SUPPLEMENTARY REPORT TO 'ENVIRONMENTAL, SOCIAL AND ECONOMIC VALUES OF MARINE PARK SANCTUARY ZONES

A Report to Department for Environment and Water

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Prepared by

BDO EconSearch

Level 7, BDO Centre, 420 King William Street
Adelaide SA 5000
Tel: +61 (8) 7324 6190
https://www.bdo.com.au/en-au/econsearch

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ABBREVIATIONS

ADS	Adelaide Dolphin Sanctuary
AFMA	Australian Fisheries Management Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
BRUVS	Baited Remote Underwater Video System
CAR	Comprehensive, Adequate and Representative
CPUE	Catch Per Unit Effort
DE	Department of Employment
DEH	Department for Environment and Heritage
DEW	Department for Environment and Water
DEWNR	Department for Environment, Water and Natural Resources
ERP	Estimated Resident Population
ESD	Ecologically Sustainable Development
Fte	Full-Time Equivalent
GMUZ	General Managed Use Zone
GRP	Gross Regional Product
GSP	Gross State Product
GSV	Gulf St Vincent
GVP	Gross Value of Production
HPZ	Habitat Protection Zone
IMCRA	Interim Marine and Coastal Regionalisation for Australia
LGA	Local Government Area
MFA	Marine Fishing Area
MPA	Marine Protected Area
MPLAG	Marine Parks Local Advisory Group
MSF	Marine Scalefish Fishery
NRM	National Resource Management
NRSMPA	National Representative System of Marine Protected Areas
NZRL	Northern Zone Rock Lobster
PIRSA	Primary Industries and Regions SA
RAZ	Restricted Access Zone
RIAS	Regional Impact Assessment Statement
RISE	Regional Industry Structure and Employment
SAG	Scientific Advisory Group

SAMPIT	South Australia's Marine Park Information Tool
SARDI	South Australia Research and Development Institute
SARSMPA	South Australian Representative System of Marine Protected Areas
SAU	Spatial Assessment Unit
SG	Spencer Gulf
SGWC	Spencer Gulf and West Coast
SPA	Special Purpose Area
SWG	Scientific Working Group
SZ	Sanctuary Zone
TACC	Total Allowable Commercial Catch
UVC	Underwater Visual Census

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EXECUTIVE SUMMARY

The South Australian Government made a 2018 election commitment to review marine park sanctuary zones. In 2018 BDO EconSearch prepared a report 'Environmental, Social and Economic Values of Marine Park Sanctuary Zones. The current report is supplementary to the 2018 report and provides updated value and impact statements that are legislatively required to make the following changes proposed by the SA Government:

1. Nuyts Archipelago Marine Park – changes to Nuyts Reef Sanctuary Zone and Isles of St Francis Sanctuary Zone
2. Upper Gulf St Vincent Marine Park - changes to Clinton Wetlands Sanctuary Zone and new protection zoning for Windara shellfish reef
3. Neptune Islands Group (Ron and Valerie Taylor) Marine Park – changes to North Neptune Islands Sanctuary Zone
4. Western Kangaroo Island Marine Park – changes to Cape du Couedic Sanctuary Zone
5. Upper South East Marine Park – changes to Coorong Beach South Sanctuary Zone
6. Encounter Marine Park – new Port Stanvac Sanctuary Zone and new protection zoning for metropolitan shellfish reef.

The establishment of SA marine parks, their management plans and zoning has been a 20-year process. This process followed a robust governance framework with a comprehensive consultation program. The design of the 83 SZ, and the zoning and management plans more generally, was guided by 14 design principles, 7 biophysical principles[1] and 7 community principles[2] and over 100 marine park policy commitments. Extensive consultation with all sectors of government and recreational fishers, local council representatives, conservationists, commercial fishers and other community interest groups developed the zoning that is currently in place, which is broadly supported[3]. For example, from the preliminary SZ scenarios provided to MPLAGS in 2010 to the final sanctuary zoning established in November 2012, the area within SZs has reduced from 7,517 km^2 (12.5 per cent of state waters) to 3,014 km^2 (5 per cent of state waters).

The marine parks network has been developed with the primary goal of establishing and managing a CAR (comprehensive, adequate and representative) system of marine protected areas to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems, and to protect South Australia's marine biodiversity.

The marine waters off the southern coast of Australia contain an unusually high level of endemism as well as species richness and is recognised as a global biodiversity 'hotspot'. The 83 SZs represent the 8 marine bioregions within state waters and the ecosystems and habitat types found within them. As such, the network and SZs include representative areas of each of the eight bioregions making it possible to build resilience and replication within the network. The physical and biological features of the network include areas of different depths, sea surface temperatures, shoreline types, shoreline exposures and marine benthic habitats.

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[1] The precautionary approach, comprehensiveness, adequacy, representativeness, connectivity and linkages, resilience and vulnerability and ecological importance

[2] Synergies with existing protected areas, complement existing land and marine management practices, consider full diversity of marine uses, respect indigenous interests and culture, consider cultural heritage, ensure ease of identification, compliance and enforcement and provide for education, appreciation and recreation

[3] Government funded research to gauge the public's understanding and perception of marine parks has found general support for marine parks has remained stable since 2006, averaging 88 per cent (DEWNR 2017b).

Marine Park SZs contribute to the overall CAR system and should not be considered in isolation as they are part of a Marine Park network. In addition, SZs (along with RAZs) are considered to be the key zone type for protection and conservation of biodiversity within the marine parks network due to their high level of protection from threatening processes. In some cases, a SZ may contain the only known habitat of that type in the reserve network (comprehensive) or be providing adequate refuge to ensure population viability (adequate) or have an example of a common habitat (representative).

Collectively the 83 SZs aim to provide protection for a range of habitats and ecosystems from threatening activities including fishing and other extractive uses, aquaculture, coastal developments, dredging, active surveying and wastewater discharge from vessels and desalination plants.

Some important fishing areas have been lost to commercial fishers which was unavoidable to achieve a CAR system of marine parks. Across the marine park network, the removed catch/effort from all commercial fisheries as a result of implementing the 83 SZs was estimated to represent 2.0 per cent of the total GVP for all fisheries, which is under the previous Government's commitment of 5 per cent. The South Australian Marine Parks Commercial Fisheries Voluntary Catch/Effort Reduction Program was implemented across six fisheries to remove the displaced catch/effort from these fisheries through voluntary buyout of licences and quota. The program aimed to prevent increased pressure on fish stocks that could result from the redistribution of commercial fishing effort that had historically occurred inside SZs. The reductions achieved through the catch and effort program were in excess of the targeted amounts for all of the six fisheries, and was successful in achieving its objectives. Analysis of individual fishery trends indicates that there has been a continuation of existing trends (catch per unit effort (CPUE), licence values and economic rent) with no obvious change since 2014 in all the affected fisheries through the period 2002 to present, indicating that the Marine Park zoning has not been a contributing factor affecting the sustainability of these fisheries.

Comparative analysis of socio-economic trends (population, labour force, unemployment property prices and school enrolments) in large, medium and small towns near SZs and away from SZs has not shown any discernible trend difference between adjacent and comparative towns, indicating that the Marine Park zoning has not been a contributing factor affecting the socio-economic performance of these towns.

With regards to the six SZs with proposed amendments, our analysis shows that the environmental values of the six SZs are significant. For example:

- Two of the six SZs are in the top ten SZ in terms of size. Large protected areas are considered to be a more effective tool for biodiversity conservation than small areas, as more species will be protected in a larger area and individual species are more likely to have their critical life stages protected
- Three of the six SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea.
- Three of the six SZs are known breeding locations for rare and threatened marine birds and mammals
- Three of the six SZs were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.
- Several of the SZs are sites of ocean upwelling or strong currents with nutrient rich waters supporting a particularly high biodiversity. Not surprisingly, these SZs were also important[4] commercial fishing areas. These SZs are the Isles of St Francis, North Neptune Islands and Cape du Couedic SZs and were important to the NZRL and/or Abalone Fisheries. Clinton Wetlands SZ was an important fishing area for the MSF. Nuyts Reef was of minor importance to commercial fishing with displaced catch or effort estimated at below $100,000. A very small amount of charter boat activity took place prior to zoning in all six SZs.

[4] Historic average annual catch greater than $400,000 GVP.

As expected from the Marine Park policy commitments, recreational fishing has not been significantly affected, with SPAs permitting shore-based fishing established in 16 of the SZs/RAZs, including two of the focus SZs with popular fishing spots (Nuyts Reef and Clinton Wetlands SZs).

Three of the six SZs are sites for the government scientific monitoring program, which if part of the SZs were opened to fishing would reduce the utility of monitoring these SZs as removal of biomass by fishing would change the ecosystem function and thus understanding of SZs function in protecting and conserving biodiversity. It is anticipated that at least 5 to 10 years will be required to start to detect changes due to SZs, although changes in rock lobster populations were detected quite rapidly inside the Cape du Couedic SZ.

The Cape du Couedic SZ is very culturally important to the Ngarrindjeri people, having features that are part of their Ngurunderi Dreaming Story. Protecting features within these SZs is consistent with these cultural values. North Neptune Islands SZ is used for non-fishing based tourism and the existence of the SZ is known to be promoted by operators in the SZ. Cape du Couedic SZ is adjacent to the Cape du Couedic precinct on Kangaroo Island and is one of the State's prime tourist destinations.

Modifying the activities or zoning arrangements in the focus SZs to allow fishing or other extractive activities inside a SZ (by changing to HPZ status), where a reduction in area is proposed, will reduce the effectiveness of the marine park network in protecting and conserving marine biodiversity and habitats. Allowing extraction can compromise ecosystem function by removing or disturbing plants and animals, altering trophic relationships and changing community structure, which in turn will result in less resilient marine systems that are more susceptible to threats associated with climate change, invasive species and pollution. In addition, it will also change the balance of habitats and features represented in the different zone types of the park network. Where a reduction in SZ area is proposed, changes to zoning will have an impact on how the marine park network satisfies the criteria for a "comprehensive, adequate and representative system of marine parks" by reducing the area of habitats and features which are afforded the highest level of biodiversity protection and conservation.

From a commercial fisheries perspective, changing the zoning arrangements will likely see the return of fisheries that historically used that part of the SZ that is proposed for amendment. Over the short-term, in quota fisheries such as the Rock Lobster and Abalone fisheries, small increases in catch rate may be expected. Over time, at the fishery level, the fisheries would be expected to stabilise at the same marginally higher level of catch and effort as if the SZ had not been implemented. For non-quota fisheries such as Marine Scalefish, there is likely to be a marginal increase in overall catch because of access to more fishing grounds. The economic benefit of these changes for quota and non-quota fisheries would be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ. Future activities such as aquaculture would be possible with conversion to HPZ status, which could impact commercial fishing access.

For recreational fishing, changing part of the zoning status from SZ to HPZ is likely to benefit recreational fishers in Clinton Wetlands through a redistribution of existing recreational fishing activity from areas adjacent to the zone. However, in Clinton Wetlands it is likely that the return of commercial fishing will not be supported by recreational fishers. Extending shore-based recreational line fishing in the Coorong Beach South SZ from 4km to 11.41 km is expected to increase the opportunities for remote, surf-based recreational fishing.

The outer boundaries of two marine parks are proposed to be amended, namely the Upper Gulf St Vincent marine park and Encounter marine park.

The Upper Gulf St Vincent marine park boundary change proposal will involve extending the marine park outer boundary to allow inclusion of Windara Shellfish Reef. This will create a SZ over Windara Reef and an SPA overlay to allow existing activities (including recreational fishing) to continue as per current management arrangements under the Fisheries Management Act. This arrangement is expected to

positively impact on environmental values by maintaining the protection of the reef in perpetuity. It is not expected to have any impact on commercial fishing or recreational fishing, tourism and other social values.

The Encounter marine park boundary change proposal will involve extending the marine park outer boundary to allow the inclusion of the existing exclusion zone at Port Stanvac and the new metro shellfish reef. The inclusion of the new metro reef will be via a geographically separated section of outer boundary of 1 km^2 in size offshore from Glenelg. A SZ will be created over part of the existing Port Stanvac exclusion zone. Extension of the Encounter Marine Park outer boundaries to incorporate the Port Stanvac restricted access area, on the available information is expected to provide potential positive benefits to the general public by providing educational and recreational (non-extractive) opportunities currently not permitted. The area has significant environmental values which will be maintained if the proposal is implemented. Extension of the Encounter Marine Park outer boundaries to incorporate the New Metro Shellfish Reef SZ, on the available information, is expected to provide potential positive benefits to dive tourism and recreational fishing in the long-term as the reef becomes established. Likewise there are potential long-term benefits for environmental values, by protection from benthic harvest or damaging activities through SZ and GMUZ zoning, respectively.

1. INTRODUCTION

1.1. Purpose of this Report

The driver for the current report is a recent South Australian Government proposal to make amendments to six marine parks as part of a 2018 election commitment by the Liberal Party of South Australia:

"If elected in March 2018, a Marshall Liberal Government will maintain South Australia's network of marine parks but revise the current Sanctuary (No Take) Zone[5] boundaries.

We will:

- Review marine park management plans and zone classifications within the State's 19 marine parks using a 'threats based determination' in accordance with the COAG National Representative System of Marine Protected Areas (NRSMPA), taking into account proposals of the Marine Park Local Advisory Groups and regional action groups
- Consider the recommendations of the final report of the Legislative Council's Select Committee into Marine Parks
- Include the protection of Adelaide metropolitan coastal waters in the same 'threat-based determination' as all other South Australian waters
- Value the input to policy implementation of the commercial and recreational fishing sectors as well as regional community representatives
- Remain committed to protecting the marine environment through the aquatic reserve provisions in the *Fisheries Management Act 2007*
- Allow Primary Industries and Regions SA (PIRSA) to continue management of sustainable fishing rather than transferring this responsibility to the Department of Environment and Water and Natural Resources (DEWNR)".

In 2018 BDO EconSearch prepared a report 'Environmental, Social and Economic Values of Marine Park Sanctuary Zones that provided information applicable to the first three of the points above. The 2018 report contains:

- An introductory section on the history of marine parks in South Australia from a governance and consultation perspective
- A state-wide introductory section that discusses the network, threats-based zoning arrangements and the 83 SZs
- A summary of the 19 marine parks and information on environmental, economic and social values for the each of 83 SZs across the 19 marine parks
- For each of the 12 focus SZs a description is provided of the zone details, policy commitments and history of the planning process for how the zone came to be
- For 12 focus SZs that were part of the Amendment Bill, a series of questions are used to guide the information to be collated against three key values (environmental, economic and social) and (1) the impacts on these values if the status quo is maintained and (2) the impacts on these values from changing the existing arrangements
- The report also explores 'new opportunities' for SZs based upon community proposals and using the same value-based approach as for the 12 focus SZs
- The report does not include recommendations to the Government.

[5] South Australia's marine parks are 'multiple-use' with different zones providing for varying levels of protection and the activities that can occur in each marine park (Appendix Table 5 1) as prescribed in each of the 19 marine park management plans. Sanctuary zones are managed to provide protection and conservation for habitats and biodiversity within a marine park, especially by prohibiting extractive uses.

The current report is supplementary to the 2018 report and provides updated value and impact statements that are legislatively required to make the following changes proposed by the SA Government:

7. Nuyts Archipelago Marine Park – changes to Nuyts Reef Sanctuary Zone and Isles of St Francis Sanctuary Zone
8. Upper Gulf St Vincent Marine Park - changes to Clinton Wetlands Sanctuary Zone and new protection zoning for Windara shellfish reef
9. Neptune Islands Group (Ron and Valerie Taylor) Marine Park – changes to North Neptune Islands Sanctuary Zone
10. Western Kangaroo Island Marine Park – changes to Cape du Couedic Sanctuary Zone
11. Upper South East Marine Park – changes to Coorong Beach South Sanctuary Zone
12. Encounter Marine Park – new Port Stanvac Sanctuary Zone and new protection zoning for metropolitan shellfish reef.

The current report is deemed a supplementary report to the 2018 report because it has utilised and modified relevant text and information from that report, and it also follows the general approach of the 2018 report. For example in the 2018 report the impacts on the 12 focus SZs were derived based upon a scenario of opening up entire SZs to fishing, whereas several of the new proposed changes by the SA government are to open up parts of those SZs to fishing and as such the anticipated impact that was documented in the 2018 report have been adjusted accordingly for this supplementary report.

1.2. Scope of this Report

As part of the legislative requirements for making amendments to marine park sanctuary zones and outer boundaries, the Department for Environment and Water (DEW) contracted BDO EconSearch to prepare this independent report titled 'Supplementary Report to 'Environmental, Social and Economic Values of Marine Park Sanctuary Zones'. The remainder of this report is organised as follows:

- Proposed changes to six SZs are discussed in Section 2, highlighting environmental, economic and social values that would accrue to the local and wider communities in two scenarios: (1) if the status quo were maintained and (2) if existing arrangements were changed to permit different fishing activities, or alternatively, permit non-fishing activities.
- Proposed changes to the outer boundaries of two marine parks are discussed in Section 3, highlighting environmental, economic and social values that would accrue to the local and wider communities in two scenarios: (1) if the status quo were maintained and (2) if existing arrangements are changed as described.
- Concluding comments are presented in Section 4, covering the twenty-year process of establishing marine parks. In addition, concluding remarks about the results of maintaining the status quo or permitting changes to SZs are presented in this section.

2. PROPOSED CHANGES TO SIX SANCTUARY ZONES

As part of the legislative requirements for making amendments to marine park sanctuary zones and outer boundaries, an impact statement is required. This section provides a summary of the environmental, economic and social values of the six SZs for which changes are proposed under (i) existing arrangements and under (ii) changed arrangements. A detailed assessment is provided in Appendix 2. The six SZs are are:

1. Nuyts Reef Sanctuary Zone, Nuyts Archipelago Marine Park
2. Isles of St Francis Sanctuary Zone, Nuyts Archipelago Marine Park
3. Clinton Wetlands Sanctuary Zone, Upper Gulf St Vincent Marine Park
4. North Neptune Islands Sanctuary Zone, Neptune Islands Group (Ron and Valerie Taylor) Marine Park
5. Cape du Couedic Sanctuary Zone, Western Kangaroo Island Marine Park
6. Coorong Beach South Sanctuary Zone, Upper South East Marine Park.

2.1. Nuyts Reef Sanctuary Zone

Table 2-1 Summary table for Nuyts Reef sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: Sixth largest SZ in the marine parks network Includes the Nuyts reef, which is the last shoreline inflection (or settling place) before the Head of the Bight and is the largest and most westerly limestone reef in the Murat bioregion Influenced by the warm, westerly Leeuwin Current, which helps support migratory pelagic species such as Southern bluefin tuna and a wide range of species more commonly found in warmer areas Conserves habitat for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep and western blue groper. **State/National priorities:** Supports a number of red macro algal species (seaweeds) with limited range of distribution Provides haul-out and breeding sites for the nationally vulnerable Australian sea lion and is one of only 5 sites nationally which produces more than 100 pups annually. **Habitats and biodiversity:** The SZ contains a mix of bedrock platform reefs and offshore island habitats exposed to moderate to high wave energy. The SZ also provides haul out and breeding sites for long-nosed seals and is used by southern right whale, common dolphin and bottlenose dolphin. The SZ is also used by a number of seabird species including white-bellied sea eagle, osprey, short-tailed shearwater (mutton bird), little penguin, fairy tern, white-faced storm petrel. Little is known about the fish and macro-invertebrate species diversity. **Threats addressed by the SZ:** The SZ addresses the following threats to conservation values within the SZ from the activities of the Rock Lobster and Abalone fisheries: removal of fished species biomass (medium risk); bycatch of Australian sea lions (medium risk, Rock Lobster Fishery); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. **Predictions due to SZ implementation:** Rock lobster, greenlip abalone, blacklip abalone and snapper in the SZ are predicted to increase in size and abundance over the next 20 years. Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep in the SZ are predicted to maintain size and abundance over the next 20 years.	**Background and context:** The NZRL and the Western Zone Abalone Fisheries were the principal fisheries that previously used the SZ. There was some use, albeit minor, of the SZ by the Marine Scalefish and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $78,000, from the Abalone (0.13% of fishery catch), NZRL (0.11% of fishery catch and Marine Scalefish (0.02% of fishery effort) Fisheries. Displaced catch and effort from the Charter Boat Fishery was confidential but would be minimal (less than $4,000 for entire marine park). Broad scale mapping has occurred in about half of the SZ most of which is reef habitat suitable for Rock Lobster and Abalone. **Predictions due to SZ implementation:** In aggregate, it was estimated that the impact of zoning in the SZ will generate the following loss of regional economic activity on an ongoing annual basis; $0.09m in total GRP (less than 0.1% of the regional total ($3.4b in 2018/19)), 1 fte job (less than 0.1% of the regional total (25,915 fte jobs in 2018/19)) and $0.05m in household income (less than 0.1% of the regional total ($1.8b in 2018/19)). **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** For each of the fisheries (Abalone, NZRL, Marine Scalefish and Charter Boat) more than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced catch and effort from these fisheries in this SZ led to buyout of quota/licences and foregone annual income of approximately $78,000. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No negative change in the Marine Scalefish and Charter Boat Fisheries since the introduction of the SZ. Catches of Southern Rock Lobster have been maintained in the presence of the SZ and there is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause. Abalone catch in this SZ has been low historically and very low in recent years and there is no evidence of a negative impact since the introduction of the SZ. These observations are based on estimated historical catches in the SZ which have been low. Current and future catch in all	No recognised tourism activities take place in or adjacent to the SZ. Since there are no tourism activities there is no economic contribution to the region from tourism. Since there were no existing tourism activities when the SZ was established, no changes to tourism values are expected.	**Recreational uses:** Recreational activity is minimal in the SZ due to the remote nature of the SZ. The SZ is far from the nearest public boat ramp and is inaccessible to most recreational boats. Shore-based recreation activities adjacent to the SZ are generally limited due to the restricted access by road to the shoreline and cliffs. The area is too exposed and rugged for recreational diving. **Recreational fishing:** Shore-based recreational line fishing was minimally impacted by the SZ, as a SPA was provided to allow for this activity to continue in the SZ. As the area was rarely if ever used by recreational boat fishers, zoning the area as a SZ did not impact recreational fishing. **Social values:** Commercial fishers value the SZ as a productive fishing area, particularly for abalone. Conservationists on the other hand welcomed steps toward a scientific solution to protecting iconic areas including Nuyts Reef. In submissions to the draft zoning, they suggested an additional area to the west of the SZ to include Cactus Beach and the western side of Point Sinclair (Point Sinclair National Surfing Reserve) in order to protect and preserve the spirit and integrity of this remote section of the Australian coastline. The SZ has significant 'wilderness value' and biodiversity value. **Observations since SZ implementation:** Due to a lack of specific information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70% (initially 64% in 2013, dropping to 59% in 2016, before increasing to 82% in 2017).

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Observations since SZ implementation: There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	fisheries could potentially be higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.		

Source: Appendix A.2.1

Table 2-2 Summary table for Nuyts Reef sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Expand the SZ by 90 km^2 to encompass more of the surrounding area and change from HPZ to SZ. New SZ area of 195 km^2. Continue to allow shore-based recreational line fishing in the expanded SZ by extending the existing SPA to the west and east by 9.88km (new total length of 21.46km) **Expected impacts** It is suspected that the new SZ area is mostly sand habitat rather than reef habitat. The proposed SZ extension does add additional buffering area around Nuyts Reef. Extends the protected area for Australian sea lion foraging areas. Expands the total area of SZs in the marine parks network and would include a range of site-attached sand species. As fisheries activity is thought to be minimal in the area, it is expected there will be minimal impact on site-attached fished species but these will be protected from potential future fishing.	**Expected impacts:** The area available to commercial fishers will be reduced by 90 km^2. The total gross value of displaced catch in the existing SZ, estimated to be at least $78,000, would remain unavailable. This would be principally by the NZRL and the Western Zone Abalone Fisheries and to a minor extent the Marine Scalefish and Charter Boat Fisheries. There are no data currently available on estimated displaced catch/effort for the new area proposed as SZ. Thus it is not possible to estimate the economic impact of the proposed increase in SZ area. Nonetheless, the new area is likely to be of relatively low value to rock lobster and abalone fisheries as it is suspected to be largely sand habitat.	**Expected impacts:** As there are no recognised tourism activities take place in or adjacent to the SZ, it is expected that there will be no impact, positive or negative, as a result of the proposed amendment to zoning.	**Expected impacts:** The Nuyts Reef SZ already has a SPA for shore-based recreational line fishing so there would be no change to this social value. In addition, the areas of shore-line in the new SZ are also proposed to allow shore-based recreational line fishing which would mean no change for this social value. An increase in the SZ area could potentially mean an increase in the 'wilderness value' of the area.

Source: Appendix A.2.1

2.2. Isles of St Francis Sanctuary Zone

Table 2-3 Summary table for Isles of St Francis sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: ▸ Third largest SZ in the marine parks network. ▸ Biodiversity hotspot influenced by the Leeuwin Current and containing species common to Western and South Australia. ▸ Contains rocky cliffs, sandy beaches, reefs, seagrass meadows and unmapped deep water habitats in a comparatively 'pristine' state. ▸ Conserves habitat for Southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep, Western blue groper, baitworm, king scallop, queen scallop and yellow-eye mullet. **State/National priorities:** ▸ Provides haul-out and breeding sites for the nationally vulnerable Australian sea lion. ▸ Provides habitat for several shark and fish species of conservation concern, including vulnerable white shark, Western blue groper, Western blue devil, harlequin fish, and blue throated wrasse. ▸ Provides habitat for rare/conservation concern species, e.g. uncommon seaweeds, sponges, ascidians, soft corals and the black cowrie. ▸ Significant breeding area for short-tailed shearwaters and white-faced storm petrels. Also protects nesting sites of state endangered ospreys, state endangered white-bellied sea eagles, rare Cape Barren geese, little penguins and the rare rock parrot. **Habitats and biodiversity:** Fish and macro-invertebrate species richness is high in comparison to other surveyed SZs. The SZ has a high abundance of large fish. Commercially and recreationally fished species abundance is about average in comparison to other surveyed SZs. Sharks and rays are relatively abundant. Fish assemblages were similar inside the SZ compared to the adjacent HPZ. **Threats addressed by the SZ:** The SZ addresses the following threats to conservation values within the SZ from the activities of the Rock Lobster and Abalone fisheries: removal of fished species biomass (medium risk); bycatch of Australian sea lions (medium risk, applies to Rock Lobster Fishery only); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. **Predictions due to SZ implementation:** Rock lobster, greenlip abalone, blacklip abalone and snapper in the SZ are predicted to increase in size and abundance over the next 20 years. Western blue groper, bight redfish,	**Background and context:** The principal fisheries that previously used the SZ was the NZRL and Abalone Fisheries. The MSF records minimal catches from this SZ. A small amount of charter boat activity occurred. Historically, the total gross value of displaced catch in this SZ is estimated to be approximately $645,000, principally from the Abalone (1.78% of fishery catch), NZRL (0.44% of fishery catch) and Marine Scalefish (0.19% of fishery effort) Fisheries. Displaced effort from the Charter Boat Fishery was confidential but would be minimal (less than $4,000 for entire marine park). Areas to the west of St Francis Island, Masillon Island and Fenelon Island are made up of reef suitable for Rock Lobster and Abalone. A large part of the SZ is made up of sandy habitats unsuitable for Rock Lobster and Abalone fishing. **Predictions due to SZ implementation:** In aggregate, it was estimated that the impact of zoning in the SZ will generate the following loss of regional economic activity on an ongoing annual basis; $0.87m in total GRP (less than 0.1% of the regional total ($3.4b in 2018/19), 6 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2018/19) and $0.50m in household income (less than 0.1% of the regional total ($1.8b in 2018/19)). **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** For each of the fisheries (Abalone, NZRL, Marine Scalefish and Charter Boat) more than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced catch and effort removed from this SZ from the Abalone Fishery was the equivalent of two-thirds of the annual gross income of an average Abalone licence and for the MSF was the equivalent of half the annual gross income of an average MSF licence. The displaced catch and effort removed from the NZRL and Charter Boat fisheries in this SZ equated to foregone annual income of approximately $645,000. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No negative change in the Marine Scalefish and Charter Boat Fisheries since the introduction of the SZ. Catches of Southern Rock Lobster have been maintained in the presence of the SZ and there is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the	No recognised tourism activities take place in or adjacent to the SZ. Since there are no tourism activities, there is no economic contribution to the region from tourism. Since there were no existing tourism activities when the SZ was established, no changes to tourism values are expected.	**Recreational uses:** Recreational activity is minimal in the SZ due to the remote nature of the SZ. The SZ is far from the nearest public boat ramp and is inaccessible to most recreational boats. Shore-based recreation activities on the islands within the SZ would be minimal due to the remote location. **Recreational fishing:** Prior to SZ implementation, recreational fishing at the SZ was minimal, with only some area lost due to the SZ, likely a result of people that had fished from commercial charter boats. Shore-based line fishing is now prohibited in the SZ but the SZ lies offshore and is unlikely to have been fished much from the shore previously. **Social values:** Commercial fisheries were concerned that the closure of this productive fishing area would negatively affect the catch of scale fish species, rock lobster and abalone for the commercial fishery and recreational catches of various species. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. The SZ has 'wilderness value'. The SZ aligns with and overlays an existing Nuyts Archipelago Wilderness Area, complying with community design principle 8, Seek synergies with existing protected areas. **Observations since SZ implementation:** Due to a lack of specific information available at the SZ level, it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70% (initially 64% in 2013, dropping to 59% in 2016, before increasing to 82% in 2017).

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
swallowtail, bluethroat wrasse, harlequin fish and/or sea sweep in the SZ are predicted to maintain size and abundance over the next 20 years. **Observations since SZ implementation:** There is insufficient data collected to note observed changes in species diversity/population characteristics due to the SZ.	cause. Abalone catch in the region has been very low in recent years and there is no evidence of a negative impact since the introduction of the SZ. These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.		

Source: Appendix A.2.2

Table 2-4 Summary table for Isles of St Francis sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Change northern part of SZ to HPZ and merge with existing adjacent HPZ (61 km^2). Expand the remaining southern part of the SZ by 177 km^2 to encompass a larger area including around Hart Island and Cannan reefs and change from HPZ to SZ. New SZ area of 249 km^2, new HPZ area of 61 km^2. **Expected impacts** Area removed from existing SZ: Threats removed from the cessation of commercial fishing will be re-introduced to parts of the SZ (selective removal of target species (rock lobster, abalone) potentially affecting trophic structure of ecosystem; removal of species caught as bycatch (Rock Lobster Fishery), disturbance and risk of entanglement of non-target species from fishing gear/activities, particularly Australian sea lion (Rock Lobster Fishery). The threats would be re-introduced in the northern section, however, they would be removed in the southern section, Rock lobster, greenlip abalone, blacklip abalone and snapper, targeted by commercial fisheries in this SZ, are unlikely to increase in size and abundance in the SZ over the next 20 years. Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep may not maintain size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site. Altering the SZ area with respect to areas with and without fishing would reduce the effectiveness of this site for monitoring purposes. The SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. It is possible that activities such as offshore cage aquaculture could occur in the location of the SZ due to the shelter provided by the islands. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass), disturbance to animals and pollution. The SZ is one of the only examples of an entire offshore island archipelago captured within a SZ. It also represents an important transitional zone between eastern and western distributed species and habitats due to the influence of the warm Leeuwin current. Changing/downgrading the zoning would compromise the marine park system by reducing protection for these unique offshore island habitats. Proposed changes to the third largest SZ would significantly compromise the adequacy of the network.	**Expected impacts:** The area available to commercial fishers will be reshaped, being reduced by 177 km^2 in the southern part, and increased by 61 km^2 in the northern section. Increased area for fishing in northern section: The total gross value of displaced catch in the proposed reduced area of the SZ, estimated to be at least $251,000, would become available again for harvest. This would be principally by the Western Zone Abalone (0.25% of fishery catch), the NZRL (0.48% of fishery catch) and the Marine Scalefish (0.08% of fishery catch) Fisheries. In aggregate, it was estimated that the impact of rezoning in the SZ will generate the following improvement of regional economic activity on an ongoing annual basis; $0.50m in total GRP (less than 0.1% of the regional total ($3.4b in 2018/19), 1 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2018/19) and $0.37m in household income (less than 0.1% of the regional total ($1.8b in 2018/19)). The rezoning of SZ to HPZ in the northern section would make other activities which could affect commercial fishing, such as aquaculture, possible in this zone, but the likelihood is unknown. Reduced area for fishing in the southern section: There are no data currently available on estimated displaced catch/effort for the proposed increased area of the SZ. Thus it is not possible to estimate the economic impact of the proposed increase in SZ area. Nonetheless, the new area is likely to be of relatively low value to rock lobster and abalone fisheries as it is suspected to be largely sand habitat.	**Expected impacts:** Since there are no tourism activities, there would be no impact on tourism from opening part of the SZ to fishing activities or of expanding the SZ to the south. It is unlikely that any relevant developments would occur in the area so the rezoning of SZ to HPZ in the northern part, and HPZ to SZ in the southern part would have no impact on tourism activities.	**Expected impacts:** As the existing SZ area was rarely used by recreational boat fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in a significant increase in recreational boat fishing activity. However, the expansion of the SZ to include Cannan Reefs will displace some recreational fishing activity that occurs there and this activity may shift to the SZ area opened around St Francis Island. Shore-based recreation activities on the islands within the Isles of St Francis SZ would be minimal due to the remote location. It is possible that activities such as offshore cage aquaculture could occur in the location of the rezoning of SZ to HPZ in the northern part and HPZ to SZ in the southern part due to the shelter provided by the islands. It is unknown what impact this might have on social values.

Source: Appendix A.2.2

2.3. North Neptune Islands Sanctuary Zone

Table 2-5 Summary table for North Neptune Islands sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: ▸ Contains steep cliff running into deep water as well as a protected bay with seagrass and sand bottom ▸ Receives warm water from the Leeuwin Current and cool water from Flinders current allowing for high biodiversity ▸ Habitat for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, western blue groper and sea sweep. **State/National priorities:** ▸ World renowned hot spot for the vulnerable white shark, which regularly forage in the area for seals ▸ Contains half of the breeding population of long-nosed fur seals in South Australia ▸ Breeding colony for the vulnerable Australian sea lion ▸ Habitat for the endangered coastal stingaree, which is endemic to South Australia ▸ Seabirds protected under international treaties roost and nest on the islands. The area also provides breeding habitat for the little penguin, rare rock parrot, rare sooty oystercatcher, rare Cape Barren goose, endangered white-bellied sea eagle and endangered fairy tern. **Habitats and biodiversity:** Little is known about the fish and macro-invertebrate species diversity, because the SZ is not currently monitored. **Threats addressed by the SZ:** The SZ addresses the following threats to conservation values within the SZ from the activities of the Rock Lobster and Abalone fisheries: removal of fished species biomass (medium risk); bycatch of Australian sea lions (medium risk, applies to Rock Lobster Fishery only); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. **Predictions due to SZ implementation:** Rock lobster, greenlip abalone and blacklip abalone in this SZ are predicted to increase in size and abundance over the next 20 years. Bight redfish, bluethroat wrasse, harlequin fish, swallowtail, sea sweep and western blue groper are predicted to maintain size and/or abundance inside the SZ. **Observations since SZ implementation:** There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	**Background and context:** The principal fishery that previously used the SZ was the NZRL Fishery. Abalone catches from this region are classed as low importance. The MSF records small or confidential catches from this SZ. A small amount of Charter Boat activity also occurred. Historically, the total gross value of displaced catch in this SZ is estimated to be $447,000, principally from the NZRL (1.06% of fishery catch), Abalone (0.17% of fishery catch), Marine Scalefish (0.06% of fishery effort) and Charter Boat (0.10% of fishery effort) Fisheries The nearshore habitat of SZ is comprised of reef suitable for Rock Lobster and Abalone. While reef habitat does occur around the North Neptune Islands, it is suspected that further offshore, much of the SZ is comprised of sand that is unsuitable habitat for Rock Lobster and Abalone. **Predictions due to SZ implementation:** In aggregate, it was estimated that the impact of zoning in the SZ will generate the following loss of regional economic activity on an ongoing annual basis; $0.50m in total GRP (less than 0.1% of the regional total ($3.4b in 2018/19), 6 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2018/19) and $0.29m in household income (less than 0.1% of the regional total ($1.8b in 2018/19)). **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** For each of the four fisheries (NZRL, Abalone, Marine Scalefish and Charter Boat) more than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced catch from the NZRL Fishery in this SZ was the equivalent of two-thirds of gross income of an average NZRL licence. The displaced catch and effort from the Marine Scalefish, Abalone or Charter Boat fisheries in this SZ equated to foregone annual income of approximately $447,000. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No negative change on regional CPUE in the Abalone, Marine Scalefish and Charter Boat Fisheries since the introduction of the SZ because these fisheries are minor contributors. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause. The NZRL Fishery has maintained nearly 100% of the TACC since 2009 indicating the overall Rock	White shark cage diving has taken place at the Neptune Islands since the late 1970s. The South Australian government currently permits three commercial shark cage diving tour operators to utilise the Neptune Islands. Visitor numbers increased from 1,127 visitors in 2008/09 to 9,807 in 2016/17. The 9,907 shark cage diving patrons in 2016/17 led to an estimated 19,614 visitor nights, $6.8 million of expenditure on tour fees and $1.5 million of other expenditure in the Eyre Peninsula region. The contribution of this activity to GRP was $7.4 million, including $3.5 million from flow-on effects. The contribution to employment was around 67 fte jobs, including 26 fte from flow-on effects. The existence of the SZ does influence the decision to visit Port Lincoln for shark cage diving for some people (around 14% of patrons). Value is added to the tour due to the existence of the SZ. This is supported by survey results from 2016 suggesting that awareness of the SZ increases on tour (from around 19% to 49%) and some patrons spoke to others specifically about the SZ after returning home (around 13% of the original sample).	**Recreational uses:** Recreational activities (including shore-based activities) are minimal in the SZ due to the remote nature of the SZ. The SZ is far from the nearest public boat ramp on the mainland and is inaccessible to most recreational boats. **Recreational fishing:** Prior to SZ implementation, recreational fishing at the SZ was minimal, with only some area lost due to the SZ. Shore-based line fishing is now prohibited in the SZ but it lies offshore and is unlikely to have been fished much from the shore previously. **Social values:** The community values the SZ for the shark cage diving industry, which generates significant income for the regional economy. Since 2012, about 32 research permits for 10 different projects have been granted for white shark research within the SZ. Research in the SZ is primarily aimed at tracking the movement and residency patterns of white sharks. This develops knowledge about the population size and site fidelity of white sharks as well as any potential impacts of the cage diving industry on shark behaviour. More recently, DEWNR has engaged with researchers to monitor the movement of acoustically tagged sharks between marine parks and assess connectivity between these parks. The shark cage tourism industry is monitored to track the number of visitors, and calculate benefits to the local community in terms of jobs created and economic contribution. The SZ has 'wilderness value'. **Observations since SZ implementation:** The SZ has provided long-term viability for the shark cage diving industry by protecting the local environment and the sharks while they are inside the zone. The shark cage industry has continued to thrive since the management plan was implemented and provides significant economic benefit to the state and region. Research has shown that tourists become more educated about marine parks and the marine environment by going on a shark cage trip. Due to a lack of specific information available at the SZ level, it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70% (initially 64% in 2013, dropping to 59% in 2016, before increasing to 82% in 2017).

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
	Lobster harvest is being maintained even with the North Neptune Island SZ. The TACC was increased in 2015. These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.		

Source: Appendix A.2.3

Table 2-6 Summary table for North Neptune Islands sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Change western and southern part of SZ to HPZ and merge with existing adjacent HPZ. New SZ area of 9 km^2, new HPZ area of 25 km^2. **Expected impacts:** Threats removed from the cessation of commercial fishing will be re-introduced if part of the SZ is opened to fishing (selective removal of target species (rock lobster, abalone) potentially affecting trophic structure of ecosystem; removal of species caught as bycatch (Rock Lobster Fishery), disturbance and risk of entanglement of non-target species from fishing gear/activities, particularly Australian sea lion (Rock Lobster Fishery)). Rock lobster, greenlip abalone and blacklip abalone, targeted by commercial fisheries in this SZ, are unlikely to increase in size and abundance in this SZ over the next 20 years. Bight redfish, bluethroat wrasse, harlequin fish, swallowtail, sea sweep and western blue groper may not maintain size and abundance in this SZ over the next 20 years. The SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. However, it is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ due to its remote location. Nonetheless, the rezoning of SZ to HPZ would allow such activities to potentially occur in the future. The SZ represents the only example of a remote offshore island ecosystem in the lower Eyre region with complete representation of intertidal and subtidal habitats. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these remote offshore island habitats.	**Expected impacts:** The area available to commercial fishers will increased by 25 km^2 in the southern and western section. The total gross value of displaced catch in the proposed reduced area of the SZ, estimated to be at least $327,000, would become available again for harvest. This would be principally by the NZRL (0.76% of fishery catch), the Western Zone Abalone (0.14% of fishery catch), the Charter Boat (0.093%) and the Marine Scalefish (0.02% of fishery catch) Fisheries. In aggregate, it was estimated that the impact of reducing the SZ area will generate the following improvement of regional economic activity on an ongoing annual basis; $0.48m in total GRP (less than 0.1% of the regional total ($3.4b in 2018/19), 2 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2018/19) and $0.31m in household income (less than 0.1% of the regional total ($1.8b in 2018/19)). The rezoning of part of the SZ to HPZ in the northern section would make other activities which could affect commercial fishing, such as aquaculture, possible in this zone, but the likelihood is unknown.	**Expected impacts:** Opening part of the SZ to fishing activities could negatively impact on tourism activities. Increased fishing activities would likely occur, such as shark, rock lobster and abalone, can be expected to have a negative effect on shark cage divers and the wilderness experience. However, the area to remain closed to fishing is the area where shark cage diving mostly occurs. The reintroduction of commercial fishing would likely not be supported by the shark cage diving industry. While relevant activities such as aquaculture and jetties would affect the wildlife experience for tourism activities, they are unlikely to occur in the area subject to the rezoning of SZ to HPZ.	**Expected impacts:** As the area was only lightly used by recreational boat fishers, it is unlikely that rezoning the SZ to HPZ would effect this. The Rock Lobster, Abalone and MSF Fisheries would likely resume fishing the area. Opening part of the SZ to commercial fishing would be supported by the commercial fishing industry, but likely not supported by the shark cage diving industry, the conservation sector nor recreational fishers. There may be possible loss of 'wilderness value'. The impact of opening part of the SZ to non-fishing activities allowed in a HPZ but not a SZ is unknown. It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would occur in the location of the rezoning of SZ to HPZ.

Source: Appendix A.2.3

2.4. Clinton Wetlands Sanctuary Zone

Table 2-7 Summary table for Clinton Wetlands sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: ▸ Represents the entire top of gulf ecosystem from land to sea including saltmarsh, mangroves, intertidal seagrass and dense shallow seagrass meadows. ▸ Only example of extensive seagrass, mangrove and saltmarsh habitats within an inverse estuary. ▸ Most extensive protected example of upper gulf shallow water seagrass communities in the GSV Bioregion. ▸ Partially overlays Clinton Conservation Park, establishing a protected corridor between the land and sea. **State/National priorities:** ▸ Home to the state rare samphire thornbill (endemic to the northern shores of GSV). ▸ Recognised as a coastal wetland of national importance. ▸ Provides important nesting and feeding grounds for resident shorebirds, as well as feeding grounds for migratory shorebirds whose habitats are required to be protected under international treaties. **Habitats and biodiversity** The mangroves and seagrass meadows in the SZ are an important fish nursery, particularly for fish species with a southern migratory path. Mangroves and saltmarsh provide habitat for a number of state or nationally protected shorebirds, including state rare samphire thornbill, state rare glossy ibis and the state rare musk duck. Fish species are typical of seagrass habitats, e.g. weedy whiting, toadfish and blue swimmer crabs. Fish species richness is comparable to other SZs dominated by seagrass habitats. Commercially and recreationally targeted fish species abundance is comparable to other SZs. Fish assemblages and abundance are similar to the adjacent HPZ. **Threats addressed by the SZ** The SZ addresses the following threats to conservation values in this SZ from the activities of the MSF: removal of fished species biomass (medium risk); introduced marine pests/aquatic diseases (medium risk); habitat disturbance from haul netting, vehicle access and anchoring (low risk). **Predictions due to SZ implementation:** Razorfish (intertidal seagrass resident) inside the SZ are predicted to increase in size and abundance over the next 20 years. Blue swimmer crab, King George whiting, southern calamari and southern garfish are predicted to temporarily increase in size and/or abundance while inside the SZ. **Observations since SZ implementation:** There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	**Background and context:** The MSF was the principal fishery that previously used the SZ with some minor use by the Blue Crab and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $179,000, principally from the MSF, accounting for 1.04% of fishery catch. Displaced catch and effort from the Blue Crab and Charter Boat Fisheries are confidential but would be minimal ($1,000 or less for the entire marine park). Most of the SZ is comprised of seagrass beds and sand flats which are suitable habitat for Blue Crabs and Marine Scalefish species. **Predictions due to SZ implementation:** In aggregate, it was estimated that the impact of zoning in the SZ will generate the following loss of regional economic activity on an ongoing annual basis; $0.59m in total GRP (less than 0.1% of the regional total ($3.1b in 2018/19)), 14 fte jobs (0.1% of the regional total (28,709 fte jobs in 2018/19)) and $0.27m in household income (less than 0.1% of the regional total ($1.6b in 2018/19)). **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** More than the estimated displaced catch has been removed from the MSF through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced effort from the MSF fishery from this SZ was the equivalent of the gross income of 5 average MSF licences and resulted in the removal of 5 fishing businesses from across the fishery, of which 3 haulnet licences were removed that targeted catch from the GSV region. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No negative change in the Blue Crab Fishery since the introduction of the SZ. Catches of Blue Crab, Southern Calamari and Snapper have been maintained in the presence of the SZ and there is no evidence of a negative impact since the introduction of the SZ. Reduced catches of Garfish and King George Whiting post SZ implementation are the continuation of the long term historic trend of reduced catch due to fishery and environmental pressures to these species and there is no evidence of a negative impact since the introduction of the SZ. These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new	No recognised tourism activities take place in or adjacent the SZ. Since there are no tourism activities there is no economic contribution to the region from tourism. Since there were no existing tourism activities when the SZ was established, no changes to tourism values are expected.	**Recreational uses:** Boating and fishing are popular in waters around Port Wakefield and Port Clinton. Boat ramps are located near the SZ at Port Clinton and Port Wakefield. Crabbing for blue swimmer crabs is popular along intertidal mud flats including Port Wakefield and Port Clinton. Caravan parks and camping facilities are located adjacent to the SZ at Port Clinton and Port Wakefield. Clinton Conservation Park and the SZ are popular with birdwatchers. The area (including the SZ) is recognised as a wetland of international importance. **Recreational fishing:** Shore-based recreational fishing was minimally impacted by the SZ. An area at Port Arthur with shore access was excluded from recreational fishing restrictions in the SZ to accommodate shore-based fishing. The other shoreline within the SZ is inaccessible or difficult to fish due to saltmarsh and mangroves. Boat-based recreational fishing has lost some nearshore and offshore areas. It is unknown how important these areas were for recreational boat fishers. **Social values:** Recreational fishers value the SZ as a garfish spawning ground that is important to protect. Recreational fishing around Port Arthur is valued. Submissions to the zoning identified the area between Port Arthur and Port Clinton as a 'hotspot' for the Marine Scale Haul Net Fishery. Likewise, submissions to the zoning identified its importance as a healthy example of an inverse estuary system. It is also known by the conservation sector as a Nationally Important Wetland, particularly for shorebirds. Birdlife Australia undertakes annual shorebird surveys of the SZ and adjacent Clinton Conservation Park, maintaining an important time series of data (from 2009) on the distribution and abundance of species. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. **Observations since SZ implementation:** Due to a lack of specific information available at the SZ level, it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the Northern and Yorke region over the period 2013 to 2017 has fluctuated around 80% (initially 85% in 2013, dropping to 65% in 2016, before increasing to 80% in 2017).

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
	industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.		

Source: Appendix A.2.4

Table 2-8 Summary table for Clinton Wetlands sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Change southern part of SZ to HPZ and merge with existing adjacent HPZ. Remove the existing SPA adjacent to Port Arthur. New SZ area of 12 km^2, new HPZ area of 47 km^2. **Expected impacts:** Threats removed from the cessation of commercial fishing (MSF) will be re-introduced if part of the SZ is opened to fishing (selective removal of target species potentially affecting trophic structure of ecosystem; removal of species caught as bycatch, disturbance and risk of entanglement of non-target species from fishing gear/activities). Razorfish, targeted by the MSF, are unlikely to increase in size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site. Opening part of the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. The SZ has several habitat types that are sensitive to disturbance such as seagrass, mangrove and saltmarsh including associated shorebird and migratory bird communities. It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would occur in the location of the SZ. However, if these activities were to occur then it is possible that they would impact on environmental values The SZ contains the only example of a shallow seagrass meadow located at the top of an inverse estuary gulf in the marine park network. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for a habitat type that is currently unique in the network.	**Expected impacts:** The area available to commercial fishers will increased by 47 km^2 in the southern section. The total gross value of displaced catch in the proposed reduced area of the SZ, estimated to be at least $144,000, would become available again for harvest. This would be principally by the Marine Scalefish (0.82% of fishery catch) Fishery. Most of the SZ is comprised of seagrass beds and sand flats which are suitable habitat for Blue Crabs and Marine Scalefish species. In aggregate, it was estimated that the impact of reducing the SZ area will generate the following improvement of regional economic activity on an ongoing annual basis; $0.51m in total GRP, 2 fte jobs (0.1% of the regional total (28,709 fte jobs in 2018/19)) and $0.38m in household income (less than 0.1% of the regional total ($1.6b in 2018/19)). Due to the shallow water environment, restricted water flows and restricted coastline access due to saltmarsh and mangroves at the head of the GSV, it is unlikely that there would be any future activities such as aquaculture or other coastal developments. Nonetheless, changing the rezoning from SZ to HPZ would allow such activities to potentially occur in the future.	**Expected impacts:** A very small positive impact on tourism could be expected if fishing activities were allowed in part of the SZ and charter boats could return to the area. Since there are no tourism activities, there would be no impact on tourism from opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ.	**Expected impacts:** Opening part of the SZ to different fishing activities would increase the opportunity for recreational fishing, particularly boat-based fishing. It would also be supported by the commercial fishing industry. However, recreational fishing and conservation sectors expressed opposition to the return of commercial netting and crabbing to the SZ. Due to the shallow water environment, restricted water flows and restricted coastline access, it is unlikely that activities such as aquaculture and other coastal would occur in the location of the SZ in the future; and the impact on social values from opening the SZ to (non-fishing) activities allowed in the HPZ is expected to be negligible. Dredging that may occur in the Port Wakefield River was accommodated in the SZ zoning and falls outside the current boundaries of the SZ.

Source: Appendix A.2.4

2.5. Cape du Couedic Sanctuary Zone

Table 2-9 Summary table for Cape du Couedic sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: ▸ Abuts the Flinders Chase National Park ▸ Representative of exposed deep water rocky reefs and sandy beach shoreline, with associated highly diverse macro-algae (seaweed) communities ▸ Located in an area with a seasonal upwelling that provides nutrients to support productive and complex ecosystems ▸ Supports 2 red macroalgae (seaweeds) with limited distribution ▸ Supports relatively high number of large fish indicating relatively pristine marine systems. **State/National priorities:** ▸ Breeding and haul out site for the nationally vulnerable Australian sea lion ▸ One of two known South Australian breeding sites for Australian fur seals ▸ Breeding area for long-nosed fur seals ▸ Nesting area for the state endangered white bellied sea eagle. Known breeding area for the nationally protected Pacific gull, crested tern and rock parrot, and state rare ruddy turnstone, state rare sooty oystercatcher. **Habitats and biodiversity** Fish species are typical of exposed deep water reef areas with reef species from the wrasse and leatherjacket families being common. Fish species richness is above average in comparison to other surveyed SZs. Commercially and recreationally targeted fish species abundance is relatively lower in comparison to other surveyed SZs. There are unusually high densities of barber perch in the SZ, which is endemic to Australian waters. **Threats addressed by the SZ** The SZ addresses the following threats to conservation values within the SZ from the activities of the Rock Lobster and Abalone fisheries: removal of fished species biomass (medium risk); bycatch of Australian sea lions (medium risk, applies to Rock Lobster Fishery only); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. **Predictions due to SZ implementation:** Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep are predicted to maintain size and abundance over the next 20 years inside the SZ.	**Background and context:** The Central Zone Abalone and NZRL Fisheries were the principal fisheries that previously used the SZ with some minor use by the Marine Scalefish and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $644,000, distributed between the Abalone ($224,000, 2.47% of fishery catch), Rock Lobster ($419,000, 1.12% of fishery catch), Marine Scalefish ($1,000, 0.03% of fishery effort) and Charter Boat (confidential) Fisheries. Displaced effort from the Charter Boat Fishery was confidential but would be minimal. Most of the SZ is comprised of reef which is suitable habitat for Rock Lobster and Abalone fishing. **Predictions due to SZ implementation:** In aggregate, it was estimated that the impact of zoning in the SZ will generate the following loss of regional economic activity on an ongoing annual basis; $0.65m in total GRP (0.1% of the regional total ($1.6b in 2018/19)), 6 fte jobs (less than 0.1% of the regional total (15,596 fte jobs in 2018/19)) and $0.42m in household income (less than 0.1% of the regional total ($834.6m in 2018/19)). **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** For each of the fisheries (Abalone, NZRL, Marine Scalefish and Charter Boat) more than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced catch from this SZ from the NZRL Fishery was the equivalent of the gross income of an average NZRL licence and resulted in the removal of one fishing business across the fishery. The displaced catch from this SZ from the Abalone Fishery was the equivalent of one-third of the gross income of an average licence. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No voluntary surrender of Central Zone Abalone Fishery licences was forthcoming through the Commercial Fisheries Voluntary Catch/Effort Reduction Program and the targeted reduction was subsequently shared evenly between the existing licence holders. More catch than required was removed through this process. There has been no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and	The Cape du Couedic precinct is the highest visited tourism destination on Kangaroo Island, attracting around 171,000 annual visitors, nearly 80% of Kangaroo Island's visitors. The precinct includes internationally recognised destinations, such as Admiral's Arch, the Remarkable Rocks and the Cape du Couedic lighthouse. Visitors are attracted to the precinct to view these attractions, to stay in heritage accommodation, and for varied wildlife experiences including with seals, whales, sea birds, kangaroos, echidnas and goannas. The economic contribution to Kangaroo Island of visitors to the Cape du Couedic precinct is estimated at around $22.2 million in GRP and 308 fte jobs, including flow-on effects. These estimates are based on the assumption that, for the 171,000 annual visitors to Flinders Chase National Park, one night of their stay on Kangaroo Island and the associated expenditure can be attributed to visiting the precinct. Interpretive signs relating to the SZ have been installed on the Admiral's Arch board walk and the Flinders Chase Visitor Centre. Additional signs are planned for the three lookouts in the precinct. The signs add educative value to existing activities, but no additional activities are expected as a result of the SZ.	**Recreational uses:** As described under the tourism industry values, the Cape du Couedic precinct in the Flinders Chase National Park is of great significance to the Kangaroo Island community. The Kangaroo Island Wilderness Trail is a 3-day/2-night walking trail that, in parts, runs adjacent to the SZ. Around 2,000 walkers use the trail each year. There is limited surfing at breaks on the western side of Cape du Couedic at Spooks and Rockies adjacent to the SZ. **Recreational fishing:** There was minimal shore-based or boat based recreational fishing in the SZ prior to zoning due to inaccessibility and rough sea conditions. Recreational fishing was not impacted by the zoning. **Social values:** At the local level, the community values the ongoing protection of the Casuarina Islets within the SZ and in particular the Australian fur seal and Australian sea lion colonies located there. The area is also valued for the productive fishing grounds for the NZRL and Central Zone Abalone Fisheries. The Casuarina Islets are part of the Ngurunderi Dreaming Story of the Ngarrindjeri people and are very culturally important to the Ngarrindjeri people. At the broader community level, conservation of environmental values is the focus. A number of scientific (both professional and community-based) studies have and will continue to occur in or adjacent to the SZ. For example, in 2017 a collaborative study between DEWNR, PIRSA, SARDI and the SA NZRL Fishermen's Association was undertaken in the SZ to assess the effects of protection from fishing on the rock lobster population. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. **Observations since SZ implementation:** Due to a lack of specific information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of Kangaroo Island over the period 2013 to 2017 has fluctuated around 75% (initially 75% cent in 2013, dropping to 60% in 2015, before increasing to 80% in 2017).

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Observations since SZ implementation: Changes in species diversity/population characteristics due to the SZ has been observed for Rock Lobster. Positive population responses within the SZ with an 81 per cent increase in relative biomass and a 42 per cent increase in relative abundance compared to outside the SZ.	the buyout of catch is consistent with this although not definitively the cause. These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.		

Source: Appendix A.2.5

Table 2-10 Summary table for Cape du Couedic sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Change eastern part of the SZ to HPZ and merge with existing adjacent HPZ. New SZ area of 6 km^2, new HPZ area of 22 km^2. **Expected impacts:** Threats removed from the cessation of commercial fishing will be re-introduced if part of the SZ is opened to fishing (selective removal of target species (rock lobster, abalone) potentially affecting trophic structure of ecosystem; removal of species caught as bycatch (Rock Lobster Fishery), disturbance and risk of entanglement of non-target species from fishing gear/activities, particularly Australian sea lion (Rock Lobster Fishery)). Rock lobster, greenlip abalone and blacklip abalone, targeted by the Rock Lobster and Abalone Fishery, are unlikely to increase in size and abundance in opened part of the SZ over the next 20 years. The SZ is a priority monitoring site. Opening part of the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. The SZ has very high conservation value and several species are sensitive to disturbance such as the state endangered white-bellied sea eagle and three species of pinniped (Australian sea lion, Australian fur seal and long nosed fur seal). However, it is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ due to its remote location. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future. The SZ contains the only example of all three native pinnipeds occurring together and actively breeding. Changing or downgrading the zoning would compromise the marine park system by reducing the protection for this collection of species that is currently unique in the network.	**Expected impacts:** The area available to commercial fishers will be increased by 22 km^2 in the eastern section. The total gross value of displaced catch in the proposed reduced area of the SZ, estimated to be at least $495,000, would become available again for harvest. This would be principally by the Central Zone Abalone (1.89% of fishery catch), the NZRL (0.86% of fishery catch) and the Marine Scalefish (0.01% of fishery catch). In aggregate, it was estimated that the impact of reducing the SZ area will generate the following improvement of regional economic activity on an ongoing annual basis; $0.59m in total GRP (less than 0.1% of the regional total ($1.6b in 2018/19)), 3 fte jobs (less than 0.1% of the regional total (15,596 fte jobs in 2018/19)) and $0.40m in household income (less than 0.1% of the regional total ($834.6m in 2018/19)). Due to the isolated and exposed location of the Cape Du Couedic SZ it is unlikely that there would be any future activities such as aquaculture or coastal developments. Nonetheless, changing the rezoning of SZ to HPZ would allow such activities to potentially occur in the future, which could affect commercial fishing.	**Expected impacts:** Impacts to tourism activities of opening the SZ to fishing activities are likely to be negligible but could affect visitation negatively if fishing activities or events were to create negative media around threats (actual or perceived) to the environmental values protected by the SZ (e.g. marine mammal interactions with fishing vessels/ activities). It is unlikely that activities such as aquaculture and coastal developments would occur in the location of the SZ and so it is expected that there would be no additional impacts (beyond those potential impacts described for the reintroduction of fishing) from opening part of the SZ to (non-fishing) activities allowed in an HPZ.	**Expected impacts:** Opening up part of the SZ to rock lobster fishing would restrict future opportunities to undertake further rock lobster pot surveys as part of the long-term study to determine the effects of protection from fishing on the rock lobster population at Cape du Couedic (see McLeay et al. 2017). If the study were continued it would improve knowledge and support decision-making with regard to the marine parks monitoring program and to fisheries management. As the SZ was not previously used by recreational fishers, it is unlikely that changing the rezoning of part of the SZ to HPZ to allow fishing would result in an increase in recreational fishing activity. The impact on social values of rezoning part of the SZ to HPZ is expected to be negligible, as it is unlikely that activities such coastal developments would occur in the location of the SZ.

Source: Appendix A.2.5

2.6. Coorong Beach South Sanctuary Zone

Table 2-11 Summary table for Coorong Beach South sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: ▸ Protects a part of the longest continuous high energy dissipative beach in the southern hemisphere. ▸ A section of the SZ neighbours the Coorong National Park and the Coorong and Lakes Alexandrina and Albert RAMSAR reserve to the medium high water mark. **State/National priorities:** ▸ Significant site for a diverse assortment of migratory and sedentary bird species including the red necked stint and vulnerable hooded plover. ▸ Encompasses a pathway area for Southern Right Whale seasonal migration. **Habitats and biodiversity:** This SZ is predominately comprised of exposed fine-medium sand beach, soft-bottom habitat and habitats that are yet to be mapped. Little is known about the fish and macro-invertebrate species diversity. There is suspected to be some deep water reef in the SZ. **Threats addressed by the SZ** The SZ addresses the following threats to conservation values within the SZ from the activities of the Rock Lobster fishery: removal of fished species biomass (medium risk); bycatch of Australian sea lions (medium risk, Rock Lobster Fishery); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. **Predictions due to SZ implementation:** Snapper and rock lobster in the SZ are predicted to increase in size and abundance over the next 20 years. Beach fishes are predicted to show a temporary increase in size and/or abundance in the SZ. **Observations since SZ implementation:** There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	**Background and context:** The Marine Scalefish Fishery was the principal fishery that previously used the SZ. There was some use, albeit minor, of the SZ by the SZRL and Charter Boat Fisheries. Historically, the total gross value of displaced catch in the Upper South East Marine Park is estimated to be approximately $33,000 from the Marine Scalefish (0.13% of fishery catch), SZRL (0.11% of fishery catch and Charter Boat (0.02% of fishery effort) Fisheries. Displaced catch and effort from the Charter Boat Fishery was confidential but would be minimal (less than $4,000 for entire marine park). **Predictions due to SZ implementation:** Estimates for historic displaced catch are available for the Upper South East Marine Park only, and it is not possible to estimate the economic impact for this SZ. **Commercial Fisheries Voluntary Catch/Effort Reduction Program:** For each of the fisheries (Marine Scalefish, SZRL and Charter Boat) more than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. The displaced catch and effort from these fisheries in the Upper South East Marine Park led to buyout of quota/licences and foregone annual income of approximately $33,000. **Observations since SZ implementation:** It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced. No negative change in the Marine Scalefish and Charter Boat Fisheries since the introduction of the SZ. Catches of Southern Rock Lobster have been maintained in the presence of the SZ and there is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause. These observations are based on estimated historical catches in the SZ which have been low. Current and future catch in all fisheries could potentially be higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.	No recognised tourism activities take place in or adjacent to the SZ. This SZ has been designed to avoid the annual Kingston Fishing Competition.	**Recreational uses:** Recreational activity is minimal in the SZ due to the remote nature of the SZ. The SZ is far from the nearest public boat ramp and is inaccessible to most recreational boats. Shore-based recreation activities adjacent to the SZ are generally minor due to the limited access by road to the shoreline. The area is too exposed and rugged for recreational diving. **Recreational fishing:** Shore-based recreational line fishing was minimally impacted by the SZ, as a buffer was provided to allow for shore based recreational fishing for 4km north from Tea Tree Crossing. As the area was rarely if ever used by recreational boat fishers, zoning the area as a SZ did not impact recreational boat fishing. The Upper South East Marine Park is a known area for shore-based recreational fishing of mulloway. **Social values:** General consistency with MPLAG advice with slight variation. This SZ was reduced in length by 4km to ease impact on commercial fishing and simplify the complex zone primarily for compliance purposes. Originally this zone was designed by MPLAG to have 8km beach fishing and 3km no beach fishing. The region is of inherent cultural value to the Ngarrindjeri people and the creation of SZs will add to the well-being of both the region and the Ngarrindjeri people. This SZ is within a Native Title Claim area. A section of the SZ neighbours the Coorong National Park and the Coorong and Lakes Alexandrina and Albert RAMSAR reserve to the medium high water mark, creating a protected passage from the land to the sea. **Observations since SZ implementation:** Due to a lack of specific information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the South East region over the period 2011 to 2017 has averaged around 81% (initially 77% in 2011, increasing to 86% in 2016, before dropping slightly to 82% in 2017).

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, DEWNR 2015a, Gill et al. 2011, Lothian 2005, Middleton and Bye 2007, Scientific Working Group 2011.

Table 2-12 Summary table for Coorong Beach South sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Description of proposed amendment to zoning: Overlay an SPA to allow shore-based recreational line fishing along the entire shoreline of the SZ (length of 7.4 km). **Expected impacts:** Opening the SZ to shore based recreational line fishing would have a negative impact on those species commonly targeted including mulloway by removing biomass and selectively removing biomass from particular sizes. Given the limited level of fishing in this zone there is expected to be little impact on non-target species. Potential for increased disturbance to nesting shorebirds by recreational fishers.	**Expected impacts:** No changes to existing economic values for commercial fishing.	**Expected impacts:** A very small positive impact on tourism could be expected if shore-based recreational fishing activities were allowed in the SZ.	**Expected impacts:** Opening the SZ for recreational shore-based line fishing would create more available space for recreational fishers to undertake shore-based line fishing along the Coorong Beach. It is unlikely that it would lead to an increase in the number of recreational fishers visiting the area, rather it would mean that existing fishers have more flexibility in where they can fish and they could potentially spread out more along the beach. Allowing fishing in the SZ could detract from the wilderness value of the SZ and would be at odds with existing interpretive signage. It would also prevent any future scientific studies of the impacts of protection from fishing on a high wave energy surf beach ecosystem in the Coorong.

2.7. Discussion

Our analysis shows that the environmental values of the six SZs are significant. For example:

- Two of the six SZs are in the top ten SZ in terms of size. Large protected areas are considered to be a more effective tool for biodiversity conservation than small areas, as more species will be protected in a larger area and individual species are more likely to have their critical life stages protected
- Three of the six SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea.
- Three of the six SZs are known breeding locations for rare and threatened marine birds and mammals
- Three of the six SZs were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.

Several of the SZs are sites of ocean upwelling or strong currents with nutrient rich waters supporting a particularly high biodiversity. Not surprisingly, these SZs were also important[6] commercial fishing areas. These SZs are the Isles of St Francis, North Neptune Islands and Cape du Couedic SZs and were important to the NZRL and/or Abalone Fisheries. Clinton Wetlands SZ was an important fishing area for the MSF. Nuyts Reef was of minor importance to commercial fishing with displaced catch or effort estimated at below $100,000. A very small amount of charter boat activity took place prior to zoning in all six SZs.

The voluntary buybacks achieved through the SA Marine Parks Commercial Fisheries Voluntary Catch/Effort Reduction Program (described in Section 2.3.8, BDO EconSearch 2018) produced reductions in excess of the targeted amounts for all of the fisheries involved, and can be viewed as successful in its objectives. Analysis of individual fishery trends (Appendix 3, BDO EconSearch 2018) over the past 15 years indicates that there has been a continuation of existing trends (CPUE, licence values, economic rent) with no obvious change since 2014 in all the affected fisheries. This indicates that the Marine Park zoning has not been a significant contributing factor affecting the sustainability of these fisheries.

Consistent with Marine Park policy commitments, recreational fishing has not been significantly affected, with SPAs permitting shore-based line fishing established in 2 focus SZs with popular fishing spots (Nuyts Reef and Clinton Wetlands SZs).

Three of the six SZs are sites for the government scientific monitoring program, which if part of the SZs were opened to fishing would reduce the utility of monitoring these SZs as removal of biomass by fishing would change the ecosystem function and thus understanding of how intact marine ecosystems function. It is anticipated that at least 5 to 10 years will be required to start to detect changes due to SZs (DEWNR 2017a, Delean 2017), although changes in rock lobster populations were detected quite rapidly inside the Cape du Couedic SZ (McLeay et al. 2017, see A.2.5.5). Data comparing various metrics from inside SZs relative to outside can be found in the 2017 Marine Parks Status Report (DEWNR 2017a).

The Cape du Couedic SZ is very culturally important to the Ngarrindjeri people, having features that are part of their Ngurunderi Dreaming Story. Protecting features within this SZ is consistent with these cultural values.

[6] Historic average annual catch greater than $400,000 GVP.

North Neptune Islands SZ is used for non-fishing based tourism and the existence of the SZ is known to be promoted by operators in the SZ. Cape du Couedic SZ is adjacent to the Cape du Couedic precinct on Kangaroo Island and is one of the State's prime tourist destinations.

Comparative analysis of socio-economic trends (population, labour force, unemployment property prices and school enrolments, see Appendix 4, BDO EconSearch 2018) in large, medium and small towns near the focus SZs and away from the focus SZs has not shown any discernible trend difference between these two sets of towns. For example, Wakefield (adjacent to a SZ, medium-sized town) and Clare (inland, medium-sized town) have experienced similar, positive trends in population, school enrolments and labour force size, and similar, negative trends in unemployment and property prices. Kangaroo Island (LGA with small towns adjacent to several SZs) and Robe (small regional town not adjacent a focus SZ) have experienced positive trends in population and labour force and negative trends in unemployment, property prices and school enrolments. Property prices dropped in real terms between 2007/08 and 2016/17 in most towns compared, with the exception of Ceduna and Elliston (small regional towns next to SZs) where property prices increased in real terms (Appendix 4, BDO EconSearch 2018). Both towns have experienced decreases in population, labour force and school enrolments, so increases in property prices are likely to be driven by other factors, e.g. supply-side shortages.

Modifying zoning arrangements in the SZs to allow fishing or other extractive activities inside a SZ (by changing to HPZ status), where a reduction in area is proposed, will reduce the effectiveness of the Marine Park network at protecting and conserving marine biodiversity and habitats by:

- Directly impacting species captured by extractive use by their selective removal and potential negative impacts to their population structure and reproductive success
- Indirectly affecting species that are reliant on captured species for food, shelter or other services and directly impacting other species through disturbance
- Compromising trophic relationships and food webs with flow on effects to ecosystem function and resilience
- Increasing the risk of pollution and the spread of disease and marine pests
- Reducing the effectiveness of the Government's monitoring program which is currently based on SZ and the protection afforded by them
- Altering the balance of habitats and features represented in the different zone types of the park network.

Where a reduction in SZ area is proposed, changes to zoning will have an impact on how the marine park network satisfies the criteria for a "comprehensive, adequate and representative system of marine parks" by reducing the area of habitats and features which are afforded the highest level of biodiversity protection and conservation.

Where a reduction in SZ area is proposed, changing the current SZ status to a lower level of protection will reintroduce threatening activities (e.g. fishing and other extractive uses, aquaculture, coastal developments, dredging, active surveying and wastewater discharge from vessels and desalination plants) to habitats and ecosystems within the zones.

From a commercial fisheries perspective, the effect on commercial fisheries of changing the status of the SZ would depend on the harvest strategy in place for each impacted fishery. For example, in the case of the Northern Zone Rock Lobster Fishery and the Abalone Fishery (which are quota fisheries), opening part of the SZ will lead to a small increase in catch rate in the region relative to no change because fishers will access reef that has not been fished

for some years. This increase in zonal catch rate[7] (not zonal catch) may be sufficient to trigger a TACC increase through the decision rules in this fishery. Expanding the fished area for the same TACC will increase catch rate through time to some degree relative to the status quo. On average this will lead to an increase in TACC but there is uncertainty because TACC changes occur in steps yet change in catch rate is continuous. Over the short-term, small changes in catch rate (from opening parts of the SZ) may trigger nothing or may trigger an increase in TACC greater than that displaced by the SZ. In the long run, the fisheries would be expected to stabilise at the same higher level of catch and effort as if that part of the SZ had not been implemented. For non-quota fisheries such as Marine Scalefish, there is likely to be a marginal increase in overall catch because of access to more fishing grounds. The economic benefit of this higher catch would be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ. Future activities such as aquaculture which could impact commercial fishing would be possible with conversion to HPZ status.

For recreational fishing, changing part of the zoning status from SZ to HPZ is likely to benefit recreational fishers in Clinton Wetlands through a redistribution of existing recreational fishing activity from areas adjacent to the zone. However, in Clinton Wetlands it is likely that the return of commercial fishing will not be supported by recreational fishers. Extending shore-based recreational line fishing in the Coorong Beach South SZ from 4km to 11.41 km is expected to increase the opportunities for remote, surf-based recreational fishing.

With regard to non-fishing tourism activities, opening part of the North Neptune Islands SZ to fishing activities could negatively impact on tourism activities. Shark long-line fishing in the area can be expected to lead to negative interactions with shark cage diving patrons. Broader fishing activities that would likely occur, including rock lobster and abalone, may affect the wilderness experience but to a lesser extent. The reintroduction of commercial fishing would likely not be supported by the shark cage diving industry.

[7] That is, catch per unit effort (CPUE).

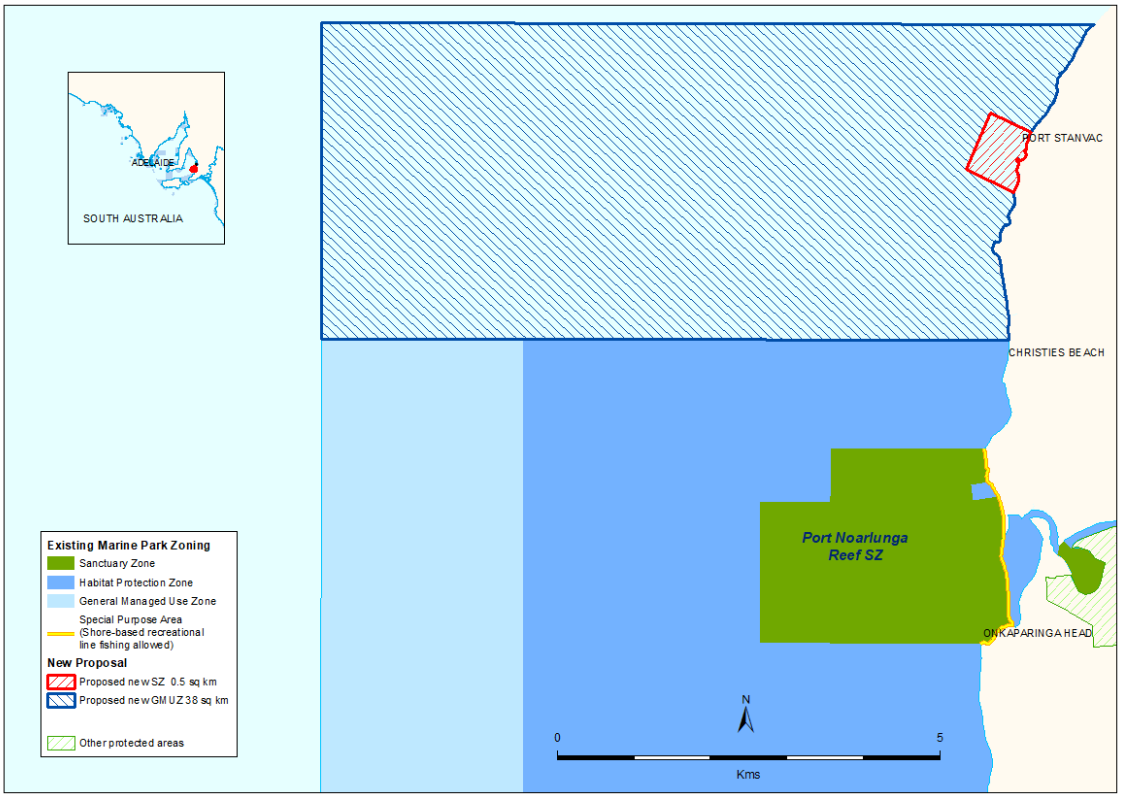
3. PROPOSED CHANGES TO OUTER BOUNDARIES OF TWO MARINE PARKS AND CREATION OF THREE NEW SANCTUARY ZONES

3.1. Port Stanvac

3.1.1. Description of the Proposed Amendment

The Port Stanvac marine area adjacent to the disused Mobil facility site has been a restricted access area for over 50 years. Mobil have now abandoned the site, and the disused jetty has been removed. The future use of the land and sea areas is currently being considered by the SA Government. Several public submissions were previously made to include the sea area as a SZ within the marine parks network once Mobil abandoned the site. This scenario would require an extension of the Encounter Marine Park outer boundaries by several kilometres to the north. This section considers the values under existing arrangements and the values under changing arrangements whereby part of the marine area is proclaimed as a marine park SZ and part of the area a general managed use zone (GMUZ).

Figure 3-1 Proposed amendments, Port Stanvac SZ and extension of outer boundaries of Encounter marine park



Source: map provided by DEW.

3.1.2. Impact analysis

See Table 3-1 for discussion of the current values and Table 3-2 for discussion of the impacts on those values expected from the proposed amendments.

3.1.3. Discussion

Port Stanvac marine area adjacent to the disused Mobil facility site has been a restricted access area for over 50 years. This scenario would require an extension of the Encounter Marine Park outer boundaries by several kilometres to the north. The area has been surveyed and shown to have significant environmental values with reef, sand and seagrass habitats represented. The area has higher biodiversity than reefs to the north and south around Fleurieu Peninsula. These values will be maintained if the proposal is implemented. Commercial and recreational fishing is currently not permitted, and implementing the proposal will not impact any of these activities. There is potential positive impact for tourism operators as the area has good access from the land, sheltered waters, and enhanced biodiversity. The public currently has restricted access, and therefore implementing the proposal would provide access to the public and would contribute positively to educational and recreational (non-extractive) activities. By allowing access to the public there is potential for negative impacts on intertidal communities through trampling and illegal harvest.

DEW is also currently investigating offshore sand deposits at Port Stanvac as a potential resource for replenishment of Adelaide's metropolitan beaches as part of the Securing the Future of Our Coastline project. The offshore sand deposits in the area immediately to the south of the existing exclusion zone at Port Stanvac were dredged on four occasions in the 1990s, supplying 1.1 million cubic metres of sand to Adelaide's beaches. The sand deposits are understood to continue northwards through the existing exclusion zone. This area would not be included in the proposed new SZ.

Table 3-1 Summary table for Port Stanvac restricted access area – impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
The sea area that currently has restricted access is about 0.8km^2 in area and encompasses about 1km of coastline. The intertidal reefs adjacent to the Port Stanvac Mobil facility and desalination plant have a higher invertebrate diversity and abundance than reefs to the north and south around Fleurieu Peninsula (Baring et al. 2010). Surveys of subtidal reef in the area have found a high diversity of fishes, invertebrates and macroalgae (Shepherd and Baker 2008, Baker et al. 2009, Russell and Connell 2011). The area lies within a region of high macroalgal species diversity (see Baker and Gurgel 2010). The subtidal seagrass and sand habitats of the area have a high diversity of epifauna, meiofauna, and infauna (Loo and Drabsch 2008, Beattie et al. 2010, Glavinic et al. 2011). The subtidal sand and reef habitats have a high diversity of fishes (e.g., Colella et al. 2011).	Commercial fishing has been not permitted in the area for over 50 years.	No tourism industry activity takes place in the area.	Well known as an area of conservation value due to the protection provided by over 50 years of restricted public access.

Table 3-2 Summary table for Port Stanvac restricted access area – impacts on values of changing existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Making the inshore area a Marine Park Sanctuary Zone Continued protection of species from fishing and other activities would maintain positive environmental values. By allowing access to the public there is potential for negative impacts on intertidal communities through trampling and illegal harvest. **Making the offshore area a Marine Park General Managed Use Zone** The offshore area is almost entirely composed of sand habitat and is considered to be of lower biodiversity value than the inshore and intertidal areas of the existing exclusion zone. The area is relatively small and would be inhabited by transient fished species that are not site-attached. Opening this area to fishing would have a minor negative impact on the environmental value of this area.	**Making the inshore area a Marine Park Sanctuary Zone** No displacement of commercial fishing as none currently occurs. **Making the offshore area a Marine Park General Managed Use Zone** Positive impact for commercial fishers by opening an area that was previously closed to fishing.	**Making the inshore area a Marine Park Sanctuary Zone** Potential positive impact for tourism operators as the area has good access from the land, sheltered waters, and enhanced biodiversity. **Making the offshore area a Marine Park General Managed Use Zone** Potential positive impact for charter boat operators by opening an area that was previously closed to fishing.	**Making the inshore area a Marine Park Sanctuary Zone** No displacement of recreational fishing By providing access to the public this would contribute positively to educational and recreational (non-extractive) activities. There is potential to include the land and sea areas within the SA Government's proposed Glenthorne National Park. **Making the offshore area a Marine Park General Managed Use Zone** Positive impact for recreational fishers by opening an area that was previously closed to fishing. Potential positive impact for recreational users and coastal protection along metropolitan Adelaide beaches if sand supplies in the area are suitable for beach replenishment purposes.

3.2. Windara Reef

3.2.1. Background

Oyster reefs are arguably one of the most threatened marine habitats in the world, with an estimated 99 per cent of shellfish reefs classified as 'functionally extinct' in southern Australian coastal waters and up to 85 per cent lost globally. Shellfish reefs, dominated by the native flat oyster, *Ostrea angasi*, were once a key ecological feature of the South Australian coastline-extending across more than 1,500km from Eyre Peninsula to Adelaide. From historical fishing records, we know that the reefs supported a significant oyster fishery in the state during the 1800s, but today only 1% of former reefs remain. Research has highlighted the importance of shellfish reef habitats to the quality of the marine environment, fish breeding, and water quality as well as delivering recreational and economic opportunities.

In a first attempt at shellfish reef restoration in South Australia, 'Windara Reef' was recently established off Ardrossan in the Gulf St Vincent through a successful partnership between The Nature Conservancy, the South Australian State Government and the Yorke Peninsula Council. The project was also supported by the University of Adelaide, RecfishSA, SA Tourism Commission, South Australian Research and Development Institute and Regional Development Authority Yorke and Mid North.

Windara Reef has a total footprint of almost 20 ha. It is comprised of numerous sections of limestone reef rubble and concrete reef 'balls' that were placed there as part of the reef construction. Some of the reef was seeded with native oysters and the reef is slowly being colonised naturally by a range of biodiversity including native oysters. The area is currently managed under Section 79 of the Fisheries Management Act 2007 which prevents the take of any benthic organism and prevents commercial fishing. Recreational fishing, boating and diving are all permitted on the reef subject to the usual rules under the *Fisheries Management Act 2007*.

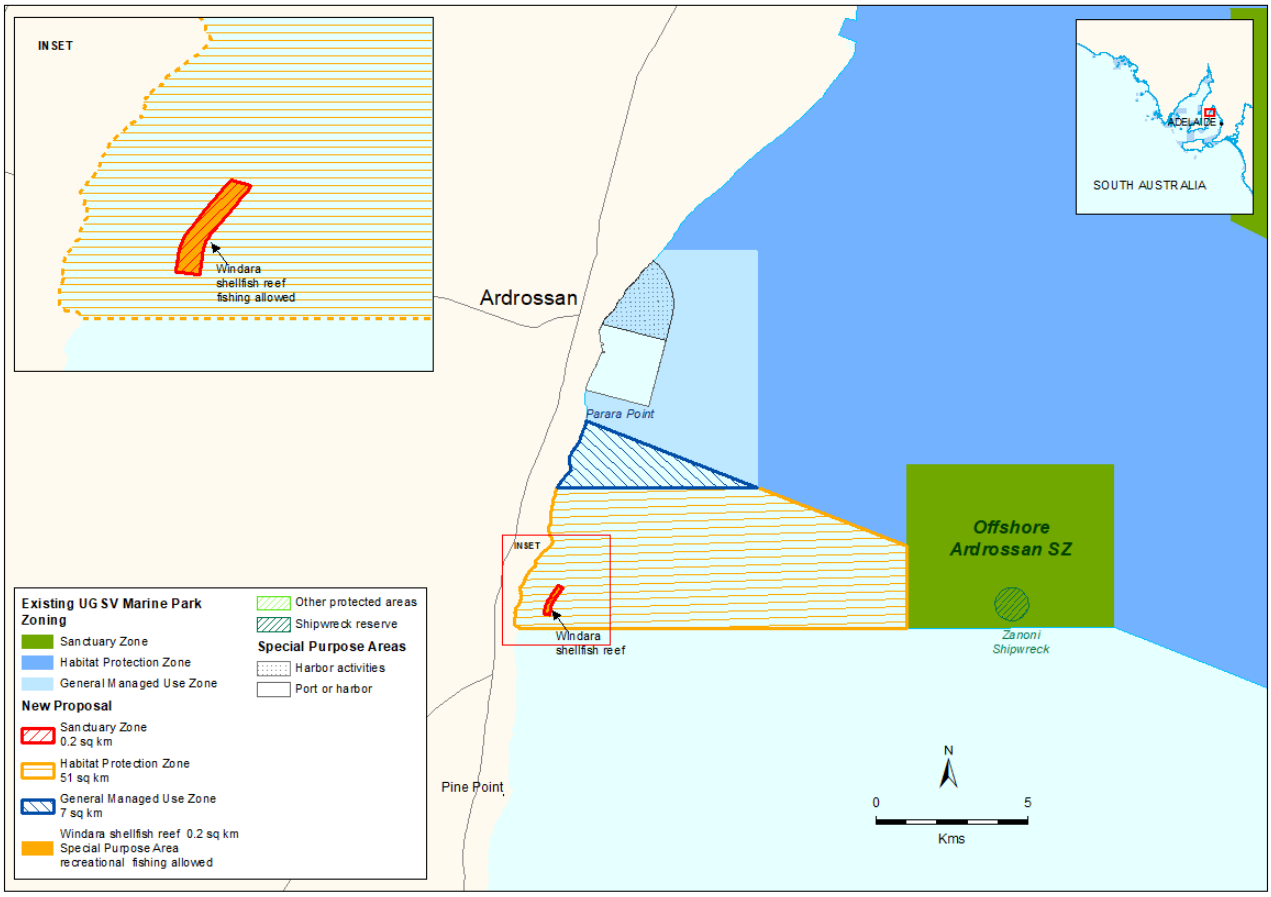
In identifying the impacts of the proposed changes, it is important to separate the impacts of the proposed legislative change from the impacts of the construction and establishment of the Windara Reef itself which have been covered in other studies (see, for example, EconSearch 2016).

3.2.2. Description of proposed amendment

The SA government would like to transfer management of the reef from the Fisheries Management Act 2007 to the Marine Parks Act 2007. In order to achieve this the reef must be included within the outer boundaries of a marine park; currently it sits just to the south of the Upper Gulf St Vincent Marine Park. Once inside the marine park, the reef area can be designated as a Sanctuary Zone with a Special Purpose Area overlay to allow the recreational fishing which is permitted under the current arrangements and which will continue to prevent take of benthic organisms including native oysters.

It is proposed that the marine park outer boundary be extended to the south to allow inclusion of Windara Reef. It is proposed that a SZ replace the existing management area over Windara Reef and then a SPA be overlaid on this to allow existing activities (including recreational fishing) to continue as per current management arrangements under the FM Act. It is proposed that a HPZ be created to surround Windara Reef and join with the existing HPZ and the Offshore Ardrossan SZ. It is proposed that a GMUZ be created in the north western part of the marine park extension that aligns with the existing GMUZ adjacent to Ardrossan.

Figure 3-2 Proposed amendment, Windara Reef SPA and extension of outer boundaries of Gulf St Vincent marine park



Source: map provided by DEW.

3.2.3. Impact analysis

See Table 3-3 for discussion of the current values and Table 3-4 for discussion of the impacts on those values expected from the proposed amendments.

Table 3-3 Summary table for Windara Reef and proposed area of marine park extension - impacts on values of existing arrangements

Environmental value	Economic value		Social value
	Commercial fishing industry	Tourism industry	
Windara Reef area Windara Reef is comprised of limestone rubble and concrete reef balls. The reef is still in the establishment phase and is currently being colonised by a range of biodiversity including fishes, crabs, and native oysters. The seabed in between the reef is predominantly sand habitat with some seagrass. The reef area currently has protection from benthic take and commercial fishing under the Fisheries Management Act 2007 which is expected to assist with the ecological establishment and long-term viability of the reef. **Area surrounding Windara Reef** The area is predominantly seagrass and sand habitat with some intertidal rocky reefs. The biodiversity is similar to that described in BDO EconSearch (2018) for the upper Gulf St Vincent Marine Park. Environmental values in the area are currently managed through a range of legislation including the *Fisheries Management Act 2007*.	**Windara Reef area** Commercial fishing is currently not permitted in the Windara Reef area. **Area surrounding Windara Reef** The Marine Scalefish Fishery operates in the area.	**Windara Reef area** It is anticipated that as the reef establishes over time it will become a destination for diving and possibly dive tour operators. Currently there is no tourism activity directly related to the reef. **Area surrounding Windara Reef** None identified.	**Windara Reef area** Recreational uses: Boating and fishing occur on Windara Reef. Recreational fishing: Since its construction, Windara Reef has become a recognised recreational fishing location. Social values: 'Windara' is the Narungga name that was chosen for the reef in recognition of the local Aboriginal peoples' connection with sea country. The name refers to the eastern area of the Yorke Peninsula region where the reef is located. **Area surrounding Windara Reef** Recreational uses: Boating and fishing are popular in the waters surrounding Windara Reef. Boat ramps are located near Windara Reef at Ardrossan and Black Point. Caravan parks and camping facilities are located near to Windara Reef at Ardrossan, Pine Point and Black Point. Recreational fishing: Recreational fishing is extremely popular in the area. Social values: The region is of inherent cultural value to the Narungga people

Table 3-4 Summary table for Windara Reef and proposed area of marine park extension – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Making the Windara Reef area a Marine Park Sanctuary Zone with an overlay SPA Positive impact as it maintains the current protection provided by the Fisheries Management Act which expires at the end of 2020. **Creation of HPZ around Windara Reef** Positive impact as it provides some protection from potential future damaging activities and it also provides buffering around Windara Reef and additional buffering for the existing Offshore Ardrossan SZ within the Upper Gulf St Vincent Marine Park. **Creation of GMUZ north of Windara Reef** No impact.	**Making the Windara Reef area a Marine Park Sanctuary Zone with an overlay SPA** No impact. No displacement of commercial fishing as none currently allowed. **Creation of HPZ around Windara Reef** No impact. While a HPZ does prevent benthic trawling, prawn trawling does not occur in the area. **Creation of GMUZ north of Windara Reef** No impact.	**Making the Windara Reef area a Marine Park Sanctuary Zone with an overlay SPA** No impact. **Creation of HPZ around Windara Reef** No impact **Creation of GMUZ north of Windara Reef** No impact.	**Making the Windara Reef area a Marine Park Sanctuary Zone with an overlay SPA** No impact. No displacement of recreational fishing. **Creation of HPZ around Windara Reef** No impact. **Creation of GMUZ north of Windara Reef** No impact.

3.3. New Metro Shellfish Reef

3.3.1. Background

As part of an election commitment and in further attempts at shellfish reef restoration, the South Australian Government committed $1.2 million towards building a shellfish reef in Adelaide's metropolitan waters. The Nature Conservancy is leading the construction of the project in partnership with the South Australian State Government and the Department for Environment and Water (DEW). This project is expected to be completed by late 2020. Out of three potential locations, Glenelg was recently announced as the location for the first metropolitan reef construction.

The Glenelg location was deemed to be suitable for a number of reasons including lower wave energy which better supports native shellfish growth and survival, sand habitat such that there will be no disturbance to existing seagrass or reef habitat, closer proximity to known historic native shellfish beds, and closer proximity to razorfish beds which harbour native oysters and might create a natural supply of oyster spat (as has occurred at Windara Reef). The Glenelg location also ranked highly on a number of social factors including education and research opportunities, additional tourism value, and ease of access. In regard to operational and cost saving benefits, the Glenelg location scored the highest, most notably due to a lower construction mobilisation cost as a result of its proximity to Outer Harbour as well as the SARDI hatchery. The resultant cost savings can then be invested into potentially creating a larger reef footprint.

3.3.2. Description of the proposed amendment

As with Windara Reef, the SA government would like to use the *Marine Parks Act 2007* for management of the new Metro Shellfish Reef. In order to achieve this the reef must be included within the outer boundaries of a marine park; currently it sits to the north of the Encounter Marine Park. Once inside the marine park, it is proposed that the reef area be designated as a Sanctuary Zone to prevent all forms of fishing during the establishment phase with a Special Purpose Area overlay to take effect after a five year period at which time fishing will then be allowed (on 1 January, 2026).

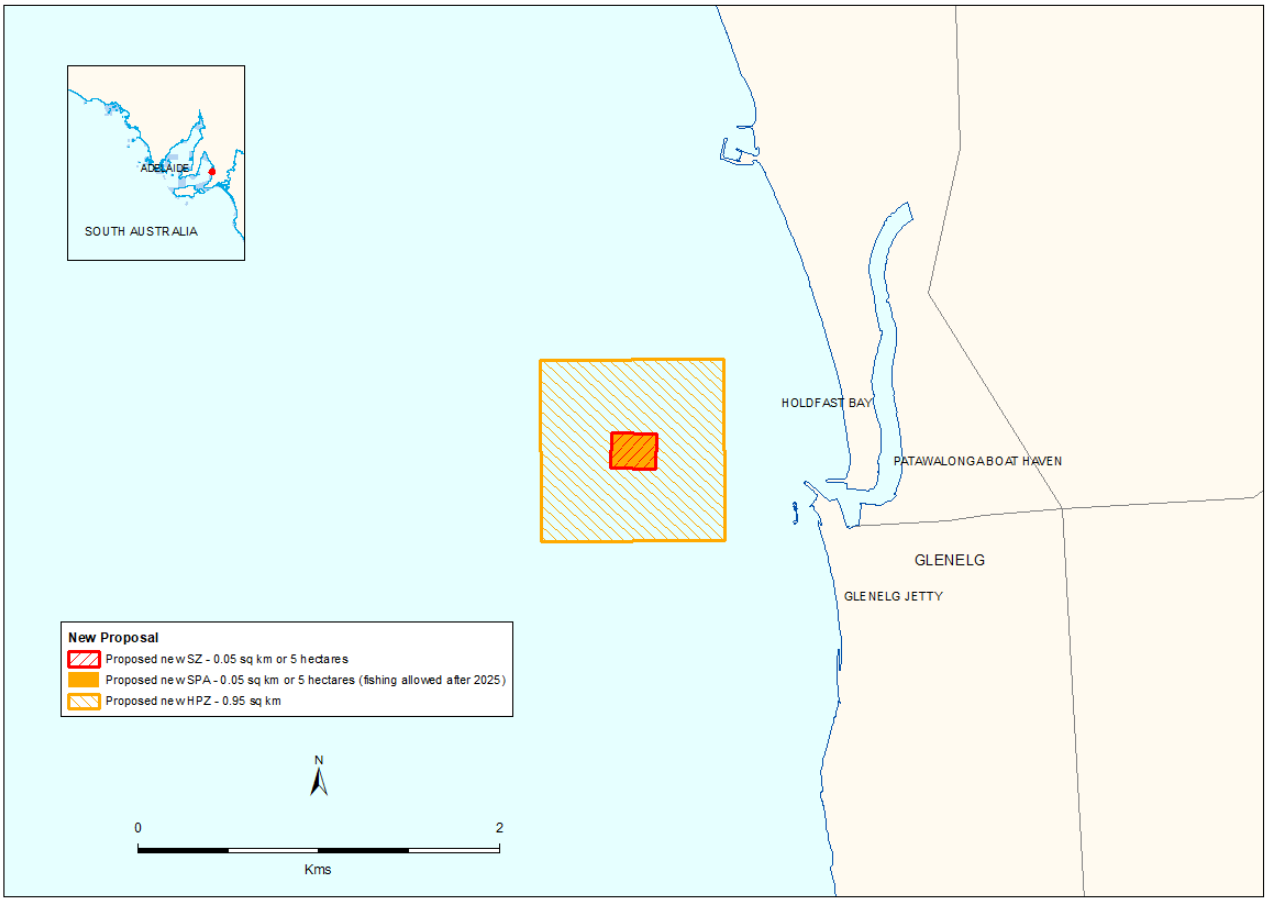
It is proposed that a geographically separate 1 x 1 km area of the Encounter Marine Park be proclaimed offshore from Glenelg that encompasses the site of the New Metro Reef. It is proposed that a 250m x 200m area (5 ha) be designated as SZ/SPA in the middle of the Outer Boundary area. A 5 ha area will enable optimal construction of the multiple reef segments which are expected to have a foot print of around 2 ha but could potentially be larger. It is proposed that the area surrounding the SZ/SPA area be designated as HPZ to provide a buffer for the reef.

In identifying the impacts of the proposed changes to marine parks legislation for the New Metro Reef, it is important to separate the impacts of the proposed legislative change from the impacts of the construction and establishment of the reef itself. Nonetheless, it also needs to be recognised that without the management arrangements in place due to the proposed legislative change, the beneficial impacts of the reef, such as increased tourism and fishing opportunities, may not be fully realised either. Thus the two processes are intertwined and it is assumed that a reef will be built within the next 12 months in the area proposed for zoning as SZ/SPA.

3.3.3. Impact analysis

See Table 3-5 for discussion of the current values and Table 3-6for discussion of the impacts on those values expected from the proposed amendments.

Figure 3-3 Proposed amendments, New Metro Shellfish Reef SZ and extension of outer boundaries of Encounter marine park



Source: map provided by DEW.

Table 3-5 Summary table for New Metro Shellfish Reef and proposed area of marine park extension - impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
New Metro Shellfish Reef area The proposed area of 1 km^2 currently has limited environmental value. The area is deemed to be degraded as historically it was covered in dense seagrass habitat but is now bare sand habitat. This is one of the reasons the site was chosen for shellfish reef restoration.	**New Metro Shellfish Reef area** The area overlaps with Block 48 of the blue crab fishery which generally harvests <10 tonnes annually from the block. It is unlikely to be used by squid fishers from the marine scalefish fishery as the area is sand with no structure that squid would aggregate on to lay eggs. The area is not used by netters from the marine scalefish fishery or prawn trawlers from the Gulf St Vincent prawn fishery.	**New Metro Shellfish Reef area** Dolphin cruises occur in the area. Dive charters don't currently use this area as it is bare sand.	**New Metro Shellfish Reef area** *Recreational uses:* Boating and fishing are extremely popular in the area. Boat ramps are located nearby at West Beach and Glenelg. The area is adjacent metropolitan Adelaide. *Recreational fishing:* Recreational fishing is extremely popular in the area. *Social values:* The region is of inherent cultural value to the Kaurna people

Table 3-6 Summary table for New Metro Shellfish Reef and proposed area of marine park extension – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Making the New Metro Shellfish Reef area a Marine Park Sanctuary Zone with an overlay SPA Positive impact as it provides protection from fishing during the first 5 years of reef establishment and will provide ongoing protection from benthic take. **Creation of GMUZ around the New Metro Shellfish Reef** Positive impact as it provides some protection from potential future damaging activities and provides buffering around the Metro Reef.	**Making the New Metro Shellfish Reef area a Marine Park Sanctuary Zone with an overlay SPA** Potential minor negative impact in the first 5 years of reef establishment when fishing not allowed in the area. However, due to the very small area of the SZ (0.0625 sq km), its location over relatively unproductive sand habitat, and the mobility of target species (e.g. blue crabs, squid), it would be unlikely to cause an issue with displaced fishing effort and/or lead to future compensation claims. Potential positive impact after 5 years when fishing allowed inside the area and the reef has become established. **Creation of GMUZ around the New Metro Shellfish Reef** No impact.	**Making the New Metro Shellfish Reef area a Marine Park Sanctuary Zone with an overlay SPA** Positive long-term impact as the reef establishes and becomes a destination for dive charters. **Creation of GMUZ around the New Metro Shellfish Reef** No impact.	**Making the New Metro Shellfish Reef area a Marine Park Sanctuary Zone with an overlay SPA** Potential minor negative impact on recreational fishing in the first 5 years of reef establishment when fishing not allowed in the area. This may be offset if some species aggregate on the reef and fishing is enhanced by fishing the boundary around the SZ. Potential positive impact on recreational fishing after 5 years when fishing allowed inside the area and the reef has become established. **Creation of GMUZ around the New Metro Shellfish Reef** The designation of a 1km^2 buffer area around the reef will be beneficial for the public to identify where the reef is located and that it lies within a marine park. This will assist with compliance and education activities.

4. CONCLUSIONS

Establishing the SA marine parks, their management plans and zoning has been a 20-year process. This process has followed a robust governance framework with a comprehensive consultation program. The design of the 83 SZ, and the zoning and management plans more generally, has been guided by 14 design principles, 7 biophysical principles[8] and 7 community principles[9] (Appendix 7, BDO EconSearch 2018) and over 100 marine park policy commitments (see Section2.2.3, BDO EconSearch 2018). Extensive consultation with all sectors of government and recreational fishers, local council representatives, conservationists, commercial fishers and other community interest groups has developed the zoning that is currently in place, which is broadly supported[10]. For example, from the preliminary SZ scenarios provided to MPLAGS in 2010 to the final sanctuary zoning established in November 2012, the area within SZs has reduced from 7,517 km^2 (12.5 per cent of state waters) to 3,014 km^2 (5 per cent of state waters).

The marine parks network has been developed with the primary goal of establishing and managing a CAR (comprehensive, adequate and representative) system of marine protected areas to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems, and to protect South Australia's biological diversity (see Section 3.1, BDO EconSearch 2018).

The marine waters off the SA coast contain an unusually high level of endemism as well as species richness and is recognised as a global biodiversity 'hotspot' (see Section 3.1, BDO EconSearch 2018). The 83 SZs represent the 8 marine bioregions within state waters and the ecosystems and habitat types found within them. As such, the network and SZs include representative areas of each of the eight bioregions making it possible to build resilience and replication within the network. The physical and biological features of the network include areas of different depths, sea surface temperatures, shoreline types, shoreline exposures and marine benthic habitats.

Marine Park SZs contribute to the overall CAR system and should not be considered in isolation as they are part of a Marine Park network. In addition, SZs (along with RAZs) are considered to be the key zone type for protection and conservation of biodiversity within the marine parks network (DEWNR 2017a) as they afford the highest level of protection. In some cases, a SZ may contain the only known habitat of that type in the reserve network (comprehensive) or be providing adequate refuge to ensure population viability (adequate) or have an example of a common habitat (representative).

Collectively the 83 SZs aim to provide protection for a range of habitats and ecosystems from threatening activities including fishing and other extractive uses, aquaculture, coastal developments, dredging, active surveying and wastewater discharge from vessels and desalination plants (see A.4.2).

Some important fishing areas have been lost to commercial fishers which was unavoidable to achieve a CAR system of marine parks. Across the marine park network, the removed catch/effort from all commercial fisheries as a result of implementing the 83 SZs was estimated to represent 2.0 per cent of the total GVP for all fisheries (see Section 3.2.1, BDO EconSearch 2018), which is under the previous SA Government's commitment of 5 per cent. South Australian Marine Parks Commercial Fisheries Voluntary Catch/Effort Reduction Program was implemented across six fisheries to remove the displaced catch/effort from these fisheries through voluntary buyout of licences and quota. The program aimed to prevent increased pressure on fish stocks that could result from the redistribution of commercial fishing

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[8] The precautionary approach, comprehensiveness, adequacy, representativeness, connectivity and linkages, resilience and vulnerability and ecological importance

[9] synergies with existing protected areas, complement existing land and marine management practices, consider full diversity of marine uses, respect indigenous interests and culture, consider cultural heritage, ensure ease of identification, compliance and enforcement and provide for education, appreciation and recreation

[10] Government funded research to guage the public's understanding and perception of marine parks has found general support for marine parks has remained stable since 2006, averaging 88 per cent (DEWNR 2017b).

effort that had historically occurred inside SZs. The reductions achieved through the catch and effort program were in excess of the targeted amounts for all of the six fisheries (Kosturjak et al. 2015, DEWNR 2017a), and can be viewed as successful in its objectives. Analysis of individual fishery trends (Section 2 and Appendix 2) indicates that there has been a continuation of existing trends (catch per unit effort (CPUE), licence values, economic rent) with no obvious change since 2014 in all the affected fisheries through the period 2002 to present, indicating that the Marine Park zoning has not been a contributing factor affecting the sustainability of these fisheries.

Comparative analysis of socio-economic trends (population, labour force, unemployment property prices and school enrolments, see Appendix 4, BDO EconSearch 2018), medium and small towns near SZs and away from SZs has not shown any discernible trend difference between adjacent and comparative towns (see discussion in Section 2.7), indicating that the Marine Park zoning has not been a contributing factor affecting the socio-economic performance of these towns.

With regards to the six SZs with proposed amendments, our analysis shows that the environmental values of the six SZs are significant. For example:

- Two of the six SZs are in the top ten SZ in terms of size. Large protected areas are considered to be a more effective tool for biodiversity conservation than small areas, as more species will be protected in a larger area and individual species are more likely to have their critical life stages protected
- Three of the six SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea.
- Three of the six SZs are known breeding locations for rare and threatened marine birds and mammals
- Three of the six SZs were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.

Several of the SZs are sites of ocean upwelling or strong currents with nutrient rich waters supporting a particularly high biodiversity. Not surprisingly, these SZs were also important[11] commercial fishing areas. These SZs are the Isles of St Francis, North Neptune Islands and Cape du Couedic SZs and were important to the NZRL and/or Abalone Fisheries. Clinton Wetlands SZ was an important fishing area for the MSF. Nuyts Reef was of minor importance to commercial fishing with displaced catch or effort estimated at below $100,000. A very small amount of charter boat activity took place prior to zoning in all six SZs.

As expected from the Marine Park policy commitments, recreational fishing has not been significantly affected, with SPAs permitting shore-based fishing established in 16 of the SZs/RAZs including two of the focus SZs with popular fishing spots (Nuyts Reef and Clinton Wetlands SZs).

Three of the six SZs are sites for the government scientific monitoring program, which if part of the SZs were opened to fishing would reduce the utility of monitoring these SZs as removal of biomass by fishing would change the ecosystem function and thus understanding of how intact marine ecosystems function. It is anticipated that at least 5 to 10 years will be required to start to detect changes due to SZs (DEWNR 2017a, Delean 2017), although changes in rock lobster populations were detected quite rapidly inside the Cape du Couedic SZ (McLeay et al. 2017, see A.2.5.5). Data comparing various metrics from inside SZs relative to outside can be found in the 2017 Marine Parks Status Report (DEWNR 2017a). The Cape du Couedic SZ is very culturally important to the Ngarrindjeri people, having features that are part of their Ngurunderi Dreaming Story. Protecting features within this SZ is consistent with these cultural values. North Neptune Islands SZ is used for non-fishing based tourism and the existence of the SZ is known to be promoted by operators in the SZ. Cape du Couedic SZ is adjacent to the Cape du Couedic precinct on Kangaroo Island and is one of the State's prime tourist destinations.

[11] Historic average annual catch greater than $400,000 GVP.

Modifying zoning arrangements in the SZs to allow fishing or other extractive activities inside a SZ (by changing to HPZ status), where a reduction in area is proposed, will reduce the effectiveness of the Marine Park network at protecting and conserving marine biodiversity and habitats by:

- Directly impacting species captured by extractive use by their selective removal and potential negative impacts to their population structure and reproductive success
- Indirectly affecting species that are reliant on captured species for food, shelter or other services and directly impacting other species through disturbance
- Compromising trophic relationships and food webs with flow on effects to ecosystem function and resilience
- Increasing the risk of pollution and the spread of disease and marine pests
- Reducing the effectiveness of the Government's monitoring program which is currently based on SZ and the protection afforded by them
- Altering the balance of habitats and features represented in the different zone types of the park network.

Where a reduction in SZ area is proposed, changes to zoning will have an impact on how the marine park network satisfies the criteria for a "comprehensive, adequate and representative system of marine parks" by reducing the area of habitats and features which are afforded the highest level of biodiversity protection and conservation.

From a commercial fisheries perspective, changing the zoning arrangements will likely see the return of fisheries that historically used that part of the SZ that is proposed for amendment. Over the short-term, in quota fisheries such as the Rock Lobster and Abalone fisheries, small increases in catch rate may be expected. Over time, at the fishery level, the fisheries would be expected to stabilise at the same marginally higher level of catch and effort as if the SZ had not been implemented. For non-quota fisheries such as Marine Scalefish, there is likely to be a marginal increase in overall catch because of access to more fishing grounds. The economic benefit of these changes for quota and non-quota fisheries would be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ.

For recreational fishing, changing part of the zoning status from SZ to HPZ is likely to benefit recreational fishers in Clinton Wetlands through a redistribution of existing recreational fishing activity from areas adjacent to the zone. However, in Clinton Wetlands it is likely that the return of commercial fishing will not be supported by recreational fishers. Extending shore-based recreational line fishing in the Coorong Beach South SZ from 4km to 11.41 km is expected to increase the opportunities for remote, surf-based recreational fishing.

The outer boundaries of two marine parks are proposed to be amended, namely the Upper Gulf St Vincent marine park and Encounter marine park.

The Upper Gulf St Vincent marine park boundary change proposal will involve extending the marine park outer boundary to allow inclusion of Windara Shellfish Reef. This will create a SZ over Windara Reef and an SPA overlay to allow existing activities (including recreational fishing) to continue as per current management arrangements under the Fisheries Management Act. This arrangement is expected to positively impact on environmental values by maintaining the protection of the reef in perpetuity. It is not expected to have any impact on commercial fishing or recreational fishing, tourism and other social values.

The Encounter marine park boundary change proposal will involve extending the marine park outer boundary to allow the inclusion of the existing exclusion zone at Port Stanvac and the new metro shellfish reef. The inclusion of the new metro reef will be via a geographically separated section of outer boundary of 1 km^2 in size offshore from Glenelg. A SZ will be created over part of the existing Port Stanvac

exclusion zone. Extension of the Encounter Marine Park outer boundaries to incorporate the Port Stanvac restricted access area, on the available information is expected to provide potential positive benefits to the general public by providing educational and recreational (non-extractive) opportunities currently not permitted. The area has significant environmental values which will be maintained if the proposal is implemented. Extension of the Encounter Marine Park outer boundaries to incorporate the New Metro Shellfish Reef SZ, on the available information, is expected to provide potential positive benefits to dive tourism and recreational fishing in the long-term as the reef becomes established. Likewise there are potential long-term benefits for environmental values, by protection from benthic harvest or damaging activities through SZ and GMUZ zoning, respectively.

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Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.

Appendix 1 NOTES ON ASSESSMENT APPROACH

Key Questions

As described in Section 1, assessment of the six SZs was based around answering the following key questions:

Economic (commercial fishing) values:

1. Which fisheries sectors previously utilised the SZ?
2. Which fisheries currently utilise the new area proposed as SZ? Relevant to Nuyts Reef SZ and Isles of St Francis SZ only.
3. For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?
4. For those fisheries that currently utilise the new area proposed as SZ, what is the historical importance of the area to the whole fishery? Relevant to Nuyts Reef SZ and Isles of St Francis SZ only.
5. What proportion of the SZ has habitat suitable for different fishing activities?
6. What proportion of the new area proposed as SZ has habitat suitable for different fishing activities? Relevant to Nuyts Reef SZ and Isles of St Francis SZ only.
7. What was the estimated economic value and impact to fishing of the SZ?
8. What was the estimated impact on individual fishers versus the whole fishery?
9. Is there any evidence of a negative impact on fisheries since the introduction of the SZ?
10. Any compensation claims related to the SZ?
11. What impact would there be to the fisheries values of expanding the SZ? Relevant to Nuyts Reef SZ and Isles of St Francis SZ
12. What impact would there be to the fisheries values of opening part of the SZ to different fishing activities? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ
13. What impact would there be to the fisheries values of opening the SZ to recreational shore-based fishing activities? Relevant to Coorong Beach South SZ only.
14. What impact would there be to the fisheries values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ

Economic (tourism) values:

1. What tourism activities occur in or adjacent to the SZ?
2. What is the economic contribution of tourism activities that utilise the SZ?
3. Have there been changes or were changes predicted in tourism activities due to the SZ?
4. What impact would there be to the tourism values of opening part of the existing SZ to different fishing activities Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ
5. What impact would there be to the tourism values of expanding the size of the SZ? Relevant to Nuyts Reef SZ and Isles of St Francis SZ
6. What impact would there be to the tourism values of opening the SZ to shore-based recreational fishing activities? Relevant to Coorong Beach South SZ only.

7. What impact would there be to the tourism values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ

Social values:

1. What recreation activities occur in or adjacent to the SZ?
2. Was recreational fishing impacted by the SZ?
3. What does the community value about the SZ?
4. What are the non-market values of the SZ?
5. Have social values changed due to the SZ?
6. What impact would there be to the social values of opening part of the SZ to different fishing activities? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ
7. What impact would there be to the social values of expanding the SZ? Relevant to Nuyts Reef SZ and Isles of St Francis SZ
8. What impact would there be to the social values of opening the SZ to recreational shore-based fishing activities? Relevant to Coorong Beach South SZ only.
9. What impact would there be to the social values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ

Environmental values

1. What habitats and biodiversity are found in the SZ?
2. How does the biodiversity compare to other areas?
3. How does the SZ contribute to the CAR network?
4. Have there been changes or are changes predicted due to the SZ?
5. What current and future threats to conservation values are addressed by the SZ?
6. What impact would there be to the environmental values of opening part of the SZ to different activities? Relevant to all SZs except Nuyts Reef SZ
8. What impact would there be to the environmental values of expanding the SZ? Relevant to Nuyts Reef SZ and Isles of St Francis SZ
9. What impact would there be to the environmental values of opening the SZ to shore-based recreational activities? Relevant to Coorong Beach South SZ only.
7. What impact would there be to the environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? Relevant to all SZs except Nuyts Reef SZ and Coorong Beach South SZ.

The assessment was based on desktop analysis of published and unpublished reports and datasets which are referenced where used. For the economic values assessment (both commercial fishing and tourism), where data allowed, regional economic impact analysis was undertaken. The methods and models used are described below.

Economic Values – Commercial Fishing

The regional impact analysis considered the state commercial fishing sector only. It was based on SARDI's estimates of displaced catch or effort in the SZs in South Australia's marine parks (data by special request).

The economic impact analysis, as with previous analyses, was based on the input-output method. This method provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various change scenarios, as has been done in this study.

For this impact assessment input-output models for the closest or most appropriate State Government region have been utilised. The model used is known as a Regional Industry Structure and Employment (RISE) model which is an extension of the standard input-output model that is used within the SA Government for various types of impact assessment (EconSearch 2017).

Because some of the activities that could potentially be impacted by marine parks are related to the tourism sector, the RISE model includes explicit specification of the regional tourism industry. This was done by following the standard ABS method of constructing tourism satellite accounts.

The following indicators of economic impact were generated using the economic modelling framework described above:

- Value of output
- Gross regional product (GRP)
- Household income
- Employment.

(Value of) Output is a measure of the gross revenue of goods and services produced by commercial organisations (e.g. the value of processed seafood products) and gross expenditure by government agencies. Total output needs to be used with care as it can include elements of double counting when the output of integrated industries is added together (e.g. the value of processed seafood includes the beach value of the fish).

Gross regional product (GRP) is a measure of the net contribution of an activity to the regional economy. GRP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as the sum of household income, 'gross operating surplus and gross mixed income net of payments to owner managers' and 'taxes less subsidies on products and production'. It represents payments to the primary inputs of production (labour, capital and land). Using GRP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose. **Household income** is a component of GRP and is a measure of wages and salaries paid in cash and in-kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and income tax, but excluding payroll tax.

Employment is a measure of the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent (fte) jobs. Employment is measured by place of remuneration rather than place of residence.

Estimates of economic impact are presented in terms of:

- Direct impacts
- Flow-on impacts
- Total impacts.

Direct (or initial) impacts are an estimate of the change in final demand or level of economic activity that is the stimulus for the total impacts.

Flow-on impacts are the sum of production-induced impacts, consumption-induced impacts and offsetting consumption effects.

- **Production-induced impacts** are the sum of first-round impacts (i.e. estimates of the requirement for or purchases of goods and services from other sectors in the economy generated by the initial economic activity) and industrial support impacts (i.e. output and employment resulting from second,

third and subsequent rounds of spending by firms). Production-induced impacts are sometimes referred to as 'indirect effects'.

- **Consumption-induced impacts** are additional output and employment resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as 'induced effects'. Offsetting consumption effects are 'lost' consumption expenditure by the local unemployed before taking a job or 'new' consumption expenditure of those losing a job as they shift to welfare payments.

Total impacts are the sum of direct and flow-on impacts.

At a micro level individual businesses could be impacted by the sanctuary zoning and management arrangements. To assess the impact on commercial fishing operations representative financial models of fishing businesses were constructed for each of the relevant fishing sectors. These models were based on financial information collected and reported by EconSearch (2018a-i). The results of the financial modelling provided input into the regional RISE model to estimate impacts on the regional economy.

The principal driver for change in fishing industry operations and profitability is lost access to the resource. Estimates of displaced catch and effort were provided by SARDI (data by special request).

Economic Values – Tourism

The economic contribution analysis for tourism activities followed a similar method to the economic impact analysis of commercial fishing to calculate flow-on activity. Direct tourism activity and expenditure were estimated as follows:

1. Establish the number of visitors by type (various sources)
2. Attribute an average number of nights to taking part in the activity (assumption)
3. Establish the average expenditure (itemised) per night by visitor type (TRA 2017)
4. Calculate total expenditure in the region (itemised) attributable to the SZ (points 1, 2 and 3)
5. Establish the total fees paid by visitors as part of their visit to the SZ (various sources)
6. Check for double-counting between points 4 and 5 then sum them to arrive at total expenditure (itemised) in the region attributable to tourism activity at the SZ.

Appendix 2 FOCUS SANCTUARY ZONE DETAILS

This Section provides the detailed assessment of the six SZs, based on the Questions listed in Appendix 1. As described in Section 1, assessment of the six SZs was based around answering these key questions.

A.2.1. Nuyts Reef Sanctuary Zone

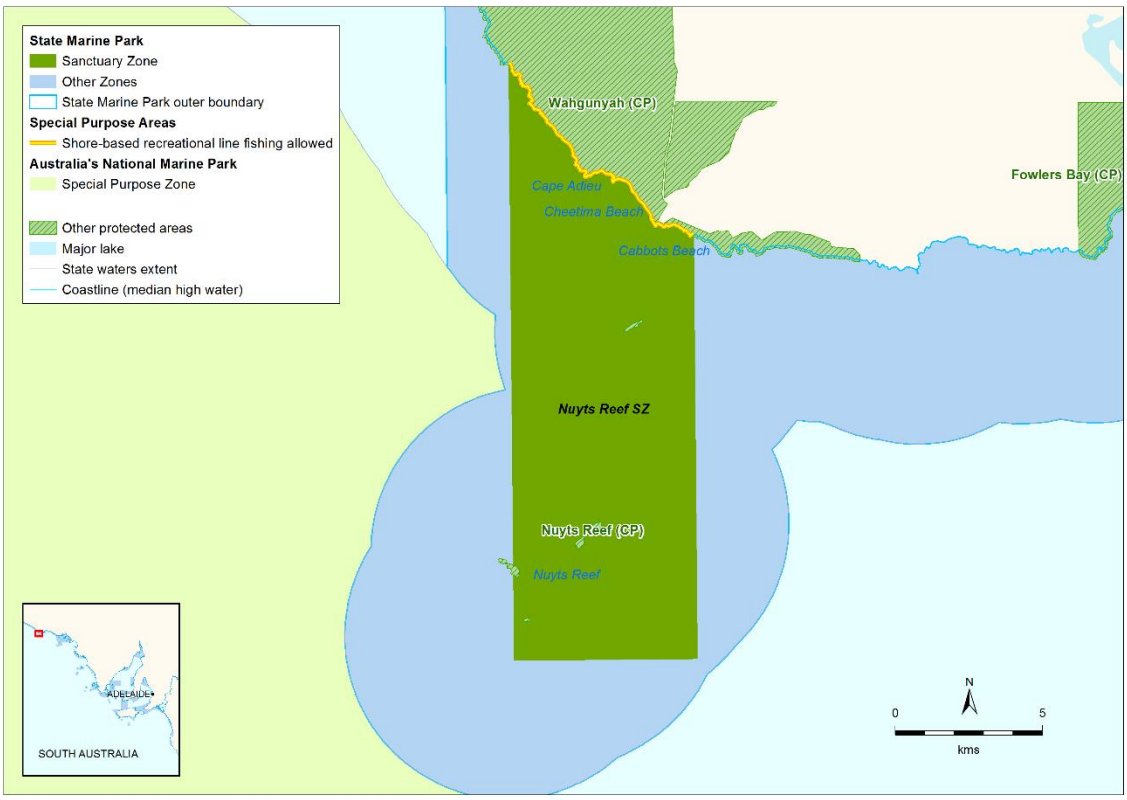
A.2.1.1. Zone description

The Nuyts Reef SZ (105km^2), located within the Nuyts Archipelago Marine Park (Appendix Figure 2-1) and is part of the Eucla and Murat Bioregions. The SZ contains a mix of bedrock platform reefs and offshore island habitats exposed to moderate to high wave energy. The area conserves important environmental feature of state and regional ecological significance. The reef is the last shoreline inflection (or settling place) before the Head of the Bight, and is the largest and most westerly limestone reef in the Murat bioregion.

The SZ provides haul out sites for the long-nosed fur seal as well as habitat for breeding for the vulnerable Australian sea lion colonies.

This SZ is influenced by the warm, westerly Leeuwin Current, which helps support migratory pelagic species such as southern bluefin tuna and a wide range of species more commonly found in tropical areas.

Appendix Figure 2-1 Nuyts Reef sanctuary zone



Source: Appendix 5

Nuyts Reef SZ conserves important spawning location for Southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep and western blue groper. The area also contains uncommon red algal communities in 30m of water.

The SZ allows for shore based recreational fishing and had low impact on commercial fisheries. In regards to MPLAG advice, this SZ was not supported by the majority of members based on fishing issues. The SZ was an outcome of the Key Stakeholder Forum to improve the environmental outcomes for this marine park.

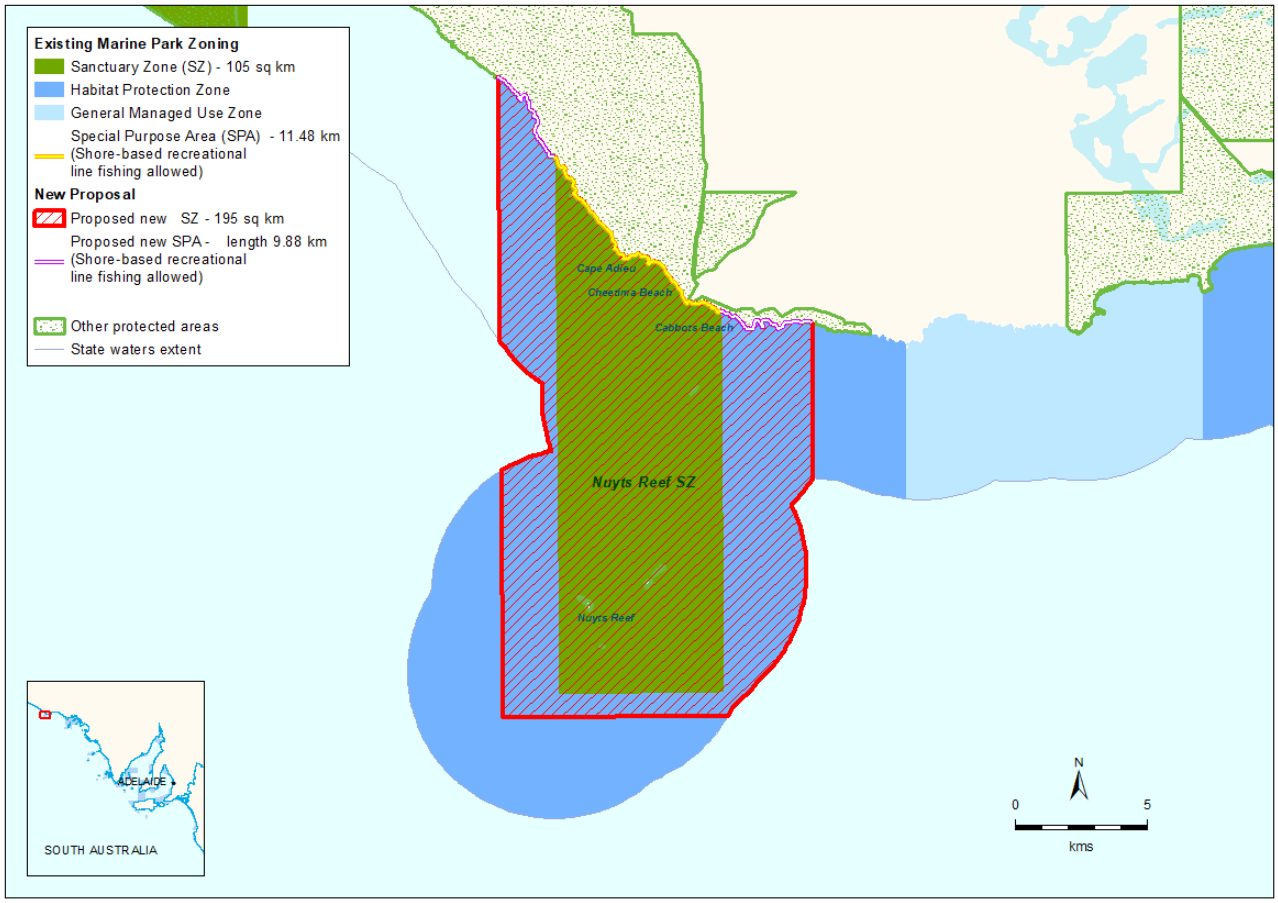
A.2.1.2. Proposed changes to zoning

The proposal is to

- Expand the SZ by 90 km2 to encompass more of the surrounding area. The additional area will change from HPZ to SZ. The new SZ area will be 195 km2.
- Continue to allow shore-based recreational line fishing in the expanded SZ by extending the existing Special Purpose Area to the west and east by 9.88km, to give a new SPA of 21.46km in length.

The proposed changes are described in Appendix Figure 2-2.

Appendix Figure 2-2 Proposed amendments, Nuyts Reef SZ



Source: maps supplied by DEW.

A.2.1.3. Economic values and impacts

A.2.1.3.1. Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The NZRL and the Western Zone Abalone Fisheries were the principal fisheries that previously used the Nuyts Reef SZ. There was some use, albeit minor, of the SZ by the Marine Scalefish and Charter Boat Fisheries.

This area was historically fished by the NZRL Fishery opportunistically, dependent on sufficient inter-annual recruitment of Southern Rock Lobster. The sea temperatures in this area are at the limits of the species biophysical coping range and recruitment is particularly variable.

Which fisheries sectors currently utilise the new area proposed as SZ?

The new area proposed as SZ is thought to be rarely fished by the NZRL, Western Zone Abalone or Marine Scalefish Fisheries.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced by the SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-1. The total gross value of displaced catch in this SZ is estimated to be at least $78,000, principally from the NZRL ($42,000), Western Zone Abalone ($34,000) and Marine Scalefish ($2,000) Fisheries.

Displaced effort from the Charter Boat Fishery was confidential but would be minimal. In fact, for the entire Nuyts Archipelago Marine Park the value of displaced effort would be $4,000.

The displaced catch for Nuyts Archipelago Marine Park (presented in Appendix Table 2-1 and Appendix Table 2-5) concurs with preliminary estimates read in the Legislative Council in May 2014 (Appendix 6, BDO EconSearch 2018) in terms of absolute catch of Abalone, but the proportion of total catch (around 1.91 per cent is lower than the preliminary estimate). The preliminary estimate for displaced Rock Lobster catch was around double that presented here.

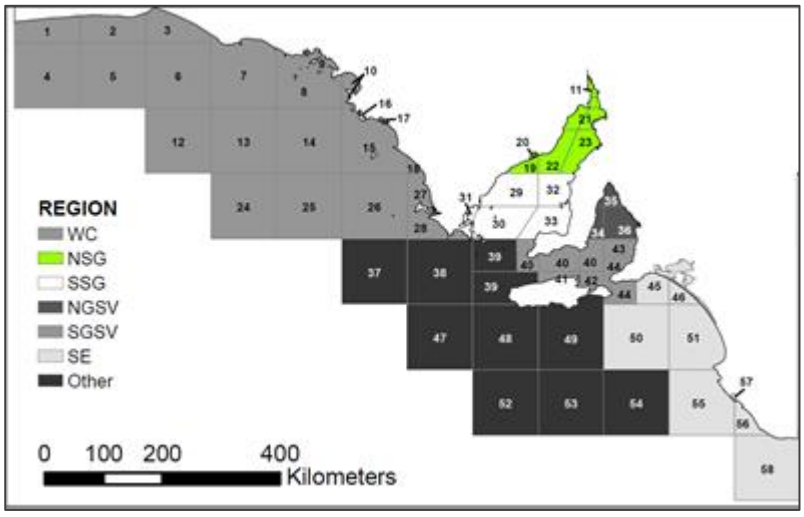
Appendix Table 2-1 Estimated catch or effort and GVP displaced by fishery, Nuyts Reef SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	750	0.13%	34
Rock Lobster	730	0.11%	42
Marine Scalefish	14	0.02%	2
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

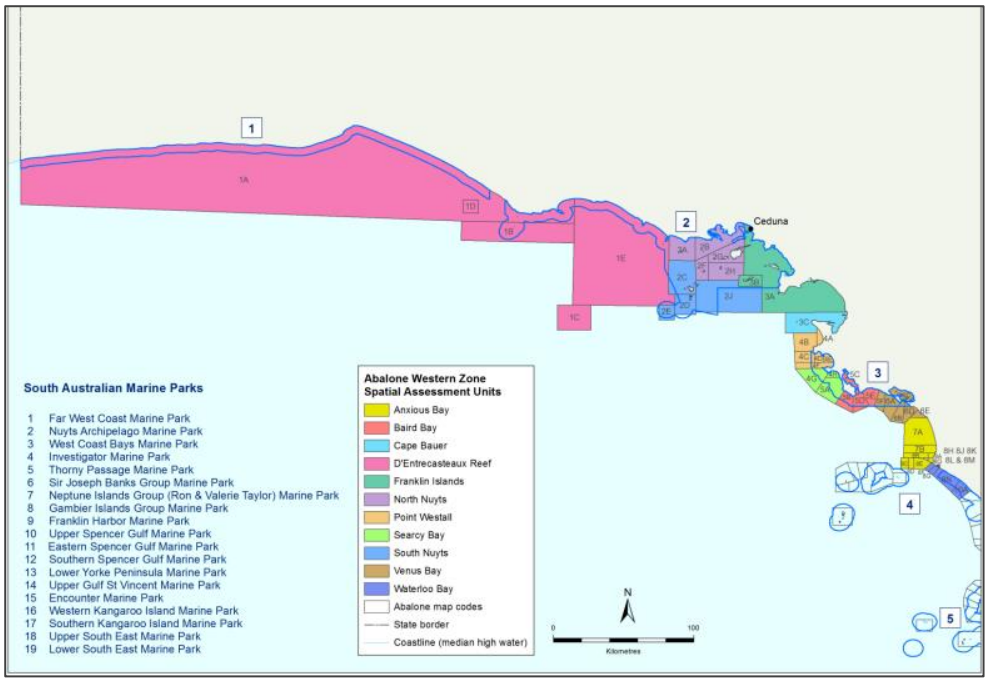
The Nuyts Reef SZ is located on the west coast of South Australia between Ceduna and the Head of the Bight. This SZ occupies 1 per cent of Marine Fishing Area 7 (MFA – Marine Scalefish and NZRL Fisheries) (Appendix Figure 2-3). This MFA is utilised by commercial fishers targeting primarily Southern Rock Lobster. The Nuyts Reef SZ overlaps 0.43 and 5 per cent of the D'Entrecasteaux Reef SAU 1A and 1B respectively (Appendix Figure 2-4). These species is also able to be targeted outside of the SZ.

Appendix Figure 2-3 SA Marine Fishing Area (MFA) blocks



Source: Steer et al. 2018

Appendix Figure 2-4 Western Zone Abalone Spatial Assessment Units



Source: Bryars et al. 2017b

Marine Scalefish Fishery

This area is a very minor part of the MSF, with a confidential catch of Snapper in (2012/13) from MFA 7.

Northern Zone Rock Lobster Fishery

Historic catches from MFA 7 over the last 10 years has averaged less than 10t out of a total fishery catch of 300 to 500t throughout this time frame (Linnane et al. 2017).

Western Zone Abalone Fishery

The Western Zone Blacklip Abalone Fishery is classified as transitional depleting while the Greenlip Abalone Fishery is classified sustainable (Stobart et al. 2017).

The historic Greenlip Abalone catch for D'Entrecasteaux Reef SAU fluctuated between roughly 1t and 2t between 1983 and 2009 but has since remained below 1t out of a total of around 75t for the Western Zone Greenlip Abalone Fishery (since 2006). Blacklip Abalone catch for D'Entrecasteaux Reef SAU decreased from around 2t in 2007 to less than 1t by 2010 out of a total of around 100t for the Western Zone Blacklip Abalone Fishery (Stobart et al. 2017).

For those fisheries that currently utilise the new area proposed as SZ, what is the historical importance of the area to the whole fishery?

There is no information available for displaced catch or effort for the proposed area. Nonetheless, the proposed area is believed to be relatively unimportant to fisheries (see previous section for general information on the area) and due to the unsuitable seabed habitat (see below) any estimate of displaced catch or effort for rock lobster and abalone would be far lower than estimates available for the adjacent Nuyts Reef SZ.

What proportion of the SZ has habitat suitable for different fishing activities?

Broad scale mapping has occurred in about half of Nuyts Reef SZ most of which is reef habitat suitable for Rock Lobster and Abalone.

What proportion of the new area proposed as SZ has habitat suitable for different fishing activities?

The area is unmapped but is likely to be mostly sand unsuitable for rock lobster and abalone fisheries

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

Appendix Table 2-2 shows the economic impact on the regional economy of sanctuary zoning on the NZRL and Western Zone Abalone Fisheries. Impacts are based on the gross value of displaced catches (Appendix Table 2-1). Note the displaced effort in the Marine Scalefish and Charter Boat Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

In aggregate, it was estimated that the impact of zoning in the Nuyts Reef SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.08m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2018/19).
- Approximately 1 fte job which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2018/19).
- Approximately $0.05m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2018/19).

Appendix Table 2-2 Regional economic impact of zoning, Nuyts Reef SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.03	18%	0	0%	-0.01	15%	-0.01	16%
Rock Lobster	-0.04	22%	0	42%	-0.01	12%	-0.01	17%
Downstream [b]	-0.02	13%	0	8%	0.00	6%	-0.01	9%
Total Direct [c]	*-0.10*	*54%*	*0*	*49%*	*-0.02*	*33%*	*-0.04*	*41%*
Total Flow-on [c]	*-0.09*	46%	*0*	51%	*-0.03*	67%	*-0.05*	59%
Total [c]	**-0.19**	**100%**	**-1**	**100%**	**-0.05**	**100%**	**-0.08**	**100%**
Regional Total [d]	5,776.0		25,915		1,826.5		3,389.9	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

What was the estimated impact on individual fishers versus the whole fishery?

Marine Scalefish Fishery

The estimated displaced effort for the marine park was 0.58 per cent of the total average annual effort in the fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. It is possible that this assumption is false for some regions (Kosturjak et al. 2015) because insufficient effort was removed in some localised areas. No data have been published to confirm or reject these assumptions.
- The majority of effort and catch is from small vessels in sheltered inshore waters, where there is a negligible overlap with the SZs. The Davenport Creek, Nadia Landing, Creek Flats and Point Peter SZs

are small and mostly lie in intertidal waters. The Barlows Beach SZ is small and is in relatively exposed waters.

- There are less than five commercial fishers catching Whaler Sharks in the offshore waters, including the Isles of St Francis and Lound Island SZs (Bryars et al. 2017b).

Southern Rock Lobster fishery

The estimated displaced catch from this marine park was 0.90 per cent of the total average annual catch in the NZRL Fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs, which based upon historical catch rate data appears to be the case (Kosturjak et al. 2015).
- In the five seasons prior to SZ implementation (2009–2013) there was a decline in effort compared with the previous 15 years in Marine Fishing Areas 7 and 8, which include the SZs that are most likely to respond (Nuyts Reef, Isles of St Francis).
- Recent catches from the region are minor relative to the entire NZRL Fishery (Kosturjak et al. 2015 and Linnane et al. 2017).
- Two of the large offshore SZs that have been inventory-mapped (Lound Island and Isles of St Francis) include substantial areas of sand habitat that are unsuitable for Rock Lobster.

Abalone Fishery

The estimated displaced catch from this marine park was 2.02 per cent of the total average annual catch in the fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm this assumption.
- There has been a decline in fishing effort in the region prior to SZ implementation and recent catches are minor relative to the entire Western Zone Abalone Fishery (Kosturjak et al. 2015 and Stobart et al. 2014, 2015).
- Two of the large offshore SZs that have been inventory-mapped (Lound Island and Isles of St Francis) include substantial areas of sand habitat that are unsuitable for Abalone.

Charter Boat Fishery

Change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm this assumption.
- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- The Isles of St Francis SZ was a recognised Charter fishing destination and will cause some modification of fishing behaviour based around prevailing wind and weather conditions. However, there are numerous other locations that remain available for fishing both in and out of the Nuyts Archipelago Marine Park.
- There are few operators within the Nuyts Archipelago Marine Park and therefore minimal competition for fishing grounds.
- The estimated displaced effort was 0.09 per cent of the total effort in the Nuyts Archipelago Marine Park (EconSearch 2014).

- The Nuyts Archipelago Marine Park is not a recognised destination for long-range charters from other regions.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ, which have been low. Current and future catch in all fisheries could potentially be higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

Marine Scalefish Fishery

The MSF does not harvest significant quantities from this SZ recording zero, 0.1t-6t, confidential and zero for King George Whiting, Snapper, Garfish and Southern Calamari respectively in 2016 (Steer et al. 2018). This is comparable to historic catches (Fowler et al 2013).

Northern Zone Rock Lobster Fishery

There is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause.

The NZRL Fishery maintained nearly 100 per cent of the total allowable commercial catch (TACC) between 2010 and 2015, 96 per cent in 2016 (when the TACC was increased) and 88 per cent in 2017 (Appendix Table 3-3, BDO EconSearch 2018). However, the catch in 2017 of 320 t was very similar to the average annual catch of the period 2010-2017 and the catch of 2015 of 321 t (Appendix Table 3-3, BDO EconSearch 2018). Catches from MFA 7 in 2015 were about 10t which was higher than the 6 years previous (Linnane et al. 2017).

Western Zone Abalone Fishery

Blacklip catch in D'Entrecasteaux Reef SAU has continued on the historic decline. Catch since 2010 has been less than 1t (Stobart et al. 2017). Greenlip catch for D'Entrecasteaux Reef has been less than 1t since 2011 and has been very low in 2014, 2015 and 2016 (Stobart et al. 2017).

The impact is complicated by the rotational nature of the fishery where divers fish successive reefs in each year thereby allowing reefs to recover. Restricting the area available to fish will impact on the ability to rotate between reefs and therefore may have implications for the long term sustainability of the fishery.

Any compensation claims related to the SZ?

It is unknown if there are any compensation claims being investigated for this SZ.

Existing Arrangement with proposed expansion of the SZ

What impact would there be to the fisheries values of expanding the SZ?

The total gross value of displaced catch in the existing SZ, estimated to be at least $78,000, would remain unavailable. This would be principally by the NZRL and the Western Zone Abalone Fisheries and to a minor extent the Marine Scalefish and Charter Boat Fisheries.

There are no data currently available on estimated displaced catch/effort for the new area proposed as SZ. Thus it is not possible to estimate the economic impact of the proposed increase in SZ area. Nonetheless, the new area is likely to be of relatively low value to rock lobster and abalone fisheries as it is suspected to be largely sand habitat (based on benthic mapping of adjacent areas) and the industry has proposed the area.

A.2.1.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

No recognised tourism activities take place in or adjacent the SZ.

What is the economic contribution of tourism activities that utilise the SZ?

Since there are no tourism activities there is no economic contribution to the region from tourism.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.1.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with proposed expansion of the SZ

What impact would there be to the tourism values of expanding the size of the SZ?

There would be no change.

A.2.1.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in and around the Nuyts Reef SZ due to the remote nature of the area. The area is far from the nearest public boat ramp and is inaccessible to most recreational boats (Bryars et al. 2016).

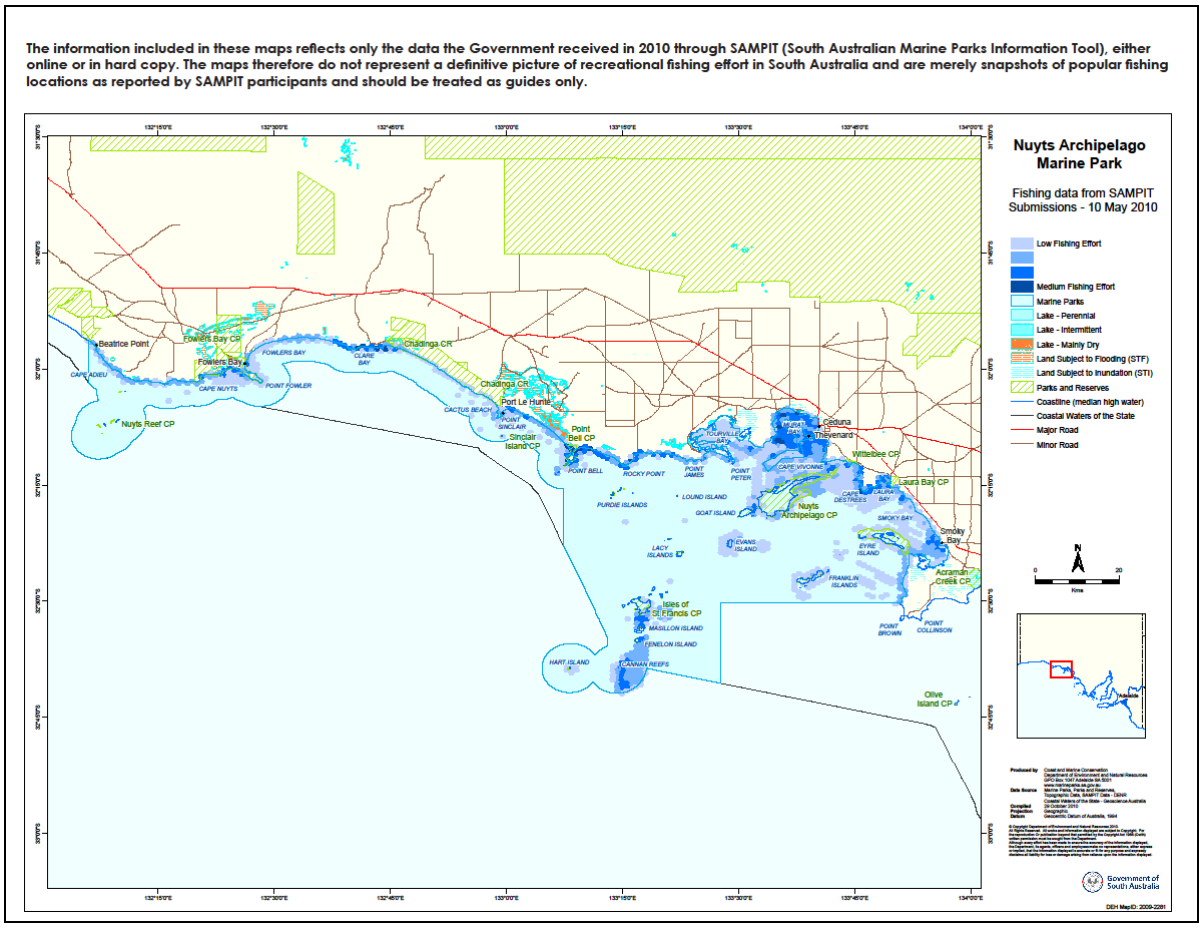
Shore-based recreation activities adjacent to the SZ are generally limited due to the restricted access by road to the shoreline and cliffs. However, some shore-based recreational line fishing does occur there as a SPA was provided to allow for this activity to continue in the SZ. The area is too exposed and rugged for recreational diving.

Existing Arrangement

Was recreational fishing impacted by the SZ?

As the area was rarely if ever used by recreational boat fishers, zoning the area as a SZ did not impact recreational fishing (Appendix Figure 2-5). The Nuyts Reef SZ has a SPA to allow shore-based recreational line fishing such that there has been no impact to this activity from the SZ.

Appendix Figure 2-5 SAMPIT map showing intensity of fishing prior to SZ implementation, Nuyts Archipelago Marine Park



Source: DENR 2010d (SAMPIT)

What does the community value about the SZ and surrounding area?

A total of 7,347 (85 per cent) of the 8,649 respondents commented specifically on the Nuyts Archipelago Marine Park during submissions to the draft zoning. 5 (0.06 per cent) agreed with the proposed zoning entirely, 7,181 (83 per cent) suggested changes to zoning to increase the conservation outcome, 161 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,302 (15 per cent) expressed no comment on the proposed zoning (DENR 2010d).

Submissions to the draft zoning identified that commercial fishers and conservationists have conflicting views with the former suggesting that the SZ removes legal access to the most productive fishing areas. Conservationists on the other hand welcomed steps taken toward a scientific solution to protecting iconic areas including Nuyts Reef. They suggested an additional area to the west of the SZ to include Cactus Beach and the western side of Point Sinclair (Point Sinclair National Surfing Reserve) in order to protect and preserve the spirit and integrity of this remote section of the Australian coastline, so that future generations of surfers may benefit from the unique experience that this fragile coastline and pristine surfing environment offers as encountered by the surfing pioneers of the 1950's and 60's. The proposal would allow for shore based fishing. The area would add to the status of South Australia's first proclaimed National Surfing Reserve. There would be no impact on commercial rock lobster fishing (DEWNR 2012b).

The overall social impacts of the Nuyts Archipelago Marine Park on communities living in the Far West Coast region of South Australia is moderate given the magnitude of economic impacts that was projected at inception. In 2012 commercial fishing was one of the four top industry sources of employment in the region, estimated to have contributed 116 jobs, compared to tourism, which contributed 180 jobs. Economic impact assessment identified a loss of five commercial fishing-related jobs even though the impact on recreational fishing has been low due to adjustments in zoning that minimised potential

negative impacts. Hence, the impact on the local community identity as a fishing centre and on fishing as a way of life has been moderate.

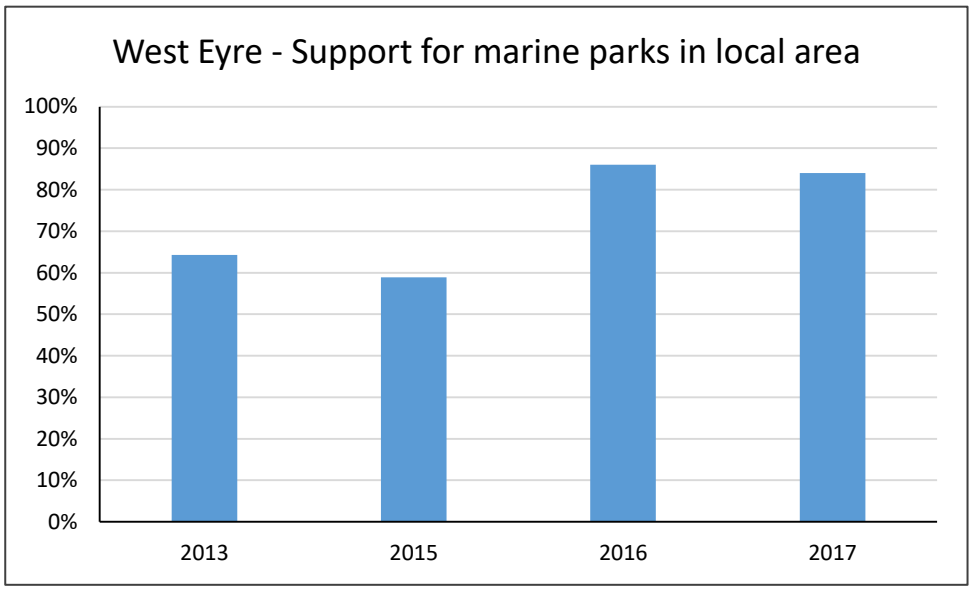
What are the non-market values of the SZ and surrounding area?

The SZ and surrounding area has 'wilderness value'.

Have social values changed due to the SZ?

Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 64 per cent in 2013, dropping to 59 per cent in 2015, before increasing to 82 per cent in 2017 (DEWNR 2017a[12]).

Appendix Figure 2-6 West Eyre support for marine parks in local area



Source: DEWNR 2017a.

Existing Arrangement with proposed expansion of the SZ

What impact would there be to the social values of expanding the SZ?

The Nuyts Reef SZ already has a SPA for shore-based recreational line fishing so there would be no change to this social value. In addition, the areas of shore-line in the new SZ are also proposed to allow shore-based recreational line fishing which would mean no change for this social value.

An increase in the SZ area could potentially mean an increase in the 'wilderness value' of the area.

A.2.1.5. Environmental values

Baseline

What habitats and biodiversity are found in the existing SZ and the new area proposed as SZ?

The Nuyts Reef SZ contains a mix of bedrock platform reefs and offshore island habitats exposed to moderate to high wave energy. The area conserves the Nuyts reef, a highly important environmental feature of state and regional ecological significance. The Nuyts reef is the last shoreline inflection (or settling place) before the Head of The Bight, and is the largest and most westerly limestone reef in the Murat bioregion. The new area proposed as SZ is mostly unmapped with a small amount of reef mapped in

[12] DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

the eastern part of the nearshore zone (see Figure 3-6 in BDO EconSearch 2018). The unmapped area is suspected to be mostly sand habitat.

Figure 3-6 in BDO EconSearch (2018) provides a map of the main benthic (subtidal) habitats of the Nuyts Archipelago Marine Park. Appendix Table 2-3 and Appendix Table 2-4 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Nuyts Reef SZ.

Appendix Table 2-3 Benthic (subtidal) habitats of the Nuyts Reef SZ

Habitat	Area (km^2)	% SZ
Bare sand	0.1	49.6
Heavy limestone reef	52.5	50.1
Unmapped	51.9	0.1

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

Appendix Table 2-4 Shoreline (intertidal) habitats of the Nuyts Reef SZ

Habitat	Length of shoreline (km	% SZ
Cliff	7	41.0
Coarse sandy beach	4	24.0
Fine sandy beach	1	6.0
Unmapped	5	29.0

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

The habitats located within the Nuyts Reef SZ and immediate surrounds support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The Nuyts Archipelago Marine Park is used by a number of shark species, including white-spotted spurdog, bronze whaler, blue shark, dusky whaler, smooth hammerhead, gummy shark, school shark and white shark (DENR 2010d). It is assumed that some of these species move through the Nuyts Reef SZ and surrounding area at times.

Mammals

The Nuyts Archipelago Marine Park is used by a number of marine mammal species, including southern right whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), common dolphin and bottlenose dolphin (DENR 2010d). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. Southern right whales migrate along this coastline between May and October (Mackay and Goldsworthy 2015).

Australian sea lion

Nuyts Reef is one of 11 breeding sites for the nationally vulnerable Australian sea lion[13] and one of only 5 sites nationally which produces more than 100 pups annually (Goldsworthy et al 2015)

[13] The Australian sea lion is an endemic Australian pinniped listed as 'Vulnerable" under the threatened species category of the Commonwealth Environment Protection and Biodiversity Act 1999 (EPBC Act), Vulnerable under the South Australian National Parks and Wildlife Act 1972 and Endangered under the International Union for the Conservation of Nature (IUCN) Redlist. Approximately 83 per cent of Australian sea lion pups are born in South Australia with the remaining in Western Australia. In 2015, the estimated population of Australian sea lion in SA was 9,652 with total pup abundance estimated at 2,520 (Goldsworthy et al. 2015). The Australian sea lion pup abundance has declined by almost 25 per cent over the last decade contributing to the overall decline in the population (Goldsworthy et al. 2015).

Long-nosed fur seal

Haul-out sites for the long-nosed fur seal include Nuyts Reef and Cape Adieu (Shaughnessy et al. 1994, Shaughnessy 1990).

Seabirds

The Nuyts Archipelago Marine Park is used by a number of seabird species, including the state endangered white-bellied sea eagle, state endangered osprey, short-tailed shearwater (mutton bird), little penguin, fairy tern, white-faced storm petrel (DENR 2010d). Some of these species are resident while others are more transient, visiting the Nuyts Archipelago Marine Park to rest, breed and/or feed. Many of the islands in the Nuyts Archipelago support seabird breeding colonies (Robinson et al. 1996). Seabirds that breed in New Zealand or Antarctica, such as albatrosses, petrels and prions also occur in the Nuyts Archipelago Marine Park (Marchant and Higgins 1990). There is one active osprey nest located on the cliffs adjacent to this SZ.

Shorebirds

The Nuyts Archipelago Marine Park is used by a number of shorebird species for breeding and feeding, including pied and sooty oystercatchers, hooded plover, grey plover, common greenshank, and eastern curlew (DENR 2010d). Some of these species are resident and others migrate to the Nuyts Archipelago Marine Park from interstate or overseas.

Fish Communities

Much of the knowledge concerning fish and marine macro-invertebrate communities has been developed through the Marine Parks baited remote underwater video (BRUVS) and Underwater Visual Census (UVC) monitoring programs (Miller et al. 2017, Brook et al. 2017), commissioned by DEW over the past few years. However, no BRUVS or UVC monitoring has been conducted in Nuyts Reef SZ so there is no data available for comparison of biodiversity.

How does the biodiversity compare to other areas?

Comparative assessment of biodiversity has been based on fish and marine macro-invertebrate communities. These assessments have been based on the results of the BRUVS and UVC monitoring programs, and because the Nuyts Reef SZ has not been surveyed as part of these programs, there is no data available for comparison of fish/macro-invertebrate biodiversity.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Nuyts Reef SZ include:

- Nuyts Reef - the largest limestone reef in the Murat marine bioregion.
- A mix of bedrock platform reefs and offshore island habitats exposed to moderate to high wave energy.
- A protected corridor of habitats from the bedrock platform reefs through to deep waters (0 - 50m) that is exposed to high swell, wave and wind energy.
- 20m high calcarenite bluff, and the last shoreline inflection before the Head of the Bight.
- Below the bluffs are a series of bluff and reef dominated beaches.

Important features of the SZ include:

- Vulnerable Australian sea lion breeding colonies and haul out sites
- Long nose fur seal as haul out site
- The influence of the warm, westerly Leeuwin Current, which helps support migratory pelagic species such as southern bluefin tuna and a wide range of species more commonly found in tropical areas.
- Area is home to a variety of sea life arriving on the warm water Leeuwin current from tropical Western Australia.

- Uncommon red algal communities in 30m deep water.
- Habitat for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep and western blue groper.
- The reef is the last shoreline inflection (or settling place) before the Head of The Bight, making it the most westerly habitat of this type in the Murat bioregion.

Have there been changes or are changes predicted due to the SZ?

Observed changes

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (see Section 10.2.5, DEWNR 2017a). No changes have been detected yet as no data have been collected since the Nuyts Reef SZ became operational in 2014.

Predicted changes

Predicted changes that apply to all SZs are described in Section A.4.1.

Predicted changes to indicator species relevant to the Nuyts Reef SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone, blacklip abalone and snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Nuyts Reef SZ (Bailey et al. 2012a). Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and/or sea sweep are predicted to maintain size and abundance over the next 20 years (Bailey et al. 2012a).

Subtidal sand

Snapper, when considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Nuyts Reef SZ (Bailey et al. 2012a).

What current and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The NZRL and the Western Zone Abalone Fisheries were the principal fisheries that previously used the Nuyts Reef SZ. There was some use, albeit minor, of the SZ by the Marine Scalefish and Charter Boat Fisheries.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The Rock Lobster and Abalone fisheries pose a threat (medium) to their respective target species. The Rock Lobster fishery poses a threat (medium) to bycatch of Australian sea lions. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

Existing Arrangement with proposed expansion of SZ

What impact would there be to the environmental values of expanding the SZ?

It is suspected that the new SZ area is mostly sand habitat rather than reef habitat. Nonetheless the proposed extension does add additional buffering area around Nuyts Reef and would have some biodiversity value as it extends the protected area for Australian sea lion foraging areas, it would expand the total area of SZ in the marine parks network, and it would include a range of site-attached sand species. As fisheries activity is thought to be minimal in the area, there will be minimal impact on site-attached fished species but these will be protected from potential future fishing.

A.2.2. Isles of St Francis Sanctuary Zone

A.2.2.1. Zone description

The Isles of St Francis SZ (133km^2) is located in the Nuyts Archipelago Marine Park (Appendix Figure 2-7) and is part of the Murat Bioregion. The SZ is a biodiversity hotspot influenced by the Leeuwin Current and containing species common to Western and South Australia making it a unique site. The site contains rocky cliffs, sandy beaches, reefs, seagrass meadows and unmapped deep water habitats. The area represents what a 'pristine' environment might look like.

The area also protects populations of resident coastal shore birds as well as seabirds including state endangered ospreys, rare Cape Barren geese, little penguins and the rare rock parrot. Migratory oceanic birds such as albatross, prion and petrel species frequent the area. The area is a significant breeding area for short-tailed shearwaters and white-faced storm petrels.

The area contains important breeding and haul out sites for the vulnerable Australian sea lion, several uncommon macroalgal species and abundant communities of sessile invertebrates such as sponges, ascidians and soft corals.

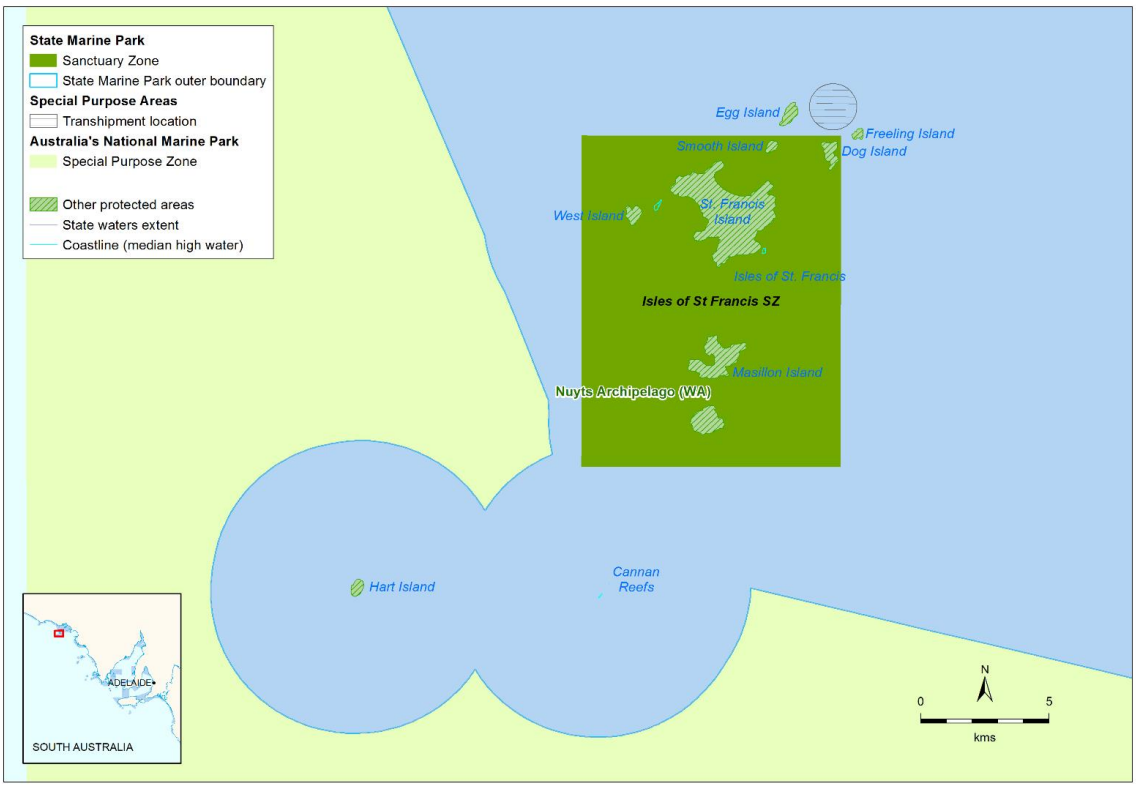
The variety of habitats within this SZ provide spawning locations for Southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep, Western blue groper, baitworm, king scallop, queen scallop and yellow-eye mullet.

The SZ provides important habitat for several shark and fish species, including species of conservation concern such as the vulnerable white shark, western blue groper, western blue devil, harlequin fish, and blue throated wrasse.

The black cowrie, a shell species of conservation concern is found within the zone. This species is under threat due to its direct development of young, strong habitat association and popularity in the shell trade. Protected within the SZ is Petrel Bay which is considered an important breeding area for molluscs.

The zoning was perceived to have outstanding conservation values, low impact to recreational fishing and a moderate impact on commercial fishing. The zoning was not consistent with unanimous MPLAG advice which did not support a SZ here due to commercial fishing interests. The Draft zoning was supported by the Key Stakeholder Forum as the SZ was considered an essential part of a CAR system.

Appendix Figure 2-7 Isles of St Francis sanctuary zone



Source: Appendix 5

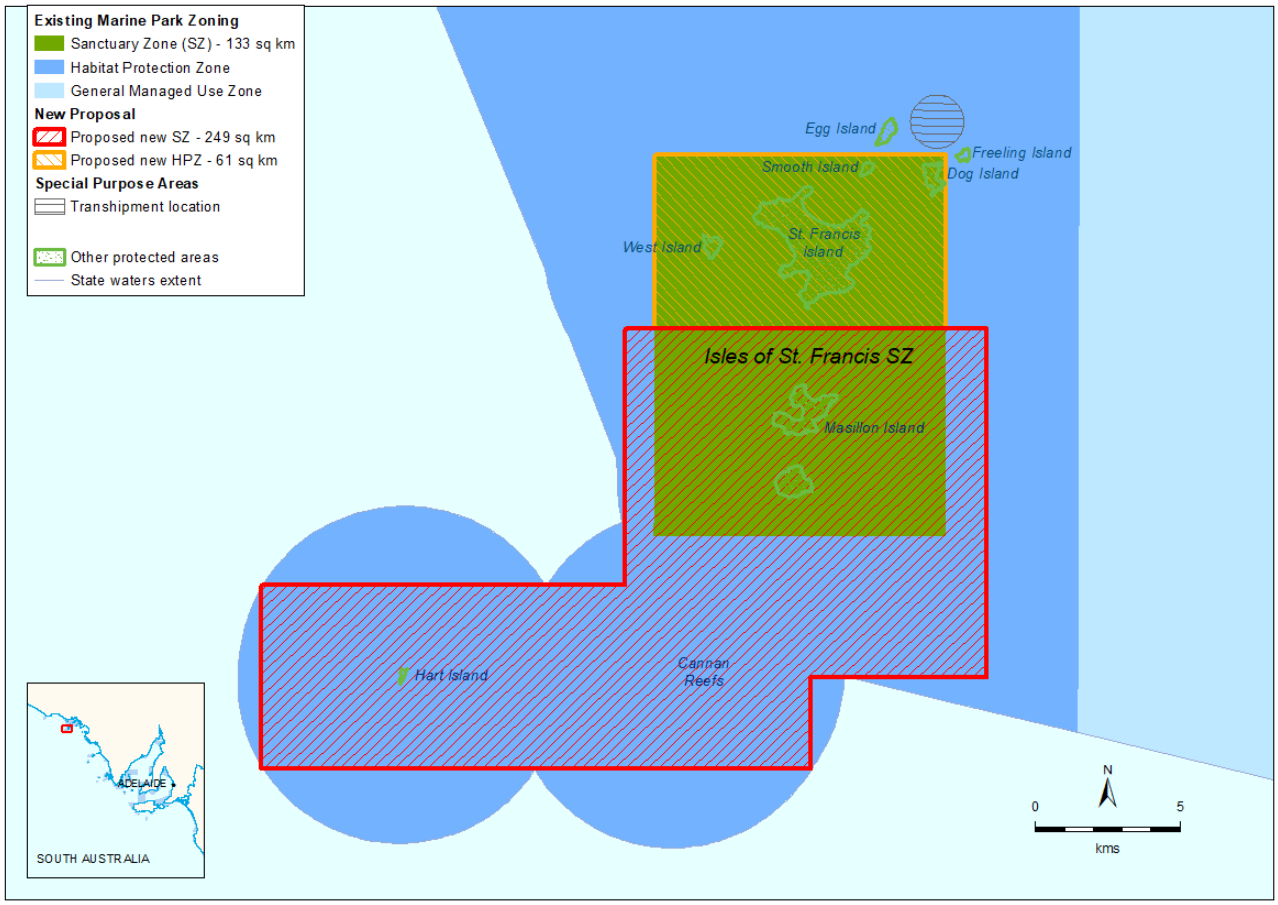
A.2.2.2. Proposed changes to zoning

The proposed changes to the zoning are as follows:

- Reduce northern part of SZ to HPZ (affects 61 km^2)
- Expand southern part of the SZ by 177 km^2 from HPZ to SZ, to encompass an area including Hart Island and Cannan reefs
- To give a new SZ area of 249 km^2.

The proposed changes are described in Appendix Figure 2-8.

Appendix Figure 2-8 Proposed amendments, Isles of St Francis SZ



Source: maps supplied by DEW.

A.2.2.3. Economic values and impacts

A.2.2.3.1. Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The principal fisheries that previously used the Isles of St Francis SZ was the NZRL and Abalone Fisheries. The MSF records minimal catches from this SZ. A small amount of charter boat activity occurred.

Which fisheries sectors currently utilise the new area proposed as SZ?

The new area proposed as SZ is thought to be lightly fished by the NZRL, Western Zone Abalone or Marine Scalefish Fisheries.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced by the SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-5. The total gross value of displaced catch in this SZ is estimated to be approximately $645,000, principally from the Abalone ($463,000), NZRL ($167,000) and Marine Scalefish ($15,000) Fisheries.

Displaced catch and effort from the Charter Boat Fishery was confidential but would be minimal. In fact, for the entire Nuyts Archipelago Marine Park the value of displaced effort would be $4,000.

The displaced catch for Nuyts Archipelago Marine Park (presented in Appendix Table 2-1 and Appendix Table 2-5) concurs with preliminary estimates read in the Legislative Council in May 2014 (Appendix 6, BDO EconSearch 2018) in terms of absolute catch of Abalone (10,850kg), but the proportion of total catch

(around 1.91 per cent) is lower than the preliminary estimate. The preliminary estimate for displaced Rock Lobster catch (7,335kg) was around double that presented here (3,630kg).

Appendix Table 2-5 Estimated catch or effort and GVP displaced by fishery, Isle of St Francis SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	10,100	1.78%	463
Rock Lobster	2,900	0.44%	167
Marine Scalefish	120	0.19%	15
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

The Isles of St Francis SZ is located offshore on the north-western side of Eyre Peninsula near Ceduna. This SZ occupies 1.8 per cent of Marine Fishing Area 8 (MFA - Marine Scalefish and NZRL fisheries) (Appendix Figure 2-3). This MFA is utilised by commercial fishers targeting primarily Southern Rock Lobster. The Isles of St Francis SZ overlaps 16, 29 and 2.2 per cent of the South Nuyts Abalone SAU 2C, 2D and 2J respectively (Appendix Figure 2-4). These species are also able to be targeted outside of the SZ.

Marine Scalefish Fishery

This area is not a large MSF with historic catches (2012/13) from MFA 8 recorded as less than 5t, 1t to 10t, confidential and confidential for King George Whiting, Snapper, Garfish and Southern Calamari, respectively (Fowler et al 2013).

Northern Zone Rock Lobster Fishery

The NZRL Fishery maintained nearly 100 per cent of the TACC between 2010 and 2015, 96 per cent in 2016 (when the TACC was increased) and 88 per cent in 2017 (Appendix Table 3-3 in BDO EconSearch 2018). However, the catch in 2017 of 320 t was very similar to the average annual catch of the period 2010-2017 and the catch of 2015 of 321 t (Appendix Table 3-3 in BDO EconSearch 2018). Historic catches from MFA 8 over the last 10 years has averaged between 10t to 30t out of a total fishery catch of 300t to 500t throughout this time frame (Linnane et al. 2017).

Western Zone Abalone Fishery

The Western Zone Blacklip Abalone Fishery is classified as transitional depleting while the Greenlip Abalone Fishery is classified sustainable (Stobart et al. 2017). The historic Greenlip Abalone catch (South Nuyts SAU) fluctuates between 1t to 5t out of a total of around 75t for the Western Zone Abalone Fishery (since 2006). The historic Blacklip Abalone catch for Isles of St Francis (South Nuyts SAU) typically fluctuates between 0.5 to 1.5t out of a total of around 100t for the Western Zone Abalone Fishery (Stobart et al. 2017).

For those fisheries that currently utilise the new area proposed as SZ, what is the historical importance of the area to the whole fishery?

There is no information available for displaced catch or effort for the proposed area. It is believed that some historical catch of rock lobster has occurred around Hart Island and Cannan Reefs. Nonetheless, the proposed area is believed to be relatively unimportant to fisheries (see previous section for general information on the area) and due to the mostly unsuitable seabed habitat (see below) any estimate of displaced catch or effort for rock lobster and abalone would be far lower than estimates available for the adjacent Isles of St Francis SZ.

What proportion of the SZ has habitat suitable for different fishing activities?

Areas to the west of St Francis Island, Masillon Island and Fenelon Island are made up of reef suitable for Rock Lobster and Abalone. A large part of the SZ is made up of sandy habitats unsuitable for Rock Lobster and Abalone fishing.

What proportion of the new area proposed as SZ has habitat suitable for different fishing activities?

The area is unmapped but is likely to be mostly sand unsuitable for rock lobster and abalone fisheries. There are known to be some areas of reef around Hart Is and Cannan Reefs.

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

Appendix Table 2-6 shows the economic impact on the regional economy of sanctuary zoning on the Abalone, Rock Lobster and Marine Scalefish Fisheries. Impacts are based on the gross value of displaced catches (Table 2-5). Note the displaced effort in the Charter Boat Fishery was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

Appendix Table 2-6 Regional economic impact of zoning, Isle of St Francis SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.46	29%	0	0%	-0.21	43%	-0.30	35%
Rock Lobster	-0.17	10%	-1	21%	-0.02	5%	-0.06	7%
Marine Scalefish	0.00	0%	-1	18%	0.02	-5%	0.01	-1%
Downstream [b]	-0.25	16%	-1	9%	-0.03	5%	-0.07	9%
Total Direct [c]	*-0.88*	*55%*	*-3*	*48%*	*-0.23*	*48%*	*-0.42*	*50%*
Total Flow-on [c]	*-0.72*	45%	*-3*	52%	*-0.25*	52%	*-0.41*	50%
Total [c]	**-1.60**	**100%**	**-6**	**100%**	**-0.48**	**100%**	**-0.83**	**100%**
Regional Total [d]	5,776.0		25,915		1,826.5		3,389.9	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

In aggregate, it was estimated that the impact of zoning in the Isle of St Francis SZ generates the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.83m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2018/19).
- Approximately 6 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2018/19).
- Approximately $0.48m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2018/19).

What was the estimated impact on individual fishers versus the whole fishery?

Marine Scalefish Fishery

The estimated displaced effort for the marine park was 0.58 per cent of the total average annual effort in the fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. It is possible that this assumption is false for some regions (Kosturjak et al. 2015) because insufficient effort was removed in some localised areas. No data have been published to confirm or reject these assumptions.
- The majority of effort and catch is from small vessels in sheltered inshore waters, where there is a negligible overlap with SZs. The Davenport Creek, Nadia Landing, Creek Flats and Point Peter SZs are small and mostly lie in intertidal waters. The Barlows Beach SZ is small and is in relatively exposed waters.
- There are less than five commercial fishers catching whaler sharks in the offshore waters, including the Isles of St Francis and Lound Island SZs.

Northern Zone Rock Lobster Fishery

The estimated displaced catch for the marine park was 0.90 per cent of the total average annual catch in the NZRL Fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs, which based upon historical catch rate data appears to be the case (Kosturjak et al. 2015).
- In the five seasons prior to SZ implementation (2009–2013) there was a decline in effort compared with the previous 15 years in MFAs 7 and 8, which include the SZs that are most likely to respond (Nuyts Reef and Isles of St Francis).
- Recent catches from the region are minor relative to the entire NZRL Fishery (Kosturjak et al. 2015 and Linnane et al. 2017).
- Two of the large offshore SZs that have been inventory-mapped (Lound Island and Isles of St Francis) include substantial areas of sand habitat that are unsuitable for Rock Lobster.

Abalone Fishery

The estimated displaced catch for the marine park was 2.02 per cent of the total average annual catch in the fishery (EconSearch 2014), but change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm this assumption.
- There has been a decline in fishing effort in the region prior to SZ implementation and recent catches are minor relative to the entire Western Zone Abalone Fishery (Kosturjak et al. 2015 and Stobart et al. 2014, 2015).
- Two of the large offshore SZs that have been inventory-mapped (Lound Island and Isles of St Francis) include substantial areas of sand habitat that are unsuitable for Abalone.

Charter Boat Fishery

Change in the fishery due to the Nuyts Archipelago Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm this assumption.
- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- The Isles of St Francis SZ was a recognised charter fishing destination and will cause some modification of fishing behaviour based around prevailing wind and weather conditions. However, there are numerous other locations that remain available for fishing both in and out of the Nuyts Archipelago Marine Park.
- There are few operators within the Nuyts Archipelago Marine Park and therefore minimal competition for fishing grounds. The estimated displaced effort was 0.09 per cent of the total effort in the Nuyts Archipelago Marine Park (EconSearch 2014).
- The Nuyts Archipelago Marine Park is not a recognised destination for long-range charters from other regions.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

Marine Scalefish Fishery

The MSF does not harvest significant quantities from this SZ recording less than 5t, less than 6t, confidential and confidential for King George Whiting, Snapper, Garfish and Southern Calamari, respectively in 2016 (Steer et al. 2018). This is comparable to historic catches (Fowler et al 2013).

Northern Zone Rock Lobster

There is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause.

The NZRL fishery has maintained nearly 100 per cent of the TACC since 2009 indicating the overall Rock Lobster harvest is being maintained even with the Isles of St Francis SZ. Catches from MFA 8 in 2015 were about 20t, which was higher than the 6 years previous (Linnane et al. 2017).

Abalone Fishery

Blacklip and Greenlip Abalone catch fluctuates annually for the South Nuyts Archipelago SAU (Stobart et al. 2017). No catch is recorded for 2015 or 2016. The impact is complicated by the rotational nature of the fishery where divers fish successive reefs in each year thereby allowing reefs to recover. Restricting the area available to fish will impact on the ability to rotate between reefs and therefore may have implications for the long term sustainability of the fishery.

Any compensation claims related to the SZ?

It is unknown if there are any compensation claims being investigated for this SZ.

Existing Arrangement with Fishing Permitted in part of the existing SZ plus an extension to the remaining part of the existing SZ

What impact would there be to the fisheries values of opening part of the SZ to different fishing activities?

Part of the total gross value of displaced catch in this SZ would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster and Abalone Fisheries and to a minor extent the Marine Scalefish and Charter Boat Fisheries. Appendix Table 2-7 presents the estimated displaced catch or effort and GVP for fisheries based on the proposed amendment (i.e. opening up part of the SZ). The total gross value of displaced catch in this SZ is estimated to be approximately $394,000, principally from the Abalone ($283,000), NZRL ($102,000) and Marine Scalefish ($9,000) Fisheries. Overall, the opening of part of the SZ to different fishing activities is expected to reduce the GVP of the displaced catch by $251,000.

Appendix Table 2-7 Estimated catch or effort and GVP displaced by fishery, Isle of St Francis SZ with proposed amendment

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	6,167	1.09%	283
Rock Lobster	1,771	0.27%	102
Marine Scalefish	73	0.12%	9
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

The effect of changing the status of part of the SZ would depend on the harvest strategy in place for each impacted fishery. In the long run, the fisheries would be expected to stabilise at the same higher level of catch and effort as if the SZ had not been implemented. The economic benefit of this higher catch would be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ.

Southern Rock Lobster catch in MFA 8 has increased slightly in the most recent year of assessment (2015 with the presence of the SZ) over the previous pre SZ years so opening the SZ to fishing is unlikely to see dramatic increases in this fishery value. The reduction in restricted areas may see a small increase in CPUE across the fishery. Abalone catch has not been recorded for 2015 and 2016 and the MSF is a minor contributor.

What impact would there be to the fisheries values of expanding the remaining part of the SZ?

There are no data currently available on estimated displaced catch/effort for the new area proposed as SZ. Thus it is not possible to estimate the economic impact of the proposed increase in SZ area.

What is the net impact to fisheries values of the proposed SZ changes?

Where the SZ area was reduced, the impacts on the regional economy were able to be estimated (Appendix Table 2-8). NZRL, Western Zone Abalone and Marine Scalefish value of catch is expected to increase by approximately $180,000, $65,000 and $6,000 respectively. However, there are no data currently available on estimated displaced catch/effort for the new area proposed as SZ, and the impact could not be quantified.

In aggregate, it was estimated that the impact of rezoning (reduced area only) in the Isle of St Francis SZ will generate the following improvement of regional economic activity on an ongoing annual basis relative to current zoning (Appendix Table 2-6).

- Approximately $0.50m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2018/19).

- Approximately 1 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2018/19).
- Approximately $0.37m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2018/19).

Appendix Table 2-8 Regional economic impact of zoning, Isle of St Francis SZ with proposed amendment

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.28	28%	0	0%	-0.08	72%	-0.13	38%
Rock Lobster	-0.10	10%	-2	30%	0.11	-98%	0.09	-26%
Marine Scalefish	-0.01	1%	-3	38%	0.06	-51%	0.01	-2%
Downstream [b]	-0.16	16%	0	5%	-0.02	16%	-0.05	15%
Total Direct [c]	*-0.55*	*55%*	*-5*	*73%*	*0.07*	*-61%*	*-0.08*	*24%*
Total Flow-on [c]	*-0.44*	45%	*-2*	27%	*-0.17*	161%	*-0.25*	76%
Total [c]	**-1.00**	**100%**	**-7**	**100%**	**-0.11**	**100%**	**-0.33**	**100%**
Regional Total [d]	5,776.0		25,915		1,826.5		3,389.9	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.

A.2.2.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

No recognised tourism activities take place in or adjacent the SZ.

What is the economic contribution of tourism activities that utilise the SZ?

Since there are no tourism activities there is no economic contribution to the region from tourism.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.2.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with Fishing Permitted in part of the existing SZ plus an extension to the remaining part of the existing SZ

What impact would there be to the tourism values of opening part of the existing SZ to different fishing activities?

A very small positive impact on tourism could be expected if fishing activities were allowed in the SZ and charter boats could return to the area.

What impact would there be to the tourism values of expanding the remaining part of the SZ?

As no recognised tourism activities take place in or adjacent the SZ, there would be no impact.

What is the net impact to tourism values of the proposed SZ changes?

As no recognised tourism activities take place in or adjacent the SZ, there would be no impact.

Habitat Protection Zone status

What impact would there be to the tourism values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

It is unlikely that any relevant developments would occur in the area so changing the zoning would have no impact on tourism activities.

A.2.2.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in and around the Isles of St Francis SZ due to the remote nature of the area. The area is far from the nearest public boat ramp and is inaccessible to most recreational boats (Bryars et al. 2016). Nonetheless, there is known to be some recreational fishing activity at Cannan Reefs.

Shore-based recreation activities on the islands within the Isles of St Francis SZ would be minimal due to the remote location.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing at the Isles St Francis SZ was minimal, with only some area lost due to the SZ. Much of the effort shown on the SAMPIT map (Appendix Figure 2-5) is likely a result of people that had fished from commercial charter boats. Shore-based line fishing is now prohibited in the SZ but the SZ lies offshore and is unlikely to have been fished much from the shore previously.

What does the community value about the SZ and surrounding area?

A total of 7,347 (85 per cent) of the 8,649 respondents commented specifically on the Nuyts Archipelago Marine Park during submissions to the draft zoning. 5 (0.06 per cent) agreed with the proposed zoning entirely, 7,181 (83 per cent) suggested changes to zoning to increase the conservation outcome, 161 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,302 (15 per cent) expressed no comment on the proposed zoning (DEWNR 2012b).

Commercial fisheries were concerned that the closure of this productive fishing area would badly affect the catch of scale fish species, rock lobster, abalone and sardines for the commercial fishery and recreational catches of various species (DENR 2010d).

Submissions to the draft zoning identified that commercial fishers and conservationists have conflicting views with the former suggesting that the SZ removes legal access to the most productive fishing areas. Conservationists on the other hand welcomed steps taken toward a scientific solution to protecting iconic areas including Nuyts Reef. They suggested an additional area to the west of the SZ to include Cactus

Beach and the western side of Point Sinclair (Point Sinclair National Surfing Reserve) in order to protect and preserve the spirit and integrity of this remote section of the Australian coastline, so that future generations of surfers may benefit from the unique experience that this fragile coastline and pristine surfing environment offers as encountered by the surfing pioneers of the 1950's and 60's. The proposal would allow for shore based fishing. The area would add to the status of South Australia's first proclaimed National Surfing Reserve. There would be no impact on commercial rock lobster fishing (DEWNR 2012b).

The overall social impacts of the Nuyts Archipelago Marine Park on communities living in the Far West Coast region of South Australia is moderate given the magnitude of economic impacts that was projected at inception. In 2012 commercial fishing was one of the four top industry sources of employment in the region, estimated to have contributed 116 jobs, compared to tourism which contributed 180 jobs. Economic impact assessment identified a loss of five commercial fishing-related jobs even though the impact on recreational fishing has been low due to adjustments in zoning that minimised potential negative impacts. Hence the impact on the local community identity as a fishing centre, and on fishing as a way of life has been moderate.

What are the non-market values of the SZ and surrounding area?

A number of scientific monitoring sites are located within the Isles of St Francis SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program.

The Isles St Francis SZ and surrounding area has 'wilderness value'.

Have social values changed due to the SZ?

Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 64 per cent in 2013, dropping to 59 per cent in 2016, before increasing to 82 per cent in 2017, DEWNR 2017a[14]) (Appendix Figure 2-6).

Existing Arrangement with Fishing Permitted in part of the existing SZ plus an extension to the remaining part of the existing SZ

What impact would there be to the social values of opening up part of the existing SZ to different fishing activities?

As the area was rarely used by recreational boat fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in a significant increase in recreational boat fishing activity. Opening the SZ to different fishing activities would definitely be supported by commercial fishers. There may be possible loss of 'wilderness value'.

What impact would there be to the social values of expanding the remaining part of the SZ?

Closing the new proposed area to fishing would have a negative impact on recreational and commercial fishing activity. There may be an increase in 'wilderness value' that could offset some of the loss of part of the existing SZ.

What is the net impact to social values of the proposed SZ changes?

Potential loss of fishing opportunities around Hart Island and Cannan Reefs might be offset by opening up St Francis Island and surrounds. The loss of St Francis Island as a wilderness area would not be offset by the inclusion of Hart Island and Cannan Reefs in the SZ such that there would be a net loss of wilderness value.

[14] DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

Habitat Protection Zone Status

What impact would there be to the social values of opening up part of the existing SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

It is possible that activities such as offshore cage aquaculture could occur in the location of the Isles St Francis SZ due to the shelter provided by the islands.

A.2.2.5. Environmental values

Baseline

What habitats and biodiversity are found in the existing SZ and the new area proposed as SZ?

The Isles of St Francis SZ contains rocky cliffs, sandy beaches, reefs, seagrass meadows and unmapped deep water habitats. The new area proposed as SZ is unmapped but is suspected to be mostly sand habitat. There are known to be some sections of reef habitat around Hart Island and Cannan Reefs, and potentially some other scattered sections of deep reef habitat in the area.

Figure 3-6 in BDO EconSearch (2018) provides a map of the main benthic (subtidal) habitats of the Nuyts Archipelago Marine Park. Appendix Table 2-9 and Appendix Table 2-10 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Isles of St Francis SZ.

Appendix Table 2-9 Benthic (subtidal) habitats of the Isles of St Francis SZ

Habitat	Area (km^2)	% SZ
Bare sand	72.6	59.0
Heavy limestone reef	39.4	32.0
Unmapped	9.8	8.0

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

Appendix Table 2-10 Shoreline (intertidal) habitats of the Isles of St Francis SZ

Habitat	Length of shoreline (km	% SZ
Unmapped	40	100

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

The habitats located within the Isles of St Francis SZ and surrounds support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The Nuyts Archipelago Marine Park is used by a number of shark species, including white-spotted spurdog, bronze whaler, blue shark, dusky whaler, smooth hammerhead, gummy shark, school shark and white shark (DENR 2010d). It is assumed that some of these species move through the Isles of St Francis SZ and the area around Hart Island/Cannan Reefs at times.

Mammals

The Nuyts Archipelago Marine Park is used by a number of marine mammal species, including southern right whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), common dolphin and bottlenose dolphin (DENR 2010d). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. Southern right whales migrate along this coastline between May and October (Mackay and Goldsworthy 2015).

Australian sea lions

There are 11 Australian sea lion breeding sites in the Nuyts Archipelago Marine Park, including, Fenelon and West Islands within the Isles of St Francis SZ (Goldsworthy and Page 2009). Total estimated annual pup production for all of Nuyts Archipelago Marine Park is about 509 (Goldsworthy and Page 2009). 19 pups

were counted on Fenelon Island in 2015. 20 pups were counted on West Island in 2015 (Goldsworthy et al. 2015).

Long-nosed fur seal

Haul-out sites for the long-nosed fur seal include Fenelon Island (Shaughnessy et al. 1994, Shaughnessy 1990) and Hart Island. Breeding was identified at Fenelon Island in 2013/14.

Seabirds

The state rare osprey and vulnerable white-bellied sea eagles are known to have territories around the around Isles of St Francis SZ and are particularly vulnerable to human disturbance (Dennis et al. 2011a). There are three active sea eagle and one active osprey nest located on the Island of St Francis. Short-tailed shearwaters (mutton birds) breed on 10 islands within the Nuyts Archipelago Marine Park (Copley 1996, Goldsworthy and Page 2010), including estimated populations of about 335,000 and 273,000 pairs within the Isles of St Francis at St Peter Island and St Francis Island, respectively (Robinson et al. 1996, Copley 1996). Little penguins breed on 6 islands in the region, and about 10,000 and 13,000 pairs of white-faced storm petrels are found within the Isles of St Francis SZ on Evans and Fenelon Islands, respectively (Copley 1996). There are also breeding sites for pied cormorants, Caspian and crested terns, and Pacific and silver gulls (Copley 1996, Goldsworthy and Page 2010).

Shorebirds

The Nuyts Archipelago Marine Park is used by a number of shorebird species for breeding and feeding, including pied and sooty oystercatchers, hooded plover, grey plover, common greenshank, and eastern curlew (DENR 2010d). Some of these species are resident and others migrate to the Nuyts Archipelago Marine Park from interstate or overseas.

Fish Communities

The primary information available on fish communities in this SZ comes from the Marine Parks BRUVS and UVC monitoring programs (Miller et al. 2017, Brook et al. 2017). BRUVS and UVC surveys have been undertaken in Isles of St Francis SZ in 2014/15. No BRUVS or UVC surveys have been undertaken in the Hart Island/Cannan Reefs area.

A total of 58 species were recorded during the BRUVS surveys comprising 50 species of fish and 6 species of sharks and rays, one crab species and one mollusc (Appendix Table 2-11). Southern Maori wrasse (*Ophthalmolepis lineolatus*) was the most common fish observed, accounting for over 20 per cent of the total fish numbers recorded. Other common species seen were toothbrush leatherjackets (*Meuschenia hippocrepis*), yellowfin pike (*Dinolestes lewini*) and sea sweep (*Scorpis aequipinnis*) which are typically all found in reef habitats (Appendix Table 2-11).

Appendix Table 2-11 Species list, BRUVS surveys, Isles of St Francis SZ[a]

Species	Common name	Total no.
Ophthalmolepis lineolatus	Southern Maori wrasse	207
Acanthaluteres vittiger	Toothbrush leatherjacket	71
Dinolestes lewini	Yellowfin pike	55
Scorpis aequipinnis	Sea sweep	42
Meuschenia freycineti	Six-spined leatherjacket	39
Meuschenia hippocrepis	Horseshoe leatherjacket	39
Pseudocaranx sp	Trevally	32
Parequula melbournensis	Southern silverbelly	29
Notolabrus parilus	Brownspotted wrasse	28
Caesioperca rasor	Barber perch	26
Sillaginodes punctatus	King George whiting	23
Notolabrus tetricus	Bluethroat wrasse	23
Myliobatis tenuicaudatus	Southern eagle ray	18
Meuschenia galii	Bluelined leatherjacket	15
Enoplosus armatus	Old wife	14
Heterodontus portusjacksoni	Port Jackson shark	14
Pictilabrus laticlavius	Senator wrasse	14
Upeneichthys vlamingii	Red mullet	14
Arripis georgianus	Australian herring	12
Neatypus obliquus	Footballer sweep	11

[a] 20 most abundant species shown out of a total of 58 species.
Source: DEW, unpublished data.

A total of 80 species were recorded during dive surveys at Isles of St Francis SZ comprising 62 species of fish and 18 species of macro-invertebrates (Appendix Table 2-12). Noarlunga hulafish (Trachinops noarlungae) were the most common fish observed, accounting for almost 30 per cent of the total fish numbers recorded. Other common species seen were common bullseye (Pempheris multiradiata), bluethroat wrasse (Notolabrus tetricus) and pencil weed-whiting (Siphonognathus beddomei) (Appendix Table 2-12). Purple urchin (Heliocidaris erythrogramma) was the most common macro-invertebrate recorded on dive surveys at Isles of St Francis SZ accounting for approximately 60 per cent of all macro-invertebrates followed by razorfish (Pinna bicolor) and ridged ear abalone (Haliotis scalaris) (Appendix Table 2-13).

Appendix Table 2-12 Fish species list, dive surveys, Isles of St Francis SZ[a]

Species	Common name	Total no.
Trachinops noarlungae	Noarlunga hulafish	2999
Pempheris multiradiata	Common bullseye	1592
Notolabrus tetricus	Bluethroat wrasse	1239
Siphonognathus beddomei	Pencil weed-whiting	375
Pictilabrus laticlavius	Senator wrasse	324
Ophthalmolepis lineolatus	Southern Maori wrasse	317
Austrolabrus maculatus	Black-spotted wrasse	303
Parma victoriae	Victorian scalyfin	283
Dotalabrus aurantiacus	Castelnau's wrasse	273
Cheilodactylus nigripes	Magpie perch	228
Scorpis aequipinnis	Sea sweep	226
Olisthops cyanomelas	Herring cale	225
Girella zebra	Zebrafish	220
Meuschenia flavolineata	Yellowstriped leatherjacket	172
Caesioperca rasor	Barber perch	170
Achoerodus gouldii	Western blue groper	154
Tilodon sexfasciatus	Moonlighter	146
Enoplosus armatus	Old wife	136
Paraprіacanthus elongatus	Elongate bullseye	131
Meuschenia hippocrepis	Horseshoe leatherjacket	112

[a] 20 most abundant species shown out of a total of 62 species.
Source: DEW, unpublished data.

Appendix Table 2-13 Macro-invertebrate species list, dive surveys, Isles of St Francis SZ

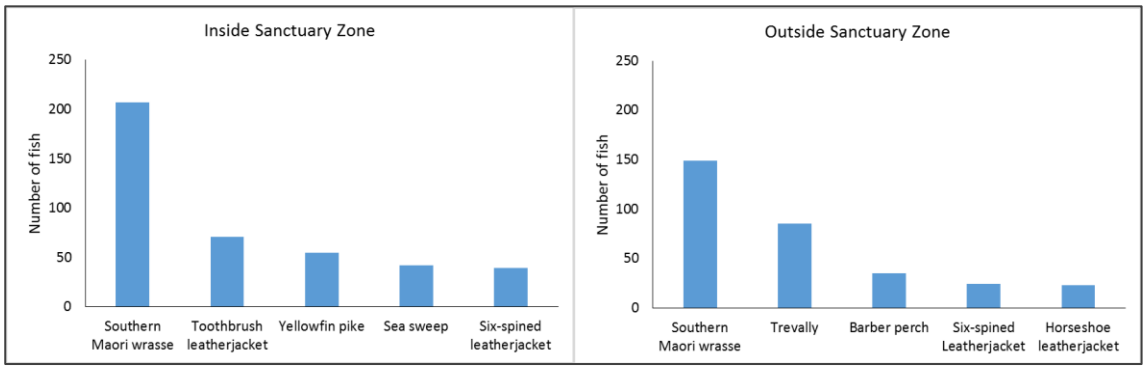
Species	Common name	Total no.
Heliocidaris erythrogramma	Purple Urchin	3810
Pinna bicolor	Razorfish	1933
Haliotis scalaris	Ridged ear abalone	367
Sepia apama	Giant cuttlefish	122
Portunus pelagicus	Blue swimmer crab	34
Anthaster valvulatus	Mottled seastar	22
Australostichopus mollis	Brown sea cucumber	16
Pterynotus triformis	Triple murex shell	6
Pleuroploca australasia	Tulip shell	6
Neothyonidium spp.	Sea cucumber	3
Paguristes frontalis	Southern hermit crab	3
Schizophrys aspera	Red spider crab	2
Tosia australis	Southern biscuit seastar	2
Goniocidaris tubaria	Pencil urchin	2
Nectocarcinus integrifrons	Red swimmer crab	1
Cassis fimbriata	Fimbriate helmet	1
Ceratosoma brevicaudatum	Short tailed nudibranch	1
Goniodiscaster seriatus	Western biscuit seastar	1

Source: DEW, unpublished data.

Species abundance

Fish assemblages were similar inside the Isle St Francis SZ compared to the adjacent HPZ (Appendix Figure 2-9). Southern Maori wrasse (*Ophthalmolepis lineolatus*) were the most abundant fish inside and outside the SZ while six-spined leatherjackets (*Meuschenia freycineti*) were also abundant inside and outside the SZ (Appendix Figure 2-9). Toothbrush leatherjackets (*Acanthaluteres vittiger*), yellowfin pike (*Dinolestes lewini*) and sea sweep (*Scorpis aequipinnis*) were all abundant inside the SZ but not outside the SZ, where trevally (*Pseudocaranx sp*), barber perch (*Caesioperca razor*) and horseshoe leatherjackets (*Meuschenia hippocrepis*) were more abundant (Appendix Figure 2-9).

Appendix Figure 2-9 Abundance of the most common species inside and outside the Isles of St Francis SZ, BRUVS surveys



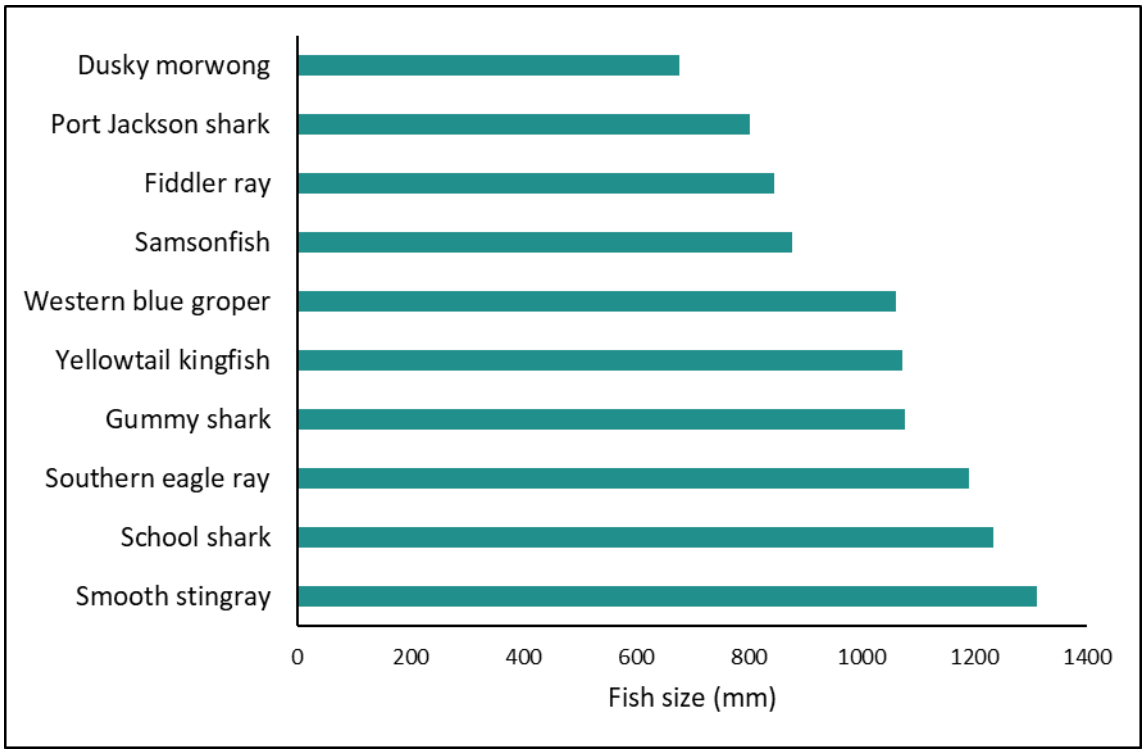
Source: DEW, unpublished data.

Largest fish

The largest fish (including sharks and rays) recorded on BRUVS at Isle St Francis SZ was a 1,311mm smooth ray (*Dasyatis brevicaudata*, Appendix Figure 2-10). Other large fish recorded included school shark (*Galeorhinus galeus*) at 1,234mm, gummy shark (*Mustelus antarcticus*) at 1,190mm and yellowtail kingfish (*Seriola lalandi*) at 1,073mm (Appendix Figure 2-10).

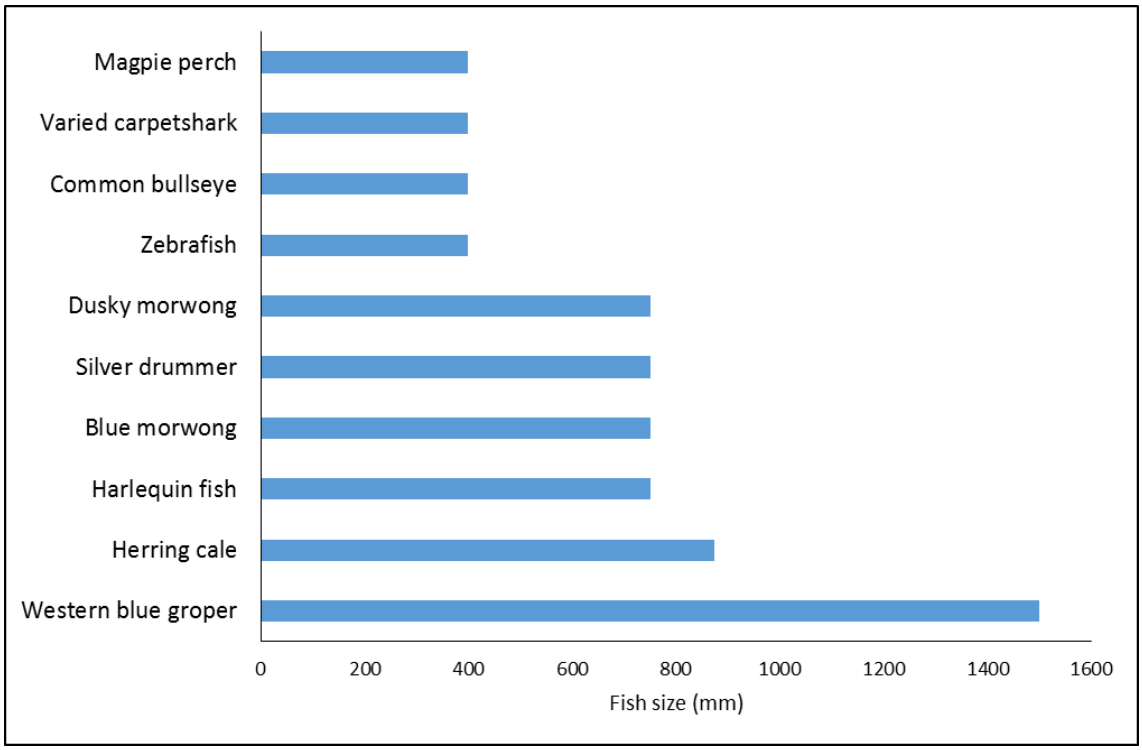
The largest fish recorded on dive surveys at Isle St Francis SZ was a 1,500mm Western blue groper (*Achoerodus gouldii*, Appendix Figure 2-11). Other large fish recorded included herring cale (*Olisthops cyanomelas*) at 875mm, a harlequin fish (Othos dentex) at 750mm and a blue morwong (*Nemadactylus valenciennesi*) at 750mm (Appendix Figure 2-11).

Appendix Figure 2-10 Largest fish recorded, BRUVS surveys, Isles of St Francis SZ



Source: DEW, unpublished data.

Appendix Figure 2-11 Largest fish recorded, dive surveys, Isles of St Francis SZ



Source: DEW, unpublished data.

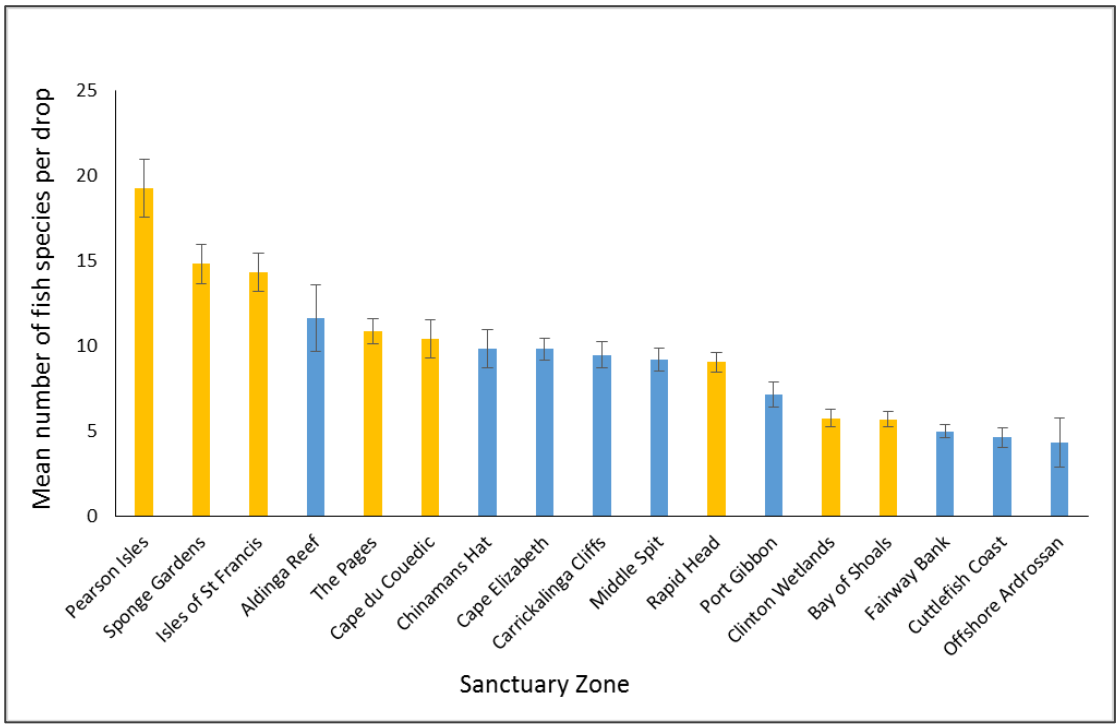
How does the biodiversity compare to other areas?

Biodiversity comparisons are restricted to where DEW have comparable datasets, e.g. from the Marine Parks BRUVS and UVC monitoring programs.

Species richness

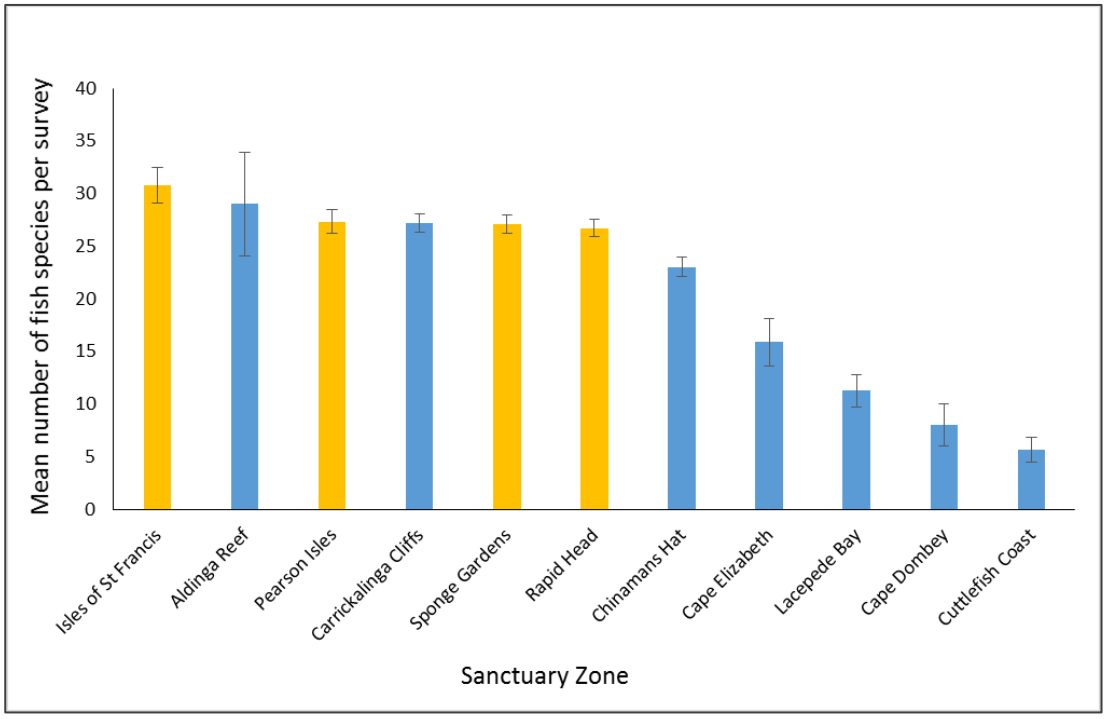
The Isles of St Francis SZ has diverse fish communities with the 3rd highest number of fish species compared to other SZs surveyed with a mean of 14.33 species recorded per BRUVS drop (Appendix Figure 2-12). The dive data showed even higher species richness with the Isles of St Francis SZ having the highest number of species recorded per dive survey compared to other SZs surveyed (Appendix Figure 2-13). The dive data also showed a relatively high abundance of macro-invertebrates with Isles of St Francis SZ having the 4th highest diversity of macro-invertebrates (Appendix Figure 2-14).

Appendix Figure 2-12 Mean (±SE) number of fish species by SZ, BRUVS surveys[a]



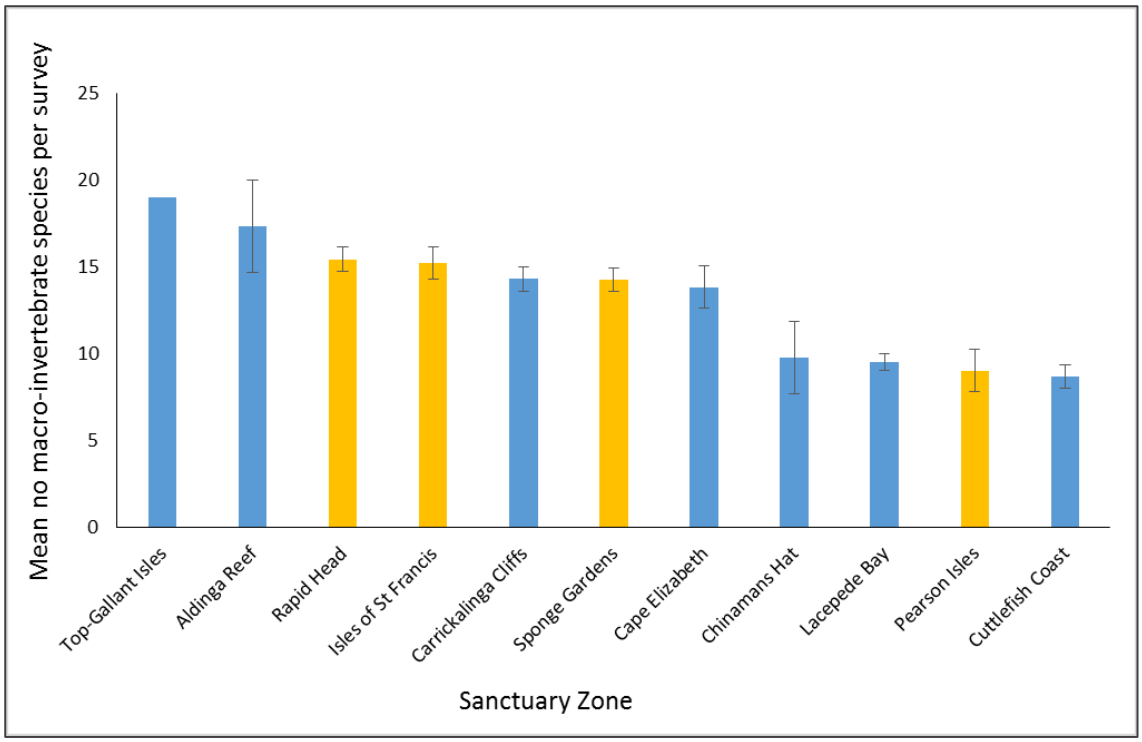
[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-13 Mean (±SE) number of fish species by SZ, dive surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-14 Mean (±SE) number of macro-invertebrate species by SZ, dive surveys[a]

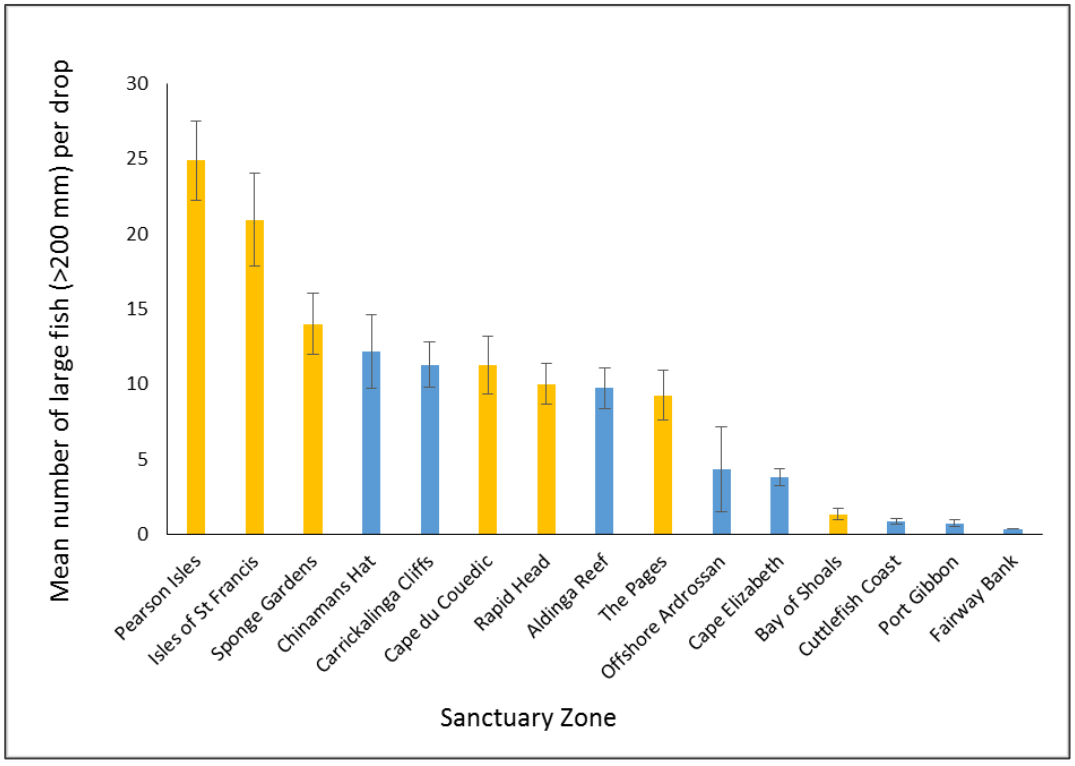


[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Large fish

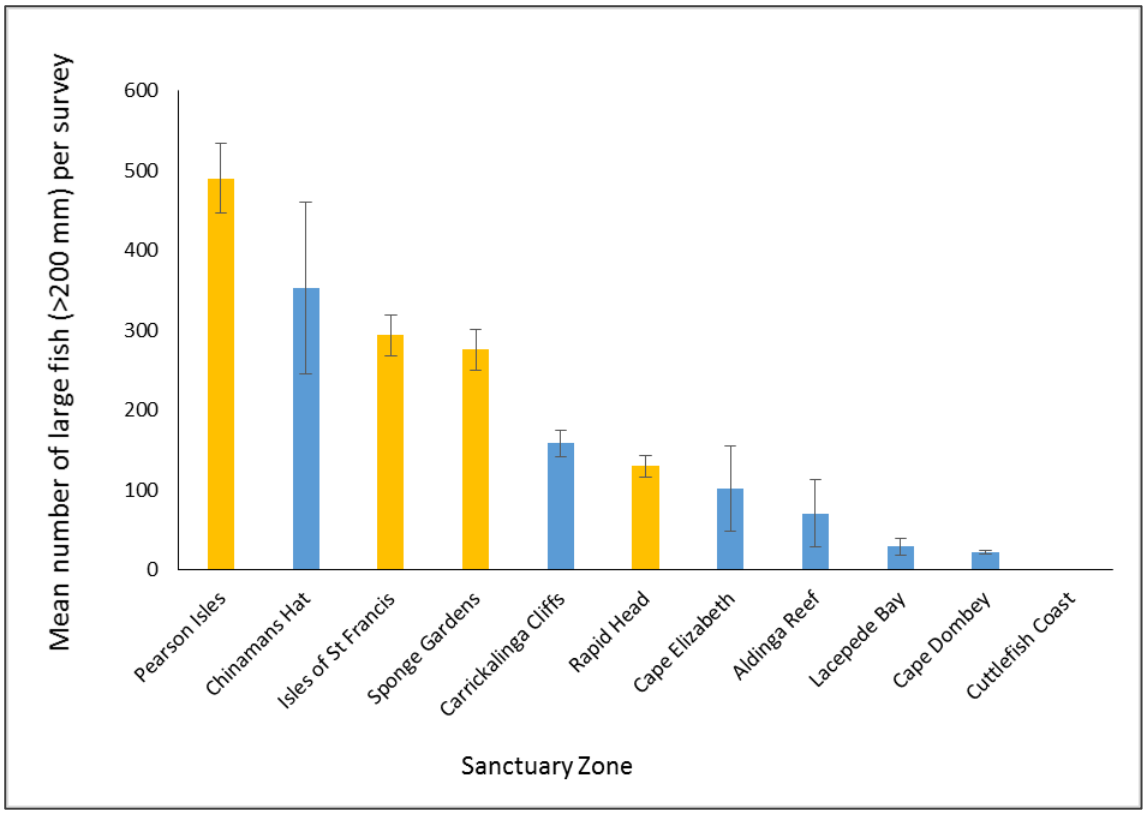
The Isles of St Francis SZ has a high abundance of large fish (>200mm) with the second highest of any SZ recorded by BRUVS after Pearson Isles SZ (Appendix Figure 2-15). The SZ has the third highest abundance of large fish (>200mm) recorded by dive surveys (Appendix Figure 2-16).

Appendix Figure 2-15 Mean (±SE) number of large fish (>200mm) by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-16 Mean (±SE) number of large fish (>200mm) by SZ, dive surveys[a]

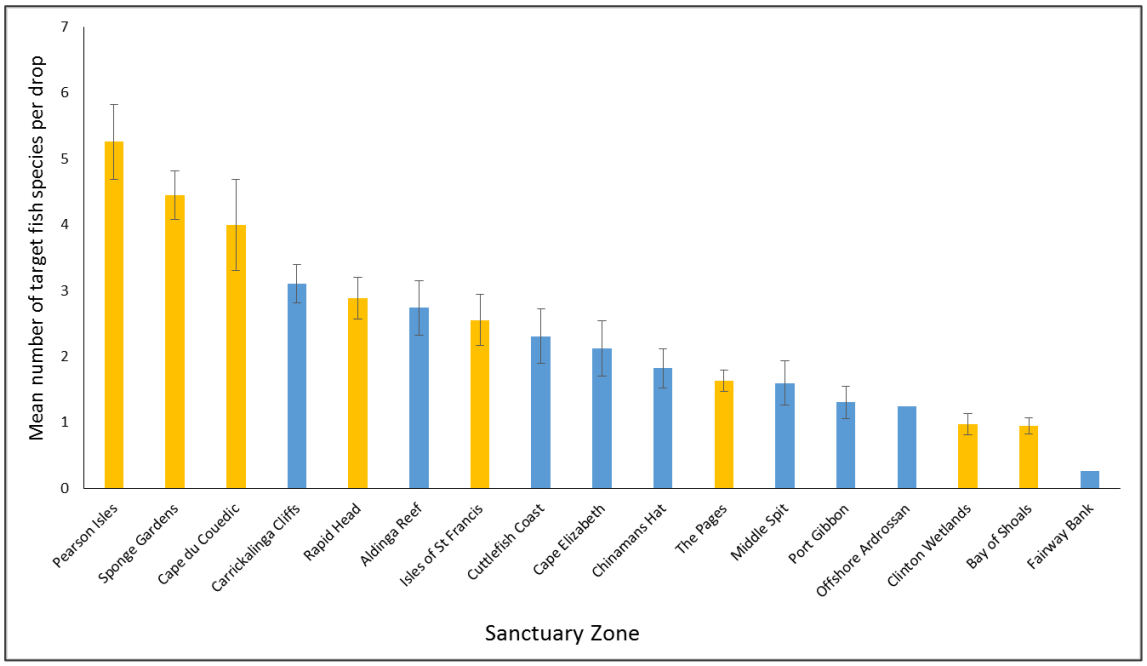


[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Fished species

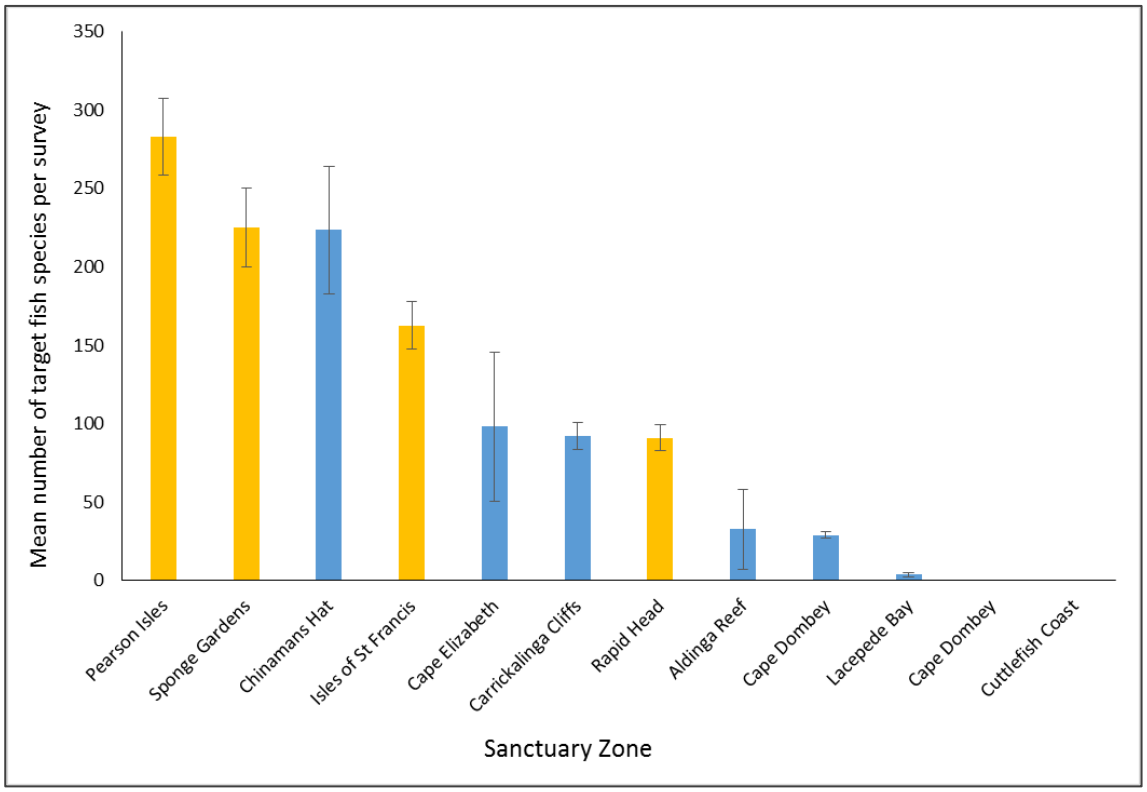
The mean number of recreationally and commercially targeted fish species recorded on BRUVS in the Isles St Francis SZ was average in comparison to other SZs surveyed (Appendix Figure 2-17). Dive surveys recorded slightly more target species on survey with a mean of greater than 150 individuals per survey (Appendix Figure 2-18). Trevally (*Pseudocaranx sp*), King George Whiting (*Sillaginodes punctatus*) and sea sweep (*Scorpis aequipinnis*) are common targeted species found at Isle St Francis SZ.

Appendix Figure 2-17 Mean (±SE) number of fished species by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-18 Mean (±SE) number of individuals of fished species by SZ, dive surveys[a]

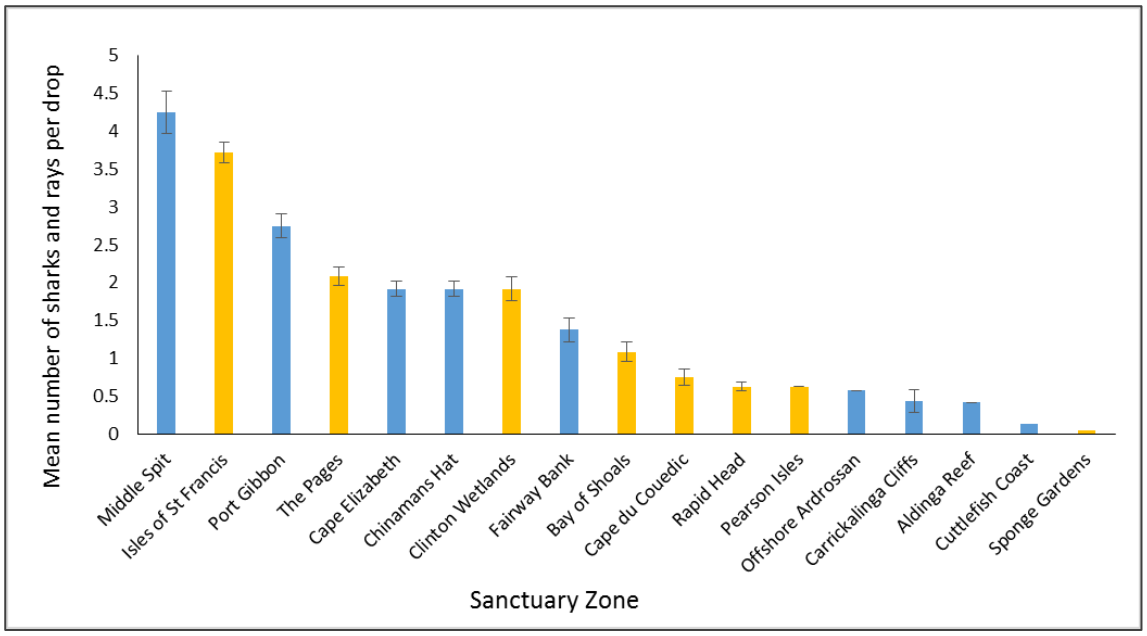


[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Sharks and rays

Sharks and rays are in relatively high abundances in the Isles St Francis SZ with second highest numbers recorded by BRUVS survey (Appendix Figure 2-19). Common shark and ray species include Port Jackson shark (*Heterodontus portusjacksoni*), southern eagle ray (*Myliobatis tenuicaudatus*) and fiddler ray (*Trygonorrhina dumerilii*).

Appendix Figure 2-19 Mean (±SE) number of sharks and rays by SZ, BRUVS surveya



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

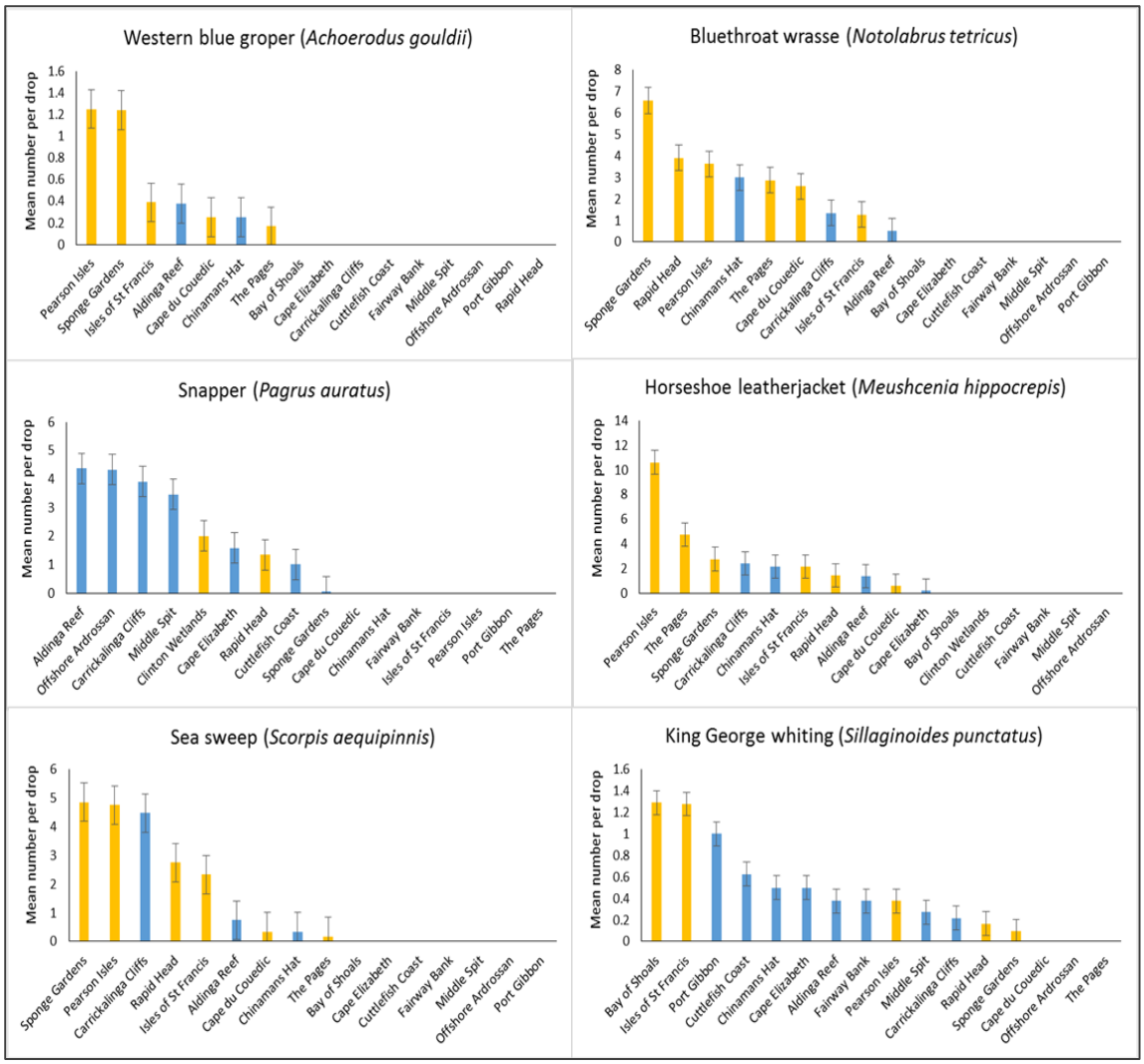
Indicator Species

Five of the six fish indicator species for reefs were recorded in the Isles St Francis SZ on BRUVS surveys (Appendix Figure 2-20). There were relatively high abundances of King George whiting (*Sillaginoides punctatus*), Western blue groper (*Achoerodus gouldi*i) and sea sweep (*Scorpis aequipinnis*). No snapper (*Pagrus auratus*) were recorded on BRUVS at Isles St Francis SZ.

Four of the six fish indicator species for reef were recorded at Isle St Francis SZ during dive surveys (Appendix Figure 2-21). There were relatively high abundances of bluethroat wrasse (*Notolabrus tetricus*) and Western blue groper (*Achoerodus gouldii*). Sea sweep (*Scorpis aequipinnis*) and horseshoe leatherjackets (*Meuschenia hippocrepsis*) were also recorded in lower abundances.

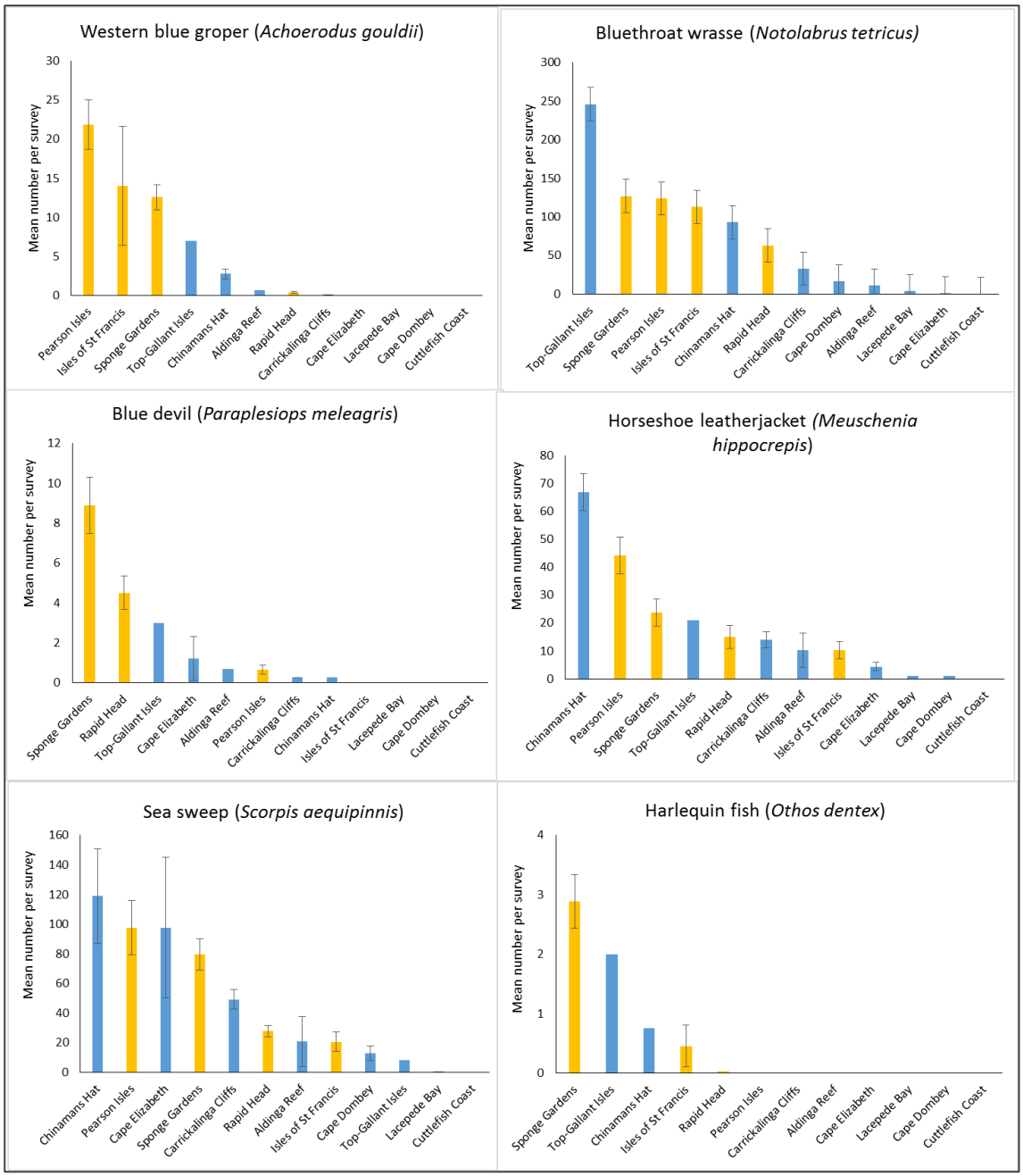
Two of the three macro-invertebrate species for reef were recorded at Isles of St Francis SZ during dive surveys (Appendix Figure 2-22). There were relatively high numbers of abalone recorded at Isles of St Francis SZ and no southern rock lobster recorded during dive surveys.

Appendix Figure 2-20 Mean number of reef fish indicator species by SZ, BRUVS surveys[a]



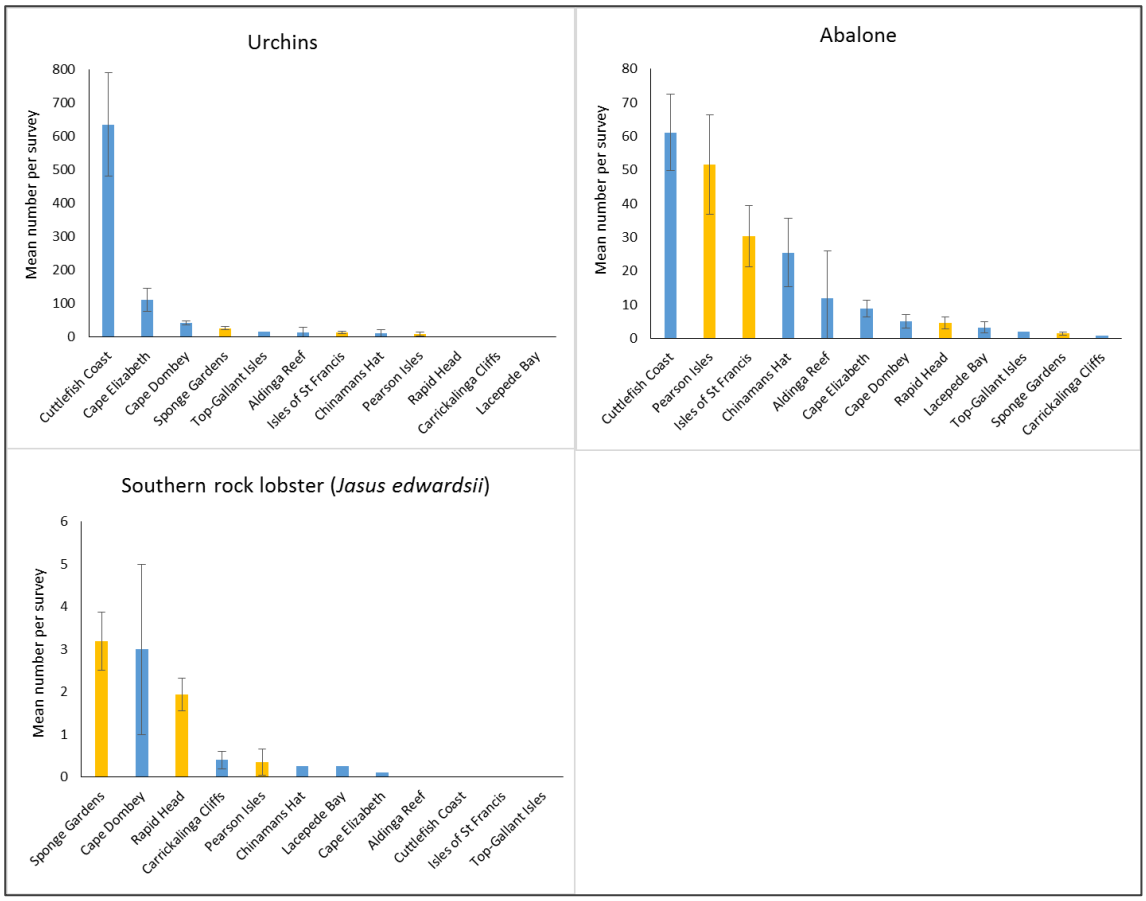
[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-21 Mean number of reef fish indicator species by SZ, dive surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Appendix Figure 2-22 Mean number of reef macro-invertebrate indicator species by SZ, dive surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Isles of St Francis SZ include:

- The shoreline rocky cliffs and sandy beaches, and out to sea reef, seagrass meadows and unmapped habitats.
- Areas of reef and, as a precautionary measure, deeper water habitats that are yet to be mapped, as well as large areas of open ocean.

Important features of the SZ include:

- The biodiversity of the area is more closely aligned with those in western Australia (due to the influence of the Leeuwin Current), but also has a mix of southern Australia, making the biodiversity quite different to any other island chain in SA.
- An example of an island chain ecosystem with extremely high biodiversity in near pristine condition. The protection of this area with a SZ ensures that the ecosystem stays pristine.
- The Isles of St Francis lie in the path of several water masses (warm Leeuwin Current and warm GAB plumes and the cool, coastal upwelling) which impact the area at different times of year. This has a major impact on the habitats and biota in the area, making it an extremely unique part of the world.
- Sections of coastline protected from strong open ocean swells and prevailing southerly winds are included in this SZ.
- This Zone connects a wide variety of habitats between the island shorelines and very deep water to the west.

- The deep water included within the Zone provides important habitat for several shark species, including species of conservation importance such as the vulnerable white shark.
- Reef fish of conservation concern which live within the zone include western blue groper, western blue devil, harlequin fish, and blue throated wrasse.
- The black cowrie, a shell species of conservation concern is found within the zone. This species is under threat due to its direct development of young, strong habitat association and popularity in the shell trade.
- The area represents high species density and diversity of fish (predominantly reef fish), sharks, rays, endangered macroalgae, blacklip and greenlip abalone western king prawns, southern rock lobster, southern calamari, sponges, ascidians and jellyfish as well as seasonal observation of the vulnerable leatherback turtle.
- Protected within the Zone is Petrel Bay which is considered an important breeding area for molluscs.
- Represented within this area is habitat for the vulnerable Australian sea lion.
- Important for the EPBC Act vulnerable listed Australian sea lion. Australian sea lion breeding site on Fenelon Island and 4 Australian sea lion haulout sites on St Francis, Masillon, Egg and Smooth Islands
- Several species of rare and uncommon macroalgae species.
- The area also protects populations of resident coastal shore birds as well as seabirds including state endangered ospreys, rare Cape Barren geese, little penguins and the rare rock parrot. Migratory oceanic birds such as albatross, prion and petrel species frequent the area.
- St Francis island has the 2nd largest breeding colony of short-tailed shearwaters in SA (second to St Peters Island) and Fenelon is a significant breeding colony for white-faced storm petrels.
- In the 2002 Nuyts Archipelago Scientific Expedition, several new species of shell, invertebrates and jellyfish were discovered. There are potentially many more which have not yet been discovered.
- Abundant sessile invertebrates such as sponges, ascidians and soft corals.
- The “geological Monument” St Francis granite formation.
- Refuge for fish species heavily targeted in areas closer to the coast, a relict population of what fish biodiversity was like prior to heavy fishing pressure decades ago;
- The variety of habitats within this zone provide habitat for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep, western blue groper, baitworm, king scallop, queen scallop and yellow-eye mullet.

Have there been changes or are changes predicted due to the SZ?

Observed changes

The Government’s MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (see Section 10.2.5, DEWNR 2017a). No changes have been detected yet as only one year of data have been collected since the Isles of St Francis SZ became operational in 2014. Changes are not expected to be measurable for 5 to 10 years (DEWNR 2017a, Delean 2017).

Predicted changes

Predicted changes that apply to all SZs are described in Section A.4.1. Predicted changes to indicator species relevant to the Isles of St Francis SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone, blacklip abalone and snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Isles of St Francis SZ (Bailey et al. 2012a). Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and/or sea sweep are predicted to maintain size and abundance over the next 20 years (Bailey et al. 2012a).

Subtidal sand

Snapper, when considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Isles of St Francis SZ (Bailey et al. 2012a).

What current and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The principal fisheries that previously used the Isles of St Francis SZ was the NZRL and Abalone Fisheries. The MSF records minimal catches from this SZ. A small amount of charter boat activity occurred.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The Rock Lobster and Abalone fisheries pose a threat (medium) to their respective target species. The Rock Lobster fishery poses a threat (medium) to bycatch of Australian sea lions. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

Existing Arrangement with Fishing Permitted in part of the existing SZ plus an extension to the remaining part of the existing SZ

What impact would there be to the environmental values of opening part of the SZ to different activities?

A general overview of what impact to the environmental values of opening the SZ to different fishing activities is given in Section A.4.3.

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

Selective removal of target species

Opening the Isles of St Francis SZ to fishing would have negative impact on those species commonly targeted including, rock lobster, abalone, Kings George whiting, snapper and a range of reef species. Many reef fish species (e.g. blue devils and western blue groper) are site attached, slow growing and have low fecundity and are therefore very vulnerable to overfishing (DEWNR 2017a). Conservation of these species may be compromised by allowing fishing in the Isles of St Francis SZ (especially if fishing pressure increases in the future) with negative flow on effects for biodiversity conservation and ecosystem function. Populations of other target species such as lobster and abalone would be reduced and would affect the trophic structure within the reef ecosystem of the SZ, which would have flow on effects to ecosystem function.

Removal of other species caught as bycatch

A number of species are captured as bycatch and in many cases damage from hooks or barotrauma reduce their survival rate when returned to the water. Opening the SZ to fishing will increase the mortality of fish caught as bycatch especially if fishing pressure increases in the future. The flow on effects of fish mortality associated with bycatch on overall marine biodiversity and ecosystem function is difficult to estimate.

Harm to non-target species by fishing gear/activity

Dolphins and whales commonly use or pass through this SZ and long nosed fur seals and Australian sea lions commonly haulout in this SZ. There are three active state endangered white-bellied sea eagle and one active state endangered osprey nest located on the Island of St Francis. Opening the SZ to fishing will increase vessel traffic and the use or fishing gear potentially increasing levels of disturbance and risk of entanglement/entrapment for these species especially vulnerable Australian sea lions.

Damage to habitats/ecosystem function/marine pest/disease

Damage to habitats from allowing fishing would be limited as the fishing techniques used are generally considered to cause little habitat damage. Allowing fishing would also increase the risk of introducing marine pests and disease.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Refer to Section A.4.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

The Isles of St Francis SZ has been selected as a priority SZ for monitoring due to the representative nearshore reef habitats it contains and high biodiversity values. Opening the SZ to fishing would reduce the utility of monitoring this SZ as removal of biomass by fishing would change the ecosystem function and thus our understanding of whether marine biodiversity was being conserved.

What impact would there be to the environmental values of expanding the remaining part of the SZ?

The proposed extension of the SZ to the south to include Cannan Reefs and Hart Island would have some biodiversity value as it extends the protected area for Australian sea lion foraging areas, it would expand the total area of SZ in the marine parks network, and it would include a range of site-attached reef and sand species.

What is the net impact to environmental values of the proposed SZ changes?

The proposed extension of the SZ to the south to include Cannan Reefs and Hart Island does not offer the equivalent habitat or biodiversity to that lost around St Francis Island. St Francis Island is viewed as a biodiversity 'hot spot' within the marine parks network. Despite an overall increase in size of the SZ, the net impact on environmental values would have to be viewed as negative.

Habitat Protection Zone status

What impact would there be to the environmental values of opening part of the existing SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Refer to Section A.4.4 for an overview of the impact to environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ.

The Isles of St Francis SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. It is possible that activities such as offshore cage aquaculture could occur in the location of the SZ due to the shelter provided by the islands. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass), disturbance to animals and pollution as outlined in Section A.4.4.

Refer to Section A.4.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Isles of St Francis SZ is one of the only examples of an entire offshore island archipelago captured within a SZ and also represents an important transitional zone between eastern and western distributed species and habitats due to the influence of the warm Leeuwin current. Changing/downgrading the zoning would compromise the CAR system by reducing protection for these unique offshore island habitats.

A.2.3. North Neptune Islands Sanctuary Zone

A.2.3.1. Zone description

The North Neptune Islands SZ (35km^2) is located in the Neptune Islands Group Marine Park (Appendix Figure 2-23) in the Eyre Bioregion. The SZ contains steep cliff running into deep water as well as a protected bay with seagrass and sand bottom. The area receives warm water from the Leeuwin Current and cool water from Flinders current allowing for high biodiversity. The area is ecologically important and represents an entire offshore island and its associated intertidal and subtidal habitats. Offshore islands are

not represented well in SZs throughout the marine parks network, due to their importance as fishing grounds.

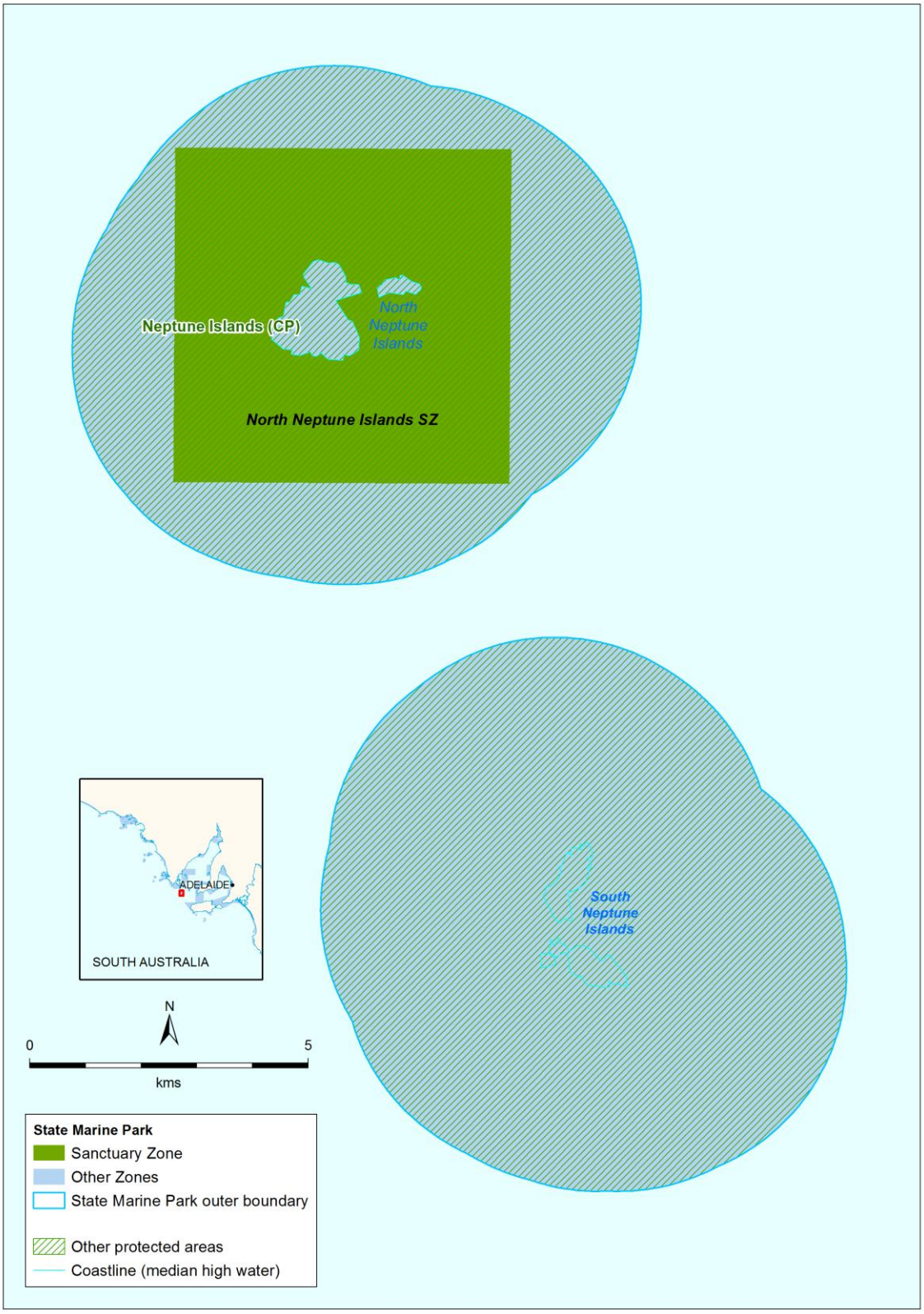
The North Neptune Islands contain half of the breeding population of long-nosed fur seals in South Australia. The area is also a breeding colony for the vulnerable Australian sea lion.

Seabirds protected under international treaties roost and nest on the islands. The area also provides breeding habitat for the little penguin, rare rock parrot, rare sooty oystercatcher, rare Cape Barren goose, endangered white-bellied sea eagle and endangered fairy tern.

The area is a world renowned viewing area for the white shark (*Carcharodon carcharias*) and ecotourism is important to the area. The North Neptune Islands SZ provides habitat for the endangered coastal stingaree, which is endemic to South Australia and is a spawning or nursery habitat for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, western blue groper and sea sweep.

In regards to MPLAG advice, this SZ was not supported by the majority - who proposed a smaller SZ to the north west of the north islands and to the north east of the south islands. Minority advice suggested a portion of the north west side of the North Neptune Islands to be included in SZ. This SZ is an outcome of the stakeholder forum, and was supported by the conservation sector through draft Management Plan consultation. There was a significant impact on the rock lobster industry.

Appendix Figure 2-23 North Neptune Islands sanctuary zone

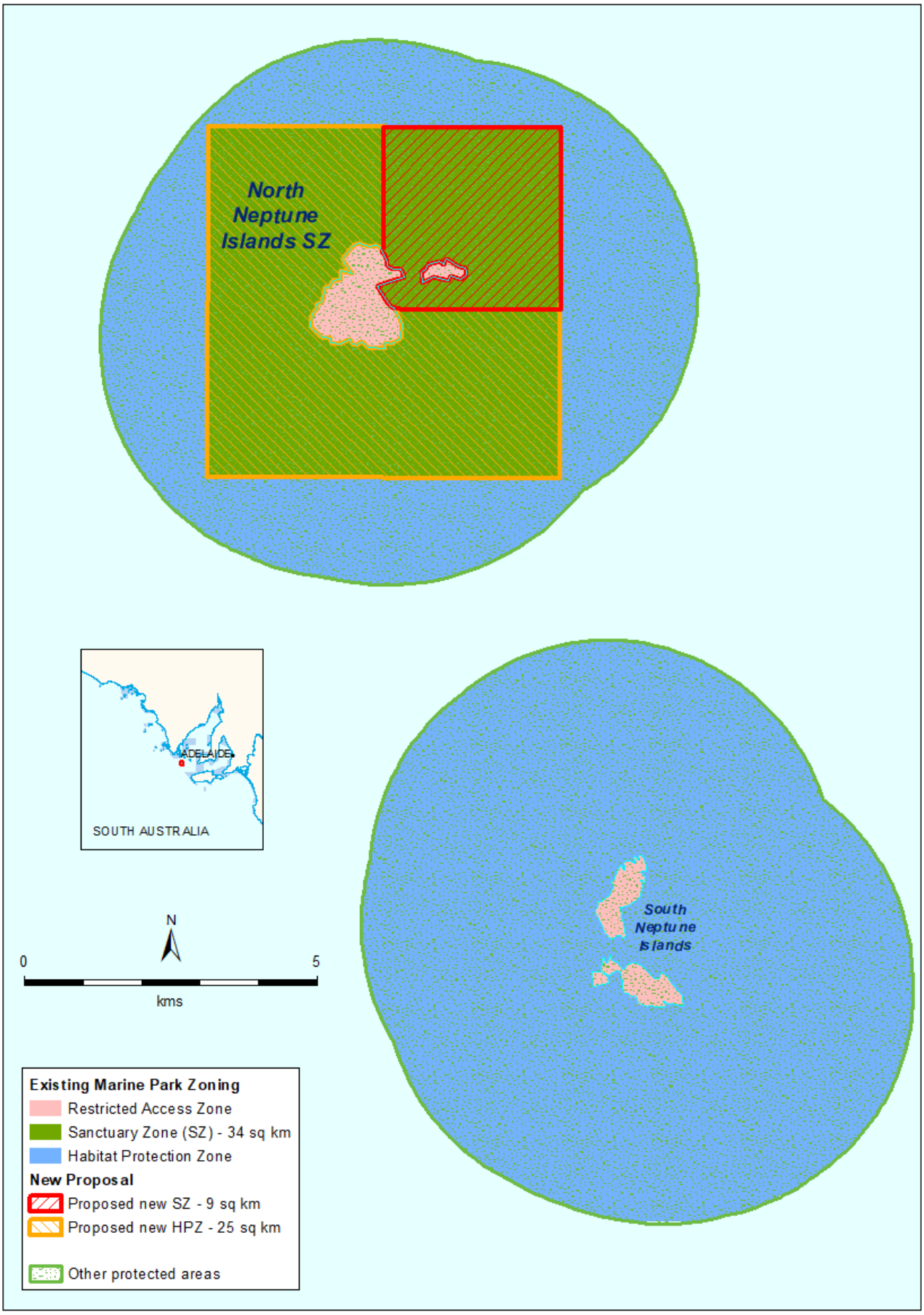


Source: Appendix 5

A.2.3.2. Proposed changes to zoning

The proposed amendments to zoning are to change western and southern part of SZ to HPZ and merge with the existing adjacent HPZ, to give a new SZ area of 9 km^2 and a new HPZ area of 25 km^2. The proposed changes are described in Appendix Figure 2-24.

Appendix Figure 2-24 Proposed amendments, North Neptunes Island SZ



Source: maps supplied by DEW.

A.2.3.3. Economic values and impacts

A.2.3.3.1. Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The principal fishery that previously used the North Neptune Island SZ was the NZRL Fishery. Abalone catches from this region are classed as low importance. The MSF only records small or confidential catches from this SZ. A small amount of Charter Boat activity also occurred.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced by the SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-14. The total gross value of displaced catch in this SZ is estimated to be at least $447,000, principally from the NZRL ($396,000), Abalone ($45,000), Marine Scalefish ($1,000) and Charter Boat ($4,000) Fisheries.

Displaced catch for the Rock Lobster fishery concurs with preliminary estimates (6 to 7 tonnes) read in the Legislative Council in May 2014 (Appendix 6, BDO EconSearch 2018).

Appendix Table 2-14 Estimated catch or effort and GVP displaced by fishery, North Neptune Island SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	990	0.17%	45
Rock Lobster	6,900	1.06%	396
Marine Scalefish	35	0.06%	1
Charter Boat	22	0.10%	4

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

The North Neptune Island SZ is located on to the south of the SG and lies between Kangaroo Island and the Eyre Peninsula. This SZ occupies 0.5 per cent of Marine Fishing Area 39 (MFA - Marine Scalefish and Southern Rock Lobster Fisheries) (Appendix Figure 2-3). This MFA is utilised by commercial fishers targeting primarily Southern Rock Lobster. The North Neptune Island SZ occupies 13 per cent of the Neptune Islands Abalone SAU 17C (Appendix Figure 2-4). These species are also able to be targeted outside of the SZ.

Marine Scalefish Fishery

This area is not a large MSF with historic catches from MFA 39 recorded as confidential, zero, 1t to 10t and 1t to 5t for Southern Calamari, Garfish, Snapper and King George Whiting, respectively (Fowler et al. 2013).

Northern Zone Rock Lobster Fishery

Historic catches from MFA 39 over the last 10 years have been declining. Catch ranges between 50t and 75t, out of a total fishery catch of 300t to 500t throughout this time frame (Linnane et al. 2017).

Abalone Fishery

The Central Zone Blacklip Abalone Fishery is classified as transitional depleting while the Greenlip Fishery is classified sustainable (Stobart et al. 2017). The historic Greenlip Abalone catch for North Neptune Island SZ is less than 2t out of a total of around 75t for the Western Zone Fishery (Stobart et al. 2017). The historic Blacklip Abalone catch for north Kangaroo Island is less than 0.5t out of a total of around 100t for the Western Zone Fishery (Stobart et al. 2017).

What proportion of the SZ has habitat suitable for different fishing activities?

The nearshore habitat of North Neptune Island SZ is comprised of reef suitable for Rock Lobster and Abalone. While reef habitat does occur around the North Neptune Islands, it is suspected that further offshore much of the SZ is comprised of sand that is unsuitable habitat for Rock Lobster and Abalone.

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

Appendix Table 2-15 shows the economic impact on the regional economy of sanctuary zoning on the Abalone and NZRL Fisheries. Impacts are based on the gross value of displaced catches (Appendix Table 2-14). Note the displaced effort in the Marine Scalefish and Charter Boat Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

In aggregate, it was estimated that the impact of zoning in the North Neptune Island SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.49m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2018/19).
- Approximately 5 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2018/19).
- Approximately $0.28m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2018/19).

Appendix Table 2-15 Regional economic impact of zoning, North Neptune Island SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Rock Lobster	-0.40	38%	-3	53%	-0.05	19%	-0.13	28%
Abalone	-0.05	4%	0	0%	-0.02	7%	-0.03	6%
Downstream [b]	-0.10	10%	0	5%	-0.01	5%	-0.03	7%
Total Direct [c]	*-0.54*	*52%*	*-3*	*58%*	*-0.09*	*32%*	*-0.20*	*41%*
Total Flow-on [c]	*-0.50*	*48%*	*-2*	*42%*	*-0.19*	*68%*	*-0.29*	*59%*
Total [c]	**-1.04**	**100%**	**-5**	**100%**	**-0.28**	**100%**	**-0.49**	**100%**
Regional Total [d]	5,776.0		25,915		1,826.5		3,389.9	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

What was the estimated impact on individual fishers versus the whole fishery?

Marine Scalefish Fishery

Change in the fishery due to the Neptune Islands Group Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries. Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. It is possible that this assumption is false for some regions (Kosturjak et al. 2015) because insufficient effort was removed in some localised areas. No data have been published to confirm or reject these assumptions.

- The South Neptune Islands are still open to fishing within the Neptune Islands Group Marine Park.
- Marine Scalefish fishers are highly mobile and should be able to adapt to the spatial restrictions.
- The estimated displaced effort was 0.06 per cent of the total average annual effort in the fishery (EconSearch 2014).

Northern Zone Rock Lobster Fishery

The estimated displaced catch in this marine park was 1.18 per cent of the total average annual catch in the NZRL Fishery (EconSearch 2014), but change in the fishery due to the Neptune Islands Group Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs, which based upon historical catch rate data appears to be the case (Kosturjak et al. 2015).
- The South Neptune Islands are still open to fishing within the Neptune Islands Group Marine Park.
- While reef habitat does occur around the North Neptune Islands, it is suspected that further offshore much of the SZ is comprised of sand that is unsuitable habitat for Rock Lobster.

Abalone Fishery

Change in the fishery due to the Neptune Islands Group Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm or reject this assumption.
- The South Neptune Islands are still open to fishing within the Neptune Islands Group Marine Park.
- While reef habitat does occur around the North Neptune Islands, it is suspected that further offshore much of the SZ is comprised of sand that is unsuitable habitat for Abalone.
- The Neptune Islands are a relatively unimportant fishing location for the Abalone Fishery (Stobart et al. 2015a).
- Estimated displaced catch was 0.17 per cent of the total average annual catch in the fishery (EconSearch 2014).

Charter Boat Fishery

Change in the fishery due to the Neptune Islands Group Marine Park is predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. No data have been published to confirm or reject this assumption.
- The South Neptune Islands are still open to fishing within the Neptune Islands Group Marine Park.
- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- The estimated displaced effort was 0.10 per cent of the total average annual effort in the fishery (EconSearch 2014).

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is

possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

Marine Scalefish Fishery

The MSF does not harvest significant quantities from this SZ recording zero, confidential, confidential and 0 to 5t for Southern Calamari, Garfish, Snapper and King George Whiting respectively in 2016 (Steer et al. 2018). This is comparable to historic catches (Fowler et al. 2013).

Northern Zone Rock Lobster Fishery

There is no evidence of a negative impact on regional CPUE in the fishery since the introduction of the SZ. The number of Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause.

The NZRL Fishery maintained nearly 100 per cent of the TACC between 2010 and 2015, 96 per cent in 2016 (when the TACC was increased) and 88 per cent in 2017 (Appendix Table3-3 in BDO EconSearch 2018). However, the catch in 2017 of 320 t was very similar to the average annual catch of the period 2010-2017 and the catch of 2015 of 321 t (Appendix Table 2-14). Historic catches from MFA 39 over the last 10 years have been declining. Catch ranges between 50t and 100t, out of a total fishery catch of 300t to 500t throughout this time frame (Linnane et al. 2017).

Abalone Fishery

Blacklip and Greenlip Abalone catch fluctuates annually for the Neptune Islands (Stobart et al. 2017). Catch in this area is small making it difficult to assess SZ impact. Data is not available for 2016 or 2017.

Any compensation claims related to the SZ?

It is unknown if there are any compensation claims being investigated for this SZ.

Existing Arrangement with Fishing Permitted in part of the SZ

What impact would there be to the fisheries values of opening part of the SZ to different fishing activities?

Part of the total gross value of displaced catch in this SZ would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster (NZRL) Fishery and to a lesser extent the Abalone, Marine Scalefish Fishery and Charter Boat Fisheries. Appendix Table 2-16 presents the estimated displaced catch or effort and GVP for fisheries based on the proposed amendment (i.e. opening up part of the SZ). The total gross value of displaced catch in this SZ is estimated to be approximately $120,000, principally from the NZRL ($106,000), Abalone ($12,000) and minor effects on the Marine Scalefish ($1,000) and Charter Boat (($1,000) Fisheries. Overall, the opening of part of the SZ to different fishing activities is expected to reduce the GVP of the displaced catch by $327,000.

Appendix Table 2-16 Estimated catch or effort and GVP displaced by fishery, North Neptune Islands SZ with proposed amendment

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	266	0.05%	12
Rock Lobster	1,851	0.28%	106
Marine Scalefish	9	0.02%	1
Charter Boat	6	0.03%	1

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

The effect of changing the status of part of the SZ would depend on the harvest strategy in place for each impacted fishery. In the long run, the fisheries would be expected to stabilise at the same higher level of catch and effort as if the SZ had not been implemented. The economic benefit of this higher catch would

be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ.

Southern Rock Lobster catch in MFA 39 has been maintained in the presence of the SZ so opening the SZ to fishing is unlikely to see dramatic increases in fisheries value. As noted above, the reduction in restricted areas may see a small increase in CPUE. Abalone and Marine Scalefish Fisheries are relatively minor contributors.

Both NZRL and Western Zone Abalone would see positive net gains from the proposed SZ changes. Western Zone Abalone would see an estimated $33,000 increase in catch, and NZRL would see an estimated $290,000 increase in catch. Marine Scalefish and Charter Boat would see an increase of $1,000 and $3,000 each in their value of catch/effort.

In aggregate, it was estimated that the impact of rezoning in the North Neptune Islands SZ will generate the following improvement of regional economic activity on an ongoing annual basis relative to current zoning (Appendix Table 2-15).

- Approximately $0.48m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2018/19).
- Approximately 2 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2018/19).
- Approximately $0.31m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2018/19).

Appendix Table 2-17 Regional economic impact of zoning, North Neptune Islands SZ with proposed amendment

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Rock Lobster	-0.11	35%	-2	73%	0.11	379%	0.09	-750%
Abalone	-0.01	4%	0	0%	0.00	-12%	-0.01	45%
Downstream [b]	-0.03	9%	0	2%	0.00	-14%	-0.01	75%
Total Direct [c]	*-0.15*	*48%*	*-2*	*75%*	*0.10*	*354%*	*0.08*	*-631%*
Total Flow-on [c]	*-0.16*	*52%*	*-1*	*25%*	*-0.07*	*-254%*	*-0.09*	*731%*
Total [c]	**-0.30**	**100%**	**-3**	**100%**	**0.03**	**100%**	**-0.01**	**100%**
Regional Total [d]	5,776.0		25,915		1,826.5		3,389.9	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.

A.2.3.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

White shark cage diving has taken place at the Neptune Islands since the late 1970s. The South Australian government currently permits three commercial shark cage diving tour operators to utilise the Neptune Islands. Visitor numbers increased from 1,127 visitors in 2008/09 to 9,807 in 2016/17 (DEWNR 2017a).

What is the economic contribution of tourism activities that utilise the SZ?

There are two recent publications that quantify the economic contribution of White Shark Diving industry to South Australia. Most recently, the South Australian Tourism Commission (SATC) reported in 2016 that in the year of analysis the industry attracted 10,322 people (64 per cent domestic and 36 per cent international), generated 80 jobs and injected $12.8 million into the state economy (SATC 2016). These numbers were reported as an infographic without units or explanation (i.e. expenditure or gross state product, fte jobs or total jobs, direct or including multiplier effects). A rapid assessment of expenditure related to the activity was carried out in 2013 by Bradford and Robbins (2013). They estimated that the 5,241 visitors in 2011 spent around $3.2 million on trip related activities in South Australia and $3.3 million on tour fees.

As part of this review, EconSearch carried out a rapid desktop analysis of the economic contribution of the activity in 2016/17. Patron numbers from 2016/17 were provided by DEW, average tour fee (inflated to current dollars) and origin of visitors were sourced from Bradford and Robbins' (2013) estimates, average overall visitor expenditure per night for the Eyre Peninsula region was sourced from Tourism Research Australia (2017). It was assumed that two average nights of tourism activity, per patron, is attributable to the shark cage diving activity as Apps and Huveneers (2016) found that most patrons spend two nights in Port Lincoln, some more and some less.

Appendix Table 2-18 presents the estimated contribution to the Eyre Peninsula economy of shark cage diving activity in or adjacent the North Neptune Islands SZ. The 9,907 shark cage diving patrons in 2016/17 led to an estimated 19,614 visitor nights, $6.8 million of expenditure on tour fees and $1.5 million of other expenditure in the Eyre Peninsula region. The contribution of this activity to GRP was $7.4 million, including $3.5 million from flow-on effects. The contribution to employment was around 67 fte jobs, including 26 from flow-on effects.

Appendix Table 2-18 Annual economic contribution of tourism activities in or adjacent the North Neptune Islands SZ

Tourism activity adjacent the SZ			
Visitor nights (nights)	19,614		
Tour fees ($m)	6.8		
Other local expenditure ($m)	1.5		
Economic Contribution			
	Direct	Flow-on	**Total**
GRP ($m)	3.8	3.5	**7.4**
Employment (fte jobs)	41	26	**67**

Source: EconSearch analysis.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

Apps and Huveneers (2016) carried out a survey of shark diving participants in 2016. They found that 14 per cent of their respondents were influenced by the SZ (20 per cent by the Marine Park) when choosing to visit Port Lincoln. Most respondents, however, were unaware of the existence of the SZ before

participating in the tour. This suggests that the existence of the SZ encourages some people to visit Port Lincoln but it is not a major factor.

Apps and Huveneers (2016) also found that awareness of the SZ among the sample increased during the tour with around 22 percent being aware before, and 49 per cent after, their tour. Over half of the respondents to the follow-up survey indicated that they had sort further information about the Neptune Islands Marine Park and the SZ after returning home, or had spoken to others about it. This shows that the existence of the SZ added value to the tour for these individuals. Note that the follow-up survey was carried out with the 20 per cent of respondents to the main survey who self-selected into the follow-up sample so the sample is likely to be biased towards those most interested in the SZ. Around 13 per cent of the original sample indicated that they had spoken to others specifically about the SZ after returning home.

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.3.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with Fishing Permitted in part of the SZ

What impact would there be to the tourism values of opening part of the SZ to different fishing activities?

Opening part of the SZ to fishing activities could negatively impact on tourism activities. Shark long-line fishing in the area can be expected to lead to negative interactions with shark cage diving patrons, however, the area to remain closed to fishing is the area where shark cage diving mostly occurs. Broader fishing activities that would likely occur, including rock lobster and abalone, may affect the wilderness experience but to a lesser extent. The reintroduction of commercial fishing would likely not be supported by the shark cage diving industry.

Habitat Protection Zone status

What impact would there be to the tourism values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

While relevant activities such as aquaculture and jetties would affect the wildlife experience for tourism activities, they are unlikely to occur in the SZ.

A.2.3.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in the North Neptune Islands SZ due to the remote nature of the SZ. The SZ is far from the nearest public boat ramp on the mainland and is inaccessible to most recreational boats (Bryars et al. 2016).

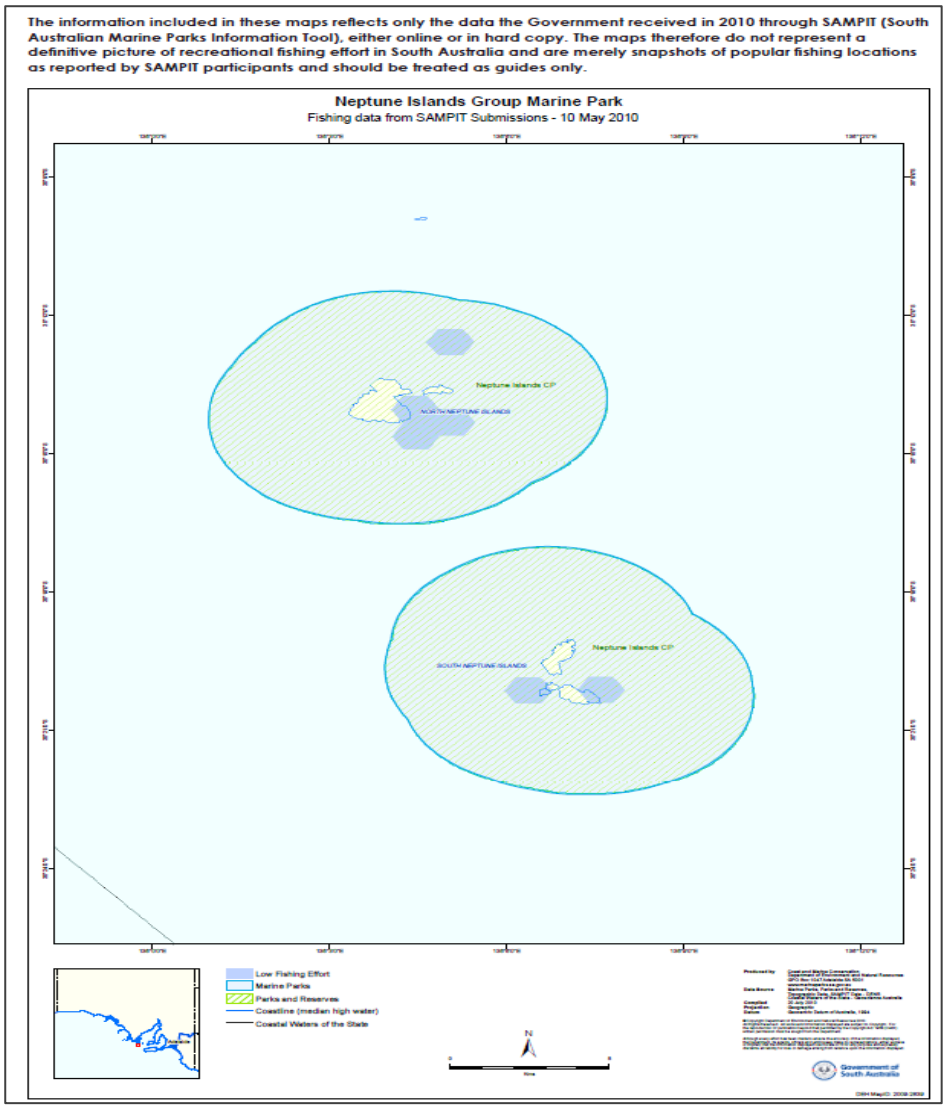
Shore-based recreational activities on the islands within the SZ would be minimal due to the remote location.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing at the SZ was minimal, with only some area lost due to the SZ. Shore-based line fishing is now prohibited in the SZ but it lies offshore and is unlikely to have been fished much from the shore previously (Appendix Figure 2-25).

Appendix Figure 2-25 SAMPIT map showing intensity of fishing prior to SZ implementation



Source: DENR 2010c (SAMPIT)

What does the community value about the SZ and surrounding areas?

It is possible that the community values the North Neptune Islands SZ for the shark cage diving industry which generates significant income for the regional economy.

A total of 152 (2 per cent) of the 8,649 respondents commented specifically on the Neptune Islands Group Marine Park during submissions to the draft zoning. 1 (0.01 per cent) agreed with the proposed zoning as is, 1 (0.01 per cent) suggested changes to zoning to increase the conservation outcome, 150 (1 per cent) suggested changes to zoning to reduce impacts on current uses, while 8,497 (98 per cent) expressed no comment on the proposed zoning (DENR 2010c).

What are the non-market values of the SZ and surrounding areas?

Since 2012, about 32 research permits for 10 different projects have been granted for white shark research within the North Neptune Islands SZ under the National Parks and Wildlife Service Act and/or Marine Park Act (DEWNR 2017a). Research in the North Neptune Islands SZ is primarily aimed at tracking the movement and residency patterns of white sharks. This helps us understand the population size and site fidelity of white sharks as well as any potential impacts of the cage diving industry on shark behaviour (e.g. Rogers et al. 2014). More recently DEWNR has engaged with researchers to monitor the movement of acoustically tagged sharks between marine parks and assess connectivity between these parks (DEWNR 2017a).

The shark cage tourism industry is monitored to track the number of visitors, and calculate benefits to the local community in terms of jobs created and economic contribution (DEWNR 2017a).

The SZ has 'wilderness value'.

Have social values changed due to the SZ?

The North Neptune Islands SZ has provided long-term viability for the shark cage diving industry by protecting the local environment and the sharks while they are inside the zone. The shark cage industry has continued to thrive since the Neptune Islands Group Marine Park management plan was implemented and provides significant economic benefit to the state and region. Research has shown that tourists become more educated about marine parks and the marine environment by going on a shark cage trip (Apps et al. 2017).

Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the West Eyre region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 64 per cent in 2013, dropping to 59 per cent in 2016, before increasing to 82 per cent in 2017, DEWNR 2017a[15]) (Appendix Figure 2-6).

Existing Arrangement with Fishing Permitted in part of the SZ

What impact would there be to the social values of opening part of the SZ to different fishing activities?

As the area was only lightly used by recreational boat fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in an increase in recreational boat fishing activity in the North Neptune Islands SZ through a redistribution of existing activity outside the SZ.

The Rock Lobster, Abalone and MSF Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry, but likely not supported by the shark cage diving industry, the conservation sector nor recreational fishers.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

What impact would there be to the social values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

The impact of opening part of the SZ to non-fishing activities allowed in a HPZ but not a SZ is unknown.

It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would occur in the location of the SZ.

A.2.3.5. Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The SZ contains steep cliff running into deep water as well as a protected bay with seagrass and sand bottom. Figure 3-45 in BDO EconSearch 2018 provides a map of the main benthic (subtidal) habitats of the Investigator Marine Park. Appendix Table 2-19 and Appendix Table 2-20 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the North Neptune Islands SZ.

15 DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

Appendix Table 2-19 Benthic (subtidal) habitats of the North Neptune Islands SZ

Habitat	Area (km^2)	% SZ
Heavy limestone reef	3.4	10.0
Unmapped	30.9	90.0

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

Appendix Table 2-20 Shoreline (intertidal) habitats of the North Neptune Islands SZ

Habitat	Length of shoreline (km)	% SZ
Unmapped	9	100

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

The habitats located within the North Neptune Islands SZ support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The Neptune Islands Group Marine Park is used by a number of shark species, including bronze whaler, blue shark, smooth hammerhead, school shark, dusky whaler, white shark, shortfin mako and porbeagle. The Neptune Islands Group is a recognised aggregation site for white sharks (DENR 2010c). The Neptune Islands Group Marine Park overlaps a productive area for gummy sharks in the MSF (Fowler et al. 2012, 2013, 2014b).

Mammals

The Neptune Islands Group Marine Park is used by a number of marine mammal species, including Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), common dolphin and bottlenose dolphin (DENR 2010c).

Australian sea lion

There is an Australian sea lion breeding site within the North Neptune Islands SZ with an estimated annual pup production of about 9 pups (Goldsworthy and Page 2009, Goldsworthy et al. 2015).

Long-nosed fur seal

There are breeding sites for the long-nosed fur seal at the North Neptune Islands SZ (6 sites) with estimated annual pup productions of around 4,700 (Shaughnessy et al. 2014).

Seabirds

The Neptune Islands Group Marine Park is used by a number of seabird species, including Caspian tern, crested tern, fairy tern, short-tailed shearwater, state endangered white-bellied sea eagle, Cape Barren goose and peregrine falcon (DENR 2010c). Some of these species are resident while others are more transient, visiting the Neptune Islands Group Marine Park to rest breed and/or feed. Many of the islands in the Neptune Islands Group Marine Park support seabird breeding colonies (Robinson et al. 1996). Seabirds that breed in New Zealand or Antarctica, such as albatrosses, petrels and prions also occur in the Neptune Islands Group Marine Park (Marchant and Higgins 1990).

White-bellied sea eagle are known to nest on North Neptune Islands SZ (Dennis et al. 2011a). Short-tailed shearwaters breed on 3 Islands within the Neptune Islands Group Marine Park, including an estimated population of about 18,900 on North Neptune Island within the SZ (Robinson et al. 1996, Copley 1996).

Shorebirds

The Neptune Islands Group Marine Park is used by a number of shorebird species, including sooty oystercatcher and ruddy turnstone (Robinson et al. 1996). Baseline information for the North Neptune Islands SZ is currently lacking.

Fish Communities

Much of the knowledge concerning fish and marine macro-invertebrate communities has been developed through the Marine BRUVS and UVC monitoring programs (Miller et al. 2017 Brook et al. 2017), commissioned by DEW over the past few years. However, no BRUVS or UVC monitoring has been conducted in North Neptune Islands SZ so there is no data available for comparison of biodiversity.

North Neptune Islands SZ is known as a spawning ground for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, western blue groper and sea sweep. It is also a nursery habitat for all these species except western blue groper.

How does the biodiversity compare to other areas?

Comparative assessment of biodiversity has been based on fish and marine macro-invertebrate communities. These assessments have been based on the results of the BRUVS and UVC monitoring programs, and because the North Neptune Islands SZ has not been surveyed as part of these programs, there is no data available for comparison of fish/macro-invertebrate biodiversity.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within North Neptune Islands SZ include:

- Exposed, offshore island habitat with exposed cliffs and rocky shores moving into.
- Although not mapped, the sheltered bay is known to contain seagrass beds and sandy bottom.
- On the more exposed sides, steep underwater slopes run along rocky reef to sandy bottoms.
- The area also represents quite deep water (up to 50m deep) which creates significant variation in habitats and the species they support

Important features of the SZ include:

- World renowned hot spot for the vulnerable white shark, who regularly forage in the area for seals.
- An existing ecotourism site and one of the few locations in the world where people can view the magnificent white shark from under the water.
- The Neptune Islands are the most important New Zealand fur seal pup production site in South Australia (half of the Australian population breed here – distributed evenly over both main islands).
- The area is also a breeding colony for the vulnerable Australian sea lion which feed in the waters surrounding the islands.
- Seabirds whose habitats are required to be protected under international treaties roost and nest on the islands.
- The area also provides breeding habitat for the little penguin, rare rock parrot, rare sooty oystercatcher, rare Cape Barren goose, endangered white-bellied sea eagle and endangered fairy tern.
- Adding to the diversity of habitats and species within this Zone is the area's exposure to the warm water Leeuwin Current and the cooler Flinders Current.
- This SZ represents an entire offshore island and its associated intertidal and subtidal habitats. Offshore islands are not represented well in SZs throughout the marine parks network, due to their importance as fishing grounds.
- Habitat for the endangered coastal stingaree, which is endemic to South Australia.
- The area is influenced by the warm Leeuwin Current in winter and the cold Flinders Current in summer, ensuring there is a large temperature difference between the seasons. This has a large impact on the biodiversity of the area.
- Spawning for southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, western blue groper and sea sweep.
- Nursery habitat for all these species except western blue groper.

Have there been changes or are changes predicted due to the SZ?

Observed changes

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (see Section 10.2.5, DEWNR 2017a). No changes have been detected yet as no data have been collected since the North Neptune Islands SZ became operational in 2014.

Predicted changes

Predicted changes that apply to all SZs are described in Section A.4.1. Predicted changes to indicator species relevant to the North Neptune Islands SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone and blacklip abalone, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the North Neptune Islands SZ (Bailey et al. 2012a). Bight redfish, bluethroat wrasse, harlequin fish, swallowtail, sea sweep and western blue groper, when each considered in isolation, are predicted to maintain size and/or abundance inside the North Neptune Islands SZ (Bailey et al. 2012a).

What current and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The principal fishery that previously used the North Neptune Island SZ was the NZRL Fishery. Abalone catches from this region are classed as low importance. The MSF only records small or confidential catches from this SZ. A small amount of Charter Boat activity also occurred.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The Rock Lobster and Abalone fisheries pose a threat (medium) to their respective target species. The Rock Lobster fishery poses a threat (medium) to bycatch of Australian sea lions. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

The North Neptune Islands SZ provides additional protection for white sharks from accidental capture by commercial shark fishers while the sharks are resident within the SZ. Since implementation of the Neptune Islands Group Marine Park management plan there has been closer scrutiny on fishers to comply with regulations and a policy framework has been developed to mitigate potential negative impacts on the white shark population.

Existing Arrangement with Fishing Permitted in part of the SZ

What impact would there be to the environmental values of opening part of the SZ to different activities?

A general overview of what impact to the environmental values of opening part of the SZ to different fishing activities is given in Section A.4.3.

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

Selective removal of target species

Opening part of the North Neptune Islands SZ would have a negative impact on rock lobster and abalone populations. It is possible that southern rock lobster populations have increased markedly in this SZ with the removal of fishing as has happened in the Cape du Couedic SZ (see Section A.2.5.5). If fishing recommenced it is expected that lobster biomass and abundance would reduce to the levels that existed prior to establishment of the SZ with some impact on ecosystem function and biodiversity.

Removal of other species caught as bycatch

A number of species are captured as bycatch and in many cases damage from hooks or barotrauma reduce their survival rate when returned to the water, especially if fishing pressure increases in the future. Opening part of the SZ to fishing will increase the mortality of fish caught as bycatch. The flow on effects of fish mortality associated with bycatch on overall marine biodiversity and ecosystem function is difficult to estimate.

Harm to non-target species by fishing gear/activity

The North Neptune Islands SZ is home to one of the largest breeding colonies of the long nosed fur seal and is also a breeding colony of the vulnerable Australian sea lion. Dolphins and whale commonly use or pass through the SZ. There is one active state endangered white-bellied sea eagle nest located on the cliffs of North Neptune Island. Opening part of the SZ to fishing will increase vessel traffic and the use or fishing gear potentially increasing levels of disturbance and risk of entanglement for these species especially vulnerable Australian sea lions.

Damage to habitats/ecosystem function/marine pest/disease

Damage to habitats from allowing fishing would be limited as the fishing techniques used are generally considered to cause little habitat damage. Allowing fishing would also increase the risk of introducing marine pests and disease.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Refer to Section A.4.3 for an overview of how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

The North Neptune Islands SZ has not been selected as a priority SZ for monitoring and therefore opening part of the SZ to fishing will not impact the ability to assess the effectiveness of the marine park network.

Habitat Protection Zone status

What impact would there be to the environmental values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Refer to Section A.4.4 for an overview of the impact to environmental values of opening part of the SZ to (non-fishing) activities allowed in a HPZ.

The North Neptune Islands SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. However, it is unlikely that there would be any future activities allowed in a HPZ such as aquaculture or coastal developments in this SZ due to its remote location. However, if these activities were to occur then it is possible that they would impact on environmental values as outlined in Section A.4.4.

Refer to Section A.4.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the North Neptune Island SZ represents the only example of a remote offshore island ecosystem in the lower Eyre region with complete representation of intertidal and subtidal habitats. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these remote offshore island habitats.

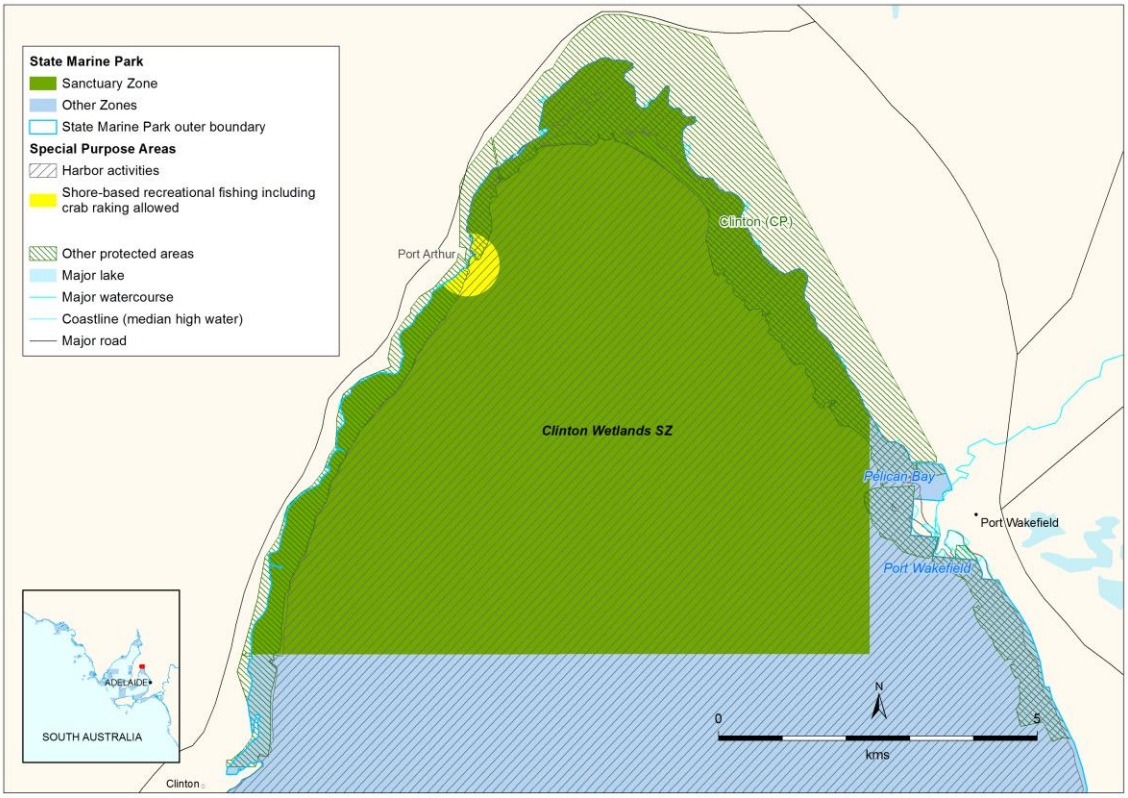
A.2.4. Clinton Wetlands Sanctuary Zone

A.2.4.1. Zone description

The Clinton Wetlands SZ (59km^2) in the Upper Gulf St. Vincent Marine Park is in an area recognised as a coastal wetland of national significance (Appendix Figure 2-26) in the Gulf St Vincent Bioregion. It conserves important nursery habitats for fish and crustaceans, tidal creeks, and significant mangrove and saltmarsh environments. The SZ partially overlays Clinton Conservation Park, and provides a protective corridor between the land and sea.

The SZ is located in the shallow head of the GSV inverse estuary ecosystem (where salinities are higher than open ocean salinities due to high evaporation and low freshwater inputs) and contains extensive intertidal and dense shallow seagrass beds along with shell grit beaches and sand flats. These seagrass meadows provide an important nursery, breeding, feeding and possible spawning habitat for blue swimmer crabs, western king prawns, whiting, garfish and snapper.

Appendix Figure 2-26 Clinton Wetlands sanctuary zone



Source: Appendix 5

Mangroves within this SZ are an important area for juvenile yellow-fin whiting. The saltmarsh in this zone is the most significant, undisturbed area of saltmarsh in the GSV region. The saltmarsh, mangrove and intertidal habitats provide important nesting and feeding grounds for resident shorebirds, as well as feeding grounds for migratory shorebirds whose habitats are required to be protected under international treaties. The area is home to the vulnerable Samphire Thornbill which is thought to be endemic to the northern shores of GSV.

The zone was designed to allow recreational crab and shore-based fishing at Port Arthur via a SPA. Some net fishing was displaced in this zone.

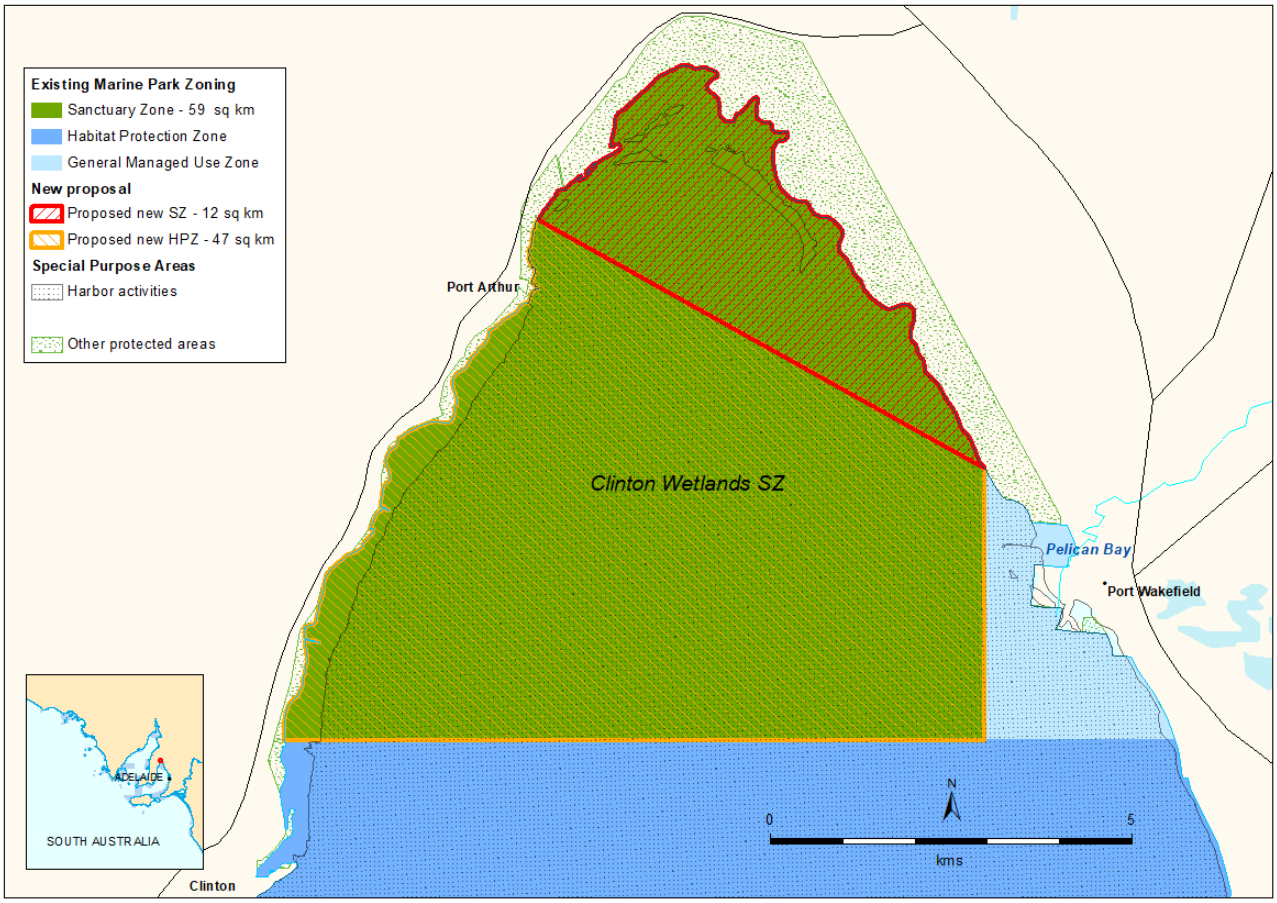
A.2.4.2. Proposed changes to zoning

The proposed amendments are to

- Change southern part of SZ to HPZ and merge with existing adjacent HPZ, to give a new SZ area of 12 km^2 and a new HPZ area of 47 km^2
- Remove the existing SPA adjacent to Port Arthur.

The proposed changes are described in Appendix Figure 2-27.

Appendix Figure 2-27 Proposed amendments, Clinton Wetlands sanctuary zone



Source: maps supplied by DEW.

A.2.4.3. Economic values and impacts

A.2.4.3.1. Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The MSF was the principal fishery that previously used the Clinton Wetlands SZ. There was some use, albeit minor, of the SZ by the Blue Crab and Charter Boat Fisheries.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced by the SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-21. The total gross value of displaced catch in this SZ is estimated to be at least $179,000, principally from the MSF.

Displaced catch and effort from the Blue Crab and Charter Boat Fisheries were confidential but would be minimal. In fact, for the entire Upper Gulf St Vincent Marine Park the value of displaced catch would be $1,000 for the Blue Crab Fishery and the value of displaced effort would be less than $1,000 for the Charter Boat Fishery.

Displaced catch presented here for the MSF ($179,000) is lower than preliminary estimates ($1.8 million) read in the Legislative Council in May 2014 (Appendix 6, BDO EconSearch 2018).

Appendix Table 2-21 Estimated catch or effort and GVP displaced by fishery, Clinton Wetlands SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	-	-	-
Rock Lobster	-	-	-
Blue Crab	Confidential	-	-
Marine Scalefish	645	1.04%	179
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

Clinton Wetlands SZ comprises the northern section of Marine Fishing Area 35 (MFA) (Appendix Figure 2-3). The SZ makes up about 7.5 per cent of the MFA. This fishing area was utilised by commercial fishers targeting a range of primary fishery species including King George Whiting, Southern Calamari, Blue Swimmer Crabs, Snapper and Southern Garfish. A number of moderate/minor fisheries also are present in the region and target species such as Western Australian Salmon, Snook, Silver Whiting and Leatherjackets. These species are all able to be targeted outside of the SZ. The proportions of the primary fishery species catch compared to the state wide catch are presented below.

King George Whiting

GSV is the smallest Whiting fishery out of the three King George Whiting stocks. In 2016 total catch (recreational and commercial) was recorded at around 150t in GSV, 310t in SG and 250t in West Coast. Historically (1999-2001), MFA 35 produced between 21-40t of King George Whiting but recently has recorded only 6-15t. This is consistent with the long term trend of decreasing catch for this species (Steer et al. 2018).

King George Whiting are currently *transitional depleting* meaning stock levels are deteriorating. The biomass is not yet recruitment overfished, but fishing pressure is too high and moving the stock in the direction of becoming recruitment overfished. The 2011 stock assessment of King George Whiting noted an increase in exploitation but deemed it no "cause for immediate concern" (Fowler et al. 2011). The 2014 stock assessment (Fowler et al. 2014a) listed King George Whiting in GSV as transitional depleting. As did the MSF stock assessment released in 2018 (Steer et al. 2018) for the year of 2016 suggesting limited recovery. It is estimated that the commercial and recreation catch represent approximately 42 per cent and 58 per cent of the total catch respectively.

Snapper

Historically, SG provided the bulk of the snapper catch in South Australia. Between 2007 and 2010 the catch from Northern GSV increased rapidly and now contributes the bulk of snapper catch to South Australia (Fowler et al. 2016).

In 2012/13, prior to SZs, MFA 35 produced between 100-200 tonnes out of around 500 tonnes state-wide (Steer et al. 2018).

It is estimated that the commercial and recreation catch represent approximately 62 per cent and 38 per cent of the total catch respectively. The GSV snapper stock is classified as sustainable (Steer et al. 2018).

Garfish

Northern GSV is the second most productive region in the state accounting for about 35 per cent of the state's annual catch. Historic catches in northern GSV have been between 80-200t out of 200-500t state-wide (Steer et al. 2016). Historically, MFA 35 produced between 75-150 t of garfish (Steer et al. 2012). It is estimated that the commercial and recreation catch are approximately 77 per cent and 23 per cent of total catch respectively.

Catch for GSV in 2016 was a record low of 53.3t. The decline corresponds with a 62.9 per cent decline in haul net targeted effort and a 46 per cent reduction in CPUE (Steer et al. 2018).

Garfish stocks in upper GSV are classified as overfished and has been over exploited prior to the introduction of marine parks. Garfish catch has remained depressed since a decline in catch in 2000-2001. Between 2005 to 2010/11 the stock did not show signs of recovery despite five years of reduced fishing effort due to a voluntary net buy-back (Steer et al. 2012). The stock is still classed overfished in 2018 despite further management restriction regarding gear and size and closed seasons (Steer et al. 2018).

Southern Calamari

Historically, the catch of Southern Calamari in the Northern GSV region has remained stable since 2009 at around 100t (about 25 per cent of total state catch (443t) (Steer et al. 2018).

Catch of Southern Calamari in MFA 35, which overlaps a portion of the Clinton Wetlands SZ, was between 25-50t in 2016, a decline from 51-75t in 2012/13 (Steer et al. 2018).

It is estimated that the commercial and recreation catch represent approximately 70 per cent and 30 per cent of total catch respectively. The Northern GSV Southern calamari stock is classified as sustainable (Steer et al. 2018).

Western Australian Salmon

Historically, the state-wide catch of Western Australian salmon has been around 100-200 t since 2002/03, but in 2012/13 and 2013/14 the catch was less than 100t (Fowler et al. 2014b).

Catch of Western Australian salmon in MFA 35 which overlaps the CWSZ was between 16-20t in 2013/14 (Fowler et al. 2014b).

It is estimated that the commercial and recreation catch represent a proportion of approximately 52 per cent and 48 per cent, respectively. The Western Australian salmon stock is classified as sustainable (Steer et al. 2018).

What proportion of the SZ has habitat suitable for different fishing activities?

Most of the SZ is comprised of seagrass beds and sand flats which are suitable habitat for Blue Crabs and Marine Scalefish species.

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

Appendix Table 2-22 shows the economic impact on the regional economy of sanctuary zoning on the MSF. Impacts are based on the gross value of displaced catches (Appendix Table 2-21). Note the displaced effort in the Blue Crab and Charter Boat Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

Appendix Table 2-22 Regional economic impact of zoning, Clinton Wetlands SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Marine Scalefish	-0.49	57%	-11	85%	-0.09	44%	-0.32	62%
Downstream [b]	0.00	0%	0	0%	0.00	0%	0.00	0%
Total Direct [c]	*-0.49*	*57%*	*-11*	*85%*	*-0.09*	*44%*	*-0.32*	*62%*
Total Flow-on [c]	*-0.37*	43%	*-2*	15%	*-0.12*	56%	*-0.19*	38%
Total [c]	**-0.85**	**100%**	**-13**	**100%**	**-0.21**	**100%**	**-0.51**	**100%**
Regional Total [d]	5,806.48		28,709		1,648.60		3,116.66	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Yorke and Mid North State Government region.
Source: EconSearch analysis.

In aggregate, it was estimated that the impact of zoning in the Clinton Wetlands SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.51m in total GRP, which represents less than 0.1 per cent of the regional total ($3.1b in 2018/19).
- Approximately 13 fte jobs which represent 0.1 per cent of the regional total (28,709 fte jobs in 2018/19).
- Approximately $0.21m in household income, which represents less than 0.1 per cent of the regional total ($1.6b in 2018/19).

What was the estimated impact on individual fishers versus the whole fishery?

Of the 4 haul net licences accepted for surrender, 3 licences (representing 490 effort days of the 794 haulnet days that were surrendered across the State as a whole) expended most of their effort at the top of GSV (Kosturjak et al. 2015).

Blue Swimmer Crab

No displaced catch or effort was deemed necessary for removal through the Commercial Fisheries Voluntary Catch/Effort Reduction Program. The Blue Crab Fishery has mostly been accommodated in the zoning arrangements and there are numerous areas still available to fish within the Upper Gulf St Vincent Marine Park.

Marine Scalefish Fishery

While the estimated displaced effort for the Upper Gulf St Vincent Marine Park was 1.36 per cent of the total average annual effort in the fishery (EconSearch 2014), change in the fishery due to the Marine Park was predicted to be minimal because:

- More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs. It is possible that this assumption is false for the Clinton Wetlands SZ because insufficient local effort was removed from the fishery in the Port Wakefield region (Kosturjak et al. 2015). No data have been published to confirm or reject these assumptions.
- Removal of effort from the Port Wakefield region was targeted as part of the Commercial Fisheries Voluntary Catch/Effort Reduction Program.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

No negative change in the Blue Crab Fishery. Recent years have achieved TACC (245t) in GSV. Commercial CPUE was the highest on record in 2016/17 (Beckmann and Hooper 2018).

King George Whiting

The GSV/ Kangaroo Island stock has been classified as transitional depleting since 2014. Total catch of King George Whiting has been decreasing since the 1990's. Since the introduction of SZs, total catch for the GSV/ Kangaroo Island King George Whiting stock has continued to follow the long term trend of reducing catch and reducing fishing effort. (Steer et al. 2018). Historically (1999-2001), MFA 35 which overlaps a portion of CWSZ produced between 21-40t of King George Whiting (Fowler et al. 2014a). In 2016 MFA recorded a catch of 6-15t. This is consistent with the long term trend of decreasing catch for this species (Steer et al. 2018).

Snapper

The GSV Snapper catch has continued on the pre SZ downward trajectory since reaching a record catch in 2010 due to increased effort by the longline industry. Reduction in catch between 2010 and 2016 is in relation to decreased fishing effort (and management changes made between 2012 and 2016 were aimed at limiting fishery catch of snapper in GSV) (Steer et al. 2018).

Since 2012, annual snapper catch in GSV has remained between 300-400t. In 2016, 310t of snapper was caught in GSV compared to the state wide catch of 382t (Steer et al. 2018).

Catch of Snapper in MFA 35 overlapping Clinton Wetlands SZ, was between 100-200t in 2016, which was the same as recorded in 2012/13 prior to SZ implementation.

Garfish

Garfish stocks have been under pressure for considerable time and numerous management efforts have been made to help protect Garfish stocks. These fisheries management measures include changes to gear allowances, size and bag limits and seasonal closures. Currently Northern SG Garfish stocks are classified as overfished.

Southern garfish catch in MFA 35 overlapping Clinton Wetlands SZ has shown historic decline from 75-150t in 2000 to 61-80t in 2012/13 and to 35-50t in 2016. State-wide catch in 2016 totalled 155t which is the lowest on record (Steer et al. 2018). The current declining trend of Garfish catch is a result of decreased fishing effort through fisheries management actions as a result of overfishing (Steer et al. 2018).

Southern Calamari

Catch of Southern Calamari in MFA 35 overlapping the CWSZ were between 25-50t in in 2013/14 and 2016 (Fowler et al. 2014b and Steer et al. 2018), a decline from 51-75t in 2012/13 (Fowler et al. 2013). Since 2009, annual Southern Calamari catch in GSV has remained steady at around 100 t suggesting fishers are still catching Southern Calamari in high numbers despite the Clinton Wetlands SZ.

Western Australian Salmon

Catch of Western Australian salmon has increased in MFA 35. In 2016, catch was recorded at between 21-40t (Steer et al. 2018) compared with 16-20t in 2013/14 (Fowler et al. 2014a).

Any compensation claims related to the SZ?

There is currently one compensation claim being investigated for this SZ from a MSF fisher based at Port Wakefield.

It was reported that one fisher moved from Port Wakefield to another location within SA (Kosturjak et al. 2015).

Existing Arrangement with Fishing Permitted

What impact would there be to the fisheries values of opening part of the SZ to different fishing activities?

Part of the total gross value of displaced catch in this SZ would become available again for harvesting. This would be principally by the Marine Scalefish Fishery and to a minor scale the Blue Crab and Charter Boat Fisheries. Appendix Table 2-23 presents the estimated displaced catch or effort and GVP for fisheries based on the proposed amendment (i.e. opening up part of the SZ). The total gross value of displaced catch in this SZ is estimated to be approximately $35,000, principally from the Marine Scalefish Fishery. Overall, the opening of part of the SZ to different fishing activities is expected to reduce the GVP of the displaced catch by $144,000.

Appendix Table 2-23 Estimated catch or effort and GVP displaced by fishery, Clinton Wetlands SZ with proposed amendment

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	-	-	-
Rock Lobster	-	-	-
Blue Crab	Confidential	-	-
Marine Scalefish	127	0.20%	35
Abalone	-	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

The effect of changing the status of part of the SZ would depend on the harvest strategy in place for each impacted fishery. In the long run, the fisheries would be expected to stabilise at the same higher level of catch and effort as if the SZ had not been implemented. The economic benefit of this higher catch would be distributed amongst fewer participants and with less employment or other regional benefit because of the buyback undertaken for the establishment of the SZ.

Catches of Southern Calamari and Snapper have been maintained in the presence of the SZ so are unlikely to see dramatic increases in fisheries value if the SZ is opened to fishing. As noted above, the reduction in restricted areas may see an increase in CPUE and a temporary increase in overall catch.

Reduced catches of Garfish and King George Whiting post SZ implementation are the continuation of the long term historic trend of reduced catch due to fishery and environmental pressures to these species. Opening the SZ may result in a temporary increase in CPUE and overall catch but may have a negative impact on the long term value of the fishery if additional pressure is placed on stocks that are not classified sustainable.

It is noted that prior to the SZ being implemented there was a seasonal netting closure and it is assumed that if fishing was permitted this fishing restriction would be reinstated.

Marine Scalefish would see positive net gains from the proposed SZ changes of an estimated $144,000 increase in catch. The Blue Crab and Charter Boat Fisheries would also stand to benefit from these proposed changes.

In aggregate, it was estimated that the impact of rezoning in the Clinton Wetlands SZ will generate the following improvement of regional economic activity on an ongoing annual basis relative to current zoning (Appendix Table 2-22).

- Approximately $0.51m in GRP, which represents less than 0.1 per cent of the regional total ($3.1b in 2018/19.
- Approximately 2 fte jobs which represent less than 0.1 per cent of the regional total (28,709 fte jobs in 2018/19).
- Approximately $0.38m in household income, which represents less than 0.1 per cent of the regional total ($1.6b in 2018/19).

Appendix Table 2-24 Regional economic impact of zoning, Clinton Wetlands SZ with proposed amendment

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Marine Scalefish	-0.04	29%	-10	96%	0.21	122%	0.03	-536%
Downstream [b]	-0.02	19%	0	1%	-0.01	-4%	-0.01	176%
Total Direct [c]	*-0.06*	*48%*	*-11*	*97%*	*0.20*	*118%*	*0.02*	*-360%*
Total Flow-on [c]	*-0.06*	52%	*0*	3%	*-0.03*	-18%	*-0.02*	460%
Total [c]	**-0.12**	**100%**	**-11**	**100%**	**0.17**	**100%**	**0.00**	**100%**
Regional Total [d]	5,806.48		28,709		1,648.60		3,116.66	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Due to the shallow water environment, restricted water flows and restricted coastline access due to saltmarsh and mangroves at the head of the GSV, it is unlikely that there would be any future activities such as aquaculture or other coastal developments. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.4.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

No recognised tourism activities take place in or adjacent the SZ.

What is the economic contribution of tourism activities that utilise the SZ?

Since there are no tourism activities there is no economic contribution to the region from tourism.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.4.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with Fishing Permitted

What impact would there be to the tourism values of opening part of the SZ to different fishing activities?

A very small positive impact on tourism could be expected if fishing activities were allowed in the SZ and charter boats could return to the area.

Habitat Protection Zone status

What impact would there be to the tourism values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

Since there are no tourism activities, there would be no impact on tourism from opening the SZ to (non-fishing) activities allowed in a HPZ but not an SZ.

A.2.4.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Boating and fishing is popular at many locations within the marine park including Port Wakefield and Port Clinton. A boat ramp is located near the Clinton Wetlands SZ at Port Clinton (DENR 2010f).

Crabbing for blue swimmer crabs is popular along many of the extensive intertidal mud flats in the marine park including Port Wakefield and Port Clinton (DENR 2010f).

Caravan parks and camping facilities are located adjacent to the marine park at Port Clinton and Port Wakefield (DENR 2010f).

The adjacent Clinton Conservation Park and the Clinton Wetlands SZ are popular with birdwatchers[16]. The area (including the Clinton Wetlands SZ) is recognised as a wetland of international importance.

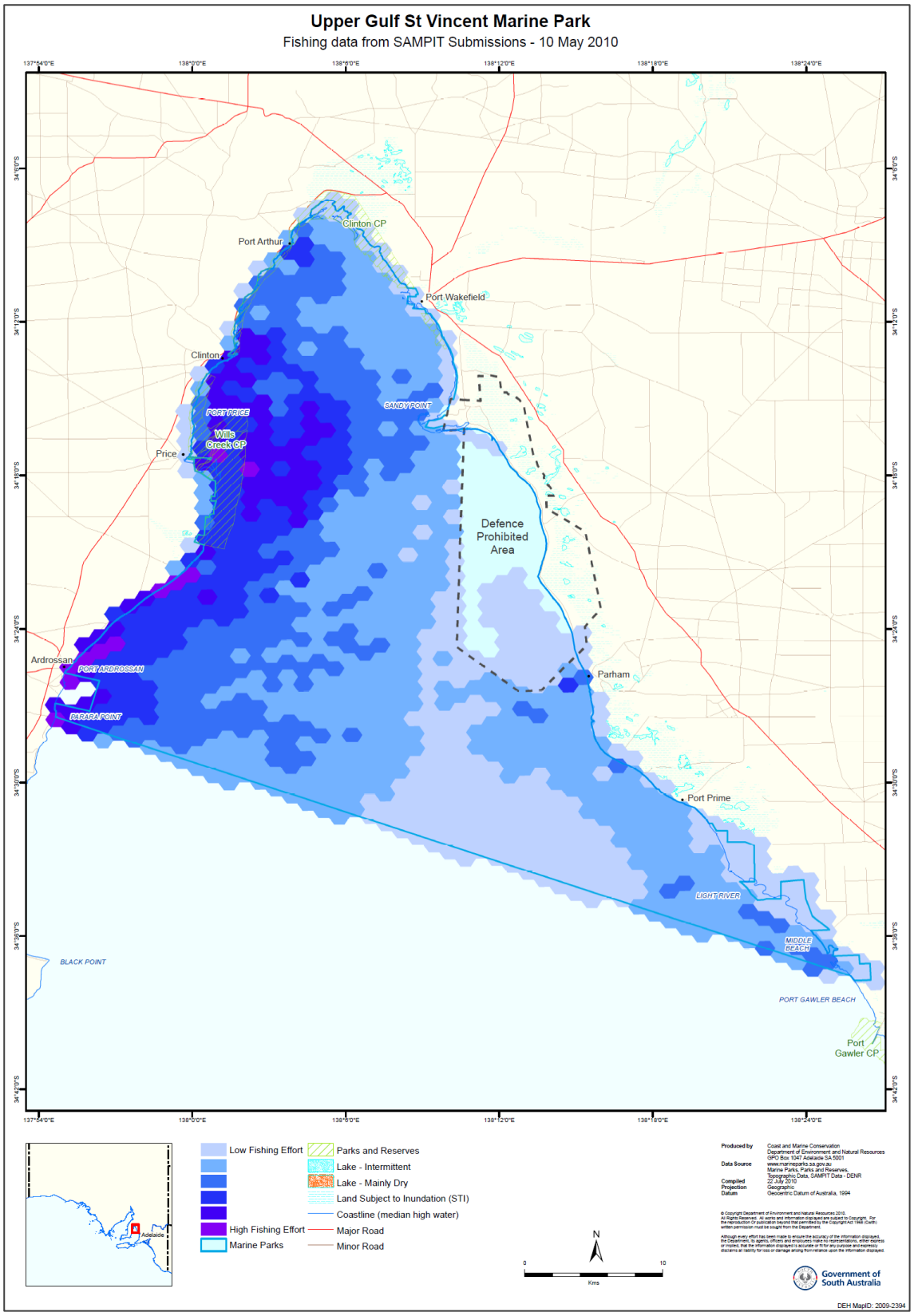
Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing occurred throughout the Upper Gulf St Vincent Marine Park, particularly along the western side from Ardrossan to Port Arthur (Appendix Figure 2-28). An area at Port Arthur with shore access was excluded from recreational fishing restrictions in the Clinton Wetlands SZ to accommodate shore-based fishing. Shore-based line fishing is now prohibited in the Clinton Wetlands SZ (except at Port Arthur) but most of the shoreline adjacent to this SZ is inaccessible or difficult to fish due to saltmarsh and mangroves. With regard to recreational boat fishing, some nearshore and offshore areas have been lost to recreational boat fishers within Clinton Wetlands SZ.

[16] https://birdssa.asn.au/location/clinton-conservation-park-port-arthur/

Appendix Figure 2-28 SAMPIT map showing intensity of fishing prior to SZ implementation



Source: DENR 2010f (SAMPIT)

It is unclear how important these areas were for recreational boat fishers (Bryars et al. 2016a). Feedback from the South Australian Recreational Fishing Advisory Council on the draft sanctuary zoning indicated that it was important to protect the Clinton Wetlands SZ as it is known as a Garfish spawning ground (Bailey et al. 2012c).

What does the community value about the SZ?

Feedback from the South Australian Recreational Fishing Advisory Council on the draft sanctuary zoning indicated that it was important to protect the Clinton Wetlands SZ as it is known as a Garfish spawning ground (Bailey et al. 2012). Recreational fishing around Port Arthur is valued (Bailey et al. 2012c, DENR 2010f, DEWNR 2012a).

Submissions to the zoning identified the area between Port Arthur and Port Clinton as a 'hotspot' for MSF Haul Net Fishery. Likewise, submissions to the zoning identified the SZ represented the healthiest example in the GSV of inverse estuary system (DEWNR 2012a).

Clinton Conservation Park is situated at the northern end of GSV and is recognised in the Directory of Nationally Important Wetlands. It covers over 18 km^2 and supports samphire and chenopod shrublands, mangroves and tidal flats. It is the largest reserve in GSV and one of the most significant sites in terms of shorebirds (Birds SA 2018, Purnell et al. 2017).

What are the non-market values of the SZ?

Scientific and wilderness value

It is a wetland of national significance, providing feeding and resting habitat sites for migratory shorebirds protected under international treaties and a known nursery area for marine species.

Clinton Conservation Park covers over 18 km^2 and supports samphire and chenopod shrublands as well as mangroves and tidal flats. It is the largest reserve in GSV, and one of the most significant sites in terms of shorebirds (Purnell et al. 2017).

Existing partnerships and monitoring

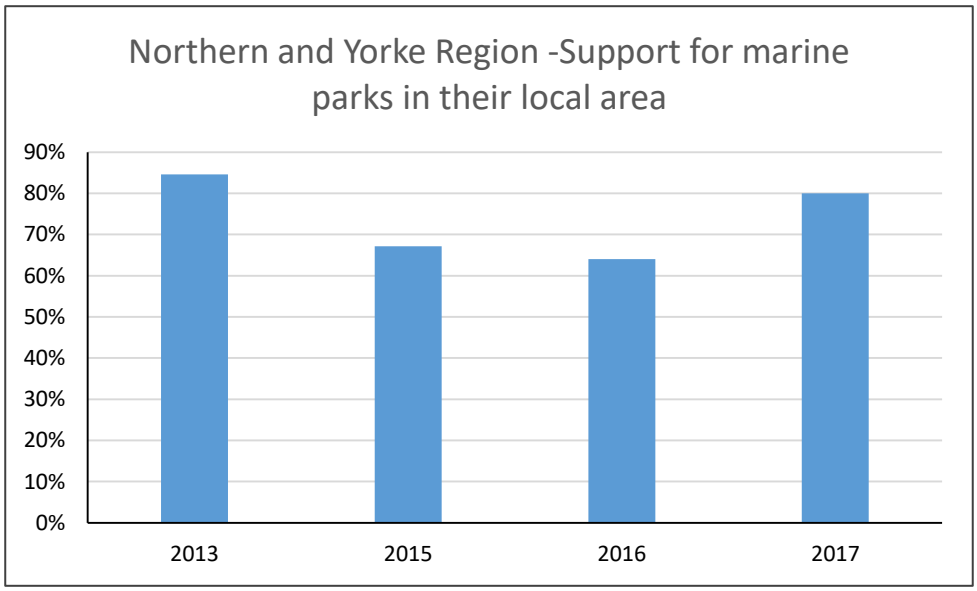
Birdlife Australia undertakes annual shorebird surveys of the SZ and adjacent Clinton Conservation Park, maintaining important time series of data (from 2009) on the distribution and abundance of shorebird species (see Purnell et al. 2018).

Have social values changed due to the SZ?

Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the Northern and Yorke region over the period 2013 to 2017 has fluctuated around 80 per cent (initially 85 per cent in 2013, dropping to 65 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a)[17] (Appendix Figure 2-29).

[17] DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

Appendix Figure 2-29 Northern and Yorke support for marine parks in local area



Source: DEWNR 2017a

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening part of the SZ to different fishing activities?

Opening the SZ to different fishing activities would increase the opportunity for recreational fishing, particularly boat-based fishing.

It would also be supported by the commercial fishing industry. However, based on consultation leading up to the zoning (DEWNR 2012a), recreational fishing and conservation sectors expressed opposition to the return of commercial netting and crabbing to the SZ.

Habitat Protection Zone status

What impact would there be to the social values of opening part of the SZ to (non-fishing) activities allowed in the HPZ but not a SZ?

Due to the shallow water environment, restricted water flows and restricted coastline access, it is unlikely that activities such as aquaculture and other coastal developments (e.g. jetties, wharves, etc.) would occur in the location of the Clinton Wetlands SZ in the future; and the impact on social values from opening the SZ to (non-fishing) activities allowed in the HPZ is expected to be negligible.

Dredging that may occur in the Port Wakefield River was accommodated in the SZ zoning and falls outside the current boundaries of the SZ.

A.2.4.5. Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

Clinton Wetlands SZ is dominated by extensive seagrass meadows with fringing samphire and mangroves with areas of beach, intertidal flats and subtidal sand plains. Figure 3-42 in BDO EconSearch 2018 provides a map of the main benthic (subtidal) habitats of the Upper Gulf St Vincent Marine Park. Appendix Table 2-25 and Appendix Table 2-26 provide estimates of the benthic (subtidal) and shoreline (intertidal) habitats in the Clinton Wetlands SZ.

Appendix Table 2-25 Benthic (subtidal) habitats, Clinton Wetlands SZ

Habitat	Area (km^2)	% SZ
Mangrove	5.0	8.4
Seagrass	44.9	75.6
Unmapped	0.3	0.4
Saltmarsh	5.6	9.5
Sand	2.2	3.8
Other coastal features	1.4	2.3

Source: DEWNR (2015c, d, e, f) & Miller et al. (2009).

Appendix Table 2-26 Shoreline (intertidal) habitats, Clinton Wetlands SZ

Habitat	Length of shoreline (km)	% SZ
Mixed beach	1	5
Mangrove	21	95

Source: DEWNR (2015c, d, e, f) & Miller et al. (2009).

Seagrass forms the largest area of habitat within Clinton Wetlands SZ growing in dense meadows in shallow, warm water. Sand habitat is prevalent across the SZ, with areas of beach, intertidal flats and subtidal sand plains. The Port Clinton area has the most significant undisturbed saltmarsh community in the GSV region (DENR 2010f). Large stands of mangrove habitat occur at Port Clinton, a Wetlands of National Importance (Department of the Environment 2018), and Port Wakefield.

Historically, extensive oyster reefs would have existed within the SZ but are currently not present (Alleway and Connell 2015).

The many habitats located within the Upper Gulf St Vincent Marine Park support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The Upper Gulf St Vincent Marine Park is used by a number of shark species, including dusky whaler, smooth hammerhead, white shark and bronze whaler (DENR 2010f). Gummy and whaler sharks are caught in Upper Gulf St Vincent Marine Park by the South Australian MSF (Fowler et al. 2012, 2013b, 2014b). It is assumed that some of these species move through the Clinton Wetlands SZ at times.

Mammals

The Upper Gulf St Vincent Marine Park is used by a number of marine mammal species, including the nationally protected bottlenose dolphin (DENR 2010f). These species are transient, visiting the Upper Gulf St Vincent Marine Park to reproduce or feed. It is assumed that some of the transient species move through the Clinton Wetlands SZ at times.

Seabirds and shorebirds

Throughout the marine park there are many important sites for local and migratory shorebirds, as well as seabirds (DENR 2010f).

Mangroves provide habitat for a variety of important bird species such as the state rare glossy ibis and the state *rare* musk duck as well as for breeding rookeries of species such as pied cormorants (DENR 2010f).

The Upper Gulf St Vincent Marine Park is used by a number of seabird species, including Caspian tern, fairy tern and pied cormorant (DENR 2010f). Some of these species are resident while others are more transient, visiting the Upper Gulf St Vincent Marine Park to rest, breed and/or feed.

The Upper Gulf St Vincent Marine Park is used by a number of shorebird species for breeding and feeding, including pied and sooty oystercatchers, greater sand plover, grey plover, terek sandpiper, red knot, red-necked stint, sharp-tailed sandpiper, eastern curlew, curlew sandpiper and masked lapwing (DENR 2010f, Purnell et al. 2015). Some of these species are resident and others migrate to the Upper Gulf St Vincent Marine Park from interstate or overseas. GSV provides a diverse range of feeding, breeding and roosting habitats (Purnell et al. 2015), including the Clinton Wetlands of National Importance (Department of the Environment 2018)[18].

Fish Communities

The main information on fish communities in this SZ comes from the Marine Parks BRUVS monitoring program (Miller et al. 2017). In 2015, BRUVS surveys were conducted in the Clinton Wetland SZ and adjacent HPZ. A total of 13 species were recorded during the surveys comprising 11 species of fish and two crab species (Appendix Table 2-27). Striped trumpeter (*Pelates octolineatus*) were the most abundant species recorded, accounting for more than 70 per cent of the total fish abundance. Other fish species recorded, e.g. weedy whiting, toadfish and blue swimmer crabs, are typical of seagrass and soft sediment habitats (Appendix Table 2-27).

Appendix Table 2-27 Species list, BRUVS survey, Clinton Wetlands SZ, 2015

Species	Common name	Total no.
Pelates octolineatus	Striped trumpeter	403
Torquigener pleurogramma	Toadfish	68
Trachurus novaezelandiae	Yellowtail Scad	31
Pagrus auratus	Snapper	24
Portunus armatus	Blue Swimmer Crab	18
Heterodontus portusjacksoni	Port Jackson shark	7
Acanthaluteres spilomelanurus	Bridled leatherjacket	4
Neoodax balteatus	Weedy whiting	3
Dinolestes lewini	Yellowfin pike	2
Upeneichthys vlamingii	Red mullet	2
Arripis georgianus	Australian herring	1
Myliobatis australis	Eagle ray	1
Ovalipes australiensis	Sand Crab	1

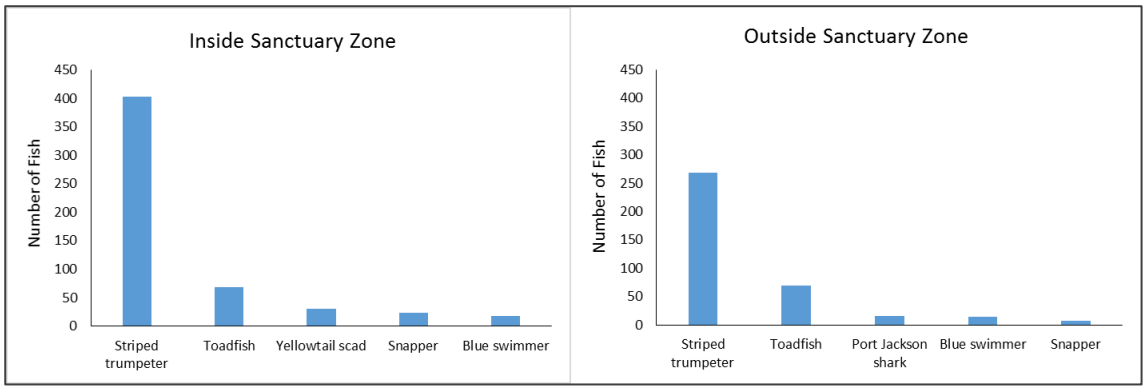
Source: DEW, unpublished data.

Fish assemblages were similar inside the Clinton Wetlands SZ compared to the adjacent HPZ (Appendix Figure 2-30). Four of the top five species were the same with similar levels of abundance indicating that the SZ captures the biodiversity on offer.

Appendix Figure 2-30 Abundance of most common species captured by BRUVS inside and outside the

[18] Baseline information on shorebirds relevant to the Upper Gulf St Vincent Marine Park includes: Diversity and abundance of shorebirds in Gulf St Vincent were surveyed between 2007/08 and 2014/15, including sites within the Upper Gulf St Vincent Marine Park at Bald Hill, Light Beach, Middle Beach, Port Parham, Webb Beach, Port Arthur, Port Clinton, Port Prime, Thompsons Beach North, Thompsons Beach South and Port Gawler Seafront (Purnell et al. 2015). These data are a subset of an ongoing statewide dataset that is maintained by the Shorebirds 2020 Project (BirdLife Australia 2015).

Clinton Wetland SZ



Source: DEW, unpublished data.

How does the biodiversity compare to other areas?

The area in which the Clinton Wetlands SZ is located is an important nursery habitat for species with pelagic larvae such as King George whiting. Juvenile King George whiting settle into seagrass beds for 2-3 years before migrating south down Gulf St. Vincent to deep water breeding areas (Fowler et al. 2002).

Likewise, it is an important nursery area for Yellowfin whiting (Ferguson 2000), a fished species, which are primarily found in the upper half of SA's gulfs (Connolly et al. 2005).

Biodiversity comparisons are restricted to where DEW have comparable datasets, e.g. from the Marine Parks BRUVS and UVC monitoring programs.

Species richness

Clinton SZ had relatively low fish species richness compared to other SZs surveyed, with a mean of 5.75 species recorded per BRUV drop (Appendix Figure 2-12). The fish species richness was however comparable to other SZs dominated by seagrass habitats (e.g. Port Gibbon, Bay of Shoals).

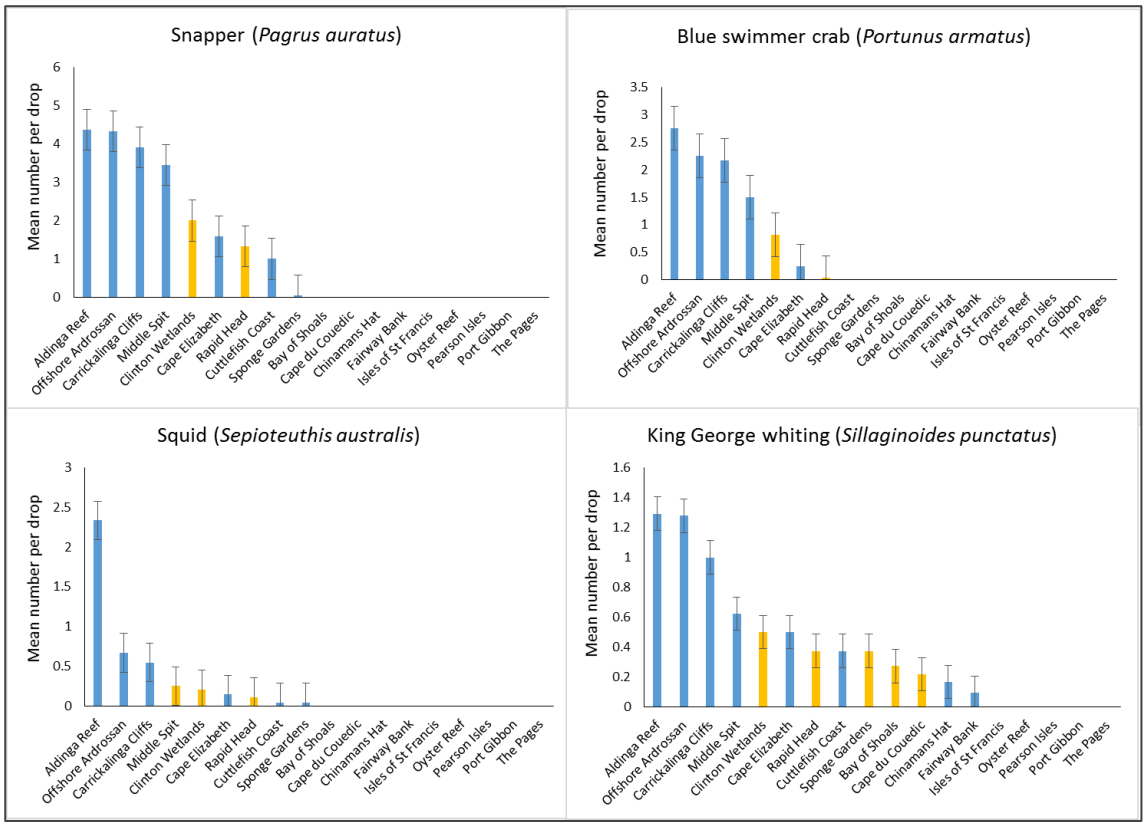
Fished species

The abundance of commercially and recreational targeted fish species in the Clinton SZ was about average in comparison with other SZs assessed as part of the BRUV surveys (Appendix Figure 2-17). Snapper (Pagrus auratus) was the most significant commercially and recreational targeted fish species recorded in this SZ.

Indicator Species

In general, Clinton SZ had moderate abundances of three out of the four indicator species for seagrass habitat compared to other SZs with only one of the indicator species Southern calamari (Sepioteuthis australis) not being recorded from BRUVS surveys (Appendix Figure 2-31). Snapper (Pagrus auratus) and blue swimmer crabs were considered the 5th and 4th highest at Clinton SZ compared to other SZs for these species.

Appendix Figure 2-31 Mean number of seagrass indicator species by SZ, BRUV survey[a]



[a] Surveyed Focus SZs highlighted in yellow.
Source: DEW, unpublished data.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Clinton Wetlands SZ include:

- The entire top of gulf ecosystem from land to sea including saltmarsh, mangroves, intertidal seagrass and dense shallow seagrass meadows.
- Aside from mangroves, other shoreline types represented are shell grit beaches and sand flats

Important features of the SZ include:

- Seagrass meadows provide an important nursery, breeding, feeding and possible spawning habitat for blue swimmer crabs, western king prawns, whiting, garfish and snapper.
- The mangroves are an important area for juvenile yellow-fin whiting.
- The saltmarsh in this zone is the most significant, undisturbed area of saltmarsh in the GSV region.
- This hyper-saline region is unique due to the tidal extremes of the gulf waters and inverse estuarine flow.
- The saltmarsh, mangrove and intertidal habitats provide important nesting and feeding grounds for resident shorebirds, as well as feeding grounds for migratory shorebirds whose habitats are required to be protected under international treaties.
- The zone partially overlays Clinton Conservation Park, establishing a protected corridor between the land and sea.
- The area is recognised as a coastal wetland of national importance.
- Home to the vulnerable Samphire Thornbill which is thought to be endemic to the northern shores of GSV.

Have there been changes or are changes predicted due to the SZ?

Observed changes

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (see Section 10.2.5, DEWNR 2017a). No changes have been detected yet as data has only been collected on one occasion since the Clinton Wetlands SZ became operational in 2014. Changes are not predicted to be measurable for 5 to 10 years (DEWNR 2017a, Delean 2017).

Predicted changes

Predicted changes that apply to all SZs are described in Section A.4.1. Predicted changes to indicator species relevant to the North Neptune Islands SZ are described below.

Intertidal seagrass

Razorfish, when considered in isolation, were predicted to increase in size and abundance over the next 20 years inside the Clinton Wetlands SZ (Bryars 2013).

Subtidal seagrass

Blue swimmer crab, King George whiting, Southern calamari and Southern garfish, when each considered in isolation, were predicted to temporarily increase in size and/or abundance while inside the Clinton Wetlands SZ (Bailey et al. 2012a).

What current threats and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The MSF was the principal fishery that previously used the Clinton Wetlands SZ. There was some use, albeit minor, of the SZ by the Blue Crab and Charter Boat Fisheries.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The MSF poses a threat (medium) to its target species. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

Existing Arrangement with Fishing Permitted

What impact would there be to the environmental values of opening part of the SZ to fishing activities?

A general overview of what impact to the environmental values of opening the SZ to different fishing activities is given in Section A.4.3.

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

Selective removal of target species

Opening the Clinton Wetlands SZ would have a negative impact on those species commonly targeted including, Kings George whiting, snapper, blue swimmer crab and garfish. It is difficult at this stage to estimate the flow on effects to overall ecosystem function but removal of these species will likely have some adverse impacts on biodiversity conservation.

Removal of other species caught as bycatch

Allowing marine scale netting into the Clinton SZ would result in increases in capture and potential mortality of bycatch species as netting is generally not as selective for target species as other fishing methods.

Harm to non-target species by fishing gear/activity

Dolphins commonly use the area and there have been mortalities associated with marine scale nets prior to the SZ becoming declared. It is likely that dolphin mortality via entanglement would increase if net fishing was allowed in the SZ.

Damage to habitats

Damage to habitats from allowing fishing would be limited as the fishing techniques used are generally considered to cause little habitat damage. There is the possibility of some damage to shallow seagrass meadows by vessel propellers.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Refer to Section A.4.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

Clinton SZ has been selected as a priority SZ for monitoring due to the extensive upper gulf seagrass meadows contained within it. Opening the SZ to fishing would reduce the utility of monitoring this SZ as removal of biomass by fishing would change the ecosystem function and thus our understanding of how intact marine ecosystems function.

Habitat Protection Zone status

What impact would there be to the environmental values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Refer to Section A.4.4 for an overview of the impact to environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ.

The Clinton SZ has several habitat types that are sensitive to disturbance such as seagrass, mangrove and saltmarsh including associated shorebird and migratory bird communities. It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would occur in the location of the SZ. However, if these activities were to occur then it is possible that they would impact on environmental values as outlined in Section A.4.4.

Refer to Section A.4.3 for an overview on what changing/downgrading the zoning would mean to the CAR system. The Clinton Wetlands SZ contains the only example of a shallow seagrass meadow located at the top of an inverse estuary gulf in the marine park network. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for a habitat type that is currently unique in the network.

If the zoning was changed, could an equivalent zone be placed elsewhere as an offset?

If the zoning was changed an equivalent zone could not be placed elsewhere as an offset. There is a comparable region at the head of SG (top of an inverse estuary in sheltered waters), however many fish species in Gulf St. Vincent, including commercially important species such as Southern garfish and Snapper are classified as separate breeding populations (Steer et al. 2018) and would not benefit from additional protection in other areas outside of the Gulf St. Vincent region.

A.2.5. Cape du Couedic Sanctuary Zone

A.2.5.1. Zone description

The Cape du Couedic (82km^2) in the Western Kangaroo Island Marine Park conserves a unique coastal environment with high biodiversity (Appendix Figure 2-32) and is within the Eyre Bioregion. The marine park adds social value to this area which contains the internationally renowned and iconic Admirals Arch and Remarkable Rocks.

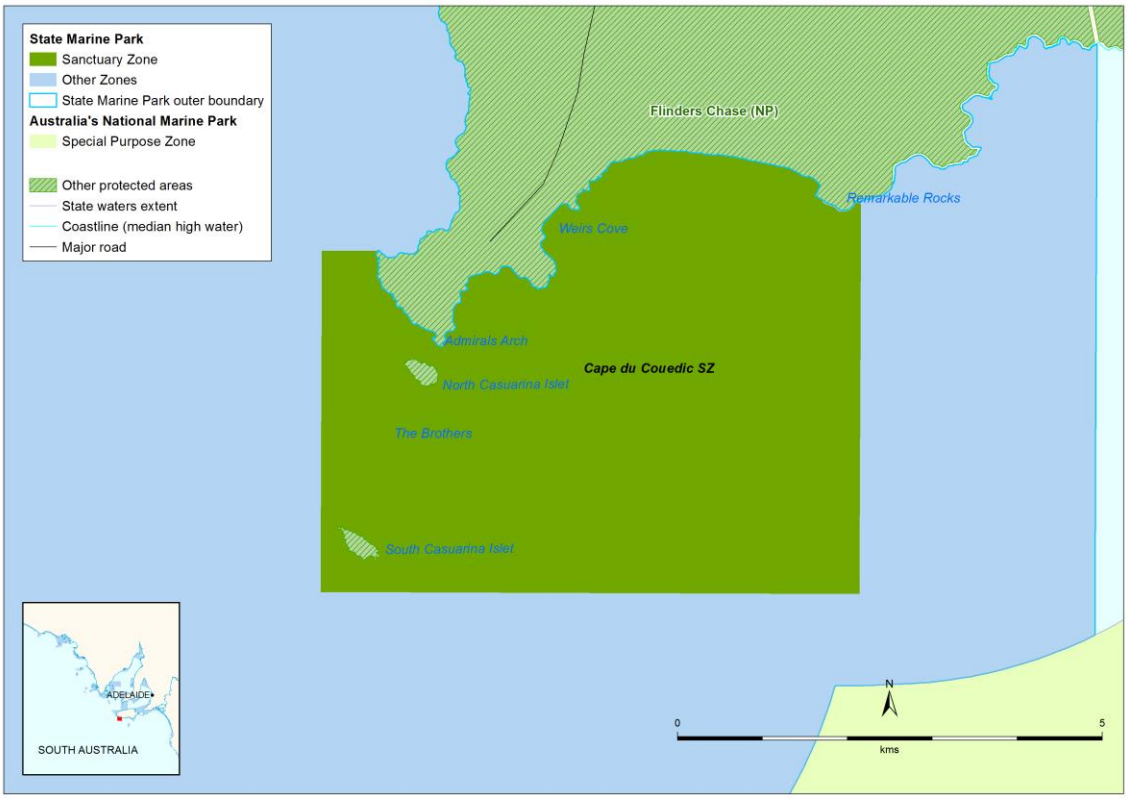
The SZ is located in an area with a seasonal upwelling that provide nutrients to support complex food webs. The SZ protects complex reefs extending at least 50 m deep as well as exposed bedrock, sand and soft bottom habitats. This productive area supports marine mammals, crustaceans, molluscs and a number of fish species.

The site is important as it is one of only two known South Australian breeding sites for Australian fur seals, a breeding site for Long-nosed fur seals and a breeding and haul out site for the vulnerable Australian sea lion. The SZ is a nesting area for the endangered white-bellied sea eagle and a breeding ground for seabirds such as Pacific gulls and crested and fairy terns.

This SZ also contains the red macroalgae *Anotrichium towinna* and *Leptoklonion fastigiatum* which have a limited range of distribution.

This SZ had minimal impact on recreational fishers due to its remote location and difficult accessibility, but was an area utilised by the commercial rock lobster and abalone industries. A SARDI fisheries study conducted in 2017 in the Cape du Couedic SZ revealed an increase in the abundance, size and biomass of rock lobsters protected by the SZ, a finding that is consistent with the predictions and indicators of change outlined in the Western Kangaroo Island Marine Park Baseline Report in 2016.

Appendix Figure 2-32 Cape du Couedic sanctuary zone



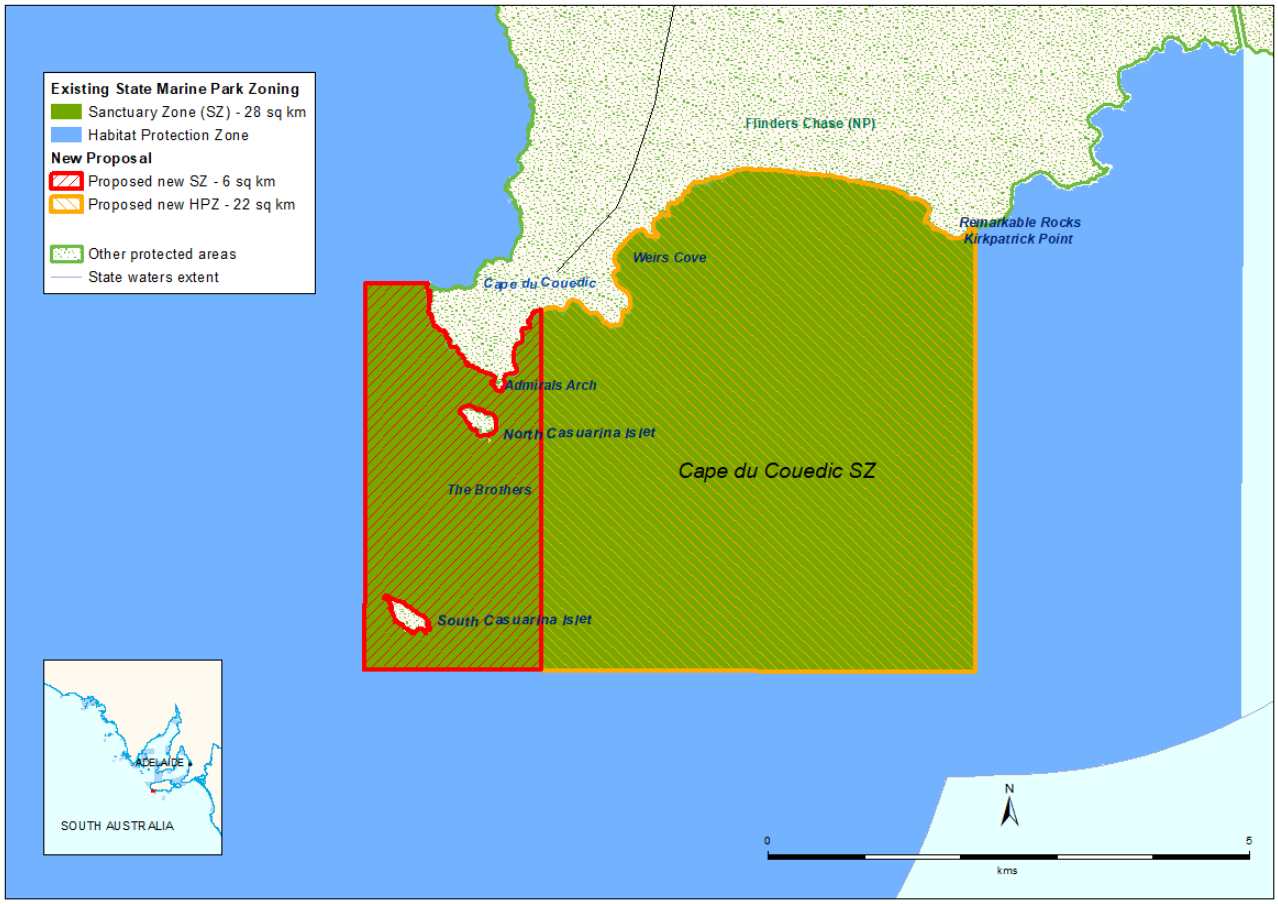
Source: Appendix 5

A.2.5.2. Proposed changes to zoning

The proposed amendment are to change the eastern part of the SZ to HPZ and merge with existing adjacent HPZ, to give a new SZ area of 6 km^2 and a new HPZ area of 22 km^2.

The proposed changes are described in Appendix Figure 2-33.

Appendix Figure 2-33 Proposed amendments, Cape du Couedic SZ



Source: maps supplied by DEW.

A.2.5.3. Economic values and impacts

A.2.5.3.1. Commercial fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The Central Zone Abalone and NZRL Fisheries were the principal fisheries that previously used the Cape Du Couedic SZ. There was some use, albeit minor, of the SZ by the Marine Scalefish and Charter Boat Fisheries.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced for the Cape Du Couedic SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-28. The total gross value of displaced catch in this SZ is estimated to be at least $644,000, distributed between the Abalone ($224,000), Rock Lobster ($419,000), Marine Scalefish ($1,000) and Charter Boat (confidential) Fisheries.

Displaced effort from the Charter Boat Fishery was confidential but would be minimal. In fact, for the entire Western Kangaroo Island Marine Park the value of displaced effort would be $19,000, the majority of which would occur in the Cape Borda SZ.

Displaced catch of Abalone ($217,000) and Rock Lobster (7,300kg) presented here are around half of the preliminary estimates ($464,000 for Abalone and 15,794kg for Rock Lobster) read in the Legislative Council in May 2014 (Appendix 6, BDO EconSearch 2018).

Appendix Table 2-28 Estimated catch or effort and GVP displaced by fishery, Cape Du Couedic SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	4,600	2.47%	224
Rock Lobster	7,300	1.12%	419
Marine Scalefish	17	0.03%	1
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[e] 2019 dollars.
Source: SARDI (by special request).

Historical catch rate data do not indicate that the reef habitat inside the SZ was any more productive for Rock Lobster fishing than reef habitat outside the SZ (McLeay et al. 2017 and Kosturjak et al. 2015). Nonetheless, Rock Lobster fishers believe that total historical catch volume was higher inside the Cape Du Couedic SZ than outside. However, due to the location and islands, the area inside the SZ was valuable for being able to fish under different weather conditions (Kosturjak et al. 2015).

In 2016, the total catch of Blacklip Abalone in the Central Zone Fisherywas 6.2t, reflecting TACC reductions in 2015 as a result of Marine parks SZs, as well as prior reductions in 2005-2006 in response to stock status (Burnell and Mayfield 2017). The Western Kangaroo Island SUAs are the most important fishing grounds for Blacklip Abalone. Historically the Western Kangaroo Island SAU provided between 40 and 70 per cent of the total Blacklip Abalone catch but in recent years has provided around 80 per cent.

Between 1994 and 2014 total catch of greenlip Abalone in the Central Zone Fishery was stable, averaging 47.6 t/yr. Over 2015 and 2016 catch has been slightly lower at approximately 46t/yr, reflecting TACC reductions following the introduction of marine park SZs (Burnell and Mayfield 2017).

What proportion of the SZ has habitat suitable for different fishing activities?

Most of the SZ is comprised of reef (see Section A.2.5.5) which is suitable habitat for Rock Lobster and Abalone and therefore those commercial fishing sectors have lost access to some fishing grounds. Historical catch data and a recent pot survey indicate that Rock Lobster are found throughout the SZ (McLeay et al. 2017), which in turn indicates wide-spread distribution of suitable reef habitat across the SZ. However, there are patches of sand which may be correlated with the deepest sections of the SZ between the Casuarina Islets and the sandy beach in the eastern part of the SZ.

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

Appendix Table 2-29 shows the economic impact on the regional economy of sanctuary zoning on the Central Zone Abalone and NZRL Fisheries. Impacts are based on the gross value of displaced catches (Appendix Table 2-28). Note the displaced effort in the Marine Scalefish and Charter Boat Fisheries was minimal and, hence the economic impact for this displaced effort has not been estimated.

Appendix Table 2-29 Regional economic impact of zoning, Cape Du Couedic SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.22	18%	0	0%	-0.17	42%	-0.22	34%
Rock Lobster	-0.42	33%	-3	50%	-0.06	14%	-0.14	22%
Downstream [b]	-0.19	15%	0	2%	-0.01	3%	-0.01	2%
Total Direct [c]	*-0.83*	*65%*	*-3*	*53%*	*-0.24*	*59%*	*-0.38*	*59%*
Total Flow-on [c]	*-0.44*	35%	*-3*	47%	*-0.17*	41%	*-0.26*	41%
Total [c]	**-1.28**	**100%**	**-6**	**100%**	**-0.41**	**100%**	**-0.64**	**100%**
Regional Total [d]	2,498.81		15,596		834.61		1,586.16	
Impact on Region	-0.1%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Fleurieu and Kangaroo Island State Government region.
Source: EconSearch analysis.

In aggregate, it was estimated that the impact of displaced catch in the Cape Du Couedic SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.64m in total GRP, which represents 0.1 per cent of the regional total ($1.6b in 2018/19).
- Approximately 6 fte jobs which represent less than 0.1 per cent of the regional total (15,596 fte jobs in 2018/19).
- Approximately $0.41m in household income, which represents 0.1 per cent of the regional total ($834.6m in 2018/19).

About 0.27 and 1.4 tonnes of shark hook and gillnet catch, respectively, from SZs within the Western Kangaroo Island Marine Park (Bailey et al. 2012b). There is a closure within the southern part of the park to protect breeding school shark and Australian sea lion populations (AFMA 2014), and fishing effort is now concentrated off Victoria (Georgeson et al. 2014).

What was the estimated impact on individual fishers versus the whole fishery?

4 licences and 7,910 units were removed from the NZRL Fishery as a result of the Commercial Fisheries Voluntary Catch /Effort Reduction Program.

No licences were removed from the Central Zone Abalone Fishery but 72.5 units were removed as a result of the Commercial Fisheries Voluntary Catch /Effort Reduction Program.

More than the estimated displaced catch has been removed from the fishery through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs, which based upon historical catch rate data appears to be the case for Rock Lobster (Kosturjak et al. 2015 and McLeay et al. 2017). No data have been published to confirm or reject this assumption for Abalone.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

For the Central Zone Abalone Fishery, it was estimated that 1.2 per cent of Greenlip and 11 per cent of Blacklip catch were derived from SZs (Ward et al. 2012a). A target reduction of 34 Greenlip quota units and 4 Blacklip quota units were sought through the buyback scheme. No voluntary surrender of Central Zone Abalone Fishery licences was forthcoming and the targeted reduction was subsequently shared evenly between the existing licence holders with a reduction of 62.1 Greenlip and 10.4 Blacklip units achieved. Thus more catch than required was removed through this process (Kosturjak et al. 2015).

Any compensation claims related to the SZ?

It is unknown if there are any compensation claims being investigated for this SZ.

Existing Arrangement with Fishing Permitted

What impact would there be to the fisheries values of opening part of the SZ to different fishing activities?

Part of the total gross value of displaced catch in this SZ would become available again for harvesting. This would be principally by the Central Zone Abalone and Northern Zone Rock Lobster (NZRL) Fishery and to a minor extent the Marine Scalefish and Charter Boat Fisheries. Appendix Table 2-30 presents the estimated displaced catch or effort and GVP for fisheries based on the proposed amendment (i.e. opening up part of the SZ). The total gross value of displaced catch in this SZ is estimated to be approximately $149,000, principally from the Rock Lobster ($97,000) and Abalone ($52,000) Fisheries. Overall, the opening of part of the SZ to different fishing activities is expected to reduce the GVP of the displaced catch by $495,000.

Appendix Table 2-30 Estimated catch or effort and GVP displaced by fishery, Cape Du Couedic SZ with proposed amendment

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	1,059	0.57%	52
Rock Lobster	1,681	0.26%	97
Marine Scalefish	4	0.01%	0
Abalone	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[b] 2019 dollars.
Source: SARDI (by special request).

Opening the Cape Du Couedic SZ to Abalone and Rock Lobster fishing would likely result in an initial increase in catch rates due to the increase in biomass that has occurred since fishing was ceased (McLeay et al. 2017). The catch rates would then likely decline and stabilise to levels seen outside the Cape Du Couedic SZ and across the western end of Kangaroo Island.

In theory the TACC for Rock Lobster and Abalone could be increased by the proportion that the Cape Du Couedic SZ contributed to historical catch and which was previously removed from the fishery through the commercial fisheries voluntary catch/effort reduction program. This would be a fisheries management decision.

In aggregate, it was estimated that the impact of rezoning in the Cape Du Couedic SZ will generate the following improvement of regional economic activity on an ongoing annual basis relative to current zoning (Appendix Table 2-29).

- Approximately $0.59m in total GRP, which represents less than 0.1 per cent of the regional total ($1.6b in 2018/19).

- Approximately 3 fte jobs which represent less than 0.1 per cent of the regional total (15,596 fte jobs in 2018/19).
- Approximately $0.40m in household income, which represents less than 0.1 per cent of the regional total ($834.6m in 2018/19).

Appendix Table 2-31 Regional economic impact of zoning, Cape Du Couedic SZ with proposed amendment

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.05	15%	0	0%	-0.04	539%	-0.05	93%
Rock Lobster	-0.10	28%	-2	65%	0.10	-1395%	0.08	-152%
Downstream [b]	-0.04	13%	0	1%	0.00	35%	0.00	6%
Total Direct [c]	*-0.19*	*57%*	*-2*	*66%*	*0.06*	*-821%*	*0.03*	*-53%*
Total Flow-on [c]	*-0.15*	43%	*-1*	34%	*-0.07*	921%	*-0.08*	153%
Total [c]	**-0.34**	**100%**	**-3**	**100%**	**-0.01**	**100%**	**-0.05**	**100%**
Regional Total [d]	2,498.81		15,596		834.61		1,586.16	
Impact on Region	0.0%		0.0%		0.0%		0.0%	

[a] Full-time equivalent jobs.
[b] Downstream activities consist of seafood processing, transport, retail trade and food services.
[c] Totals may not sum due to rounding.
[d] Eyre and Western State Government region.
Source: EconSearch analysis.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Due to the isolated and exposed location of the Cape Du Couedic SZ it is unlikely that there would be any future activities such as aquaculture or coastal developments. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.5.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

214,000 people visit Kangaroo Island each year and nearly 80 per cent of them visit Cape du Couedic in Flinders Chase National Park, making it the highest visited tourism destination on Kangaroo Island (Regional Australia Institute 2015).

Visitors list “a chance to see wildlife I don’t normally see” and “getting close to nature” as important reasons for visiting Kangaroo Island, with “seeing wildlife in their natural environment”, “seeing wildlife behaving naturally” and “an untouched natural environment” being the most important features of a wildlife encounter (Colmar Brunton 2017).

The Cape du Couedic precinct includes a number of iconic and internationally recognised destinations, such as Admiral’s Arch, the Remarkable Rocks and the Cape du Couedic lighthouse. The area is also featured as an overnight stop on the Kangaroo Island Wilderness Trail.

The area also offers heritage accommodation at the lighthouse keepers cottages and a number of walking trails, including the Cape du Couedic Hike, Lighthouse Heritage Walk, Weirs Cove Hike and Remarkable Rocks Walk.

The old store rooms at Weirs Cove and surrounding clifftops are commonly used by commercial tour operators as locations for setting up lunch for their guests.

Visitors to Cape du Couedic are provided with a number of wildlife viewing opportunities, including:

- A colony of long-nosed fur seals can be seen all year round on the rocky platforms surrounding the cape
- Kangaroos, echidnas, goannas, and tiger snakes are often seen from the walking trails
- White-bellied sea eagles, fairy terns, oystercatchers and a wide variety of other sea and shorebirds can be seen feeding or roosting
- On a seasonal basis, southern right whales and humpback whales can be seen migrating through the SZ.

Interpretive signage along the Admirals Arch boardwalk and at the lookout platforms helps to educate visitors about the importance of the marine environment and how marine park SZs play a vital role in protecting the habitats and ecosystems that exist within them.

What is the economic contribution of tourism activities that utilise the SZ?

An estimated 171,200 tourists visit the Cape du Couedic precinct annually (Regional Australia Institute 2015). Only a proportion of each visitor's trip to Kangaroo Island and associated expenditure can be attributed to visiting the precinct. Given the high profile attractions at the precinct, we assume that one night of each trip can be attributed to visiting it. Therefore, we attribute 171,200 visitor nights to the precinct. The local expenditure associated with this visitation is around $29.1 million, 33 per cent of expenditure by overnight visitors to Kangaroo Island) (TRA 2017).

Appendix Table 2-32 presents the estimated economic contribution to the Kangaroo Island economy of visitation attributable to the Cape du Couedic precinct in 2016/17. The contribution to GRP was $22.2 million, including $8.2 million from flow-on effects. The contribution to employment eas 308 fte jobs, including 75 from flow-on effects.

Appendix Table 2-32 Annual economic contribution of tourism activities in ro adjacent the Cape du Couedic SZ

Tourism activity adjacent the SZ			
Visitor nights (nights)	171,200		
Local expenditure ($m)	29.1		
Economic Contribution			
	Direct	Flow-on	**Total**
GRP ($m)	14.1	8.2	**22.2**
Employment (fte jobs)	233	75	**308**

Source: EconSearch analysis.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

DEW has installed new interpretive signage because of the existence of the SZ. Three new signs have been installed on the Admirals Arch boardwalk and one mural with an interpretative panel at the Flinders Chase Medical Centre. Four new signs and six updates to existing signs are planned for the precinct.

The existence of the SZ, paired with signage, can be expected to add educative value to existing activities in the precinct. No additional activities are expected to begin as a direct result of the SZ.

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.5.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with Fishing Permitted

What impact would there be to the tourism values of opening part of the SZ to different fishing activities?

Impacts to tourism activities of opening the SZ to fishing activities are likely to be negligible but could affect visitation negatively if fishing activities or events were to create negative media around threats (actual or perceived) to the environmental values protected by the SZ (e.g. marine mammal interactions with fishing vessels/ activities).

Habitat Protection Zone status

What impact would there be to the tourism values of opening part of the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

It is unlikely that activities such as aquaculture and coastal developments would occur in the location of the SZ and so it is expected that there would be no additional impacts (beyond those potential impacts described for the reintroduction of fishing) from opening part of the SZ to (non-fishing) activities allowed in an HPZ.

A.2.5.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

The Kangaroo Island Wilderness Trail is a 3-day/2-night walking trail that, in parts, runs adjacent to the Cape du Couedic SZ. Around 2,000 walkers use the trail each year (DEWNR 2017b).

Approximately 171,000 people visit Cape du Couedic in Flinders Chase National Park. The Cape du Couedic precinct includes a number of iconic and internationally recognised destinations, such as Admiral's Arch, the Remarkable Rocks and the Cape du Couedic lighthouse.

There is limited surfing with some surfing at breaks on the western side of Cape du Couedic at Spooks and Rockies adjacent to the SZ. Cape du Couedic is too exposed and rugged for recreational diving (DEWNR, pers. comm.).

Existing Arrangement

Was recreational fishing impacted by the SZ?

There was minimal shore-based or boat based recreational fishing in the SZ prior to zoning due to inaccessibility and rough sea conditions. Recreational fishing was not impacted by the zoning (Bryars et al. 2016b).

What does the community value about the SZ?

At the local level, the community values the ongoing protection of the Casuarina Islets, particularly the Australian fur seal and Australian sea lion colonies located there. The area is also valued for the productive fishing grounds for the NZRL and Central Zone Abalone Fisheries. For example, the Kangaroo Island Marine Park Local Advisory Group provided minority support for a zone including the Casuarina Islets and connecting to Cape de Couedic and majority support for no zone at this location. It was noted that the area is important for Australian fur seal and Australian sea lion populations and consideration was paramount in the management plan (KIMPLAG 2011).

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for Cape du Couedic were significant in number. A total of 6,501 (75 per cent) of the 8,649 respondents commented specifically on the Western Kangaroo Island Marine Park. None agreed with the proposed zoning as is, 6,371 (73 per cent) suggested changes to zoning to increase the conservation outcomes, 130 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 2,148 (25 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

The Casuarina Islets are part of the Ngurunderi Dreaming Story of the Ngarrindjeri people and are very culturally important to the Ngarrindjeri people[19] (Robinson 1990).

What are the non-market values of the SZ?

Nature-based experience and education value

Tourism is important to Kangaroo Island's economy[20]. Admiral's Arch and Remarkable Rocks are two of South Australia's most internationally recognised tourist drawcards. The SZ adds significant experience value to visitors seeking a nature-based tourism experience at Admiral's Arch and Remarkable Rocks.

Scientific and wilderness value

As described in Section A.2.5.5, Cape du Couedic SZ is rich in fish species, boasting the 6th highest number of mean fish species recorded per BRUVS drop for the SZs surveyed (Appendix Figure 2-12).

This SZ also adds significant experience value to visitors seeking a nature-based tourism experience at Admiral's Arch and Remarkable Rocks.

Existing partnerships and monitoring

A number of scientific (both professional and community-based) studies have and will continue to occur in or adjacent to the SZ. For example, in 2017 a collaborative study between DEWNR, PIRSA, SARDI and the SA NZRL Fishermen's Association was undertaken in the SZ to assess the effects of protection from fishing on the rock lobster population (McLeay et al. 2017, DEWNR 2017a).

Aboriginal cultural heritage

As described earlier in this section, the Casuarina Islets are part of the Ngurunderi Dreaming Story of the Ngarrindjeri people and are very culturally important to the Ngarrindjeri people.

Have social values changed due to the SZ?

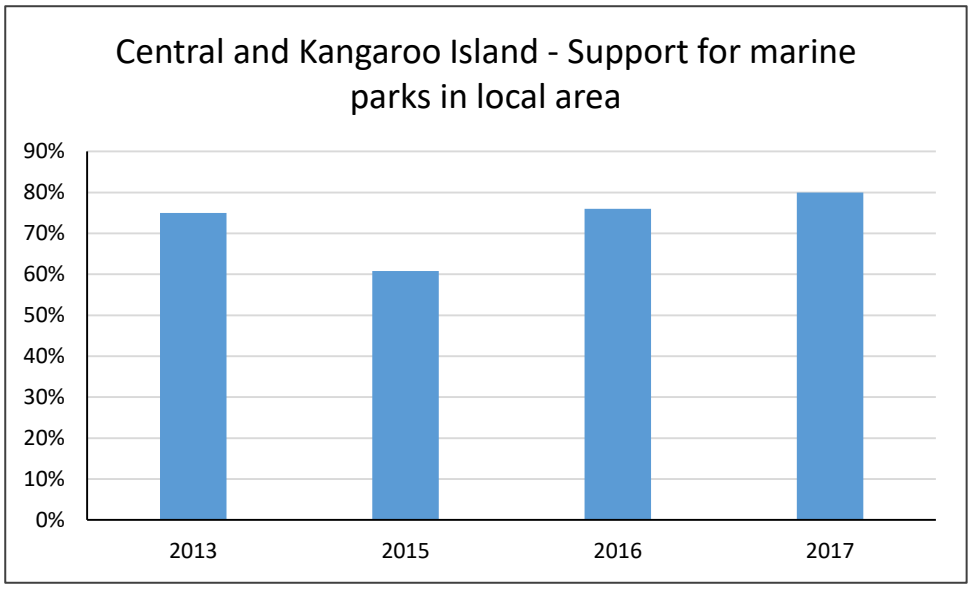
Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of Kangaroo Island over the period 2013 to 2017 has fluctuated around 75 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2015, before increasing to 80 per cent in 2017 (DEWNR 2017a[21]) (Appendix Figure 2-1).

[19] 'Karta' is a most sacred place for Ngarindjeri, Ramindjeri and Kaurna people from the mainland adjacent to Kangaroo Island. Elders of these tribes maintain their own oral history and traditions pertaining to the island even though most islands (including Kangaroo Island were not occupied by Aboriginal people by the time of white settlers). This cultural knowledge is largely confidential to these people, and has never been researched in detail. It would therefore be a mistake to consider that Kangaroo Island has been in any way divorced from living Aboriginal culture, despite its mysterious past.

[20] The Kangaroo Island economy is significantly reliant on the tourism industry. Tourism contributes directly to 500 jobs and indirectly to 900 jobs on Kangaroo Island, 64.9 per cent of total employment (Regional Australia Institute 2015).

[21] DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

Appendix Figure 2-1 Kangaroo Island support for marine parks in respondents' local area



Source: DEWNR 2017a

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening part of the SZ to different fishing activities?

Opening up the SZ to rock lobster fishing would prevent future opportunities to undertake further rock lobster pot surveys as part of the long-term study to determine the effects of protection from fishing on the rock lobster population at Cape du Couedic (see McLeay et al. 2017). If the study were continued it would improve knowledge and support decision-making with regard to the marine parks monitoring program and to fisheries management.

As the SZ was not previously used by recreational fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in an increase in recreational fishing activity.

Habitat Protection Zone status

What impact would there be to the social values of opening the SZ to (non-fishing) activities allowed in the HPZ but not a SZ?

The impact on social values from opening the SZ to (non-fishing) activities allowed in an HPZ is expected to be negligible, as it is unlikely that activities such as aquaculture and other coastal developments would occur in the location of the SZ.

A.2.5.5. Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

Physical influences shape the type of habitats and species found in an area (DENR 2010g). Physical influences typical of the Western Kangaroo Island Marine Park relevant to Cape du Couedic SZ include:

- seasonal sea surface temperatures ranging from averages of 26°C in summer and 12°C in winter;
- the warm, relatively nutrient poor Leeuwin current from the west and the cold, fast flowing Flinders Current from the south-east;
- seasonal, nutrient rich upwelling;
- full exposure to strong winds and wave/swell conditions on the western and southern coasts of Kangaroo Island.

Cape du Couedic SZ is characterised by medium to high profile reefs dominated by large brown algae (Fucoid and Ecklonia) as well as mixed algal beds. An area of sand habitat overlying flat reef also exists inshore in the bay approximately 1 km offshore.

Figure 3-48 in BDO EconSearch 2018 provides a map of the main benthic (subtidal) habitats of the Western Kangaroo Island Marine Park. Appendix Table 2-33 and Appendix Table 2-34 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Cape du Couedic SZ.

Appendix Table 2-33 Benthic (subtidal) habitats of the Cape du Couedic SZ

Habitat	Area (km^2)	% SZ
Bare sand	6.6	24.0
Heavy limestone reef	21.1	76.0

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

Appendix Table 2-34 Shoreline (intertidal) habitats of the Cape du Couedic SZ

Habitat	Length of shoreline (km)	% SZ
Boulder beach		
Bedrock platform	6	50
Fine sandy beach	3	25
Unmapped	3	25

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

The habitats located within the Cape du Couedic SZ support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The Western Kangaroo Island Marine Park is used by a number of shark species, including blue shark, dusky whaler, smooth hammerhead, school shark, white shark, shortfin mako and porbeagle (DENR 2010g). It is assumed that some of these species move through the Cape du Couedic SZ at times.

Mammals

The Western Kangaroo Island Marine Park is used by a number of marine mammal species, including southern right whale, pygmy blue whale, sperm whale, pygmy sperm whale, dwarf sperm whale, pigmy right whale, beaked whale, short-finned pilot whale, false killer whale, Risso's dolphin, southern right whale dolphin, Australian sea lion, long-nosed fur seal (formerly Long-nosed fur seal), Australian fur seal, common dolphin and bottlenose dolphin (DENR 2010g). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed.

Australian sea lion

There is an Australian sea lion breeding site on North Casuarina Island within the Cape du Couedic SZ, with an estimated annual pup production of about 11 (Goldsworthy and Page 2009, Goldsworthy et al. 2014).

Australian fur seal

For the Australian fur seal, most of the South Australian population is on Kangaroo Island and the nearby Casuarina Islands. There is a breeding site for the Australian fur seal on North Casuarina Island (Shaughnessy et al. 2014) and haul-out sites on the Casuarina Islets, Cape du Couedic and Nautilus Rocks within/adjacent to the Cape du Couedic SZ (DEH 2008).

Long-nosed fur seal

Haul-out sites for the long-nosed fur seal in Cape du Couedic SZ include Vennachar Point, South Casuarina Islet, Nautilus Rock, Nautilus North, North Casuarina Islet, Libke, Cape du Couedic, Admirals Arch, Spooks

North, Ladders South, Ladders North and Knife and Steel Point (Shaughnessy et al. 1994, Shaughnessy 1990).

There are breeding sites for the long-nosed fur seal at Cape du Couedic (12 sites), North Casuarina Island (2 sites) and East Remarkable Rocks (Shaughnessy et al. 2014).

Seabirds

The North Casuarina Islet is a known breeding area for the nationally protected Pacific gull, crested tern and rock parrot, while the South Casuarina Islet is used by the state rare ruddy turnstone, state rare sooty oystercatcher and Pacific gull for breeding (DENR 2010g). It assumed that these species utilise the Cape du Couedic SZ.

The state vulnerable southern giant petrel, as well as many migratory albatross species such as the nationally and state listed vulnerable shy albatross and the state endangered yellow-nosed albatross have been recorded in the area surrounding Flinders Chase National Park. Other species found there include the state rare Cape Barren goose, musk duck, fleshy-footed shearwater and eastern reef egret, and the state endangered fairy tern (DENR 2010g). It assumed that these species utilise the Cape du Couedic SZ.

Offshore islands including Kangaroo Island are particularly important habitat for the state endangered white-bellied sea eagle. There are 19 white-bellied sea eagle territories on Kangaroo Island with one in the vicinity of Cape du Couedic SZ. There are also 14 osprey territories on Kangaroo Island with one located in the vicinity of Cape du Couedic SZ (Dennis et al. 2011a). It assumed that these species utilise the Cape du Couedic SZ.

Shorebirds

The Western Kangaroo Island Marine Park is used by a number of shorebird species for feeding, including pied oystercatchers, red necked stint, grey plover, sharp-tailed sandpiper and hooded plover (DENR 2010g, Watkins 1993). Areas of international or national importance have been identified on Kangaroo Island outside the Western Kangaroo Island Marine Park for the shorebirds listed above (Watkins 1993). Some of these species are resident while others are migratory from interstate or overseas. It assumed that these species utilise the Cape du Couedic SZ.

Fish Communities

The main information on fish communities in this SZ comes from the Marine Parks BRUVS monitoring program (Miller et al. 2017). In 2015, BRUVS surveys were conducted in the Cape du Couedic SZ. A total of 34 species of fish and southern rock lobster were recorded during the surveys (Appendix Table 2-35). The fish community is typical of exposed deep water reef areas with reef species from the Labridae (wrasse) and Monacanthidae (leatherjackets) being common. The SZ was notable for the high number of barber perch (*Caesioperca rasor*) which was four times more abundant than the next most common fish species (Appendix Table 2-35). The barber perch is a pelagic schooling fish found only in southern Australia and form large schools on sheltered coastal reefs, where they feed on plankton above rocky reefs, outcrops and drop-offs (Bray 2018).

Appendix Table 2-35 Species list, BRUVS survey, Cape du Couedic SZ, 2015[a]

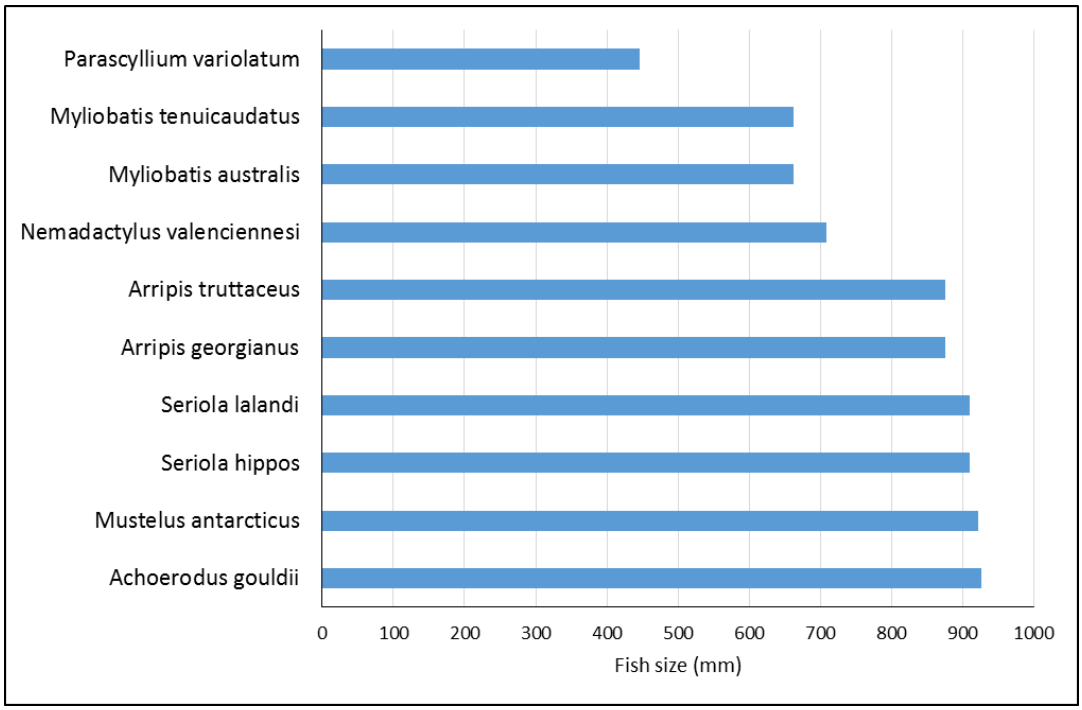
Species	Common name	Total no.
Caesioperca razor	barber perch	264
Arripis truttaceus	Western Australian salmon	64
Notolabrus tetricus	bluethroat wrasse	31
Centroberyx gerrardi	bight redfish	27
Centroberyx lineatus	swallowtail	20
Pictilabrus laticlavius	senator wrasse	15
Dinolestes lewini	yellowfin pike	12
Trachurus novaezelandiae	yellowtail scad	10
Cheilodactylus nigripes	magpie perch	9
Meuschenia hippocrepis	horseshoe leatherjacket	7
Nemadactylus valenciennesi	blue morwong	7
Meuschenia flavolineata	yellowstriped leatherjacket	5
Olisthops cyanomelas	herring cale	5
Parascyllium variolatum	varied carpetshark	4
Scorpis aequipinnis	sea sweep	4
Achoerodus gouldii	western blue groper	3
Heteroscarus acroptilus	rainbow cale	3
Meuschenia freycineti	six-spined leatherjacket	3
Austrolabrus maculatus	black-spotted wrasse	2
Meuschenia galii	bluelined leatherjacket	2

[a] 20 most abundant species shown out of a total of 34 species.
Source: DEW, unpublished data.

Largest fish

Also of note was the relatively high number of large fish recorded in the BRUVs survey. A blue groper (Archoroderus gouldii) was the largest fish recorded at 925 mm in length with several other species including gummy shark (Mustelus antarcticus) and yellowtail kingfish (Seriola lalandii) recorded between 850 and 1000mm (Appendix Figure 2-34).

Appendix Figure 2-34 Largest fish recorded in the Cape du Couedic SZ, 2015



Source: DEW, unpublished data.

How does the biodiversity compare to other areas?

Biodiversity comparisons are restricted to where DEW have comparable datasets, e.g. from the Marine Parks BRUVS and UVC monitoring programs.

Species richness

In terms of fish species richness, Cape du Couedic SZ has the 6th highest number of mean fish species recorded per BRUVS drop for the SZs surveyed (Appendix Figure 2-12).

Large fish

Cape du Couedic SZ has relatively high number of large fish (>200mm) present (3rd highest) compared to other SZ that have been assessed (Appendix Figure 2-15).

Fished species

Based on the BRUV surveys, overall Cape du Couedic SZ had moderate to low abundances of fished species present compared to other SZs (Appendix Figure 2-17).

Sharks and rays

In terms of sharks and rays, Cape du Couedic SZ had low numbers recorded on BRUVS (Appendix Figure 2-19).

Indicator species

Overall Cape du Couedic SZ has relatively low abundances of the reef associated indicator species identified for BRUVS monitoring (Appendix Figure 2-20). Blue groper (Achoerodus gouldii) and blue throat wrasse (Notolabrus tetricus) were relatively numerous having the 5th highest abundance for both species, however there were very low numbers of the other four indicator species (Appendix Figure 2-20).

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Cape du Couedic SZ include:

- The habitat represented in this zone is characterised by exposed bedrock platform and sandy beach shoreline.
- The subtidal habitat includes rocky reefs extending to at least 50m deep and some soft-sediment habitats.

Important features of the SZ include:

- Complex food webs are influenced by seasonal upwelling creating a nutrient-rich environment.
- This zone contains highly productive near shore waters which supports seabirds, fur seals, whales, abalone, rock lobster and a large diversity of fish species.
- This area is an Australian sea lion haul-out location.
- A significant New Zealand fur seal breeding site is located within this zone, with up to eight breeding locations.
- This zone is one of only 2 known South Australian breeding sites for Australian fur seals.
- State endangered white-bellied sea eagles nest on the cliffs.
- Seabirds such as Pacific gulls and crested and fairy terns breed in this location during summer months.
- This zone contains populations of red macroalgae *Anotrichium towinna* and *Leptoklonion fastigiatum* which have a nationally recognised limited range.

Have there been changes or are changes predicted due to the SZ?

Observed changes

Research commissioned by the DEW Marine Parks Program and delivered by SARDI demonstrated large increases in the size and abundance of southern rock lobster upon removal of fishing when SZs were declared in October 2014 (McLeay et al. 2017). Positive population responses within the Cape du Couedic SZ were indicated by an 81 per cent increase in relative biomass and a 42 per cent increase in relative abundance compared to outside the zone after 28 months of protection from fishing (McLeay et al. 2017).

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (see Section 10.2.5, DEWNR 2017a). No changes have been detected yet for fish communities as data has been collected once since the Cape du Couedic SZ became operational in 2014. Changes are not predicted to be measurable for 5 to 10 years (DEWNR 2017a, Delean 2017).

Predicted changes

Subtidal reef

Rock lobster, greenlip abalone and blacklip abalone, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside Cape du Couedic SZ. Western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep are predicted to maintain size and abundance over the next 20 years inside the Cape du Couedic SZ (Bailey et al. 2012a, Bryars 2013).

What current and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The Central Zone Abalone and NZRL Fisheries were the principal fisheries that previously used the Cape Du Couedic SZ. There was some use, albeit minor, of the SZ by the Marine Scalefish and Charter Boat Fisheries.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The Rock Lobster and Abalone fisheries pose a threat (medium) to their respective target species. The Rock Lobster fishery poses a threat (medium) to bycatch of Australian sea lions. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk

of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

Existing Arrangement with Fishing Permitted

What impact would there be to the environmental values of opening part of the SZ to different activities?

Refer to Introduction Section A.4.3 for an overview of the impacts to environmental values of opening the SZ to different fishing activities.

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

Selective removal of target species

Opening the SZ would have negative impact on those species commonly targeted particularly lobster and abalone by removing biomass and selectively removing biomass from particular sizes. If fishing recommenced it is expected that rock lobster and abalone biomass and abundance would reduce to the levels that existed prior to establishment of the SZ with some impact on ecosystem function and biodiversity.

Removal of other species caught as bycatch

Rock lobster pots routinely capture non-target species including octopus (Maori octopus), a range of fish species (e.g. leatherjackets, McLeay et al. 2017) and occasionally seals/sea lions. The flow on effects of the removal of octopus and fish on biodiversity and ecosystem function is unknown, however the bycatch of Australian sea lions is considered a serious threat for this species (DEWNR 2012a). Australian Fisheries Management Authority (AFMA) set trigger limits for the bycatch of Australian sea lion. Southern Kangaroo Island is protected by a gillnet closure under the Australian sea lion Management Strategy. For the Australian sea lion management zone in closest proximity to the Cape du Couedic SZ (zone F) the trigger bycatch amount is 2 individuals with a total trigger of 15 across the range of the Australian sea lion population (AFMA 2015).

It is anticipated that capture of bycatch species would recommence if the Cape du Couedic SZ was opened for fishing.

Harm to non-target species by fishing gear/activity

Cape du Couedic SZ is the only location in the state that contains breeding colonies of three different pinniped species (Australian sea lion, Australian fur seal and long-nosed fur seal). There is one active state endangered white-bellied sea eagle nest adjacent to the SZ. Opening the SZ to fishing will increase vessel traffic and the use or fishing gear potentially increasing levels of disturbance and risk of entanglement for these species especially the vulnerable Australian sea lion.

Damage to habitats

Damage to habitats from allowing fishing (e.g. from anchoring) would be limited as the fishing techniques used are generally considered to cause little habitat damage.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Refer to Section A.4.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

Cape du Couedic SZ has been selected as a priority SZ for monitoring due to the high conservation values contained within it. Opening the SZ to fishing would reduce the utility of monitoring this SZ as removal of biomass by fishing would change the ecosystem function and thus understanding of how intact marine ecosystems function.

Habitat Protection Zone status

What impact would there be to the environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Refer to Section A.4.4 for an overview of the impact to environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ. The Cape du Couedic SZ has very high conservation value and several species are sensitive to disturbance such as white-bellied sea eagles and three species of pinniped (Australian sea lion, Australian fur seal and long nosed fur seal). It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would occur in the location of the SZ. However, if these activities were to occur then it is possible that they would impact on environmental values as outlined in Section A.4.4.

Refer to Section A.4.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Cape du Couedic SZ contains the only example of all three native pinnipeds occurring together and actively breeding. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for this collection of species that is currently unique in the network.

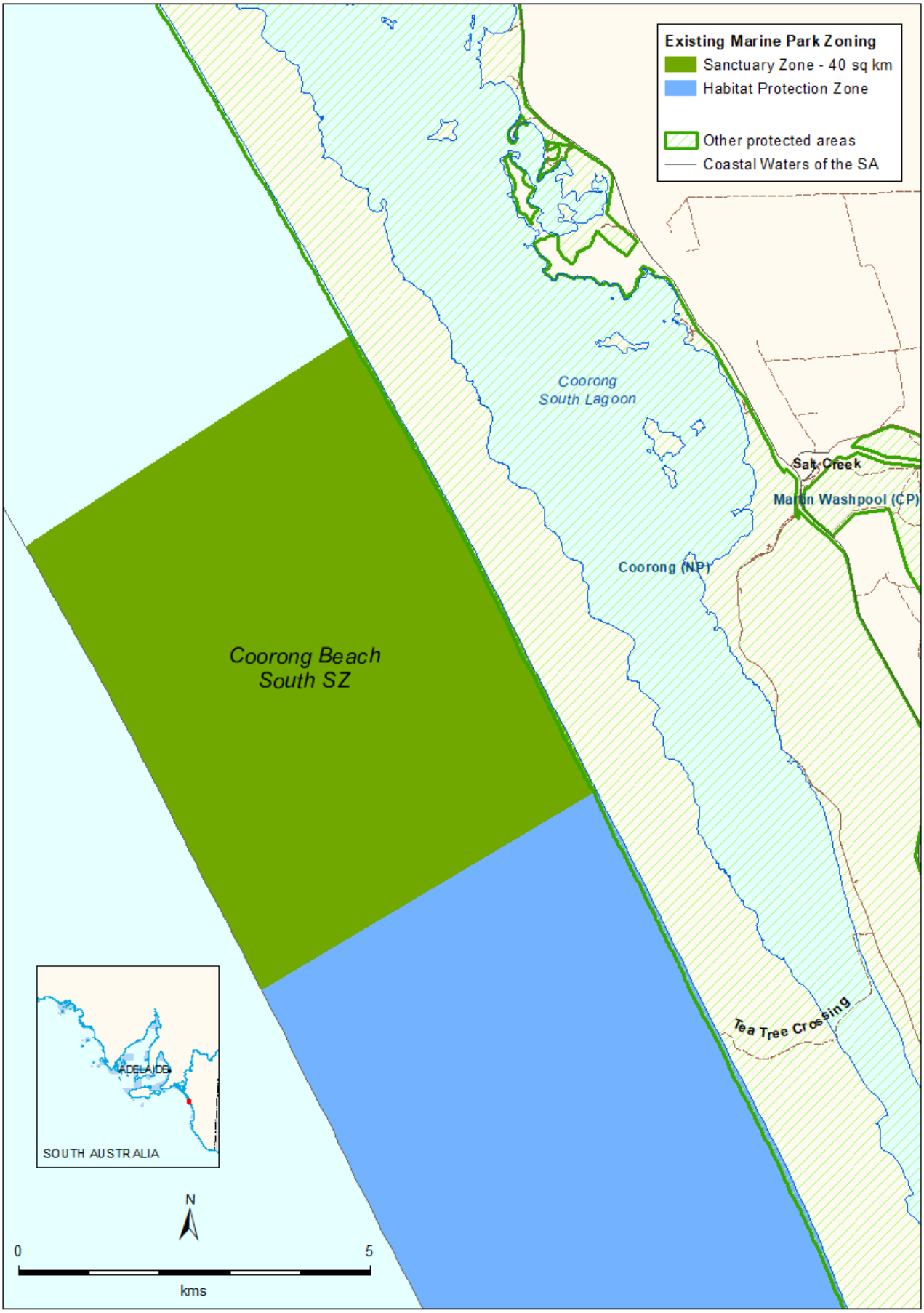
A.2.6. Coorong Beach South Sanctuary Zone

A.2.6.1. Zone description

The Coorong Beach South SZ (40km^2) in the Upper South East Marine Park (Appendix Figure 2-35) conserves a section of the longest continuous high energy dissipative beach in the southern hemisphere and lies within the Coorong Bioregion. The SZ extends from the intertidal surf zone out to deeper waters over 6 km offshore. The SZ is predominately comprised of exposed fine-medium sand beach, soft-bottom habitat and habitats that are yet to be mapped. It is a significant site for a diverse assortment of migratory and sedentary bird species including the red necked stint and vulnerable hooded plover. Little is known about the fish and macro-invertebrate species diversity, but the area is well known for fished species such as mulloway, Australian salmon, and pipi.

The SZ was located away from popular recreational fishing sites at Tea Cross Crossing and commercial fishing areas for pipi.

Appendix Figure 2-35 Coorong Beach South sanctuary zone



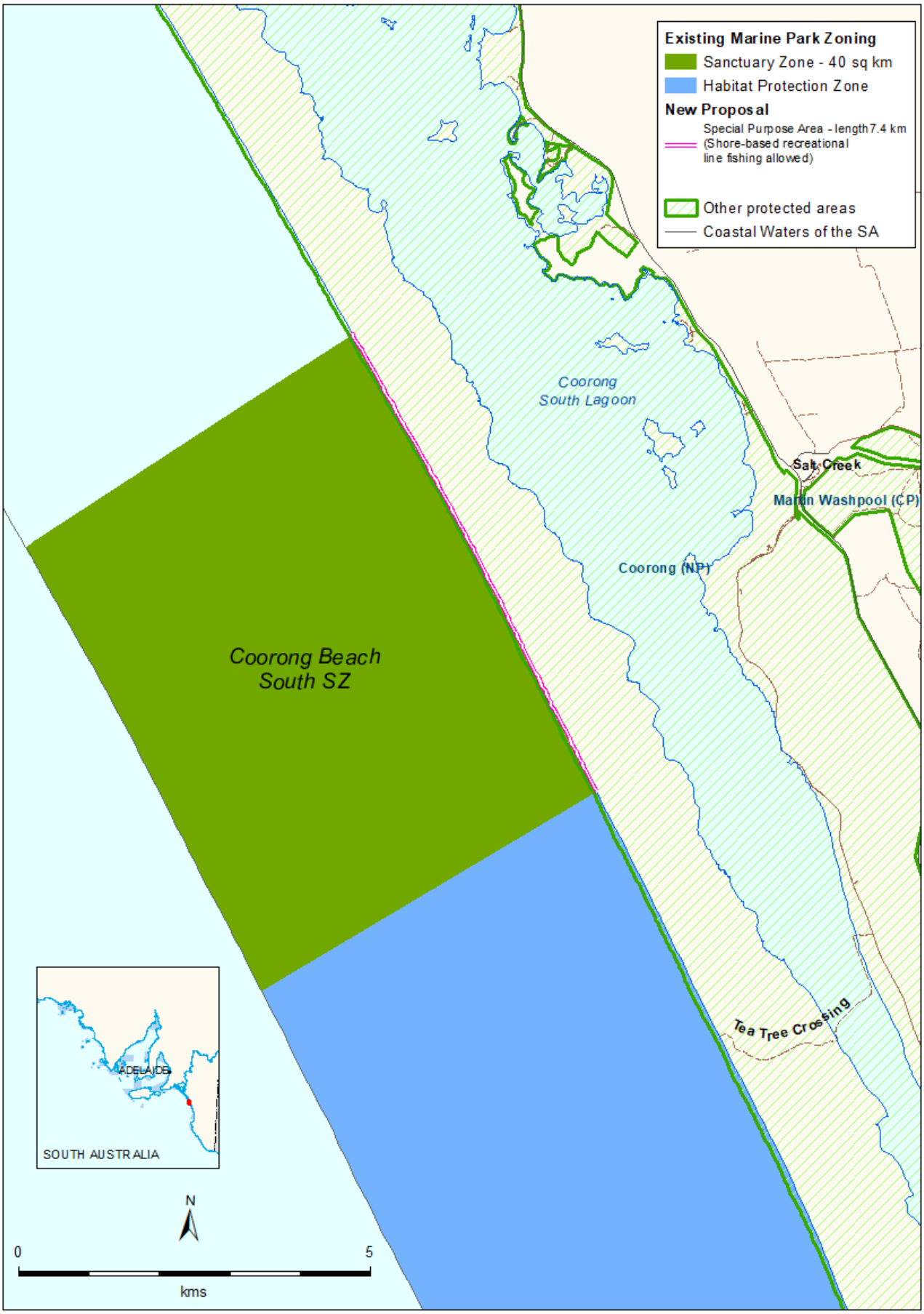
Source: Appendix 5

A.2.6.2. Proposed changes to zoning

The proposed amendments are to overlay a special purpose area to enable shore-based recreational line fishing (new length of 7.4 km). Other SZ restrictions are to remain and the area of SZ remains unchanged.

The proposed changes are described in Appendix Figure 2-36.

Appendix Figure 2-36 Proposed amendments, Coorong Beach South SZ



Source: maps supplied by DEW.

A.2.6.3. Economic values and impacts

A.2.6.3.1. Commercial fishing

Baseline

Which fisheries sectors previously utilised the SZ?

There was use by the MSF of the SZs within the Upper South East Marine Park previously. There was also minimal use by the Southern Zone Abalone, Southern Zone Rock Lobster and Charter Boat fisheries.

Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.

For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?

Estimates of catch and effort displaced for the Upper South East Marine Park for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-36. The total gross value of displaced catch in this Marine Park is estimated to be at least $13,000, distributed between the Marine Scalefish ($13,000), Rock Lobster (confidential), Abalone (confidential) and Charter Boat (confidential) Fisheries. A specific estimate of displaced catch and effort for the Coorong Beach South SZ was unavailable for this report.

Appendix Table 2-36 Estimated catch or effort and GVP displaced by fishery, Upper South East Marine Park

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	Confidential	Confidential	Confidential
Rock Lobster	Confidential	Confidential	Confidential
Marine Scalefish	32	0.05%	13
Charter Boat	Confidential	Confidential	Confidential

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).
[e] 2019 dollars.
Source: SARDI (by special request).

What proportion of the SZ has habitat suitable for different fishing activities?

This zone is predominately comprised of exposed fine-medium sand beach, soft-bottom habitat and habitats that are yet to be mapped. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ for non-reef associated species.

Existing Arrangement

What was the estimated economic value and impact to fishing of the SZ?

The GVP impacts for each affected fishery are relatively minor and the impact on the regional economy would be minor and have not been modelled.

What was the estimated impact on individual fishers versus the whole fishery?

Forty one pots were removed from the SZRL Fishery as a result of the Commercial Fisheries Voluntary Catch /Effort Reduction Program.

For the Marine Scalefish Fishery the targeted effort reduction was 2,461 fisher days and the accepted effort reduction was 2,661 fisher days as a result of the Commercial Fisheries Voluntary Catch /Effort Reduction Program.

