass for snapper (*Chrysophrys auratus*). Final Report to FRDC (Project No. 2014/019). 68 pp.

Steer MA, Fowler AJ, McGarvey R, Feenstra J, Westlake EL, Matthews D, Drew M, Rogers PJ, Earl J (2018) Assessment of the South Australian Marine Scalefish Fishery in 2016. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2017/000427-1. SARDI Research Report Series No. 974. 250pp.

Steer, M.A., Fowler, A.J., McGarvey, R., Feenstra, J., Smart, J., Rogers, P.J., Earl, J., Beckmann, C., Drew, M. and Matthews, J. (2018). Assessment of the South Australian Marine Scalefish Fishery in 2017. Report to PIRSA Fisheries and Aquaculture (PDF 7.9 MB). South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000427-2. SARDI Research Report Series No. 1002. 230pp.

Appendix 4: Recent snapper stock assessments and management responses

Recent snapper Stock Assessments and Management Responses		
Year and Publication	Stock/Status	Management Response
2010 Snapper Fishery Assessment Report 2010 Snapper Management Strategy Evaluation report 2010	<ul style="list-style-type: none"> • High biomass in all stocks (Northern Spencer Gulf, Southern Spencer Gulf, Southern Gulf St Vincent, Northern Gulf St Vincent) based on good recruitment and management interventions since 1997 • Southern Spencer Gulf could benefit from a strong year class recruiting into the fishery 	<ul style="list-style-type: none"> • N/A
2011	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • PIRSA establish snapper Working Group in response to stock concerns
2012	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • 800 kg a day trip limit introduced in Spencer Gulf and Gulf St Vincent for commercial sector • Prior reporting requirements • Extension of seasonal closure to mid-December for all sectors
2013 Snapper Fishery Assessment Report 2013	<ul style="list-style-type: none"> • Northern Spencer Gulf, Southern Spencer Gulf, Southern Gulf St Vincent and South East all assessed as 'transitional depleting' • Northern Gulf St Vincent 'sustainable' • West Coast 'undefined' 	<ul style="list-style-type: none"> • Reduction of daily trip limits to 500 kg for commercial fishing sector • Maximum three multi-trip applied • Hook limits reduced for longlines in the gulfs from 400 to 200 • Snapper must not be transshipped at sea

		<ul style="list-style-type: none"> • Implementation of spawning spatial closures for all sectors
<p>2013</p> <p><u>Management Plan for the South Australian Commercial Marine Scalefish Fishery</u></p> <p><u>Ecologically Sustainable Development (ESD) Risk Assessment of the SA MSF</u></p>	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Management plan released October 2013 • Goals and objectives to support management of Marine Scalefish Fishery • Snapper Harvest Strategy with decision making framework • First allocations between the Commercial 81%, Recreational 18% and Aboriginal Traditional 1% • Co-management arrangements
<p>2014</p> <p><u>Status of Australian Fish Stock Report 2014</u></p>	<ul style="list-style-type: none"> • Northern Spencer Gulf, Southern Spencer Gulf, Southern Gulf St Vincent and South East all assessed as 'transitional depleting' • Northern Gulf St Vincent 'sustainable' • West Coast 'undefined' 	<ul style="list-style-type: none"> • 2013/14 recreational fishing survey undertaken • Management arrangements continued for all sectors
<p>2015</p>	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Management arrangements continued for all sectors
<p>2016</p> <p><u>Snapper Fishery Assessment Report 2016</u></p> <p><u>Status of Australian Fish stocks report 2016</u></p>	<ul style="list-style-type: none"> • West Coast/Spencer Gulf stock assessed as 'transitional depleting' • Gulf St Vincent and Western Victoria (South East) stock assessed as 'sustainable' 	<ul style="list-style-type: none"> • Continuation of seasonal closure • Continuation of spawning spatial closures • Reduction of daily trip limits to 200 kg in Spencer Gulf and 350 kg in Gulf St Vincent / South East for commercial fishing sector • Restrictions to longlining on weekends for commercial sector • Snapper must be landed in the same region in which they were taken

		<ul style="list-style-type: none"> • Reduction in bag and boat limits for recreational fishing sector following recreational fishing review
2016 Strategic review of Marine Scalefish Fishery	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Marine Scalefish Fishery Strategic Review Working Group established to develop a new strategic direction for the management of the fishery • Discussion paper developed and distributed, port meetings held with commercial fishery
2017 <i>Developing a fishery independent estimate of biomass for snapper</i>	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Management arrangements continued for all sectors
2017 Strategic review of Marine Scalefish Fishery	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Recommendations from strategic review of Marine Scalefish Fishery focused on modernising the fishery management framework and restructuring/rationalising the fishery through a voluntary structural adjustment process.
2017 <i>Management Plan for Recreational Fishing</i>	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Released in September 2017 • Goals and objectives to support management of recreational fishing • Harvest Strategy with decision rules • Co-management arrangements
2018 <i>Assessment of the South Australian Marine Scalefish Fishery in 2017</i>	<ul style="list-style-type: none"> • West Coast/Spencer Gulf assessed as 'depleted' (overfished) • Gulf St Vincent and Western Victoria (South 	<ul style="list-style-type: none"> • Revision of spatial closures to include Point Lowly, Tapley Shoal and Sellicks Grounds