More than the estimated displaced catch has been removed from these fisheries through the Commercial Fisheries Voluntary Catch/Effort Reduction Program, such that the remaining fishers now have greater relative access to the available biomass. This assumes that historical catch rates in this fishery were the same inside versus outside SZs, which based upon historical catch rate data appears to be the case for

Rock Lobster (Kosturjak et al. 2015 and McLeay et al. 2017). No data have been published to confirm or reject this assumption for Marine Scalefish.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ?

It should be noted that the detection of any impact of the SZ on the stocks and fisheries of impacted species is not possible because the scale of natural inter-annual variation is greater than the scale of the catch displaced.

These observations are based on estimated historical catches in the SZ. Current and future catch in all fisheries could potentially be lower/higher and the development of new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunities and therefore they were not measured.

Any compensation claims related to the SZ?

It is unknown if there are any compensation claims being investigated for this SZ.

Existing Arrangement with Recreational Shore-based Fishing Permitted

What impact would there be to the fisheries values of opening the SZ to recreational shore-based fishing activities?

Historical catches from commercial fisheries across the SZs in the Upper South East Marine Park were minor. Introduction of shore-based recreational line fishing in this SZ is unlikely to have an impact on commercial fishing either within this Marine Park or these fisheries as a whole.

A.2.6.3.2. Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

The annual Kingston Fishing competition occurs adjacent to this SZ.

What is the economic contribution of tourism activities that utilise the SZ?

This is unknown.

Existing Arrangement

Have there been changes or were changes predicted in tourism activities due to the SZ?

A very small amount of charter boat activity took place in the area before the SZ was established (see Section A.2.6.3.1). This activity ceased when the SZ was established, adding a constraint to some charter boat businesses.

Existing Arrangement with Fishing Permitted

What impact would there be to the tourism values of opening the SZ to shore-based recreational fishing activities?

A very small positive impact on tourism could be expected if shore-based recreational fishing activities were extended in the SZ.

A.2.6.4. Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational fishing around Tea Tree Crossing.

Existing Arrangement

Was recreational fishing impacted by the SZ?

This zone was designed to take avoid important recreational fishing locations near Tea Tree Crossing and towards 42 Mile Crossing.

What does the community value about the SZ?

A section of the Zone neighbours the Coorong National Park and the Coorong and Lakes Alexandrina and Albert RAMSAR reserve to the medium high water mark, creating a protected passage from the land to the sea.

The region is of inherent cultural value to the Ngarrindjeri people and the creation of SZs will add to the well-being of both the region and the Ngarrindjeri people.

This SZ is within a Native Title Claim area.

What are the non-market values of the SZ?

Nature-based experience and education value

There are a number of interpretive signs about the SZ located adjacent to the SZ and at points of entry to the Coorong Beach which are of education value.

Scientific and wilderness value

As one of the few high wave energy beaches in the marine parks network that has full SZ protection with no shore based recreational line fishing allowed, the SZ is of inherent scientific value for studying the effects of protection on high wave energy beach ecosystems. Due to its remote location and difficulty with access, the SZ has 'wilderness value'.

Existing partnerships and monitoring

None identified.

Aboriginal cultural heritage

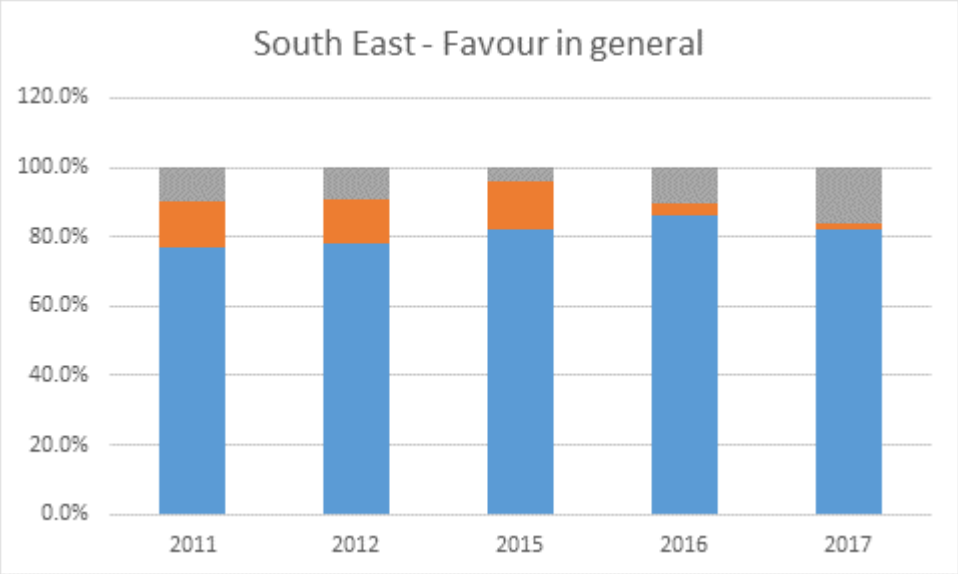
The region is of inherent cultural value to the Ngarrindjeri people.

Have social values changed due to the SZ?

Due to a lack of information available at the SZ level it is difficult to assess whether social values have changed due to the implementation of the SZ. More broadly, support for marine parks in the local region by residents of the South East over the period 2011 to 2017 has averaged 81%. Initially in 2011 support was at 77% and increased to 86% in 2016. At the last survey in 2017, 82% support was recorded (DEWNR 2017a[22]) (Appendix Figure 2-37).

[22] DEWNR have conducted regular surveys through external market research agencies (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding and perception of marine parks.

Appendix Figure 2-37 South East support for marine parks in respondents' local area



Source: DEWNR 2017a

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening the SZ to recreational shore-based fishing activities?

Opening the SZ would create more available space for recreational fishers to undertake shore-based line fishing along the Coorong Beach. It is unlikely that it would lead to an increase in the number of recreational fishers visiting the area, rather it would mean that existing fishers have more flexibility in where they can fish and they could potentially spread out more along the beach.

A.2.6.5. Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The following habitats and biodiversity are found within the SZ:

- A large dissipative high energy beach backed by vast sand dunes and the Coorong lakes.
- Beach wrack deposits with significant ecological values in terms of nutrient recycling and providing carbon to form the basis of marine food webs.
- Species such as Australian Salmon, Mulloway, sharks and rays, cockles.
- Internationally recognised habitat for Seabirds and local and migratory shorebirds (management plan summary)
- The zone protects 7km of fine-medium sand beach habitat (6% of beach length in USEMP).
- About 37 per cent of the Coorong Beach South Sanctuary Zone has been broadscale mapped and found mostly to consist of sand.

Physical influences shape the type of habitats and species found in an area. Physical influences typical of this region include:

- average sea surface temperatures ranging from 14ºC in winter to 18ºC in summer, but decreasing to 11 - 12ºC in summer due to the influence of the upwellings;
- the cool Flinders current;
- the nutrient rich Bonney upwelling from December to May;
- estuaries, creeks and drainage channels connecting the fresh and marine waters.

Figure 3-54 in BDO EconSearch 2018 provides a map of the main benthic (subtidal) habitats of the Upper South East Marine Park. Appendix Table 2-33 and Appendix Table 2-34 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Coorong Beach South SZ.

Appendix Table 2-37 Benthic (subtidal) habitats of the Coorong Beach South SZ

Habitat	Area (km^2)	% SZ
Sand	37%	15.1
Not mapped	63%	25.3

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

Appendix Table 2-38 Shoreline (intertidal) habitats of the Coorong Beach South SZ

Habitat	Length of shoreline (km	% SZ
Fine-medium sand beach	7.0	100%

Source: DEWNR (2015c, d, e, f) & Edyvane (1999a, b)

The habitats located within the Coorong Beach South SZ support a variety of marine and coastal species, some of which have been identified as ecologically important.

Sharks

The USEMP is used by a number of shark species, including blue shark, dusky whaler, smooth hammerhead, school shark, white shark, shortfin mako and porbeagle (DENR 2010h). The USEMP is within a relatively productive area for gummy sharks in the South Australian Marine Scalefish Fishery (Fowler et al. 2012, 2013b, 2014b). It is assumed that some of these species move through the Coorong Beach South SZ at times.

Marine mammals

The USEMP is used by a number of marine mammal species, including the Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), Australian fur seal, blue whale, common dolphin and bottlenose dolphin (DENR 2010h). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. Blue whales feed in several areas between the eastern Great Australian Bight and Cape Otway in Victoria between November and May each year (Gill et al. 2011).

Seabirds

The USEMP is used by a number of seabird species, including black-faced cormorant, crested tern, fairy tern, little penguin, pied cormorant and silver gull (DENR 2010h). Some of these species are resident while others are more transient, visiting the USEMP to rest, breed and/or feed.

Baseline information on seabirds relevant to the USEMP includes:

The distribution and abundance of breeding sites for 16 species of seabird have been surveyed numerous times since 1971 (Copley 1996, DEWNR 2015a). Goldsworthy and Page (2010) reviewed the distribution and abundance of crested terns, little penguins, short-tailed shearwaters and flesh-footed shearwaters. Crested terns and little penguins breed at Baudin Rocks within the USEMP, including estimated populations of about 1,500 and 100 pairs, respectively (Copley 1996). There are also breeding sites for the black-faced cormorant and pied cormorant (Copley 1996).

Shorebirds

The USEMP is used by a number of shorebird species for breeding and feeding, including pied and sooty oystercatchers, hooded plover, red capped plover, common sandpiper and masked lapwing (DENR 2010, Christie and Jessop 2007). Habitat includes the Coorong which is a Wetland of National Importance (Department of the Environment 2015). Some of these species are resident and others migrate to the USEMP from interstate or overseas.

Baseline information on shorebirds relevant to the USEMP includes:

Diversity and abundance have been surveyed along the Limestone Coast since 1981, including sites within this park at Nora Creina, Creina Bay, Boatswain Point, Wright Bay and Guichen Bay. Counts were recorded from 2 to 22 times per site for 15 species of shorebird (Christie and Jessop 2007). These data are a subset of an ongoing statewide dataset that is maintained by the Shorebirds 2020 Project (BirdLife Australia 2015).

Fish

A number of fish species inhabit the Coorong South Beach Sanctuary Zone. A list of species in the USEMP is presented in

Appendix Table 2-39 Bony fish, sharks, rays species list, Upper South East Marine Park

Species	Common name
Arripis georgianus	Australian herring
Arripis truttaceus	Australian salmon
Dasyatis thetidis	black ray
Prionace glauca	blue shark
Notolabrus tetricus	blue-throated wrasse
Notolabrus parilus	brown-spotted wrasse
Urolophus orarius	coastal stingaree
Histiogamphelus cristatus	crested pipefish
Carcharhinus obscurus	dusky whaler
Platycephalus bassensis	flathead
Mustelus antarcticus	gummy shark
Lissocampus runa	javelin pipefish
Sillaginodes punctata	King George whiting
Phycodurus equus	leafy seadragon
Monacanthidae	leatherjacket
Argyrosomus japonicus	mulloway
Signathidae	pipefish
Lamna nasus	porbeagle
Notolabrus fucicola	purple wrasse
Arripis truttaceus	salmon
Galeorhinus galeus	school shark
Isurus oxyrinchus	shortfin mako
Sphyrna zygaena	smooth hammerhead
Pagrus auratus	snapper
Thunnus maccoyi	southern bluefin tuna
Hyporhamphus melanochir	southern garfish
Orectolobus maculatus	spotted wobbygong
Pseudocaranx georgianus	trevally
Phyllopteryx taeniolatus	weedy seadragon
Arripis truttaceus	Western Australian salmon
Achoerodus gouldii	western blue groper
Carcharhinus brachyurus	whaler shark

Species	Common name
Carcharadon carcharias	white shark
Squalus acanthias	whitespotted spurdog
Seriola lalandi	yellow-tail kingfish

Source: DEW.

How does the biodiversity compare to other areas?

Comparative assessment of biodiversity has been based on fish and marine macro-invertebrate communities. These assessments have been based on the results of the BRUVS and UVC monitoring programs, and because the Coorong Beach South SZ has not been surveyed as part of these programs, there is no data available for comparison of fish/macro-invertebrate biodiversity.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within the Coorong Beach South SZ include:

- Predominately comprised of exposed fine-medium sand beach, soft-bottom habitat and habitats that are yet to be mapped.

Important features of the SZ include:

- The Coorong ocean beach is a significant site for a diverse assortment of migratory and sedentary bird species including the red necked stint and vulnerable hooded plover.
- Protects a part of the longest continuous high energy dissipative beach in the southern hemisphere.
- Encompasses a pathway area for Southern Right Whales.

Have there been changes or are changes predicted due to the SZ?

Observed changes

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside SZs to detect changes that may be due to SZs (DEWNR 2017a). No changes have been detected yet as no data have been collected since the Coorong Beach South SZ became operational in 2014.

Predicted changes

Snapper and rock lobster in the SZ are predicted to increase in size and abundance over the next 20 years.

What current and future threats to conservation values are addressed by the SZ?

A general overview of current and future threats is given in the introduction to Environmental Values Section A.4.2.

The Marine Scalefish and SZRL Fisheries were the principal fisheries that previously used the Coorong Beach South SZ. There was some use, albeit minor, of the SZ by the Abalone and Charter Boat Fisheries.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The Rock Lobster and Marine Scalefish fisheries pose a threat (relatively low impact based on relatively low levels of historical fishing) to their respective target species. The Rock Lobster fishery poses a threat (medium) to bycatch of Australian sea lions. Fishing, in general, poses a threat (low) to ecosystem function by (i) selective removal of species/size cohorts, (ii) increasing the risk of spreading marine pests and disease and (iii) potentially disturbing breeding colonies of marine mammals and birds.

Existing Arrangement with Fishing Permitted

Refer to Introduction Section A.4.3 for an overview of the impacts to environmental values of opening the SZ to different fishing activities.

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

Selective removal of target species

Opening the SZ would have negative impact on those species commonly targeted including mulloway by removing biomass and selectively removing biomass from particular sizes.

Harm to non-target species by fishing gear/activity

Potential for increased disturbance to nesting shorebirds by recreational fishers.

Damage to habitats

Damage to habitats from allowing fishing would be limited as the fishing techniques used are generally considered to cause little habitat damage. Allowing fishing would also increase the risk of introducing marine pests and disease.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Refer to Section A.4.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

The Coorong Beach South SZ has not been selected as a priority SZ for monitoring and therefore opening the SZ to fishing will not impact the ability to assess the effectiveness of the marine park network.

Appendix 3 ACTIVITIES AND USES TABLE

Appendix Table 3-1 Activities and uses permitted by marine park zone

The following tables summarise how activities and uses are expected to be managed once marine park management plans are adopted. The prohibitions and restrictions described in the tables (grey shaded boxes) will be represented in the *Marine Park (Zoning) Variation Regulations 2012*.

Section 4 of the *Marine Parks Act 2007* establishes four types of marine park zones. These are General Managed Use, Habitat Protection, Sanctuary and RAZs.

Section 5 of the *Marine Parks Act 2007* provides for SPAs. These are areas within a marine park, defined by management plans, in which specified activities will be allowed that would otherwise be prohibited or restricted by zoning.

No additional permits under the *Marine Parks Act 2007* will be required if the activity is already permitted or licensed under another Act.

Exemptions

- The Minister responsible for marine parks may provide a permit for any activity to take place that would not ordinarily be allowed in a specific zone in accordance with section 19 of the *Marine Parks Act 2007*.
- The Regulations also provide an exemption for any person acting in the course of an emergency.
- The Regulations will not apply to a person exercising official powers or functions under a State or Commonwealth Act or an Aboriginal person acting in accordance with an ILUA or Aboriginal tradition.

Existing activities and uses:

When management plans are developed, existing and reasonably foreseeable activities and uses will be accommodated, (as outlined by the policy commitments endorsed by Government) by appropriate zoning, the application of SPAs or the provision of permits. Apart from fishing activities, any permits, licences or leases that are current at the time of the adoption of management plans, will not be affected by these restrictions.

Key

GMUZ	General Managed Use Zone - being a zone primarily established so that an area may be managed to provide protection for habitats and biodiversity within a marine park, while allowing ecologically sustainable development and use
HPZ	Habitat Protection Zone - being a zone primarily established so that an area may be managed to provide protection for habitats and biodiversity within a marine park, while allowing activities and uses that do not harm habitats or the functioning of ecosystems
SZ	SZ - being a zone primarily established so that an area may be managed to provide protection and conservation for habitats and biodiversity within a marine park, especially by prohibiting the removal or harm of plants, animals or marine products
RAZ	RAZ - being a zone primarily established so that an area may be managed by limiting access to the area

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

RECREATION, EDUCATION AND OTHER					
	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Operating aircraft				limit	Limit: Aircraft cannot fly within 300m of the ground or sea level, and helicopters not within 500m of the ground or sea level.
Diving e.g. scuba/snorkel					
Pedestrian access					
Recreational boating/yachting					
Surfing/swimming					
Domestic animals			limit		Limit: Dogs on leads (up to 2m long); or animals confined to vessels/vehicles; or animals under effective control and behaving in accordance with relevant local Council by-laws.
Research			permit	permit	Permit[3]: A permit is not required for research authorised under another Act.
Commercial photography / film making			permit		Permit[3]: A permit is not required for commercial photography/film making authorised under another Act.
Competitions / organised events (non-fishing)			permit		Permit[3]: A permit is not required for non-fishing competitions/organised events authorised under another Act.
Tourism operations			permit		Permit[3]: A permit is not required for tourism operations authorised under another Act.
Animal feeding/baiting/berleying [1]					

RECREATION, EDUCATION AND OTHER					
	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Motorised water sports[2]					
Lighting and supervision of fires		limit	limit		Limit: Lighting and supervision of fires is confined to designated areas.
Camping		limit	limit		Limit: Camping is confined to designated areas.
Collection of naturally occurring materials for burning in fires					

Notes:

[1] Feeding/baiting/berleying animals is not recommended in marine parks, except as required for fishing, aquaculture, research or tourism purposes.

[2] A person may transit through a SZ in a motorised vessel, but gear such as water skis or a wake board must be stowed.

[3] Standard permits (and conditions) may be issued for activities that are deemed to be low impact. All other activities will be subject to case-by-case assessments and non-standard permits (and conditions) may be issued. DEWNR will develop a permit policy to provide clear guidance to users about activities that require permits.

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

FISHING AND COLLECTING (commercial, recreational and traditional)
Fishing activities are regulated under provisions of the *Fisheries Management Act 2007*.

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Bait digging/pumping					
Berleying for fishing					
Cockling (pipi and mud cockles)					
Collecting fish by hand (abalone, urchin, scallop, etc)					
Line fishing (including long lining)					
Netting (e.g. dab, haul, swing, gill, beach or power)					
Pot and trap fishing (including drop/hoop nets)					
Purse seine netting (including sardine)					
Raking (crab)					
Spear fishing					

FISHING AND COLLECTING (commercial, recreational and traditional) Fishing activities are regulated under provisions of the *Fisheries Management Act 2007*.					
	GMUZ	**HPZ**	**SZ**	**RAZ**	**Limits / Permits / Exceptions**
Competitions / organised events (fishing)					
Traditional fishing and collecting (Aboriginal)					Limit: Activity is limited to persons who are exercising their rights in accordance with an ILUA or Aboriginal tradition.
Collecting seagrass/algae (including beach cast)					
Collecting sessile assemblages, stromatolites, fossils and archaeological remains					
Trawling					

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

HARBOR, NAVIGATION and TRANSPORT ACTIVITIES [1]
Harbor, navigation and transport activities are regulated under provisions of the *Harbors and Navigation Act 1993*

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Navigation markers/aids					
General navigation and operation of vessels (other than anchoring)					
Anchoring of vessels – less than 80 metres (overall length)					
Anchoring of vessels – 80 metres and over (overall length)					SPAs will provide for anchoring of vessels 80 metres and over in all harbors and in designated transhipment and anchoring locations and pilot boarding grounds
Permanent vessel moorings			permit		Permit: A permit will be required, which includes assessment by DEWNR and DPTI.
Dredging		limit			Limit: Activity is confined to harbors established under the *Harbors and Navigation Act 1993*.
Depositing dredged materials		limit			

Notes:
[1] Activities undertaken to support the ongoing operation of ports and harbors will be provided for in all zones. Also, given the extensive development expected to occur over the next 5-10 years in Upper Spencer Gulf, transitional arrangements will be required. For this purpose, all HPZ, SZ and RAZ in Upper Spencer Gulf Marine Park will be declared SPAs. This will provide for (a) developments comprising a development or project, or that part of a development or project, within the ambit of a declaration under section 46 of the *Development Act 1993*; and (b) activities comprising development approved under section 49 (crown development and public infrastructure) or section 49A (Electricity infrastructure development) of the *Development Act 1993*. This arrangement will be assessed at the time the first management plan is reviewed.

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

COASTAL DEVELOPMENTS AND INFRASTRUCTURE [1]

Coastal developments and infrastructure are regulated under provisions of the *Development Act 1993*.

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Infrastructure (marinas, jetties, pontoons, breakwalls)					
Outfall and pipelines					
Renewable energy infrastructure (wind, wave, tidal)					

Notes:

[1] Coastal developments and infrastructure in HPZ will be managed under the *Development Act 1993* to achieve the definition of the zone (i.e. no harm to habitats or the functioning of ecosystems). Developments will be considered on a case by case basis to ensure that the achievement of the objects of the *Act* and the zone are supported appropriately. Development Plans and significant rojects are informed by the Planning Strategy which now includes the objects of the *Marine Parks Act 2007* so consideration of these will inform the assessment process. In addition, as part of the assessment process, advice or direction may be required from the Coast Protection Board and/or the Environment Protection Authority and other authorities, depending on the nature of the development. These agencies also have the requirement to take into account the objects of the *Marine Parks Act 2007*.

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

AQUACULTURE

Aquaculture activities are regulated under provisions of the *Aquaculture Act 2001*.

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Farming of bivalve molluscs					
Farming of aquatic animals (other than prescribed wild-caught tuna) with regular feeding					
Farming of prescribed wild-caught tuna					
Farming of algae					
Pilot leases					

Notes:
Aquaculture in HPZ will be managed under the *Aquaculture Act 2001* to ensure that all reasonable and practicable measures are taken to achieve the definition of the zone (i.e. no harm to habitats or the functioning of ecosystems). The *Aquaculture Act 2001* operates in addition to the *Marine Parks Act 2007* and requires aquaculture policies to seek to further the objects of the *Marine Parks Act 2007* where they apply within a marine park.

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with stated limits under the Regulations.
permit	Activity is deemed to be consistent with the definition of the zone when conducted in accordance with a permit under the Regulations.
	Activity is deemed to be inconsistent with the definition of the zone and will not be allowed. However, the Minister for Sustainability, Environment and Conservation may grant a permit for an activity that would otherwise be prohibited or restricted in a zone on a case by case basis.

WASTEWATER DISPOSAL/ DISCHARGES

Discharges are generally regulated under provisions of the *Environment Protection Act 1993* and the *Environment Protection (Water Quality) Policy 2003*.

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Discharge [1]					Discharges regulated under sections 3(2) or 8(7) of Schedule 1 of the *Environment Protection Act 1993* are prohibited
Extraction and disposal for a desalination plant[1]					
Vessel discharge of wastewater [2]					Specifically regulated by Clause 36 of the E*nvironment Protection (Water Quality) Policy 2003*

Notes:

[1] Discharges in HPZ will be managed under the *Environment Protection (Water Quality) Policy 2003* to ensure that all reasonable and practicable measures are taken to achieve the definition of the zone (i.e. no harm to habitats or the functioning of ecosystems).

[2] Wastewater includes black water, concentrated black water and grey water as defined by the *Environment Protection (Water Quality) Policy 2003*.

Key

	Activity is deemed to be consistent with the definition of the zone (i.e. no change to current activity/use).
limit	Activity is consistent with the definition of the zone when conducted in accordance with stated limits.
*	Activity is deemed to be inconsistent with the definition of the zone and will not be considered until such time as it can be demonstrated otherwise.
	Activity is deemed to be inconsistent with the definition of the zone and will not be permitted.

RESOURCE EXPLORATION AND PRODUCTION

These activities are regulated under provisions of the *Mining Act 1971*, the *Petroleum and Geothermal Act 2000, the Offshore Minerals Act 2000 and the Petroleum (Submerged Lands) Act 1982* to achieve the objectives of the marine park zones described under the *Marine Parks Act 2007*.

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Exploration (passive)	□	□	□	□	
- satellite/high level airborne					
- airborne surveys				*	*Will depend on the nature and timing of the proposed survey in relation to key environmental considerations (e.g. breeding and migration cycles of protected species).
- geophysical/geochemical surveys			limit		Limit: Will depend on the nature and timing of the proposed survey in relation to key environmental considerations (e.g. breeding and migration cycles of protected species).
Exploration (active)	□	□	□	□	
- geological sampling			*		* Will depend on nature of proposed surveying
- geophysical/geochemical surveys			*		* Will depend on nature of proposed surveying
- drilling (drill rig within zone)		*			* Will depend on nature of proposal and its location
– deviated drilling (drill rig outside zone)			limit	*	Limit: Activity will need to be conducted in accordance with approved conditions * Deviated drilling from outside zone may be considered if consistent with the zone
– trenching/bulk sampling	*	*			* Will depend on nature of proposal and its location

RESOURCE EXPLORATION AND PRODUCTION These activities are regulated under provisions of the *Mining Act 1971*, the *Petroleum and Geothermal Act 2000, the Offshore Minerals Act 2000 and the Petroleum (Submerged Lands) Act 1982* to achieve the objectives of the marine park zones described under the *Marine Parks Act 2007*.					
	GMUZ	**HPZ**	**SZ**	**RAZ**	**Limits / Permits / Exceptions**
Gas storage					
- carbon sequestration (surface facilities within zone)		*	▫	▫	* Will depend on nature of proposal and its location
- carbon sequestration (surface facilities outside zone)			*	*	* Deviated drilling from outside zone may be considered if consistent with the zone
Production/ Extraction	▫	▫	▫	▫	
- seawater (for extraction of resources such as salt)					
- through drillhole (surface facilities within zone)		*			* Will depend on nature of proposal and its location
- through drillhole (surface facilities outside zone)			limit	*	Limit: Activity will need to be conducted in accordance with approved conditions * Extraction from deviated drillhole from outside zone may be considered if consistent with the zone
- underground mining with surface facility	*				* Will depend on nature of proposal and its location
- underground mining with no surface facility		limit	*	*	Limit: Activity will need to be conducted in accordance with approved conditions. May be considered if activity does not compromise habitats or the functioning of ecosystems. * Will depend on nature of proposal and its location.
- pipeline on/above ground/seabed/trenched		*			* Will depend on nature of proposal and its location
- pipeline underground			*	*	* Will depend on nature of proposal and its location

RESOURCE EXPLORATION AND PRODUCTION These activities are regulated under provisions of the *Mining Act 1971*, the *Petroleum and Geothermal Act 2000, the Offshore Minerals Act 2000 and the Petroleum (Submerged Lands) Act 1982* to achieve the objectives of the marine park zones described under the *Marine Parks Act 2007*.					
	GMUZ	**HPZ**	**SZ**	**RAZ**	**Limits / Permits / Exceptions**
- seabed dredging	*				* Will depend on nature of proposal and its location
- pit-type extraction	*				* Will depend on nature of proposal and its location
Processing	□	□	□	□	
- mineral facility (mobile e.g. vessel based)	*				* Will depend on nature of proposal and its location
- mineral facility (permanent)					
- petroleum/geothermal facility					

Notes:
All licence applications under the *Mining Act 1971* and the *Petroleum and Geothermal Act 2000* within and adjacent to marine parks are referred by the Minister for Mineral Resources and Development to the Minister for Sustainability, Environment and Conservation for concurrence. A referral process is required for the approval of on-ground exploration, and production activities, as part of the relevant mining regulation protocols between DMITRE and DEWNR. This provides for case-by-case assessment of each proposed activity. This includes activities deemed consistent with with the definition of the zone. The table indicates which activities are likely to be restricted when leases, licences and permits are considered by the Ministers. Activity proposals are considered by assessing risk. Activities likely to compromise the values of any zone would not be approved. A similar process is expected to be undertaken for activities authorised under the *Offshore Minerals Act 2000* and the *Petroleum (Submerged Lands) Act 1982*.

This table may be revised over time as new technologies and techniques are developed, to ensure that new technologies are appropriately considered, consistent with marine park zone objectives.

The following types of SPA may be identified in accordance with section 13(1)(c) of the *Marine Parks Act 2007*. Notwithstanding the zoning of the area, the following activities will be permitted in the SPAs.

Special Purpose Areas (significant economic development)
Activities comprising a development or project, or that part of a development or project, within the ambit of a declaration under section 46 of the *Development Act 1993*; and
Activities comprising development approved under section 49 (Crown development and public infrastructure) or section 49A (Electricity infrastructure development) of the *Development Act 1993*.

Special Purpose Areas (harbor activities)
Activities undertaken by or on behalf of the Minister responsible for the administration of the *Harbors and Navigation Act 1993*, or a port operator, for the purposes of maintaining or improving a harbor or port. (Harbor, port and port operator have the same meanings as in the *Harbors and Navigation Act 1993*.)

Special Purpose Areas (submarine cables and pipelines)
Activities undertaken for the purposes of maintaining or improving submarine cables or pipelines comprising public infrastructure (within the meaning of section 49 of the *Development Act 1993*).

Special Purpose Areas (transhipment)
Activities comprising the establishment, maintenance or improvement of facilities for a transhipment point prescribed or to be prescribed under the *Harbors and Navigation Regulations 2009*; and
Activities comprising or connected with loading or unloading a vessel at a transhipment point prescribed under the Harbors and Navigation Regulations 2009.

Special Purpose Areas (anchoring)
Activities comprising anchoring a commercial vessel (within the meaning of the *Harbors and Navigation Act 1993*) in an area recommended for that purpose by way of a Notice to Mariners by the Minister responsible for the administration of the *Harbors and Navigation Act 1993*.

Special Purpose Areas (shore-based recreational line fishing)
Recreational fishing from the shore by use of a hand line or rod and line. (Hand line, recreational fishing and rod and line have the same respective meanings as in the *Fisheries Management Act 2007*.)

Special Purpose Areas (Murray Mouth dredging)
Activities associated with dredging undertaken for the purposes of maintaining or improving water flows through the mouth of the River Murray.

Special Purpose Areas (Defence Prohibited Area)
Activities undertaken by the Department of Defence in relation to the Proof and Experimental Establishment (Port Wakefield).

Special Purpose Areas (Aquaculture)
Activities authorised under the *Aquaculture Act 2001*.

Appendix 4 EXPLANATORY INFORMATION FOR ENVIRONMENTAL VALUES ASSESSMENT

A.4.1. Have there been changes or are changes predicted due to the SZ?

Predictions of change due to the marine park management plans and SZs have previously been made for different species groups, habitat types and a range of fished species (Bailey et al. 2012a, Bryars 2013, Bryars et al. 2017b). A monitoring, evaluation and reporting (MER) program has been developed by the SA Government to test whether these predictions are being observed (see Bryars et al. 2017a). The success of SZs depends on a range of factors including the size of the zone, effective compliance from illegal activities, and the length of time that the SZ is in place (Edgar et al. 2014). It is expected that the larger SZs in the SA marine parks network will be the most effective ones for protecting and conserving biodiversity, and are generally where predictions of change will most likely occur (Bryars et al. 2017a). The DEW marine parks program has an ongoing compliance program to detect and prevent illegal activities, and this has proven to be effective in many cases during the first few years after SZ implementation (DEWNR 2017a).

The Government's MER program collects temporal data on the size, abundance and diversity of fishes and invertebrates both inside and outside a number of SZs to detect changes that may be due to SZs (see Section 10.2.5 of DEWNR 2017a). It is anticipated that at least 5 to 10 years will be required to start to detect changes due to SZs (DEWNR 2017a, Delean 2017), although changes in rock lobster populations were detected quite rapidly inside the Cape du Couedic SZ (McLeay et al. 2017, see A.2.5.5). Data comparing various metrics from inside SZs relative to outside can be found in the 2017 Marine Parks Status Report (DEWNR 2017a).

Invasive pest species

Protection of the ecosystems within SZs from other impacts, e.g. fishing, may make them more resilient to pest introductions (Bailey et al. 2012a), but the management plans are not likely to reduce the number of marine pest species that are introduced to marine parks.

Monitoring programs within the marine parks may improve the detection of invasive species. For example, marine park reef surveys in Tasmania detect and monitor the southward migration of the hollow-spined urchin (Centrostephanus rodgersii), which is facilitated by climate change and increasing water temperatures (Ling et al. 2009).

Climate change

Protection of the ecosystems within SZs from other impacts, e.g. fishing, may make them more resilient to pest introductions associated with climate change and range extensions (Bailey et al. 2012a), but the management plans are not likely to reduce pressures associated with climate change. The marine parks were designed to provide scope for saltmarsh and mangrove habitats to migrate inland under a scenario of sea level rise (DEH 2009a).

Intertidal reef

Intertidal reef animals were fully protected in South Australia before the implementation of the marine park management plans (Bailey et al. 2012b). Nonetheless, there could potentially be some change inside zones if illegal fishing is reduced due to increased compliance, signage and education or if visitation rates are increased as part of the overall marine parks program. However, evidence from South Australia (Benkendorff and Thomas 2007, Baring et al. 2010) suggests that only RAZs are effective in protecting intertidal communities from illegal fishing (and there are no new RAZs in the network) and that SZs may lead to increased trampling and disturbance by humans. If changes occur in adjacent subtidal reef communities (see next section), there could be flow-on effects for intertidal communities, but the changes that are attributable to the management plan are unlikely to be detectable.

Subtidal reef

A number of fished species use subtidal reef ecosystems in South Australia (Bryars 2003). Some of these species are expected to change in size and/or abundance following protection from fishing and this may in turn drive ecosystem changes (Bailey et al. 2012b). Experience from Tasmania and New Zealand suggests that some species may increase in size and/or abundance within SZs, but others may decrease in abundance (Shears and Babcock 2003, Barrett et al. 2007, 2009, Edgar et al. 2007, 2009, Babcock et al. 2010) and other unforeseen ecosystem shifts may occur (Freeman and MacDiarmid 2009, Edgar et al. 2007, Buxton et al. 2006, Langlois and Ballantine 2005).

Intertidal seagrass

A number of fished species reside on intertidal seagrass flats or use them at high tide (Bryars 2003). Little is known about the possible response of other intertidal seagrass species and ecosystem changes following protection.

Subtidal seagrass

A number of fished species use subtidal seagrass in South Australia (Bryars 2003). Due to uncertainties around fished species' responses in these ecosystems, predictions of change are limited compared to subtidal reef species (Bailey et al. 2012b).

Subtidal sand

A number of fished species use subtidal sand plains in South Australia (Bryars 2003). Little is known about the possible response of other subtidal sand species and ecosystem changes following protection.

Mangrove ecosystems

It is unlikely that ecosystem changes will occur in mangrove ecosystems as a result of the management plans and the cessation of existing activities (Bailey et al. 2012b, unpublished information from expert workshops in 2013).

Saltmarsh ecosystems

It is unlikely that ecosystem changes will occur in saltmarsh ecosystems as a result of the management plans and the cessation of existing activities (Bailey et al. 2012b, unpublished information from expert workshops in 2013).

Sharks

It is unlikely that measurable changes will occur to populations of sharks as a result of the management plans and the cessation of existing activities (Bailey et al. 2012b). Nonetheless, protection of sharks at aggregation sites will provide temporary protection from fishing.

Marine mammals

It is unlikely that measurable changes will occur to populations of marine mammals as a result of the management plans and the cessation of existing activities given that these species have already been afforded protection via other regulatory processes (Bailey et al. 2012b). Nonetheless, it is possible that expected increases in biomass of some fished species adjacent to pinniped breeding colonies where juveniles forage and in foraging areas for dolphins could have a positive benefit for those species. It is also possible that positive benefits may occur if fishing is removed from areas of increased marine mammal activity for those fisheries where bycatch sometimes occurs, e.g. rock lobster potting adjacent to Australian Sea Lion breeding colonies or in whale migration pathways (see next section below).

Seabirds

It is unlikely that measurable changes will occur to populations of seabirds as a result of the management plans and the cessation of existing activities (Bailey et al. 2012b). However, a recent study of osprey in South Australia indicated that breeding colonies were in decline across the state except where they occurred in SZs and RAZs (Detmar and Dennis 2018) indicating the important role these zones may play in the conservation of coastal raptors.

Shorebirds

It is unlikely that measurable changes will occur to populations of shorebirds as a result of the management plans and the cessation of existing activities (Bailey et al. 2012b).

A.4.2. What current threats and future threats to conservation values are addressed by the SZ?

Threat posed by fishing

Fishing, depending on its scale and extent can have significant negative impacts on habitat and diversity, structure and productivity of marine communities (Dayton et al. 1995, Gray 1997). Removal of any biomass from marine ecosystems by fishing or other means can be a threat to biodiversity conservation and ecosystem function in a number of ways, including;

- Selective removal of target species
- Removal of other species caught as bycatch
- Harm to non-target species by fishing gear/activity (e.g. entanglement, noise)
- Damage to habitats/ecosystem function

SZs are designed to enable ecosystems to remain as intact as possible to allow ecological processes to be maintained and/or enhanced. Studies have shown that maintenance of biodiversity, provision of ecosystem services and resistance to disturbance are reliant on healthy functioning ecosystems. Any removal of biomass, disturbance or damage to habitats can compromise the functioning of marine ecosystems (Jennings and Kaiser 1998, Kaiser et al. 2002).

Selective removal of target species

Fishing can be a threat to target species in a number of ways. Overfishing can lead to reduced abundance of target species and negatively affect long term population viability. Fishing can alter sex ratios, increase sub-legal mortality, reduce reproductive potential by selecting for larger individuals and reduce overall genetic diversity (Hamilton et al. 2007, Jennings et al. 1998, Smith et al. 1991).

Removal of other species caught as bycatch

Some fishing methods result in bycatch or the catch of non-target fish. In many cases these bycatch species suffer high mortality rates. Regardless of species, this results in removal of biomass from the system, which depending on severity may have a negative impact on environmental values. In some cases, the bycatch may involve endangered species such as Australian sea lions that can be caught in gillnets and lobster pots (Hamer et al. 2013). The level of bycatch in these instances can be high enough to threaten the viability of populations (Hall et al. 2000, Lewison et al. 2004). In many cases bycatch species may be important food sources for sea birds and marine mammals (Read 2008).

Harm to non-target species (e.g. entanglement, noise)

Fishing can be a threat to species not targeted or caught as bycatch. Entanglement in fishing gear is a threat to many marine mammals and sea birds (Dayton et al. 1995, Laist 1997). Fishing activities can also be a threat to species by modifying or affecting behaviour. Physical presence, noise and additional nutrient inputs are all fishing related activities that can modify animal behaviour. Marine mammals can be particularly susceptible to these types of disturbances (Read 2008).

Habitat/Ecosystem function/Marine Pests/Disease

Selective removal of species associated with commercial or recreational fishing is a threat to biodiversity conservation as it removes biomass from the system (Borer et al. 2006). These species may be important food sources, competitors or keystone species; the removal of which can result in catastrophic changes in the state of the system. For example, selective removal of large lobsters, the natural predator of urchins, by fishing has led to the loss of kelp forests in parts of Tasmania due to overgrazing by urchins (Ling et al. 2009).

Often target species are higher level trophic predators (e.g. sharks, snapper) and their removal can result in fundamental changes to plant and animal assemblages via trophic cascades (Daskalov et al. 2007). "Fishing down the food web" has been observed in many places and can result in changes in productivity and community structures and comprised ecosystems less able to cope with other threats such as climate change and invasion by pest species (Tompkins et al. 2004).

Several fishing practises can cause significant damage to benthic habitats. Prawn trawling has been shown to be extremely damaging to benthic habitats while other techniques such as lobster potting are relatively benign (Thrush et al. 1998). Fishing activities may also increase the spread of marine pests or diseases (Bax et al. 2003).

Individual fisheries

Primary industries and Resources SA (PIRSA) has conducted a number of ESD risk assessments for the various fishing sectors. The following section uses these documents to summarise the risk ratings (threats) to environmental values of fishing; for more details, please refer to the relevant reports on the PIRSA website.

Marine Scalefish Fishery

The MSF applies pressure on reef, seagrass and sand biodiversity and ecosystems through the removal of various species (Bryars et al. 2016). There are a range of techniques used for capture in the MSF, including netting, line fishing, and cockle raking that can impact a number of target and bycatch species, and cause disturbance to habitats and ecosystems; only a brief overview is provided here.

Selective removal of target species

The risk rating for snapper, southern garfish was high, for bronze and dusky whaler, mud cockles and razor fish the risk rating was medium and for broadnose shark the risk rating was low. For all other target species the risk rating was negligible (Appendix Table 4-1).

Removal of other species caught as bycatch

The risk rating for Australian sea lion and white shark was medium and for western blue groper and whales the risk rating was low. The risk rating for all other bycatch species was negligible (Appendix Table 4-1).

Habitat/Ecosystem function

In general, the risk to ecosystems of marine scale fishing was rated as medium and the risk of introduced marine pests rated as medium. Habitat disturbance related to vehicles, anchoring, haul netting, cockle raking and razorfish tongs was rated as low. Other types of fishing (e.g. line, traps, purse seine) were rated to have negligible impact on habitats (Appendix Table 4-1).

Appendix Table 4-1 Summary of Marine Scale Fishery ESD Risk Rating

Issue	Details	Risk
Target species	Snapper	High
	Southern Garfish	High
	Bronze and Dusky Whaler Shark	Medium
	Mud cockles	Medium
	All other species	Low
Bycatch	Australian sea lion	Medium
	White shark	Medium
	Western blue groper (NZ)	Low
	Whales	Low
	All other species	negligible
Ecosystem effects	Commercial fishing	Medium
	Introduced pests and diseases	Medium
Habitat effects	Haul netting, cockle raking, razorfish tongs	Low
	Vehicles and anchoring	Low
	All other activities	negligible

Source: PIRSA 2011b

Charter fishing

The Charter Boat Fishery applies pressure on reef and sand biodiversity and ecosystems through the removal of various fishes and sharks (Bryars et al. 2016). King George whiting, snapper and bight redfish were most frequently targeted but at least 70 different marine species were taken, including finfish, rays and skates, sharks, crustaceans, and molluscs (Tsolos 2013). According to the ESD risk assessment undertaken by PIRSA 2010, charter fishing is a medium risk to target species and a negligible risk to bycatch species (Appendix Table 4-2). Charter fishing is a negligible risk to non-retained species and ecosystems and habitats, however it is considered a medium risk for disease Appendix Table 4-2).

Appendix Table 4-2 Summary of Charter Fishing ESD Risk Rating

Issue	Details	Risk
Target species	primary	Medium
	regional	Low to Negligible
Bycatch		negligible
Ecosystem effects	fishing	negligible
	Disease	Medium
Habitat effects		negligible

Source: PIRSA 2011b

Commercial Rock Lobster Fishery

The Rock Lobster Fishery applies pressure on reef biodiversity and ecosystems through the removal of southern rock lobster and Maori octopus (Bryars et al. 2016). Rock lobster fishing results in the capture of several species of bycatch including crabs, conger eel and several fish species (PIRSA 2011a). Pots can also damage the sea floor and fishing gear and vessel activity can result in entanglements and disturbance to marine mammals and seabirds. According to the ESD risk assessment undertaken by PIRSA, commercial

lobster fishing is a medium risk to lobster, low risk to octopus and negligible risk to other bycatch species. Capture of Australian sea lions is considered a medium risk in the Northern Zone and negligible in the Southern Zone Fishery. It should be noted that the likelihood of an interaction between a juvenile sea lion (which is the age class most vulnerable to entering a pot) and a rock lobster pot would be increased when potting occurs adjacent to a breeding colony as demonstrated by hot spot maps of sea lion activity (see Goldsworthy et al 2010b). Potting must therefore be considered as an increased threat when conducted adjacent to breeding colonies.

Impacts to ecosystems and habitats range from low to negligible (Appendix Table 4-3). Winter fishing is now allowed in the outer zone of the NZRLF. This is a time when southern right whales move into inshore waters in SA. This would increase the chance of entanglement with lobster pots, but to date no entanglements have been recorded (noting however that a humpback whale was recently entangled in rock lobster gear in the South East of SA in October 2018).

Appendix Table 4-3 Summary of Southern Rock Lobster Fishery ESD Risk Rating

Issue	Details	Risk
Target species	Southern rock lobster	Medium
	Octopus	Low to Negligible
Bycatch	Australian sea lion (NZ)	Medium
	Australian sea lion (SZ)	negligible
	Western blue groper (NZ)	negligible
	Other species	negligible
Ecosystem effects	Commercial fishing	Low
	Ghost fishing	Negligible
Habitat effects		Negligible

Source: PIRSA 2011a

Commercial Abalone Fishery

The Abalone Fishery applies direct pressure on reef biodiversity and ecosystems through the removal of greenlip and blacklip abalone (Bryars et al. 2016). According to the ESD risk assessment undertaken by PIRSA, commercial abalone fishing is a medium risk to target species, low risk to ecosystem function and a negligible risk of bycatch, harm to TEPS or disturbance to habitats (PIRSA 2009) (Appendix Table 4-4).

Appendix Table 4-4 Summary of Abalone Fishery ESD Risk Rating

Issue	Details	Risk
Target species	Greenlip abalone	Medium
	Blacklip abalone	Medium
Bycatch	No capture	Negligible
TEPS	Interaction but no capture	Negligible
Ecosystem effects	Impact on predators	Low
	Impact on competitors	Low
Habitat effects		Negligible

Source: PIRSA 2009

Sardine Fishery

The Sardine Fishery applies pressure on pelagic biodiversity and ecosystems through the removal of sardines and anchovies (Bryars et al. 2016). The fishery does have negative interactions with dolphins (Ward et al. 2015). The potential impact of purse seine nets on benthic habitats is unknown.

Indigenous fishing

Aboriginal traditional fishing does occur in some parts of South Australia. While catch is unquantified, due to the relatively small size and number of coastal communities, the amount of catch is likely to be insignificant in comparison to commercial and recreational fishing.

Recreational fishing

The information presented here is a summary from the ESD risk assessment for recreational fishing that PIRSA undertook in 2016 (PIRSA 2016). For marine species the risk rating for mulloway was considered high while for all other recreationally targeted species the risk rating was considered moderate. The risk rating for ecosystem effects of fishing was moderate while other impacts on the marine environment were considered negligible (Appendix Table 4-5).

Appendix Table 4-5 Summary of Recreational Fishing ESD Risk Rating

Issue	Details	Risk
Target species	Mulloway	High
	Snapper, King George Whiting, souther calamari, garfish, western blue groper, blue swimmer crabs, yellowtail kingfish	Moderate
Bycatch	No capture	Negligible
Ecosystem effects	fishing	Moderate
Habitat effects		Negligible

Source: PIRSA 2009

A.4.3. What impact would there be to the environmental values of opening the SZ to different fishing activities

SZs are one of the most effective tools to achieve the primary objective of the *Marine Parks Act 2007* "to protect and conserve marine biological diversity and marine habitats by declaring and providing for the management of a comprehensive, adequate and representative system of marine parks" because they prevent the removal of plants and animals.

Reduction in the level of protection afforded by SZs may result in some or all of the following threats to environmental values:

- Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats
- Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats

As outlined in the previous section, fishing has a number of impacts on environmental values ranging from impacts on target species, non-target fish retained (bycatch) and ecosystem function through to damage to habitats, and increased risk of the spread of pests and diseases. All of these impacts if significant enough will reduce the likelihood that a zone will achieve objectives related to conservation of biological diversity and marine habitats.

By preventing commercial and recreational fishing, a range of benefits for species and ecosystems may occur, including but not limited to: elimination of direct fishing mortality and post-release mortality; more natural age, size structure and sex ratio of populations, age and size at maturity and fish behaviour; and reduced incidence of disease (Bailey et al. 2012a). By reversing the protection from fishing afforded to SZs since October 2014 (a period of almost 4 years), it is likely that any benefits of this protection would be lost quite quickly. The impact on environmental values will depend on the level of positive impact observed over the 4-year period, and on the type of fishing specific to each SZ. For example, it is evident that the rock lobster population in the Cape du Couedic SZ has seen a significant positive impact due to the removal of rock lobster fishing in just 28 months. If rock lobster fishing were to recommence then the increase in biomass would likely be 'fished down' to levels comparable to outside the SZ. In other SZs there is currently insufficient data to know if positive impacts have occurred since protection commenced in 2014.

Therefore, the impact on environmental values will be a combination on the improvement in the values that have occurred over the last 4 years, in addition to the threats that commercial and recreational fishing as outlined previously pose to environmental values in general.

Reduced ability to assess the effectiveness of Marine Park at conserving marine biological diversity and marine habitats

The Marine Park Program has established an ecological monitoring program to assess the effectiveness of the Marine park network at achieving the primary objective of the Marine Parks Act that is ""to protect and conserve marine biological diversity and marine habitats by declaring and providing for the management of a comprehensive, adequate and representative system of marine parks" (Scholz et al. 2017, Bryars et al. 2017a).

The ecological monitoring program is focused on SZ's as these are the areas where predicted change due to zoning is most likely to occur (Bryars et al. 2017a). A number of priority SZs were chosen for long term ongoing monitoring based on their ecological value, likely changes and community interest. Some of these zones are relatively non-impacted and therefore serve as important reference sites by which intact marine ecosystems can be observed and information used to improve understanding of their biodiversity and functioning. Other SZ's have experienced a range of extractive resource use and it is expected that in some cases ecosystem health and function will improve with the removal of extractive processes. Having both types of SZ included in the monitoring program is important for assessing the long term effectiveness of the park network.

Several of the focus SZs under review (7 out of 12) have been selected as priority SZs for ongoing monitoring and considerable effort has already been spent collecting several years of data for establishing ecological baselines for these SZ. Any change to the zoning arrangements will compromise the value of these SZs for monitoring, especially in the case where there is significant data collected prior to marine park implementation (3 out of the 12 focus SZs).

A.4.4. What impact would there be to the environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

Impact to environmental values posed by non-fishing activities allowed in HPZ (e.g. dredging, coastal development or aquaculture).

Several non-fishing activities allowed in HPZ's are a threat to environmental values by reducing the effectiveness of a zone to protect and conserve marine biological diversity and marine habitats. Some activities allowed in a HPZ but not a SZ include:

- Aquaculture
- Coastal development (marinas, jetties, breakwalls etc)

- Dredging and depositing dredge materials
- Motorised water sports and aerobatics
- Animal feeding and berleying
- Active surveying (physical or chemical)
- Wastewater discharge from vessels
- Discharge from a desalination plant

Aquaculture developments can result in loss and or modification of habitats, modification of native animal behaviour associated with food availability, increased nutrient inputs and negative interaction with animals via disturbance and deterrents (Primavera 2006). Coastal development can result in the loss of coastal habitats, increased coastal erosion and increased pollutants and nutrients entering the marine environment via storm water run-off and wastewater treatment systems (Ward et al. 1998). Dredging damages benthic habitats and can result in increased sediment inputs into the marine environment that can negatively impact marine plants and animals (Thrush and Dayton 2002). Motorised water sports and aerobatics can increase disturbance levels for marine wildlife impairing their breeding/feeding behaviour and potentially their survival (Thurstan et al. 2012). Animal feeding and berleying can alter animal behaviour and welfare (Orams 2002). Waste water discharge from vessels and desalination plants can reduce water quality with negative impacts on habitats and animals (Lattenmann and Höpner 2008). All of these activities depending on extent and severity have the potential to negatively impact environmental values.

By allowing potential future activities such as aquaculture and coastal developments inside SZs, there may be negative impacts on species and ecosystems. Any impacts would be location- and activity-specific and therefore impossible to forecast at this point in time. Nonetheless, the impacts of activities on different ecosystems are generally well documented (e.g. dredging has a negative impact on seagrasses) and these are reflected in the matrix of zoning and allowable activities.

Reduced ability of network to satisfy marine park design principles

A number of design principles were used to develop the current Marine Park zoning such that the network is CAR (Scholz et al. 2017). This feature of the network is captured in the *Marine Parks Act 2007* "management of a comprehensive, adequate and representative system of marine parks". Marine Park SZs contribute to the overall CAR system and should not be considered in isolation as they are part of a Marine Park network. In some cases, a SZ may contain the only known habitat of that type in the reserve network (comprehensive) or be providing adequate refuge to ensure population viability (Adequate) or have a representation of a common habitat (Representative).

By modifying the activities or zoning arrangements to allow fishing or other activities allowed in HPZ's, it will alter the balance of habitats and features represented in the different zones of the marine parks network. Any changes to zoning will have, to a greater or lesser extent, an impact on how the marine park network satisfies the criteria for a "comprehensive, adequate and representative system of marine parks".

Appendix 5 MAP METADATA

Appendix Table 5-1 Location SA Map Metadata

Dataset Description	Dataset Name	Reference Metadata
Adelaide Dolphin Sanctuary Boundary	CONSERVATION.DolphinSanctuary	LMS #982
AMBIS South Australian Maritime State Waters Jurisdiction	ADMIN.StateWatersJurisdiction	LMS #1815
Aquaculture Licence and Lease Boundaries	ADMIN.AquacultureLeases	LMS #950
Aquaculture Zones	ADMIN.AquacultureZones	LMS #952
Aquatic Reserves	CONSERVATION.AquaticReserves	LMS #954
Australian Marine Parks	CONSERVATION.AustralianMarineParks	LMS #2155
Australian Maritime Boundaries	ADMIN.MaritimeBoundaries	LMS #1194
Benthic Habitat Inventory Mapping	*points generated from inventory survey tables*	LMS # TBA
Coastal saltmarsh and Mangrove Mapping (Habitats)	COASTAL.SaltmarshMangroveHabitats	LMS #886
Coastal shoreline classification	COASTAL.ShorelineClassification	LMS #1149
Estuarine Habitats of South Australia (Estuary Habitats)	Marine.EstuaryHabitats	LMS #1581
Land Use Generalised	ADMIN.LandUse2017	LMS #219
Marine Benthic Habitats	MARINE.BenthicHabitats	LMS #1224
Marine Bioregions	LANDSCAPE.MarineBioRegions	LMS #1111
Marine Biounits	LANDSCAPE.MarineBioUnits	LMS #1114
Netting Closures - South Australian Coastal Waters	ADMIN.NettingClosures	LMS #1590
Ports and Harbors	ADMIN.Ports_Harbors	LMS #834
Protected Areas - National Parks and Wildlife Service and Conservation Reserve Boundaries	CONSERVATION.NpwsaReserves	LMS #137
Rock Lobster Sanctuaries	CONSERVATION.RockLobsterSanctuary	LMS #1196
Shipwreck Aquatic Reserves	CONSERVATION.ShipwreckReserves	LMS #1008
South Australian Marine Park Internal Zoning Coordinates	CONSERVATION.StateMarineParkNW_ZonePnt	LMS #988
South Australian Marine Park Special Purpose Areas	CONSERVATION.StateMarineParkNW_SpecPurpArea	LMS #986
South Australian Marine Park Special Purpose Line (Shore-based Recreational Line Fishing)	CONSERVATION.StateMarineParkNW_SpecPurpLine	LMS #2145
South Australian Marine Parks Network (Boundaries)	CONSERVATION.StateMarineParkNetwork	LMS #989
South Australian Marine Parks Network (Internal Zoning)	CONSERVATION.StateMarineParkNW_Zoning	LMS #1024
South Australian Place Names	TOPO.PlaceNames_50k	LMS #1124
South Australian State Marine Park Network Points	CONSERVATION.StateMarineParkNetworkPoints	LMS #893
State Marine Benthic Habitats	MARINE.StateBenthicHabitats	LMS #1233
Topography - Coastline	TOPO.Coastline	LMS #970
Topography - South Australia	TOPO.SouthAustralia	LMS #967
Topography - State Reference Map Layers	TOPO.SaRefMap_Roads	LMS #1901

Source: Location SA Map Metadata http://location.sa.gov.au