	<p>East) stock assessed as 'sustainable'</p>	<ul style="list-style-type: none"> • Reduction in daily bag limits for recreational fishers on a charter boat • Continuation of commercial, trip and hook limits, weekend restrictions • Further consultation with commercial, recreational and charter sectors to continue in 2019 regarding future management arrangements for snapper • Restricted the transfer of Marine Scalefish Fishery licences to 1 in every 5 years
<p>2018 MoU between PIRSA and VFA regarding the management of the Western Victorian Snapper Stock</p>	<ul style="list-style-type: none"> • Western Victorian (South East) Stock 	<ul style="list-style-type: none"> • PIRSA and VFA establish a multi-jurisdictional MoU to support management on the Western Victorian stock • The MoU is to formalise the communication between PIRSA and VFA to ensure a more cohesive approach to the management, engagement and stock assessment of the western Victorian snapper stock.
<p>2018 Reform of Marine Scalefish Fishery</p>	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Commercial Marine Scalefish Fishery Reform Advisory Committee established to develop a reform package for the Marine Scalefish Fishery, which is to include exploring: <ul style="list-style-type: none"> ○ Introducing zones ○ Fleet rationalisation ○ Introduction of a modernised fisheries management system

Appendix 5: End notes

- ¹Steer, M.A., Fowler, A.J., McGarvey, R., Feenstra, J., Smart, J., Rogers, P.J., Earl, J., Beckmann, C., Drew, M. and Matthews, J. (2018). Assessment of the South Australian Marine Scalefish Fishery in 2017. Report to PIRSA Fisheries and Aquaculture (PDF 7.9 MB). South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000427-2. SARDI Research Report Series No. 1002. 230pp.
- ² The objectives of the *Fisheries Management Act 2007*, the relevant Management Plans and the South Australian Fisheries Harvest Strategy Policy.
- ³ To achieve the objectives set out in the *Fisheries Management Act 2007* and meeting the goals in the *Management Plan for the Commercial Marine Scalefish Fishery* and the *Management Plan for Recreational Fishing in South Australia*.
- ⁴ As set out in the management plans.
- ⁵ Steer MA, Fowler AJ, McGarvey R, Feenstra J, Westlake EL, Matthews D, Drew M, Rogers PJ, Earl J (2018) Assessment of the South Australian Marine Scalefish Fishery in 2016. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2017/000427-1. SARDI Research Report Series No. 974. 250pp.
- ⁶ Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.
- ⁷ From the analysis of thousands of gonads assessed from the market sampling program undertaken by SARDI between 2000 and 2018
- ⁸ Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.
- ⁹Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.
- ¹⁰ Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.
- ¹¹ Fowler AJ, McGarvey R, Carroll J, Feenstra JE, Jackson WB, Lloyd MT (2016) snapper (*Chrysophrys auratus*) Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2007/000523-4. SARDI Research Report Series No. 930. 82pp.
- ¹² Fowler AJ (2016) The influence of fish movement on regional fishery production and stock structure for South Australia's snapper (*Chrysophrys auratus*) fishery. FRDC Project 2012/020. Final Report.
- ¹³ Fowler AJ (2016) The influence of fish movement on regional fishery production and stock structure for South Australia's snapper (*Chrysophrys auratus*) fishery. FRDC Project 2012/020. Final Report.
- ¹⁴ Steer MA, Fowler AJ, McGarvey R, Feenstra J, Westlake EL, Matthews D, Drew M, Rogers PJ, Earl J (2018) Assessment of the South Australian Marine Scalefish Fishery in 2016. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2017/000427-1. SARDI Research Report Series No. 974. 250pp.
- ¹⁵Fowler AJ (2016) The influence of fish movement on regional fishery production and stock structure for South Australia's snapper (*Chrysophrys auratus*) fishery. FRDC Project 2012/020. Final Report.
- ¹⁶ Hamer P, Conron, S (2016) snapper stock assessment 2016, Fisheries Victoria Science Report Series 10, Fisheries Victoria, Queenscliff.
- ¹⁷ The *Fisheries Management Act 2007* provides that a fishery management plan must specify the share of the fishery to be allocated to each fishing sector, based on the existing shares at the time the first management plan is

requested. The Management Plan for the Commercial Marine Scalefish Fishery formally allocates these shares for snapper.

¹⁸ A nominal share of 1% was allocated for the Aboriginal fishing sector to allow for the resolution of any Indigenous Land Use Agreements. There is limited information available to inform estimates of Aboriginal traditional catches of snapper. A current national FRDC project being led by PIRSA is underway to develop improved national data collection methods for the Aboriginal Traditional fishing sector.

¹⁹ A number of fisheries managed by the Australian Government through the Australian Fisheries Management Authority (AFMA) operate in waters adjacent to South Australia and have access to a daily 50 kg bycatch limit of snapper. In 2018, AFMA implemented complementary seasonal closure arrangements for the Commonwealth fisheries that take snapper as by-catch, in support of PIRSA's efforts to effectively manage South Australian snapper stocks. These arrangements are expected to continue in 2019.

²⁰ Steer MA, Fowler AJ, McGarvey R, Feenstra J, Westlake EL, Matthews D, Drew M, Rogers PJ, Earl J (2018) Assessment of the South Australian Marine Scalefish Fishery in 2016. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. F2017/000427-1. SARDI Research Report Series No. 974. 250pp.

²¹ Giri K, Hall K (2015). South Australian Recreational Fishing Survey. Fisheries Victoria Internal Report Series No. 62.

²² Giri K, Hall K (2015). South Australian Recreational Fishing Survey. Fisheries Victoria Internal Report Series No. 62.

²³ Giri K, Hall K (2015). South Australian Recreational Fishing Survey. Fisheries Victoria Internal Report Series No. 62.

²⁴ Rogers, P. J., Tsolos, A., Boyle, M.K. and Steer, M. (Steer 2017). South Australian Charter Boat Fishery Data Summary. Final Report to PIRSA Fisheries and Aquaculture. South Australia Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000437-2. SARDI Research Report Series No. 966. 17pp.

²⁵ Rogers, P. J., Tsolos, A., Boyle, M.K. and Steer, M.A. (in prep). South Australian Charter Boat Fishery 2017/18. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide.