Environmental, Social and Economic Values of Marine Park Sanctuary Zones

A report to

Department for Environment and Water

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31 October 2018

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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	Deparment 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

ACKNOWLEDGEMENTS

EconSearch gratefully acknowledges the assistance that was provided to us by the staff of DEW towards this report by collating a substantial amount of material about the marine parks for us. Comments and feedback provided by external reviewers has been gratefully received, helping to make a better final product, from Prof. Peter Fairweather, Professor of Marine Biology, Flinders University; Prof. Caleb Gardner, Centre Head (acting) Fisheries and Aquaculture, Institute for Marine and Antarctic Studies, UTAS, Prof. Rod Connolly, Australian Rivers Institute - Coast & Estuaries, Griffith University and Prof. Rob Lewis (retired).

DOCUMENT HISTORY AND STATUS

Printed:	31/10/2018 5:14:00 PM
Last Saved:	31/10/2018 5:14:00 PM
File Name:	I:\CLIENTS\DEW\ES1826_Marine Parks Review\Reports\Marine Parks Review_Final_181031.docx
Project Manager:	Julian Morison
Principal Author/s:	Heather Bailey, Lisa Carlin, Truphena Mahindu and Anders Magnusson
Name of Client:	Department for Environment and Water
Name of Project:	Environmental, Social and Economic Values of Marine Park Sanctuary Zones
Document Version:	7
Job Number:	1826

EXECUTIVE SUMMARY

The South Australian Government made a 2018 election commitment to review marine park sanctuary zones.

To assist with the Marine Parks Election Commitment, the Department for Environment and Water (DEW) contracted EconSearch to prepare an independent report titled 'Environmental, Social and Economic Values of Marine Park Sanctuary Zones' that includes the following:

- 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 Sanctuary Zones (SZs).
- A summary of the 19 marine parks and information on environmental, economic and social values for each of the 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 review 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.

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

[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).

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.

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.

For example, of the fisheries that sustained more than 1 per cent of displaced catch/effort from the implementation of SZs (i.e. Rock Lobster, Abalone, Marine Scalefish, Charter Boat and Sardine Fisheries), all experienced reductions in their catch/effort over the 10 years prior to zoning in 2014. Abalone and Charter Fisheries experienced minor changes and Northern Zone Rock Lobster, Sardine and Marine Scalefish Fisheries experienced significant declines of approximately 26 per cent, 42 per cent and 9 per cent, respectively. These declines are due to a range of factors including changes in environmental conditions, market conditions, interannual fluctations in stock biomass and fisheries management changes (e.g. quota reductions, reductions in licence numbers, new spatial closures for netting). It should be noted that Abalone, Sardine and Marine Scalefish Fisheries have experienced increased catch/effort in the period since 2014, further underscoring the relative unimportance of marine park zoning in the trends in 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 focus SZs, our analysis shows that the environmental values of these 12 focus SZs are significant. For example:

- Five of the 12 focus SZs are in the top eight SZs in terms of size (see Table ES 1). Large protected areas are considered to be more effective tools 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.
- Seven of the 12 focus SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea. Pearson Isles SZ is adjacent to a Commonwealth marine park zone.
- 10 of the 12 focus SZs are known breeding locations for rare and threatened marine birds and mammals (see Table ES 1).
- 8 of the 12 focus SZs were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.

Several of the focus 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, Pearson Isles, 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, Salt Creek, Rapid Head, Bay of Shoals, The Pages and Cape Borda were of minor importance to commercial fishing

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

with displaced catch or effort estimated at below $100,000 for each of these SZs. A very small amount of charter boat activity took place prior to zoning in 10 focus SZs. The Sponge Gardens SZ was historically moderately important[5] to the Charter Boat Fishery (1.7 per cent of fishery effort).

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).

Eight of the 12 Focus SZs are sites for the government scientific monitoring program, which if 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 Pages and Cape du Couedic SZs are 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. Four of the 12 focus SZs are used for non-fishing based tourism. The existence of the SZs is known to be promoted by operators in two of the four SZs.

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) 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. 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 the SZ. 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

[5] Historic average annual catch between $100,000 and $400,000 GVP.

activities such as aquaculture would be possible with conversion to HPZ status, which could impact commercial fishing access.

For recreational fishing, changing zoning status from SZ to allowing fishing or HPZ is likely to benefit recreational fishers in Clinton Wetlands, Rapid Head and Sponge Gardens SZs through a redistribution of existing recreational fishing activity from areas adjacent to these zones. However, in Clinton Wetlands and Rapid Head it is likely that the return of commercial fishing will not be supported by recreational fishers. The reintroduction of commercial fishing in North Neptune Island SZ would likely not be supported by the shark cage diving industry.

Two areas that are within metropolitan waters have been identified as potential opportunities for protection. They have been suggested through public submission and do not result in displacement of commercial or recreational fishing or other recreational activities. These are (i) the southerly extension of the Adelaide Dolphin Sanctuary and (ii) Port Stanvac restricted access area. Extending the Adelaide Dolphin Sanctuary would appear to be of little conservation or social benefit and alternative approaches to afford more effective protection of the Port River dolphin population may be worth considering. Extenson of the Encounter Marine Park outer boundaries to incorporate the Port Stanvac restricted access area, on the available information would appear worthy of further investigation with 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.

Table ES-1 Summary table for 12 focus sanctuary zones – impacts on values of existing arrangements

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
Nuyts Reef (Nuyts Archipelago Marine Park)	***Area***: 105 km^2 (53 km^2 mapped, 50%) ***Mapped benthic (subtidal) habitats***: Reef (100%), sand (<1%) ***Features:*** • Sixth largest SZ in the state marine park network • Largest and most westerly limestone reef in the Murat bioregion • Last shoreline inflection (or settling place) before the Head of the Bight.	Important breeding ground for nationally vulnerable Australian sea lion and state endangered osprey.	Prior to zoning, total gross value of displaced catch estimated at $82,000, principally from the NZRL (0.11% of fishery catch) and Abalone (0.13% of fishery catch) Fisheries. Also Marine Scalefish (0.02% of fishery effort). Ongoing impact: $0.09m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, boat-based recreational fishing was minimal (difficult access due to remoteness). Shore-based recreational fishing accommodated through SPA. Significant wilderness value maintained since zoning.
Isles of St Francis (Nuyts Archipelago Marine Park)	***Area***: 123 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Sand (60%), reef (32%), seagrass (8%) ***Features:*** • Third largest SZ in the state marine park network • Biodiversity hotspot influenced by the Leeuwin Current and containing species common to Western and South Australia • Diverse habitats in comparatively 'pristine' condition.	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle, osprey).	Prior to zoning, total gross value of displaced catch estimated at $668,000, principally from the Abalone (1.78% of fishery catch), NZRL (0.44% of fishery catch) and Marine Scalefish (0.19% of fishery effort) Fisheries. Ongoing impact: $0.94m in total GRP (<0.1% regional total), 6 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific and wilderness values enhanced since zoning.
Pearson Isles (Investigator Marine Park)	***Area***: 165 km^2 (5 km^2 mapped, 3%) ***Mapped benthic (subtidal) habitats***: Reef (38%), sand (34%), seagrass (28%) ***Features:*** • Second largest SZ in the state marine park network • Adjacent to Commonwealth Marine Park Zone • Exceptional example of marine biodiversity and habitats, including deep seagrass meadows • Isolated and unique geological feature (inselberg).	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish. Large populations of blue groper. Largest breeding colony of little penguins in the state Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle)	Prior to zoning, total gross value of displaced catch estimated at $597,000. Principally from the NZRL Fishery (1.42% of fishery catch). Also Abalone (0.09% of fishery catch) and Marine Scalefish (0.16% of fishery effort) Fisheries. Ongoing impact: $0.69m in total GRP (<0.1% regional total), 5 fte jobs (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific, educational and wilderness values enhanced since zoning.
Salt Creek (Sir Joseph Banks Group Marine Park)	***Area***: 105 km^2 (16 km^2 mapped, 15%) ***Mapped benthic (subtidal) habitats***: Seagrass (95%), reef (4%), sand (2%) ***Features:*** • Seventh largest SZ in the state marine park network • Borders both Eyre and SG bioregions protecting a mix of the ecological characteristics of both bioregions	At least 5 migratory coastal shorebird species listed under international migratory treaties and other resident coastal waders use SZ for roosting and feeding Provides habitat for rare/conservation concern species,	Prior to zoning, the total gross value of displaced catch in this SZ is estimated to be at least $13,000, from the Marine Scalefish (0.02% of fishery effort) Fishery. Ongoing impact: $0.27m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minor (most of effort was inshore where SZ boundary inflection accommodates this).

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
	• Protects the ecosystem from estuary mouth, across sandflats and out to seagrass beds, providing protective corridor and important breeding and nursery ground for many fish and invertebrate species.	e.g. white shark, sculptured sea moth and the Eastern stargazer.			
North Neptune Islands (Neptune Isles Group Marine Park)	***Area***: 34 km^2 (3 km^2 mapped, 10%) ***Mapped benthic (subtidal) habitats***: Reef (100%) ***Features***: • 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.	World renowned hot spot for the vulnerable white shark Nationally significant breeding colony for long-nosed fur seals (50% of total SA breeding population) Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle) Habitat for the endangered coastal stingaree, SA endemic.	Prior to zoning, total gross value of displaced catch estimated at $468,000, principally from the NZRL Fishery (1.06% of fishery catch). Also Abalone Fishery (0.17% of fishery catch). Ongoing impact: $0.56m in total GRP (<0.1% regional total), 4 fte jobs (< 0.1% regional total).	White shark cage diving tours are run in the SZ by 3 operators. There were 9,807 tour participants in 2016/17, generating around $7.4m total GRP and 67 fte jobs in Eyre Peninsula. The existence of the SZ influences the decision of some participants to take part in the activity. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific, educational and wilderness values enhanced since zoning.
Clinton Wetlands (Upper Gulf St Vincent Marine Park)	***Area***: 59 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Seagrass (76%), saltmarsh (9%), mangrove (8%), sand (4%), other (2%) ***Features***: • Contains entire top of gulf ecosystem from land to sea including saltmarsh, mangroves, intertidal seagrass and dense shallow seagrass meadows • Only example within State waters of hypersaline water due to the interaction between tidal extremes and inverse estuarine flow • Partially overlays Clinton Conservation Park, establishing a protected corridor between the land and sea.	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, and feeding grounds for migratory shorebirds protected under international treaties.	Prior to zoning, total gross value of displaced catch estimated at $485,000, principally from the MSF (1.04% of fishery catch). Ongoing impact: $0.73m in total GRP (<0.1% regional total), 16 fte jobs (0.1% regional total).	No recognised tourism industry activities took place in the area prior to the SZ and none have begun since.	Prior to zoning, recreational fishing was moderate. Shore-based fishing accommodated through SPA. Scientific and wilderness values maintained since zoning.
Rapid Head (Encounter Marine Park)	***Area***: 50 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Sand (89%), seagrass (9%), reef (2%) ***Features***: • Captures complete transition from near shore reef and seagrass habitats to deep water sand habitats characteristic of southern GSV coastal ecosystem	Protection for all life cycle stages of southern calamari (adult breeding and eggs inshore, juveniles offshore). Key habitat for protected leafy sea dragon. Contains a haul-out site for the vulnerable Australian sea lion. SZ with longest ecological timeseries dataset.	Prior to zoning, total gross value of displaced catch estimated at $71,000, principally from the Charter Boat (0.79% of fishery effort), Marine Scalefish (0.08% of fishery effort) and GSV Prawn (0.45% of fishery effort) Fisheries. Ongoing impact: $0.07m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	Some commercial diving tours operate in the SZ and utilise the ex-HMAS Hobart ship wreck. The number of tours and participants before and since the establishment of the SZ is unknown. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Prior to zoning, recreational fishing was moderate. Relatively easy access for recreational (diving, kayaking and boating), scientific and educational values enhanced.
Bay of Shoals (Encounter Marine Park)	***Area***: 25 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Seagrass (79%), sand (15%), other (6%) ***Features***:	Busby and Beatrice Islets recognised as Wetlands of National Importance	Prior to zoning, total gross value of displaced catch estimated at $13,000, principally from the MSF (0.05% of fishery effort).	One tour operator directly utilises the SZ for full-day tours. It is unknown whether any change to	Prior to zoning, boat-based recreational fishing was minimal (most of effort was in entrance to

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
	• Regionally significant sheltered embayment dominated by seagrass meadows to 5m deep. Large shallow bay has natural channels protected by a tidally exposed sandbar including Busby and Beatrice Islets • Nursery area for King George whiting, and Western king prawn, Southern garfish and snook. Dense seagrass meadows support a range of fish and invertebrates including cryptic species like pipefish and leafy sea dragons	Provides important nesting and feeding grounds for resident shorebirds, and feeding grounds for migratory shorebirds protected under international treaties Nesting area for state endangered osprey.	Ongoing economic impact is minimal.	activities has occurred due to the presence of the SZ.	the Bay). Boat-based fishing accommodated through zoning. Boating, kayaking and recreational diving activities maintained. Scientific and wilderness values maintained since zoning.
Sponge Gardens (Encounter Marine Park)	***Area***: 60 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Deep sea sponges (50%), reef (18%), sand (23%), seagrass (2%) ***Features****:* • Includes one of two deep water trenches in State waters • Supports sponge communities with unusually large specimens. These sponge-dominated community types are uncommon at the bioregional scale.	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish. Important refuge for fish species of conservation concern (blue devils, harlequin fish). Supports a haul-out site for the vulnerable Australian sea lion and nesting site for state endangered species (sea eagle and osprey). Supports a number of red macro algal species (seaweeds) with very limited range of distribution.	Prior to zoning, total gross value of displaced catch estimated at $152,000, mainly from the Charter Boat (1.70% of fishery effort), Marine Scalefish (0.19% of fishery effort and NZRL (0.08% of fishery catch) Fisheries. Ongoing impact: $0.34m in total GRP (<0.1% regional total), 6 fte jobs (< 0.1% regional total).	One tour operator directly utilises the SZ for tours. The operator uses the existence of the SZ for marketing and has since gained permits for seal and dolphin interactions as part of their tours. It is unknown whether activities have changed significantly due to the existence of the SZ.	Prior to zoning, boat-based recreational fishing was moderate. Scientific, educational and wilderness values enhanced since zoning.
The Pages (Encounter Marine Park)	***Area***: 42 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Reef (51%), sand (49%) ***Features****:* • Only offshore islands in Encounter Marine Park. • Overlays part of the Pages Conservation Park establishing a protected corridor from the land to the sea.	Internationally significant breeding population of vulnerable Australian sea lion (Supports approximately one quarter of the world population). Recognised aggregation site for the vulnerable white shark.	Prior to zoning, total gross value of displaced catch estimated at $31,000, principally from the Marine Scalefish (0.09% of fishery effort) and Charter Boat (0.20% of fishery effort) Fisheries. Ongoing impact: $0.03m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). The Pages are very culturally important to the Ngarrindjeri people. Scientific and wilderness values enhanced since zoning.
Cape Borda (Western Kangaroo Island Marine Park)	***Area***: 82 km^2 (11 km^2 mapped, 14%) ***Mapped benthic (subtidal) habitats***: Sand (81%), reef (19%) ***Features****:* • Eighth largest SZ in the state marine park network • Adjacent to Ravine des Casoars and Cape Torrens Wilderness Areas and Flinders Chase National Park establishing a protected corridor from land to sea.	Supports a haul-out site for the vulnerable Australian sea lion. Nesting area for the state endangered white-bellied sea eagle.	Prior to zoning, the total gross value of displaced catch estimated at $58,000, principally from the NZRL Fishery (0.11% of fishery catch). Also Charter Boat Fishery (0.33% of fishery effort). Ongoing impact: $0.04m in total GRP (<0.1% regional total), <1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific and wilderness values enhanced since zoning.

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
Cape du Couedic (Western Kangaroo Island Marine Park)	***Area***: 28 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Reef (76%), sand (24%) ***Features****:* • Adjacent to Flinders Chase National Park establishing a protected corridor from land to sea. • Located in an area with a seasonal upwelling that provides nutrients to support productive and complex ecosystems, including seabirds, fur seals/sea lions, whales, abalone, rock lobster and a large diversity of fish species.	Important breeding site for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle) One of two known South Australian breeding sites for Australian fur seals. Breeding area for long-nosed fur seals. Observed changes: rock lobster increase in size and abundance in SZ since zoning implemented.	Prior to zoning, the total gross value of displaced catch estimated at $659,000, principally from the NZRL (2.47% of fishery catch) and Central Zone Abalone (1.12% of fishery catch) Fisheries. Ongoing impact: $0.83m in total GRP (0.1% regional total), 6 fte jobs (< 0.1% regional total).	The Cape du Couedic precinct attracts around 171,000 annual visitors who contribute around $22.2m in total GRP and 308 fte jobs to Kangaroo Island. Interpretive signage added since the SZ was established adds educative value for visitors but no additional activities are expected from the existence of the SZ. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). The Casuarina Islets are very culturally important to the Ngarrindjeri people. Scientific, educational and wilderness values enhanced since zoning.

1. INTRODUCTION

1.1 Purpose of this Report

The driver for the current report is 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[6] 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, Water and Natural Resources (DEWNR)".

The current report will provide information that is applicable to the first three of the points above (see scope in next section).

[6] 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.

1.2 Scope of this Report

To assist with the Marine Parks Election Commitment, DEW contracted EconSearch to prepare an independent report titled 'Environmental, Social and Economic Values of Marine Park Sanctuary Zones' that includes the following:

- 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.

1.3 Structure of this Report

The remainder of this report is organised as follows:

- In Section 2 the process and governance for the establishment of marine parks and zoning is presented, covering the summary timeline, planning phase 2001-2012, transition phase 2012-2014 and the implementation phase 2014-present.
- Marine parks network is presented in Section 3, covering marine park boundaries and bioregions, park descriptions and land uses as well as the environmental, economic and social values of the 19 marine parks.
- 12 focus SZs are discussed in Section 4, 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.
- In Section 5 opportunities for marine parks or marine protection are presented, considering the metropolitan area (as per election commitment), areas previously suggested through public submissions as well as areas that do not result in the displacement of commercial or recreational fishing or other recreational activities.

- Concluding comments are presented in Section 6, 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. PROCESS AND GOVERNANCE FOR THE ESTABLISHMENT OF MARINE PARKS AND ZONING

The following history synopsis is based on information provided by DEW and describes the steps taken and governance established to deliver the South Australian System of Marine Parks (formerly known as Marine Protected Areas). URLS's of referenced documents are provided as footnotes. The timeline of these processes is summarised in Figure 2-1.

2.1 Intention to Establish Marine Parks: Pre 2001

1998

- The Liberal SA Government released Our Seas and Our Coasts, a marine and estuarine strategy for South Australia[7], which outlined foundations required to conserve biodiversity and heritage in the marine environment.

2001

- The Liberal SA Government announced an intention to establish a network of Marine Protected Areas in South Australia.

2.2 Phases of the Marine Parks Process

The process can be described in the following phases:

Phase 1: Scoping, 2001-2005

Phase 2: Legislation, 2006-2009

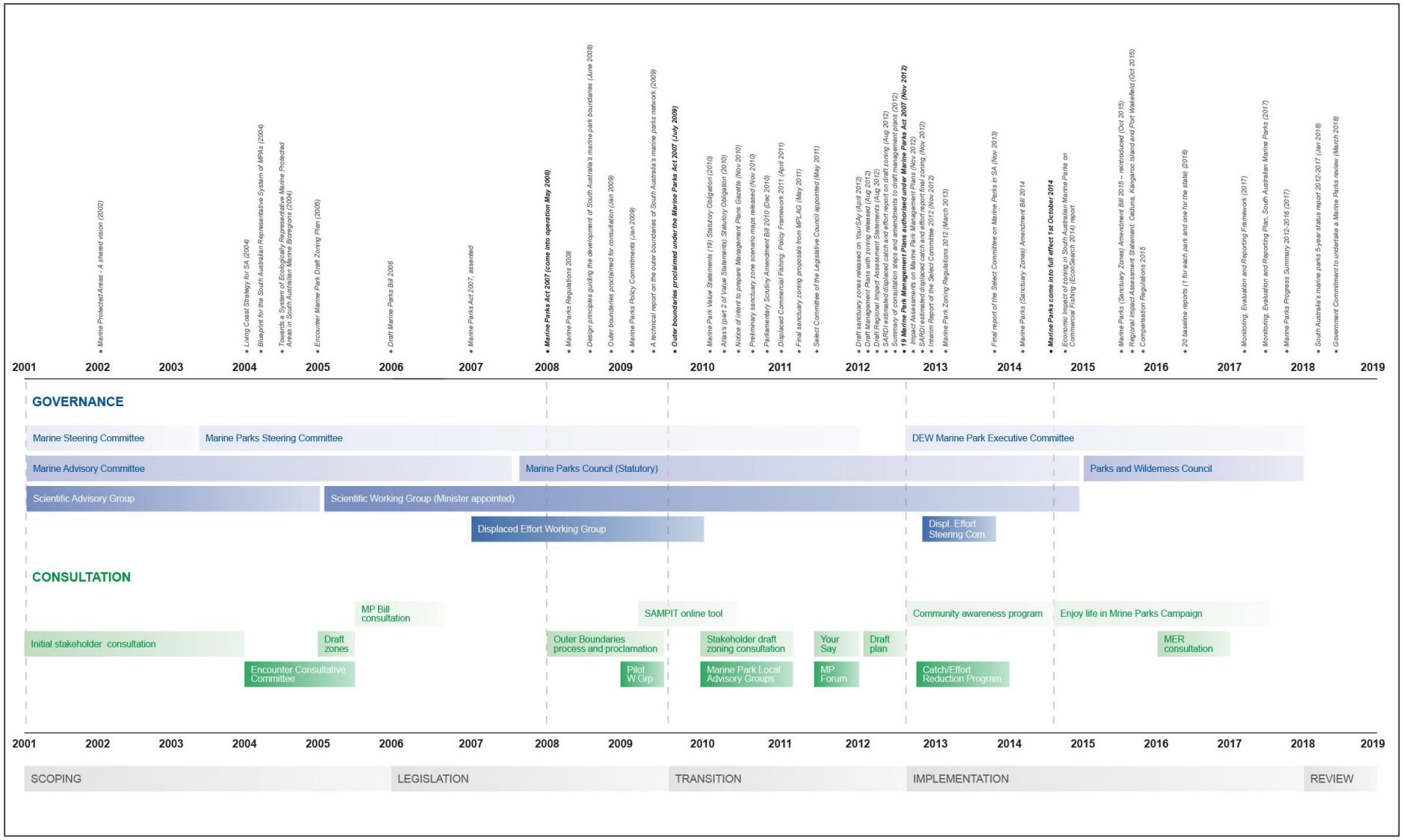
Phase 3: Planning, 2010-2012

Phase 4: Transition, 2013-2014

Phase 5: Implementation, 2015 to present.

[7] https://www.epa.sa.gov.au/files/8614_seasandcoasts.pdf

Figure 2-1 Process and governance for establishing marine parks



Source: DEW

2.2.1 Phase 1: Scoping, 2001-2005

The scoping phase between 2001 and 2005 includes the period between the announcement of the intent to establish the Marine Protected Areas network through to the end of the consultation process for the Encounter Marine Park Draft Zoning Plan. The following chronologically summaries the steps taken and the consultation involved in this phase.

Year	Milestone/consultation/key product
2001	• The Liberal SA Government announced an intention to develop the Marine Protected Areas network. • The Liberal SA Government established the Marine Advisory Committee. • Cross-Government Steering Committee established.
2002	• The previous SA Government developed a draft policy document *Marine Protected Areas – A Shared Vision*, outlining concepts and design principles. State-wide consultation on this document occurred in early 2002 and consisted of 23 public meetings/information sessions and engaged approximately 1600 people. The finalised document was released later in 2002.
2004	• *The Living Coast Strategy* was released by the previous SA Government and was a plan designed to preserve SA's coast including provision for delivering the South Australian Representative System of Marine Protected Areas (SARSMPA). • The Blueprint for the South Australian Representative System of MPAs[8] was released by the previous SA Government and incorporated feedback received during the consultation process in 2001/02. • The previous SA Government released Towards a System of Ecologically Representative Marine Protected Areas in South Australian Marine Bioregions (Baker 2004)[9] which presented evidence-based recommendations for potential outer boundaries for marine parks. • Encounter Consultative Committee was established and members provided advice to the draft zoning of the Encounter Marine Park Draft Zoning Plan. Members were required to live adjacent to and/or work within the Encounter Marine Park and have demonstrated expertise in one or more of the areas listed within the Terms of Reference. Membership was made up of Local Council Members (from Kangaroo Island and Fleurieu region), National Resource Management (NRM) Board representative, commercial and charter fishers, tourism operators, education sector and conservation and community experts.

[8] https://www.environment.sa.gov.au/files/sharedassets/public/marine_parks/mpa_blueprint.pdf
[9] http://www.environment.sa.gov.au/files/sharedassets/public/marine_parks/part_1.pdf

2005	• The Scientific Working Group (SWG) was established. • The Encounter Marine Park Draft Zoning Plan was released as a 'test case' of multiple-use zoning, e.g. SZs and Habitat Protection Zones (HPZ). This included the activities and uses matrix; a threats-based analysis developed with support from the SWG. A three-month consultation period was undertaken which focussed on the Fleurieu Peninsula, Kangaroo Island and Adelaide. It included 15 public information days, 48 stakeholder group meetings and 427 submissions from 498 respondents. These informed the drafting of the marine parks legislation.

2.2.2 Phase 2: Legislation, 2006-2009

The legislation phase between 2006 and 2009 covered the establishment of the *Marine Parks Act 2007* through to the proclamation of the outer boundaries of the 19 marine parks. The following chronologically summaries the steps taken and the consultation involved in this phase.

Year	Milestone/consultation/key product
2006	• The draft Marine Parks Bill 2006 was released for public comment. Over 670 people attended 16 public meetings across 15 metropolitan and regional locations. 162 written submissions were received. The Marine Parks Cross-Government Steering Committee oversaw the development of the Bill, with. advice from the Marine Advisory Committee and the SWG.

2007	• *Marine Parks Act 2007*[10] was assented to on 29 November 2007.
	• The Minister established a Displaced Effort Working Group[11] in late 2007, to provide advice to help address commercial fishing displaced by the introduction of marine parks. Membership included representatives from:
	  ○ commercial fishing industries
	  ○ aquaculture industries
	  ○ PIRSA Fisheries
	  ○ PIRSA Aquaculture
	  ○ DEWNR.

2008	• In 2008, the *Marine Parks Act 2007*[12] came into operation, providing for a CAR System of marine parks. • The Marine Parks Council of South Australia, a statutory body established under the *Marine Parks Act 2007*, replaced the Marine Advisory Committee.

[10] http://www.legislation.sa.gov.au/LZ/C/A/MARINE%20PARKS%20ACT%202007.aspx
[11] https://www.environment.sa.gov.au/marineparks/About/history/displaced-commercial-fishing/displaced-effort-working-group
[12] http://www.legislation.sa.gov.au/LZ/C/A/MARINE%20PARKS%20ACT%202007.aspx

- Marine Parks Regulations 2008[13] under the *Marine Parks Act 2007*. These regulations set out the administrative and permitting procedures under the Act.
- The previous SA Government released the Design principles guiding the development of South Australia's marine park boundaries - June 2008[14]. Design principles were based on international best practice and advice received from both the SWG and the Marine Parks Council of South Australia.

2009

- The *Marine Parks Act 2007* requires there be consultation on the marine park outer boundaries prior to the finalisation of management plans and zoning. Provisional outer boundaries for 19 marine parks were proclaimed[15] on 29 January 2009 and released for eight-weeks public comment.
- The previous SA Government released the Marine Park Policy Commitments[16]. These commitments (over 100 in total) aimed to accommodate existing users such as mining, aquaculture, shipping and developers, as well as provide an indication of the expected impact to commercial and recreational fishing by marine park zoning.
- To inform the zoning within marine parks, in particular the establishment of SZs, the previous SA Government developed an on-line tool known as South Australia's Marine Park Information Tool (SAMPIT). The tool collected information from the community on how they use South Australia's marine environment. This was used to help ensure, where possible, popular recreational fishing areas were not included in SZs. The outputs of the SAMPIT[17] were shared on the SA Marine Parks website.
- The previous SA Government released a Technical report on the outer boundaries of South Australia's marine parks network[18]. The report outlined the draft outer boundaries for SA Marine Parks Network for consultation. This incorporated the design principles outlined in the 2008 report (above).

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13 https://www.legislation.sa.gov.au/LZ/C/R/MARINE%20PARKS%20REGULATIONS%202008/2017.06.30/2008.284.UN.PDF

14 https://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=3&CId=263&DUId=17c288c7-6fda-4a90-8464-dfd26baa6b08

15 https://www.legislation.sa.gov.au/LZ/C/P/MARINE%20PARKS%20PROCLAMATION%202009/2009.07.22_(2009.01.29)/2009.-.UN.PDF

16 https://www.environment.sa.gov.au/files/sharedassets/public/marine_parks/to_archive/mp-gen-policycommitt09.pdf

17 https://www.environment.sa.gov.au/marineparks/About/history/Draft_zoning_consultation_2012

18 https://data.environment.sa.gov.au/Content/_layouts/15/WopiFrame.aspx?sourcedoc=/Content/Publications/SA-MarineParks-outer-boundaries-2009.pdf&action=default&DefaultItemOpen=1

- In April 2009, the previous SA Government established three Pilot Working Groups[19] to support the finalisation of the outer boundaries of marine parks. Each group included representatives nominated from the following sectors:
    - seafood
    - conservation
    - recreational fishing
    - local government.
- The Groups were asked to provide advice to the Minister on outer boundaries and indicative zoning arrangements in relation to five marine parks (parks 1, 2, 6, 18 and 19).
- The outer boundaries of the marine parks were reproclaimed[20] on 23 July 2009 under the *Marine Parks Act 2007* following 2,360 written submissions and amendments to seven park boundaries.

2.2.3 Phase 3. Planning, 2010-2012

The planning phase between 2010 and 2012 covered the establishment of marine park local advisory groups through to the finalisation of management plans for the 19 marine parks. During this period, there were also ongoing discussions with the Australian Government, who were also establishing a network of marine reserves in Commonwealth waters adjacent to South Australia. The aim of these discussions was to seek alignment and complementarity of boundaries and zones[21] to assist with public education and compliance. The following chronologically summaries the steps taken and the consultation involved in this phase.

Year	Milestone/consultation/key product
2010	• The MPLAGs were established in late 2009 and met on five occasions between February 2010 and May 2011, and included representatives from: recreational fishers, local council representatives, conservationists, commercial fishers and other community interest groups. Members were required to live adjacent to and/or work within the marine parks and have demonstrated expertise in one or more of the areas listed within the Terms of Reference.

[19] https://www.environment.sa.gov.au/marineparks/About/history/Pilot_working_groups_2009

[20] https://www.legislation.sa.gov.au/LZ/C/P/MARINE%20PARKS%20PROCLAMATION%202009/2012.11.28/2009.-.UN.PDF

[21] 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.

- Over 1,500 people, predominantly recreational fishers, entered information into the SAMPIT tool. Maps were produced for the second round of MPLAG meetings and feedback was sought on what SAMPIT was showing about the distribution of recreational fishing.
- November 2010, preliminary sanctuary zone scenario maps[22] were provided to the third meeting of the MPLAGs (see section 2.4).
- On 8 November 2010, a Notice of Intent to Prepare Management Plans[23] was issued in the Government Gazette, pursuant to section 14 of the *Marine Parks Act 2007*, stating that the Minister for Environment and Conservation gives notice of the intention to make management plans for South Australia's 19 established marine parks.
- 19 Marine Park value statements[24] were released, outlining the environmental, economic and social values for all Marine Parks along with atlas maps[25].
- In December 2010, the *Marine Parks (Parliamentary Scrutiny) Amendment Act 2010*[26] came into effect to change the procedure for making amendments to management plans.

2011

- February 2011, MPLAGs provided initial advice[27] about SZ proposals and the Department provided a rapid assessment[28] of those proposals.
- At the final meetings in May 2011, each MPLAG formulated final zoning proposals[29] for zoning their local marine park. Some groups were unable to provide a consensus position so submitted several zoning proposals to reflect the alternate views (see section 2.4).

22 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

23 http://www.governmentgazette.sa.gov.au/2010/november/2010_077.pdf

24 https://www.environment.sa.gov.au/marineparks/About/history/Outer_boundaries_consultation_2009

25 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

26 http://www.legislation.sa.gov.au/LZ/V/A/2010/MARINE%20PARKS%20(PARLIAMENTARY%20SCRUTINY)%20AMENDMENT%20ACT%202010_24/2010.24.UN.PDF

27 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

28 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

29 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

- The previous SA Government released the Displaced Commercial Fishing: Policy Framework: South Australian Government, April 2011[30]. Advice provided by the Displaced Effort Working Group[31] was considered in formulating the policy framework.
- On 18 May 2011, a Select Committee of the Legislative Council was appointed to review and report on marine parks in South Australia (for Terms of Reference of the Select Committee please refer to Section 3 below).
- November 2011, following no consensus or alignment in the advice the previous SA Government received from the MPLAGs, SWG and other stakeholders on the zoning within Marine Parks, in particular the location and size of SZs, the Government called for a "reset of the process", to allow for more consultation.

2012

- The Minister for Sustainability, Environment and Conservation and leaders from the conservation, recreational and commercial fishing sectors attended the Key Stakeholder Forum[32] in Adelaide on 11 and 12 April 2012[33]. Consensus was reached on a zoning approach.
- Outcomes of the Key Stakeholder Forum were made public on 13 April 2012 on the previous Government's YourSAy website for a pre-draft management plan preview. 1,892 comments were received.
- 19 draft management plans, with the draft zoning (see Draft zoning consultation process in August 2012 [stage 3]), were released by the previous SA Government for an 8-week state-wide consultation process along with:
    - South Australia Research and Development Institute (SARDI) report SARDI estimates of historical commercial fishery catches/effort in South Australia's Marine Parks - draft zoning (July 2012)[34]. This report estimates historical catch/effort for key commercial fisheries in proposed sanctuary and HPZs to support consultation.

30 https://www.environment.sa.gov.au/marineparks/About/history/displaced-commercial-fishing

31 https://www.environment.sa.gov.au/marineparks/About/history/displaced-commercial-fishing/displaced-effort-working-group

32 https://yoursay.sa.gov.au/media/BAhbBlsHOgZmSSIhMjAxMi8wNC8yNi8yMV8xMl8yNl82OTVfZmlsZQY6BkVU/21_12_26_695_file

33 Two independent scientific advisors attended the proceedings.

34 http://www.pir.sa.gov.au/__data/assets/pdf_file/0003/232257/Habitat_Protection_Zones_in_SA_Marine_Parks_1.pdf

  - The draft regional impact statements[35], based on draft zoning for each marine park (Bailey et al. 2012a, b, c).

- Consultation on the draft management plans included 40 briefings and 41 information days, engaging approximately 3,000 people. Consultation closed on 22 October 2012. 8,649 submissions were received and a Summary of Submissions[36] was released in November 2012.
- The Marine Parks Council provided advice[37] to the Minister on draft management plans on 16 November 2012. This included a number of recommendations, which formed part of the Draft zoning consultation 2012[38].
- Zoning and management plans were amended based on advice received (see Finalising management plans for South Australia's marine park network – a summary of consultation steps and amendments to draft management plans)[39]. Zoning of the marine parks was finalised (see Draft zoning consultation process [stage 4]) with 42 general managed use zones (GMUZ), 59 HPZs, 83 SZs, 27 RAZ and 52 SPA designated across the parks.
- The Management Plans for 19 Marine Parks were authorised under the *Marine Parks Act 2007* by the SA Governor on 29 November 2012.
- SARDI released the report - SARDI estimates of historical commercial fishery catches/effort in South Australia's Marine Parks - final zoning (Nov 2012)[40]. The report estimated historical catch/effort for key commercial fisheries on the final sanctuary and habitat protection zones.
- On 27 November 2012, the Select Committee on marine parks in South Australia tabled an interim report[41], including recommendations (see Section 3 below on Select Committee).

2.2.4 Phase 4: Transition, 2013-2014

A two-year transition phase was established between November 2012 to October 2014 to support commercial and recreational fishers to adjust to the Marine Park zoning arrangements.

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35 https://www.environment.sa.gov.au/files/sharedassets/marine_parks/consultation_2012/impact_statements/mp-gen-impactstatements-2012.zip

36 http://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-submissionsummary-nov12.pdf

37 https://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-mpcouncil-advicetominister-nov12.pdf

38 https://www.environment.sa.gov.au/marineparks/About/history/Draft_zoning_consultation_2012

39 https://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-finalisingmanagementplansummary-nov12.pdf

40 http://www.pir.sa.gov.au/__data/assets/pdf_file/0004/232258/Habitat_Protection_Zones_in_SA_Marine_Parks_2.pdf

41 https://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=3&PId=52&CId=263

During this transition period, the previous SA Government implemented the South Australian Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program[42] (Government of South Australia 2013) to address residual impact of displaced commercial fishing. A community awareness program was undertaken during this period to prepare for full implementation of SZs on 1 October 2014.

Year	Milestone/consultation/key product
2012	• On 29 November 2012, a community awareness program was launched, 'Enjoy Life in Our Marine Parks'. Key features of the program included information disseminated in newspapers and on television, as well as distribution of printed materials including maps, GPS coordinates, regional brochures and fishing guides. • Marine Parks (Zoning) Regulations 2012[43] under the *Marine Parks Act 2007*. These regulations were made on 29 November 2012, but did not commence until 29 March 2013. They set out the prohibitions and restrictions applying within a marine park under the Act.
2013	• Implementation of the South Australian Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program[44] commenced (refer to section 2.3.8 for further details) • The final Select Committee on Marine Parks in South Australia report[45] was tabled in the Legislative Council on 26 November 2013 (refer to 2.3.9 section below on Select Committee).
2014	• In 2014, election commitments were made to enhance experiences for recreational fishers and encourage more use of marine parks, by offering grants to support recreational fishing in and around marine parks; trialling a new artificial reef (Windara Reef); and opening offline reservoirs to recreational fishing. • In May 2014, a Bill to amend the *Marine Parks Act 2007* was introduced into the Legislative Council by Hon Michelle Lensink (see Section 3). The Bill was defeated in the House of Assembly on 18 September 2014. • Subsequently, the previous SA Government made a commitment to prepare, within 12 months, a Regional Impact Assessment Statement

42 http://www.pir.sa.gov.au/__data/assets/pdf_file/0005/261914/SA_Marine_Parks_Commercial_Fisheries_Voluntary_Catch_Effort_Reduction_Program_Plan-15_July_2013.pdf

43 https://www.legislation.sa.gov.au/LZ/C/R/MARINE%20PARKS%20(ZONING)%20REGULATIONS%202012/CURRENT/2012.243.UN.PDF

44 http://www.pir.sa.gov.au/__data/assets/pdf_file/0005/261914/SA_Marine_Parks_Commercial_Fisheries_Voluntary_Catch_Effort_Reduction_Program_Plan-15_July_2013.pdf

45 https://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=3&PId=52&CId=263

(RIAS) for Ceduna, Kangaroo Island and Port Wakefield. This commitment was made to provide an early warning of any impacts from the full implementation of marine park zoning.

- SZs came into effect on 1 October 2014.
- Economic Impact of Zoning in SA Marine Parks on Commercial Fishing (EconSearch 2014)[46] report was released. Displaced catch GVP across the state for all fisheries was estimated to be 1.98%.

2.2.5 Phase 5: Implementation, 2015 to Present

From 1 October 2014, when Marine Park SZs took full effect, the previous SA Government implementation program focused on community engagement programs, compliance with zoning arrangements and monitoring and evaluating the effectiveness of the network in achieving the objects of the Act.

Year	Milestone/consultation/key product
2015	• 1 October 2015, Goyder delivered the Regional Impact Assessment Statement for Ceduna, Kangaroo Island and Port Wakefield[47] to the previous SA Government. • The previous SA Government reform of Boards and Committees leads to the establishment of the Parks and Wilderness Council, superseding the Marine Parks Council and SWG. • In October 2015, the Bill to amend the *Marine Parks Act 2007* was re-introduced in the House of Assembly by Hon Steven Griffiths and was defeated. • PIRSA commenced a process to repeal aquatic reserves declared under the *Fisheries Management Act 2007* that resided within marine parks SZs.
2016	• Regulations that set out the process and eligibility for applications of compensation associated with a marine park under the Act came into effect, Compensation Regulations 2015[48], under the *Marine Parks Act 2007*.

[46] http://www.econsearch.com.au/media/Documents/Fishing/Marine_Parks_Update_Final_140828.pdf
[47] https://www.environment.sa.gov.au/files/sharedassets/marine_parks/regional_impact_statements/151001-marine-parks-rias-report-ceduna-ki-port-wakefield.pdf
[48] https://www.legislation.sa.gov.au/LZ/C/R/MARINE%20PARKS%20(STATUTORY%20AUTHORISATION%20COMPENSATION)%20REGULATIONS%202015/CURRENT/2015.227.UN.PDF

- Baseline reports for each of the 19 marine parks and one state-wide[49] were released by the previous SA Government. These reports outlined predictions of change to ecological and socio-economic values that might occur due to the marine park management plans and presented a range of potential indicators that could be used to track these changes.

2017

- The MER framework[50] and MER Plan[51] were released by the previous SA Government and outlined the process and the evidence that would be used to assess whether marine parks achieved the objectives of the Act.
- The First Annual Progress Summary[52] was released by the previous SA Government and communicated a snapshot of monitoring and implementation activities.

2018

- The South Australia's marine parks 5-year status report 2012 - 2017[53] and Summary Report[54] were released by the previous SA Government in January 2018. The Status Report assessed the progress of the marine parks program since implementation of the 19 management plans.
- 11 case studies within the Status Report showcased key findings and activities from the marine parks program over the past 5 years, and were developed into fact sheets[55].
- The newly elected SA Government committed to undertake a review of the network of marine parks, to ensure a sensible and successful balance between economic development and environmental preservation.

[49] https://data.environment.sa.gov.au/Coast-and-Marine/Coast-Marine-Management/Pages/Marine-Parks.aspx
[50] https://data.environment.sa.gov.au/Content/Publications/MER_Framework_MarineParks.pdf
[51] https://data.environment.sa.gov.au/Content/Publications/DEWNR-TR-2017-05.pdf
[52] http://www.environment.sa.gov.au/files/sharedassets/marine_parks/marine-parks-progress-summary-12-16.pdf
[53] https://data.environment.sa.gov.au/Content/Publications/South-Australias-Marine-Parks-5-year-Status-Report-2012-2017.pdf
[54] https://data.environment.sa.gov.au/Content/Publications/South-Australias-Marine-Parks-5-year-Status-Report-2012-2017-summary.pdf
[55] https://data.environment.sa.gov.au/Content/Publications/South-Australias-Marine-Parks-5-year-Status-Report-2012-2017-summary.pdf

2.3 Further Explanation of Advisory Groups, Stakeholder Consultation, and Other Key Steps in Marine Parks Process

2.3.1 Advice to SA Government on the Establishment of Marine Parks

Department for Environment and Water (DEW), formally known as Department for Environment and Heritage (DEH), was the agency responsible for leading the establishment of Marine Parks on behalf of the SA Government.

A series of governance and advisory groups were established to provide advice for the previous SA Government to consider in the establishment of Marine Parks.

2.3.2 Advisory Council/Committee (2001-present)

Between 2001 and 2008, prior to the establishment the *Marine Parks Act 2007*, the Marine Advisory Committee provided advice to the Minister on matters related to marine parks.

The Marine Parks Council of South Australia was a statutory body established by the *Marine Parks Act 2007* to provide independent advice to the Minister for Environment and Conservation on the establishment of South Australia's marine parks.

Members included representatives with knowledge of, or experience in, the following fields:

- Commercial fishing
- Aquaculture
- Recreational fishing
- Marine conservation
- Science relevant to the marine environment

And members with:

- Extensive involvement in community affairs
- Extensive knowledge of indigenous culture, especially in connection with the marine environment.

The role of the Marine Parks Council is defined under Section 29 of the *Marine Parks Act 2007*, and states the Council has the following functions:

- To provide advice to the Minister on the establishment of marine parks, including:
- advice on any community nominations for marine parks; and
- advice on areas to be specified as marine parks;
- to provide advice to the Minister in relation to the introduction, variation or revocation of interim protection orders;

- to provide advice to the Minister in relation to a proposal to alter the boundaries of a marine park;
- to provide advice to the Minister in relation to a proposal to establish or alter a zone within a marine park;
- to provide advice to the Minister in relation to the management of marine parks, the formulation and operation of management plans under this Act, and the extent to which the objects of the Act are being achieved through the implementation of management plans under this Act;
- to provide advice to the Minister on ways to promote community participation in the management of marine parks and the conservation of relevant marine areas; and
- to carry out such other functions as may be assigned to the Council by or under this Act or by the Minister.

From 1 July 2015, the Parks and Wilderness Council[56] acquired all statutory functions previously undertaken by the Marine Parks Council, following the previous SA Government reform of Boards and Committees.

The Parks and Wilderness Council is required to carry out its functions under the *National Parks and Wildlife Act 1972*[57], along with the functions assigned to the Council under the *Adelaide Dolphin Sanctuary Act 2005*[58], the *Marine Parks Act 2007*[59] and the *Wilderness Protection Act 1992*[60], and provides advice at the Minister's request on any matter relating to the administration of these four Acts for which the Council has a legislative role.

2.3.3 Scientific Advisory/Working Group (2001-2015)

In 2000, the Scientific Advisory Group (SAG) was established to assist with the process of refining potential areas for a network of Marine Parks. The SAG consisted of representatives from:

- SARDI
- Primary Industries and Regions South Australia (PIRSA),
- DEW, formerly the DEH,
- University of Adelaide,
- Flinders University, and
- South Australian Museum.

Collectively, this group had expertise in the fields of marine ecology and biology, marine geology, and commercial and recreational fisheries research.

[56] https://www.environment.sa.gov.au/about-us/boards-and-committees/parks-and-wilderness-council
[57] http://www.legislation.sa.gov.au/LZ/C/A/NATIONAL%20PARKS%20AND%20WILDLIFE%20ACT%201972.aspx
[58] http://www.legislation.sa.gov.au/LZ/C/A/ADELAIDE%20DOLPHIN%20SANCTUARY%20ACT%202005.aspx
[59] http://www.legislation.sa.gov.au/LZ/C/A/MARINE%20PARKS%20ACT%202007.aspx
[60] http://www.legislation.sa.gov.au/LZ/C/A/WILDERNESS%20PROTECTION%20ACT%201992.aspx

In 2005, the SWG was established to provide independent advice to the Minister for Environment and Conservation on technical and scientific matters relating to the marine environment, including marine parks design. The SWG comprised 12 independent scientists appointed by the Minister.

Communiqués and meeting outcomes of the SWG are available from the Marine Parks website[61].

The SWG was abolished in 2015, following the previous SA Government reform of Boards and Committees.

2.3.4 Marine Parks Cross Government Steering Committee (2001-2012)

In 2001, a Liberal SA Government steering committee, with representation from multiple agencies, was created. The Committee was chaired by DEWNR[62] and included representatives from:

- Primary Industries and Regions SA (PIRSA),
- Department of Planning, Transport and Infrastructure
- Environment Protection Authority,
- South Australian Tourism Commission,
- Department of Manufacturing, Innovation, Trade, Resources and Energy (which became the Department of State Development),
- Department of Treasury and Finance, and
- Department of the Premier and Cabinet.

The committee's role was to represent all relevant government interests in the marine park planning and implementation process.

Since 2012, the implementation of Marine Parks was administered by DEW's internal Marine Park Executive Committee and consultation continued across government as required.

2.3.5 A Displaced Effort Working Group (2007-2010)

In 2007, a Displaced Effort Working Group was established to advise the Minister on the development of policy, processes, and mechanisms for addressing displaced commercial fishing and/or aquaculture effort arising from the dedication, zoning and management of South Australian marine parks.

The working group included representatives from: commercial fishing and aquaculture industries; PIRSA Fisheries; PIRSA Aquaculture and DEWNR.

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[61] https://www.environment.sa.gov.au/marineparks/About/history/scientific-working-group

[62] Now the Department for Environment and Water (DEW).

In April 2011, the previous SA Government released its *Displaced Commercial Fishing Policy Framework: South Australian Government, April 2011*, having regard to advice previously received from the Displaced Effort Working Group.

2.3.6 A Displaced Effort Government Steering Committee (Feb-July 2013)

Established to implement the *Displaced Commercial Fishing Policy Framework*, this group sought advice from two expert advisory bodies;

- The Plan Working Group, which consisted of independent fisher experts responsible for developing a buyback plan, and
- The Technical Advisory Group, which assessed applications from fishers who volunteered for their licences and entitlements to be included in the catch/effort reduction buyback program.

2.3.7 Marine Park Local Advisory Groups (2009-2011)

Under the *Marine Parks Act 2007*, formal community consultation is required throughout the marine parks development process.

In 2010, 14 MPLAGs (including the existing Great Australian Bight Consultative Committee) were created to provide local knowledge into the development of management plans and zoning. They comprised 180 volunteer community members including: recreational fishers, local council representatives, conservationists, commercial fishers and other community interest groups.

Five meetings were held between February 2010 and May 2011. At the final meetings each Group formulated proposals for zoning within their local marine park. Some groups were unable to provide a consensus position so submitted several zoning proposals to reflect alternative views.

The history of all the MPLAG meetings is available on the Marine Parks website[63]. Although each MPLAG ran slightly differently, the primary focus of each meeting is documented below:

Meeting 1: February 2010

- Introductory meeting to set expectations, discuss the role and direction of the MPLAGs.
- The use of the SAMPIT was discussed as a mechanism to gather information and the Groups supported its use and agreed to promote through their networks.

Meeting 2: May 2010

- MPLAG members reviewed the information provided through the SAMPIT. Additional information was included by MPLAGs.

63 https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

- Members were provided with outlines of the management plan content and the design process.
- Members were asked to identify local management issues and strategies prior to the next meeting.

Meeting 3: November 2010

- Preliminary SZ scenario maps were tabled/released as a starting point for discussions on zoning. MPLAG advice was sought on zoning scenario(s). The preliminary SZ scenarios were developed using the environmental, social and economic information available to the previous SA Government at the time, including information provided through SAMPIT (the South Australian Marine Parks Information Tool).

In November 2010, a letter from the Minister to the Chairs of the Marine Parks Local Advisory Groups (see below) outlined the way in which advice from a range of sources would be considered by the previous SA Government:

'…. As the Government develops marine park management plans with zoning over the next two years, many sources of information will be carefully considered, including:

- Advice provided by MPLAGs,
- User data provided by recreational fishers;
- User data provided by the seafood industry, resources and shipping sectors, infrastructure developers and other commercial interests;
- Advice from the SWG and other marine scientists;
- Views of other Ministers
- Views of the Marine Park Council of South Australia;
- Views of indigenous representatives; and
- Views of key stakeholders, including:
    - environment and conservation sector
    - local government
    - the commercial fishing industry
    - the aquaculture industry
    - the recreational fishing sector
    - the mining and petroleum industries
    - the tourism sector, and
    - the general business sector….'

Meeting 4: February 2011

- Discussions on the preliminary SZ merits and concerns. Alternative zones were suggested and discussed.
- MPLAG members shared feedback they had received from the broader community.
- Many MPLAG members had issues with the size of the preliminary SZs.

Meeting 5: May 2011

- Groups were provided with further information and a Rapid Assessment on CAR Principles for each of the Marine Parks suggested zoning options. The intent of the rapid assessment was to assist in determining if the zoning option meets the core biophysical principles of CAR and provide options of how they could zone to meet these objectives.
- MPLAG submitted their final zoning advice, which comprised only MPLAG unanimous and majority advice. Minority advice was excluded.

2.3.8 Commercial Fisheries Voluntary Catch/Effort Reduction Program (2013-2014)

The previous SA Government made a commitment that marine parks zoning would have no more than a 5 per cent economic impact on the commercial fishing industry's state-wide GVP (SA Government policy commitments[64]).

The previous SA Government's policy framework for the management of displaced commercial fishing effort used the following steps (Displaced Commercial Fishing: Policy Framework: South Australian Government, April 2011[65]):

- Pragmatic zoning to avoid displacement
- Redistribution of effort (where possible) without impacting ecological or economic sustainability of fishery
- Market-based buyback of fishing licences or adjustments of quotas or other mechanisms of sufficient effort to avoid negative impacts on the fishery
- Compulsory acquisition of fishing authorities (as a last resort option) or adjustments of quotas or other mechanisms.

The likely impacts on the commercial catch/effort of South Australian fisheries were estimated in the report SARDI estimates of historical commercial fishery catches/effort in South Australia's

64 http://www.environment.sa.gov.au/files/sharedassets/public/marine_parks/to_archive/mp-gen-policycommitt09.pdf

65 https://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-displaced-commercial-fishing-policy-framework.pdf

Marine Parks - final zoning (Nov 2012)[66]. This informed the estimates of impact, in terms of 'total lost catch', in the Economic Impact of Zoning in SA Marine Parks on Commercial Fishing (EconSearch 2014)[67] report. This estimated displaced catch GVP across the state for all fisheries at 1.98 per cent, which was less than the previous SA Government's commitment of 5 per cent.

PIRSA administered the SA Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program[68] on behalf of the previous SA Government (PIRSA 2011a,b). 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 Program invited commercial fishers to offer their licences and entitlements for inclusion in the market-based reduction program. The following fisheries were invited to be part of the Catch/Effort Voluntary Reduction Program:

- Western and Central Zone Abalone
- Northern and Southern Zone Rock Lobster
- Marine Scalefish
- Charter.

The targets for the displaced catch and effort reduction program were met through voluntary participation in the buyback program. The previous SA Government invested over $20M in the effort reduction program (DEWNR 2017a).

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). The abalone fishery had only a small number of affected fishers and separate negotiations with them to obtain the required quota were successfully concluded (Thomas and Hughes 2016).

The Prawn, Blue Crab, and Sardine Fisheries were not included in the catch and effort reduction program as it was considered that these could be redistributed without impact (PIRSA 2011a,b).

66 http://www.pir.sa.gov.au/__data/assets/pdf_file/0004/232258/Habitat_Protection_Zones_in_SA_Marine_Parks_2.pdf

67 http://www.econsearch.com.au/media/Documents/Fishing/Marine_Parks_Update_Final_140828.pdf

68 http://www.pir.sa.gov.au/fishing/commercial_fishing/licensing_registration/catch_effort_reduction_program

Table 2-1 Abalone Fishery: Estimated effort displacement by sanctuary zones and effort removed, Western Zone and Central Zone

	Greenlip	Blacklip	Licences
Western Zone			
Buyback target (quota units)	61.0	21.0	NA
Buyback reduction achieved (quota units)	48.0	44.0	1.0
Central Zone			
Buyback target (quota units)	34.0	4.0	NA
Buyback reduction achieved[(a)]	62.1	10.4	- [(a)]

[a] No licenses were bought out. Consequently, the reduction was shared equally across all licence holders.

Source: Kosturjak et al. 2015

Table 2-2 Rock Lobster Fishery: Estimated effort displaced by sanctuary zones and effort removed, Northern Zone and Southern Zone

	Quota units	Pots	Licences
Northern Zone			
Buyback target	3,563	225	NA
Buyback reduction achieved	3,955	256	4
Southern Zone			
Buyback target	40	40	NA
Buyback reduction achieved	41	41	1

Source: Kosturjak et al. 2015 with additional information on Southern Zone from A. Burnell (DEWNR) pers. comm. February 2017

Table 2-3 Marine Scalefish Fishery: Historical total effort, estimated effort displaced by sanctuary zones and effort removed, South Australia

	Handline effort (fisher days)	Longline effort (fisher days)	Haulnet effort (fisher days)	Other gear effort (fisher days)	Licences
Historic annual average effort	27,516[(a)]	126,939[(a)]	43,124[(b)]	474,960[(a)]	NA
Estimated displacement and buyback target	863	225	701	672	NA
Buyback reduction achieved	904	296	794	820	12

[a] Average for the period 1990/91 to 2011/2012 (b) Average for the period 2006/07 to 2011/2012

Source: Kosturjak et al. 2015

Table 2-4 Charter Boat Fishery: Historical total effort, estimated effort displaced by sanctuary zones and effort removed, South Australia

	Customer days	Licences
Average annual effort (2005/06 to 2011/12)	21,808	NA
Estimated displacement	1,136	NA
Buyback reduction achieved	1,197	3

Source: Kosturjak et al. 2015

2.3.9 Select Committee on Marine Parks (2011-2013)

On 18 May 2011, a Select Committee of the Legislative Council was appointed to enquire into and report upon marine parks in South Australia and, in particular:

(a) what scientific evidence is available to guide the design and management of marine parks;

(b) detrimental effects to recreational fishers and the commercial fishing industry through the imposition of marine parks;

(c) detrimental effects to property values through the imposition of marine parks;

(d) complaints by local communities and fishing groups regarding the consultation process associated with the implementation of marine parks;

(e) interstate and international moves to limit the extent of SZs;

(f) the correct balance of general marine park areas to no-take SZs;

(g) how the management of marine parks will be funded.

On 20 February 2013 the terms of reference were extended as follows:

That the Select Committee inquiry into and report upon -

(a) the Government's proposed recent amendments to the Draft Management Plans and Impact Statements for each of the proposed 19 marine parks in South Australia; and

(b) any other related matter.

On 27 November 2012, the Select Committee tabled an interim report[69]. The report had nine recommendations. On 15 July 2013 in the second round of hearings, the previous SA Government provided the following responses to those recommendations:

'…Recommendation 1. The Government follow the process set out by the Convention on Biological Diversity, that is to take a bio-regional threats-based approach rather than a spatial mapping approach to the establishment of marine parks.

[69] https://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=3&PId=52&CId=263

Response: The planning process was 'consistent with the process set out by the Convention on Biological Diversity' and also with the approach used by the Australian Government.

Recommendation 2. The benefits of each park should be clearly articulated prior to its establishment.

Response: These benefits were summarised in 'the value statements … on the marine parks website, and succinct summaries of the benefits … are available in some of the communication products'.

Recommendation 3. The Government undertakes further consultation with commercial and recreational fishing interests, and local communities to determine the economic impact on local communities.

Response: DEWNR maintains that the process is 'one of South Australia's largest community engagement processes involving recreational fishers, local council representatives, conservationists, commercial fishers, and other community interests over a period of ten years'.

Recommendation 4. That any future zoning or management plans be referred back to the local advisory groups for advice prior to implementation.

Response: The government 'considered the advice of the local advisory groups and about 70 per cent of the sanctuary zoning now in place was originally suggested by local advisory groups'.

Recommendation 5. That regional impact statements be undertaken prior to the release of management plans.

Response: In 2012, 'impact statements covering social, economic and environmental factors were prepared to accompany the release of the draft management plans for public review'.

Recommendation 6. That the proposed outer boundaries for marine parks in South Australia be substantially reduced in line with those in other Australian jurisdictions.

Response: 'The boundaries … have been carefully designed in line with the objects of the *Marine Parks Act 2007* specifically to enable a comprehensive, adequate and representative marine park system.' Mr Goodes told the Committee that other states are at different stages of completing their networks and that 'South Australia is the first Australian state to complete a network of marine protected areas'.

Recommendation 7. That the Government undertakes broad-based consultation with all affected parties prior to establishing no-take zones.

Response: 'The release of the final marine park management plans in November 2012 marked the end of an extensive state-wide consultation process'.

Recommendation 8. That the Government should not gazette no-take zones larger than the endorsed Local Advisory Group proposals.

Response: While Local Advisory Groups were significant, other groups also played a role and 'Approximately 85 per cent of respondents to the government's draft management plan consultation process supported increasing the number or size of SZs to achieve a stronger conservation outcome'.

Recommendation 9. That neither commercial nor recreational fishers be responsible for the costs of the establishment and maintenance of marine parks.

Response: The Government has made clear its commitment that there will be no additional fishing licence fees or visitor entry fees raised to cover the cost of marine parks…'

On 26 November 2013, the final report[70] of the select committee was released. The final report had the following sections:

- Select Committee on Marine Parks (including a sub-section on Response to Recommendations of Interim Report, which summarised the response of the Department of Environment, Water and Natural Resources to all nine recommendations).
- Outstanding issues (including sub-sections on economic issues, consultation process, and other issues).

The nine recommendations from the interim report along with the previous SA Government responses to those recommendations were included in the final report. No new recommendations were made in the final report; however, a number of outstanding issues were raised.

2.3.10 Recreational fishing commitments

DEW committed funding, up to $750,000 annually for three years from 2015 to 2017, to increase recreational fishing opportunities and facilities across the state. DEWNR has allocated nearly $2 million in funding for 107 projects proposed by local councils and fishing groups with $250,000 over three years in contractor, advertising and administrative costs. In addition to the funding provided by the previous SA Government, the projects attracted a large amount of co-contributors which provided an additional $1.5 million to add to the funded projects for a total investment of $3.74 million (DEWNR 2017a).

The previous SA Government invested $600,000 towards restoring native oyster beds in Gulf St Vincent (GSV) that were prevalent before European settlement (PIRSA 2018). In addition, the Australian Government has awarded a further $900,000 to The Nature Conservancy to expand the reef by a further 20 hectares and to provide the reef with hundreds of thousands of juvenile native oysters. The 20-hectare reef extension is proposed to be finished by the end of 2018. The

[70] https://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=3&PId=52&CId=263

reef has been named Windara Reef (for more information refer to the Windara Reef Recreational Fishing Guide).

The previous SA Government allocated up to $400,000 with a further $210,000 from the Australian Government to improve access and amenities at the proposed fishing reservoir sites. The Warren and Bundaleer reservoirs received around $237,600 of state funding to improve facilities and there is approximately $140,000 of allocated funds remaining to improve the Aroona and Beetaloo reservoirs. The Port Lincoln High School also received $20,000 for the Tod Reservoir Research Project (DEWNR 2017a).

2.3.11 Marine Parks (Sanctuary Zones) Amendment Bill 2014

In May 2014, a Bill was introduced into the Legislative Council to amend the *Marine Parks Act 2007*. Key elements of the Marine Parks (Sanctuary Zones) Amendment Bill 2014[71] (the Bill) were:

- Twelve nominated SZs become habitat protection zones and relevant management plans are taken to be amended accordingly without any further public consultation or key stakeholder advice.
- Management plans with SZs be reviewed every two years.
- Areas within the nominated SZs in the nominated marine parks cannot ever become SZs as a result of any review, even if they are located in different marine parks.
- Persons who received compensation under the voluntary catch/effort reduction scheme before the Bill takes effect, keep the compensation even if the restrictions no longer exist.

The motion to support the Bill was defeated in the House of Assembly on 18 September 2014. A commitment was made to undertake a RIAS within 12 months for Ceduna, Kangaroo Island and Port Wakefield to investigate the impacts of implementing the marine parks. This commitment was to provide an early warning of potential impacts from the full implementation of marine park zoning. The South Australian Centre for Economic Studies was engaged by the Goyder Institute as the independent experts and delivered the report to the previous SA Government by 1 October 2015.

The RIAS report[72] found no evidence of region-wide impacts, although interviews undertaken through the RIAS processes identified a small group of individuals who felt they had been impacted.

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71 https://www.legislation.sa.gov.au/LZ/B/ARCHIVE/MARINE%20PARKS%20(SANCTUARY%20ZONES)%20AMENDMENT%20BILL%202014_HON%20MICHELLE%20LENSINK%20MLC/C_AS%20RECEIVED%20IN%20HA/MARINE%20ZONES%20AMENDMENT%20BILL%202014.UN.PDF

72 https://www.environment.sa.gov.au/marineparks/Learn/regional-impact-assessment-statements

The RIAS identified a number of indications appropriate to track potential impacts of SZs. The previous SA Government considered these measures and recommendations in the Marine Parks Monitoring and Evaluation Program Monitoring, Evaluation and Reporting Plan[73] and the Marine Parks Status Report[74].

In October 2015, the Marine Parks (Sanctuary Zones) Amendment Bill[75] was re-introduced in the House of Assembly and was defeated.

2.4 Draft Zoning Consultation Process

The following history synopsis is based on information provided by DEW and describes the draft zoning consultation process. URLS's of referenced documents are provided as footnotes. Statistics on the areas and numbers of SZs by each stage of the zoning consultation process are provided in Appendix Table 10-1. The changes in zoning are summarised in a series of maps for each of the 19 marine parks (Figure 2-2 to Figure 2-20).

2.4.1 Stage 1. Marine Parks Local Advisory Group Process

13 MPLAGs were established across the state, plus the (existing) Great Australian Bight Consultative Committee, representing recreational fishers, local councils, commercial fishers, and other community interest groups.

At the third MPLAG meeting, the previous SA Government provided the groups with the preliminary SZ scenarios, as a starting point to assist the MPLAGs with zoning. In November 2010, preliminary sanctuary zone scenarios[76] were mapped and provided to the MPLAGs.

- In May/June 2011 final MPLAG zoning advice[77] was provided to the previous SA Government.

2.4.2 Stage 2. Seek Stakeholder Advice and Support

- There was no consensus or alignment in the advice the previous SA Government received from the MPLAGs, SWG and other stakeholders on the zoning within Marine Parks, in particular the location and size of SZs. The Minister called for a Key Stakeholder Forum to resolve the zoning.

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[73] https://data.environment.sa.gov.au/Content/Publications/DEWNR-TR-2017-05.pdf

[74] https://data.environment.sa.gov.au/Content/Publications/South-Australias-Marine-Parks-5-year-Status-Report-2012-2017.pdf

[75] https://www.legislation.sa.gov.au/LZ/B/ARCHIVE/MARINE%20PARKS%20(SANCTUARY%20ZONES)%20AMENDMENT%20BILL%202014_HON%20MICHELLE%20LENSINK%20MLC/C_AS%20RECEIVED%20IN%20HA/MARINE%20ZONES%20AMENDMENT%20BILL%202014.UN.PDF

[76] https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

[77] https://www.environment.sa.gov.au/marineparks/About/history/Local_Advisory_Groups/LAG_meetings_and_reports

- On 11 and 12 April 2012, a two-day Key Stakeholder Forum on sanctuary zoning of marine parks was held. The Minister for Sustainability, Environment and Conservation, and leaders from the conservation, recreational and commercial fishing sectors; key representatives from each the MPC and the SWG were present. Agreement was reached on a sanctuary zoning approach and SZs were proposed.

2.4.3 Stage 3, Draft Sanctuary Zones Established

- SZ outcomes from the key stakeholder forums were made public in April 2012 on the SA Government's YourSAy website for a pre-draft management plan zoning preview. Maps were updated in July 2012.
- Draft Management Plans with zoning were officially released in August 2012 for an 8-week consultation period.
- The SA Government conducted 40 briefings and 41 information days, engaging approximately 3000 people. Consultation closed on the 22 October 2012, by which time, 8,649 submissions had been received.
- The SWG provided independent advice to the Minister on scientific matters.
- Marine Parks Council of SA provided independent advice to the Minister on environmental, economic and social matters.
- Marine Parks Steering Committee provided whole-of-government advice.
- The Minister held meetings with stakeholders and interest groups in relation to key areas.

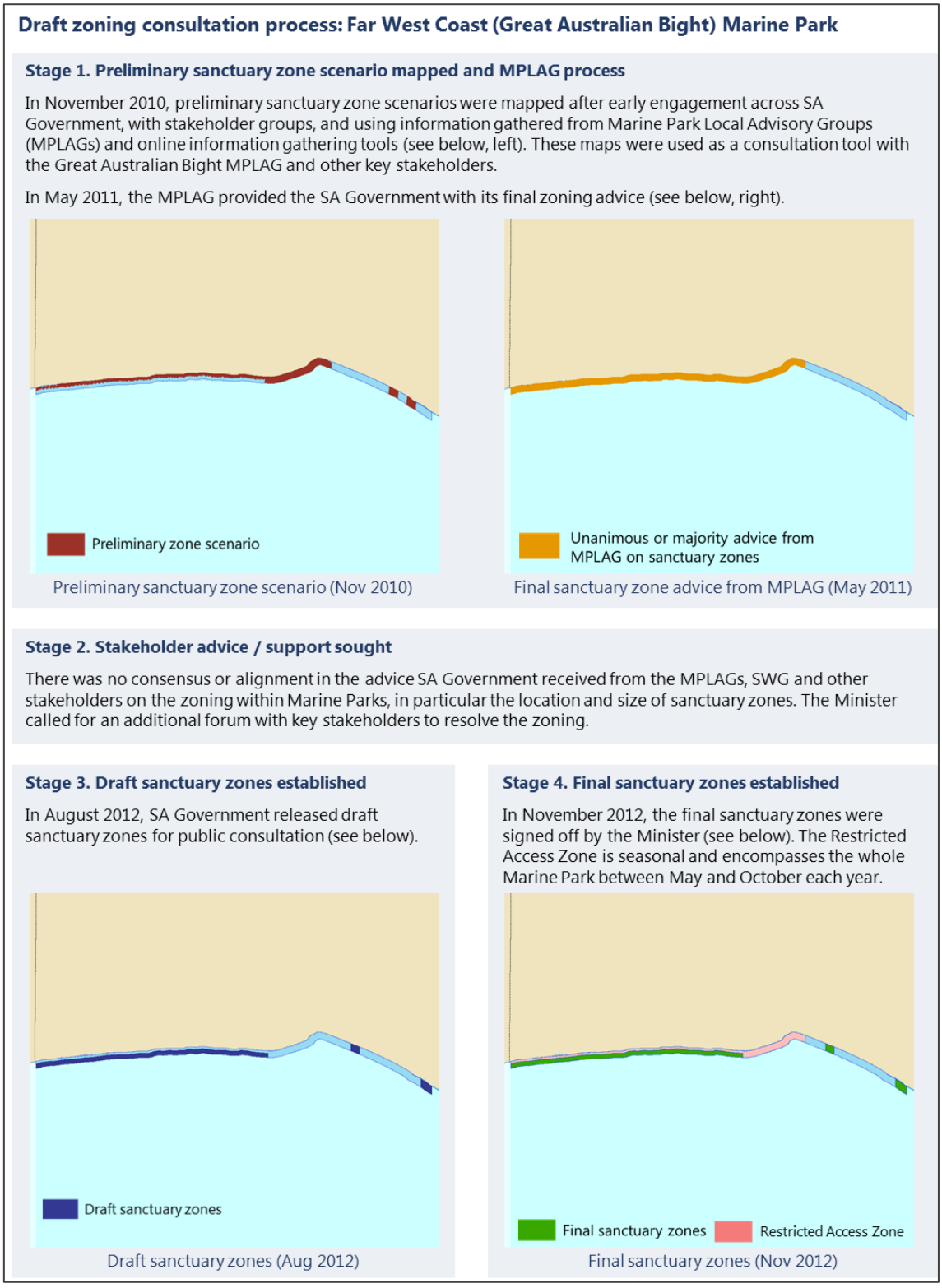
2.4.4 Stage 4, Final Sanctuary Zones Established

- Advice received from all sources contributed to over 50 amendments to park zoning and management strategies in final marine park management plans - Summary of submissions[78], MPC advice to Minister[79].
- In November 2012, final SZs were approved by the Minister.
- In November 2012, South Australia's Marine Parks Management Plans were authorised under the *Marine Parks Act 2007*.

[78] https://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-submissionsummary-nov12.pdf
[79] https://www.environment.sa.gov.au/files/sharedassets/marine_parks/mp-gen-mpcouncil-advicetominister-nov12.pdf

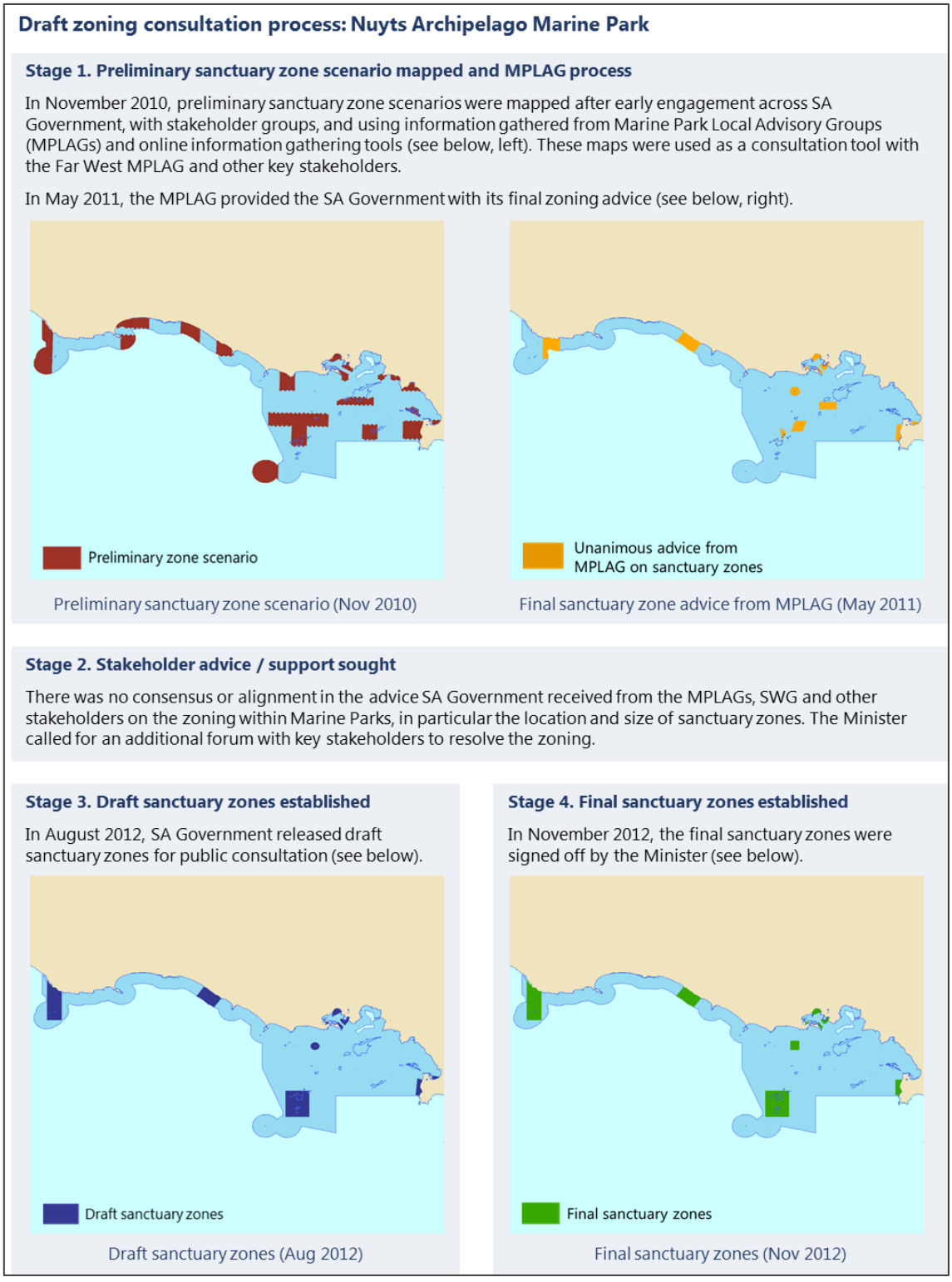
2.4.5 Draft zoning consultation process for 19 marine parks

Figure 2-2 Draft zoning consultation process: Far West Coast (Great Australian Bight) Marine Park



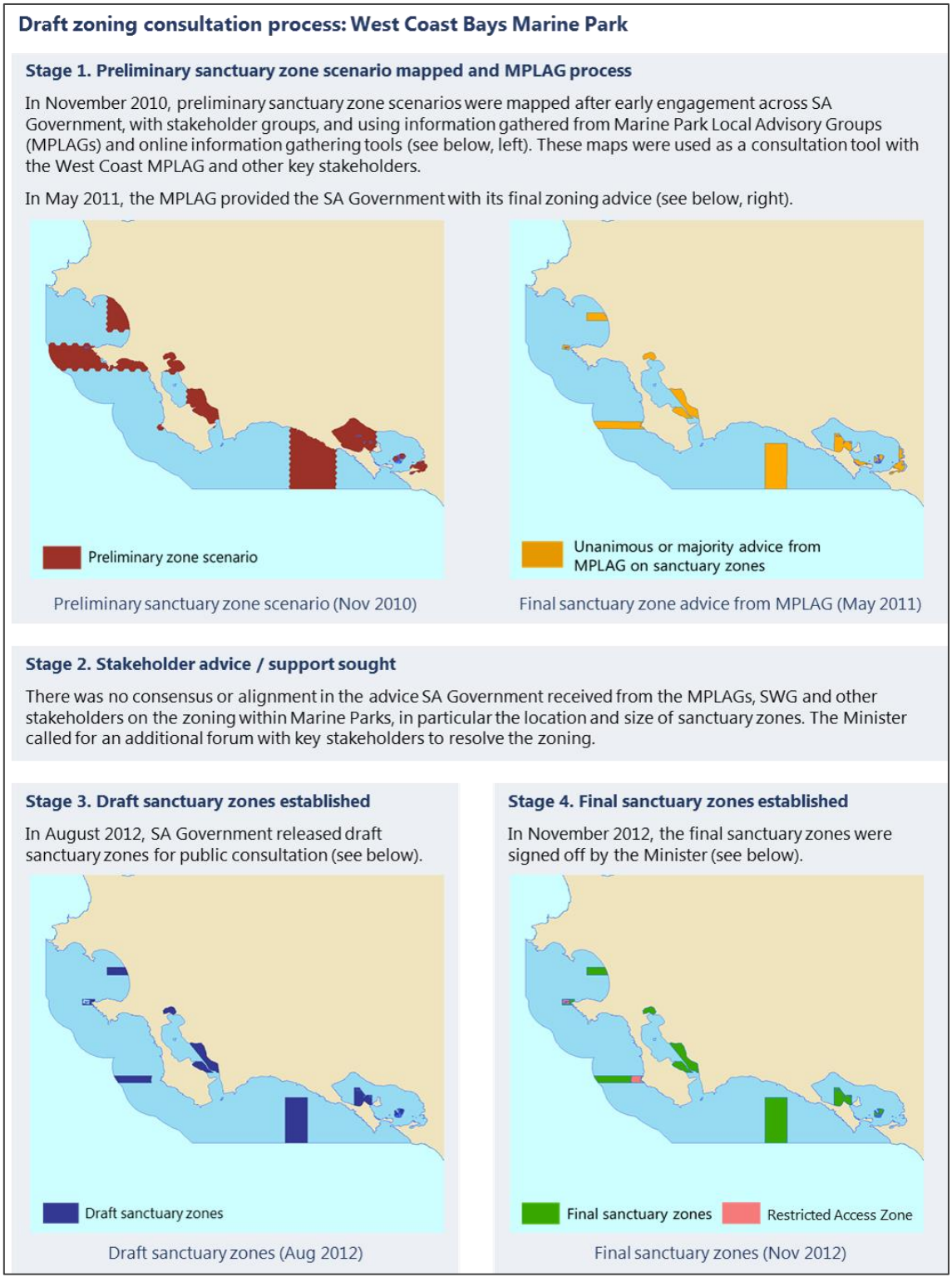
Source: APPENDIX 9

Figure 2-3 Draft zoning consultation process: Nuyts Archipelago Marine Park



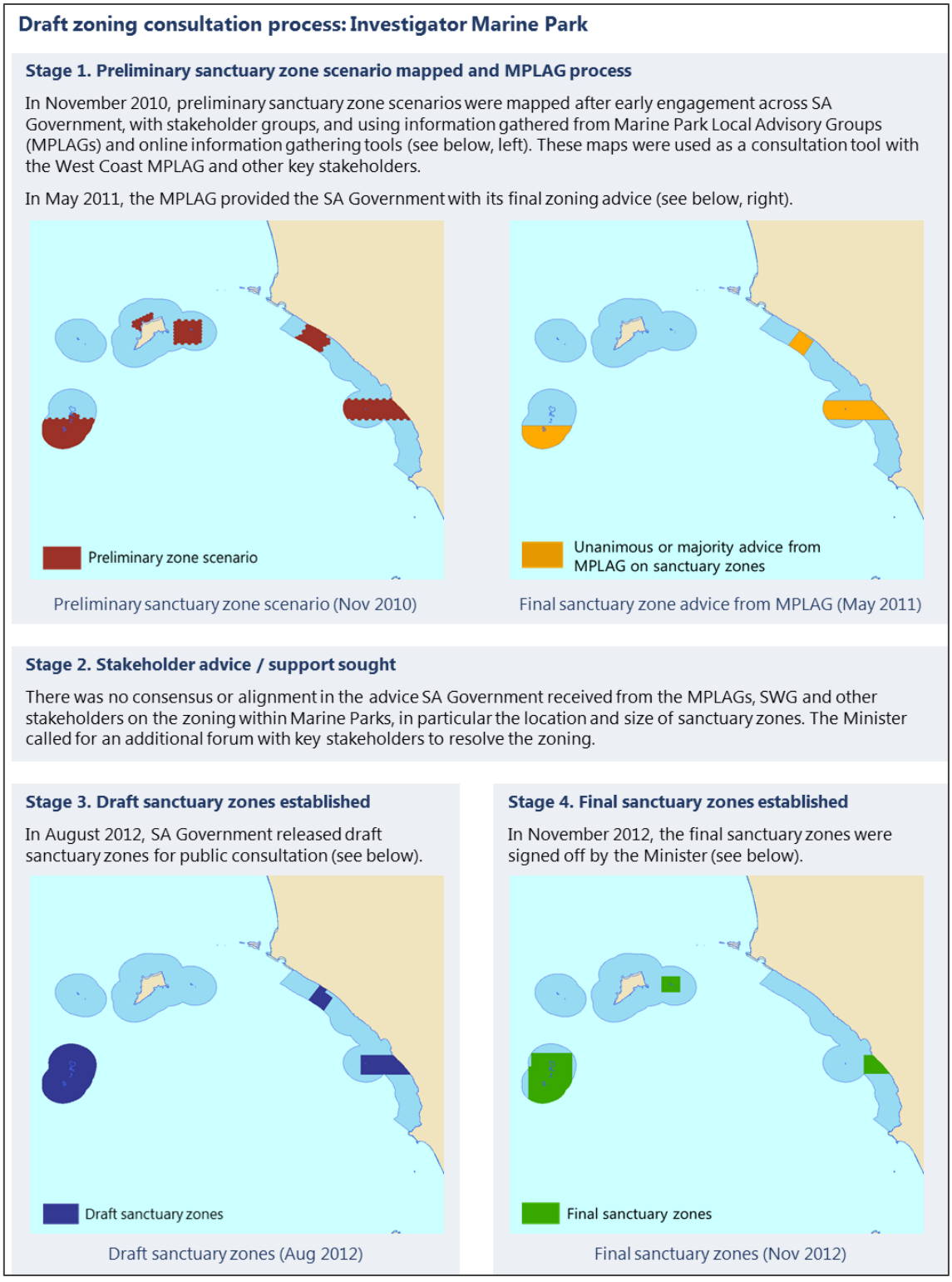
Source: APPENDIX 9

Figure 2-4 Draft zoning consultation process: West Coast Bays Marine Park



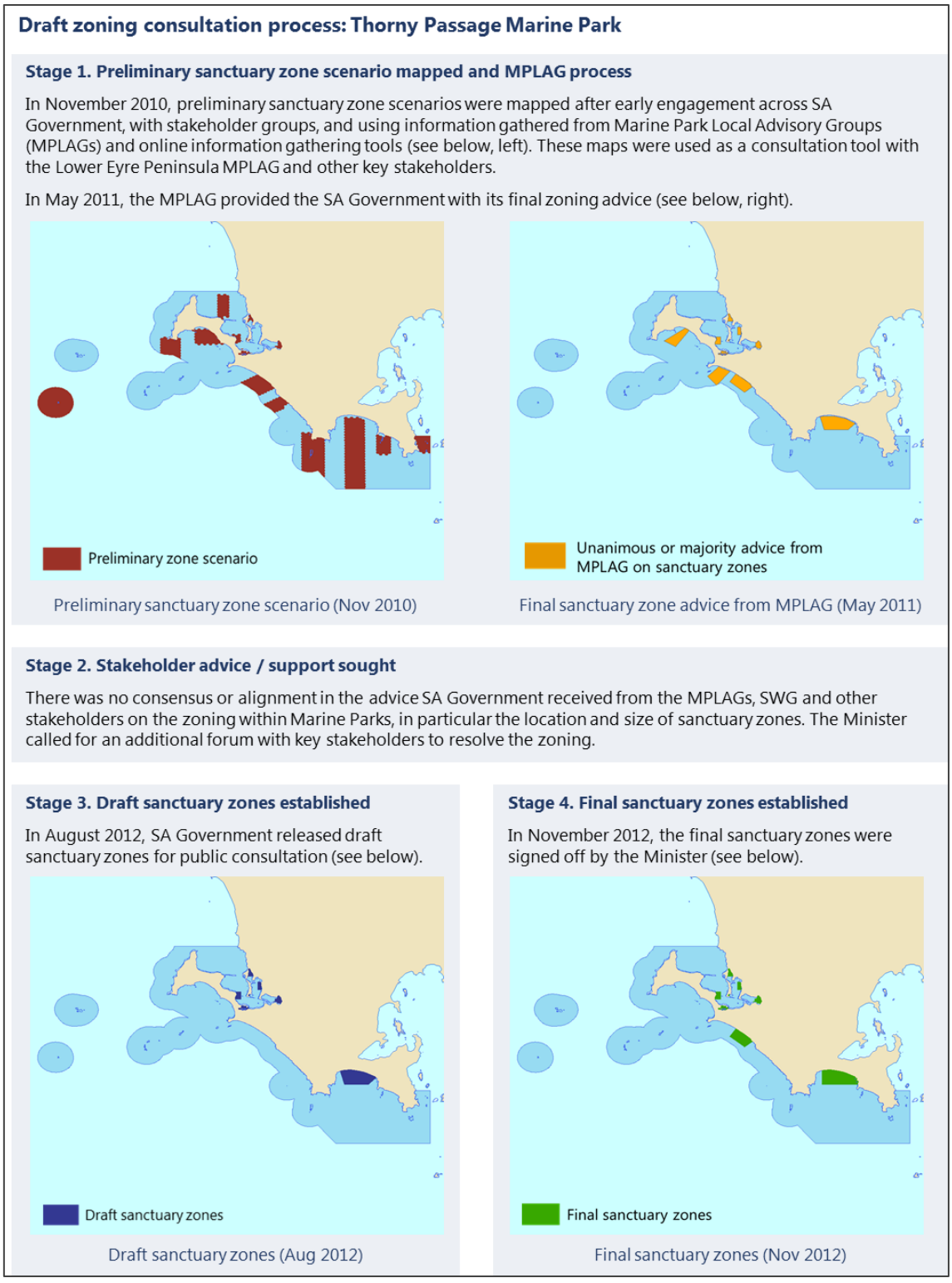
Source: APPENDIX 9

Figure 2-5 Draft zoning consultation process: Investigator Marine Park



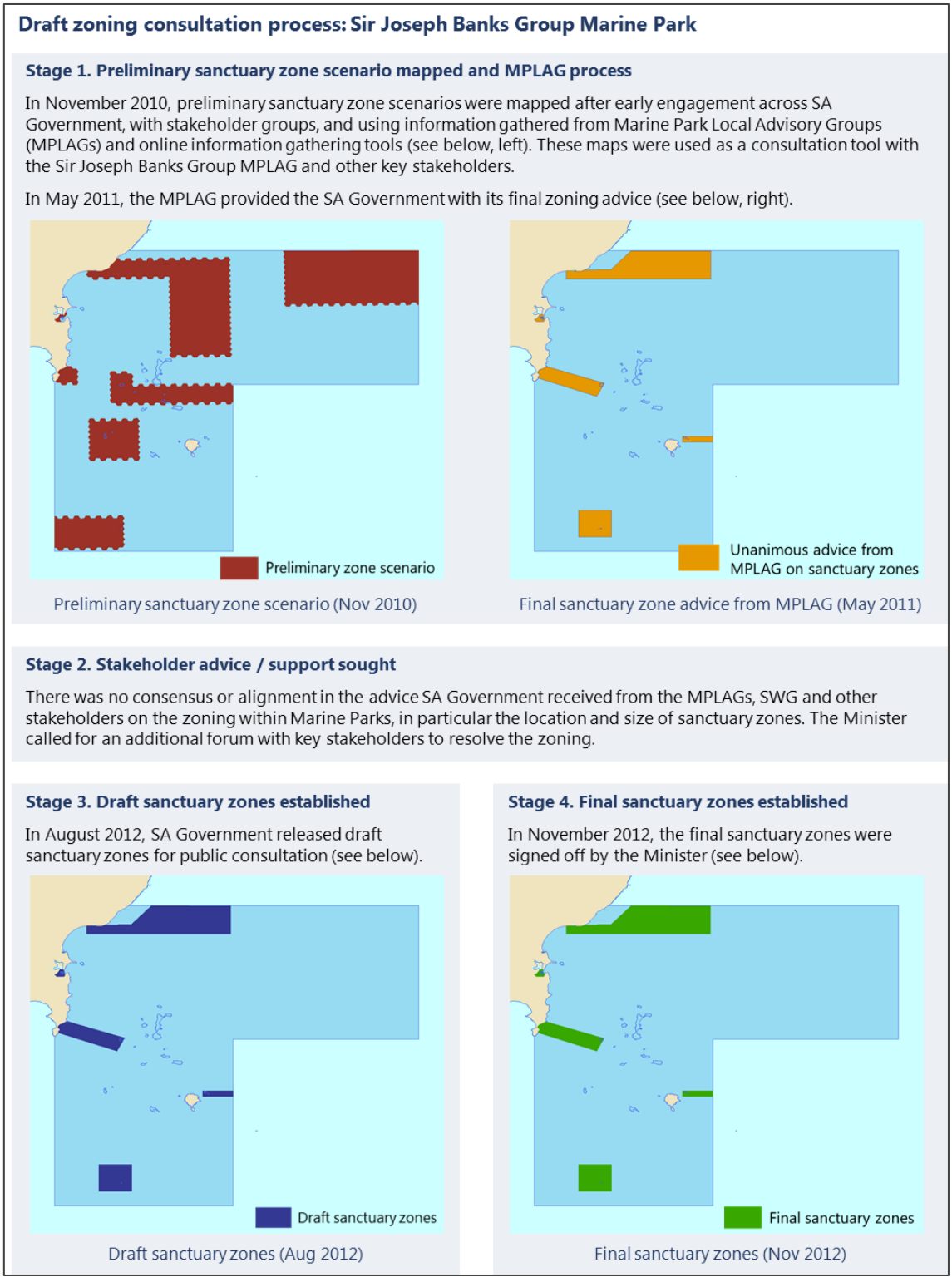
Source: APPENDIX 9

Figure 2-6 Draft zoning consultation process: Thorny Passage Marine Park



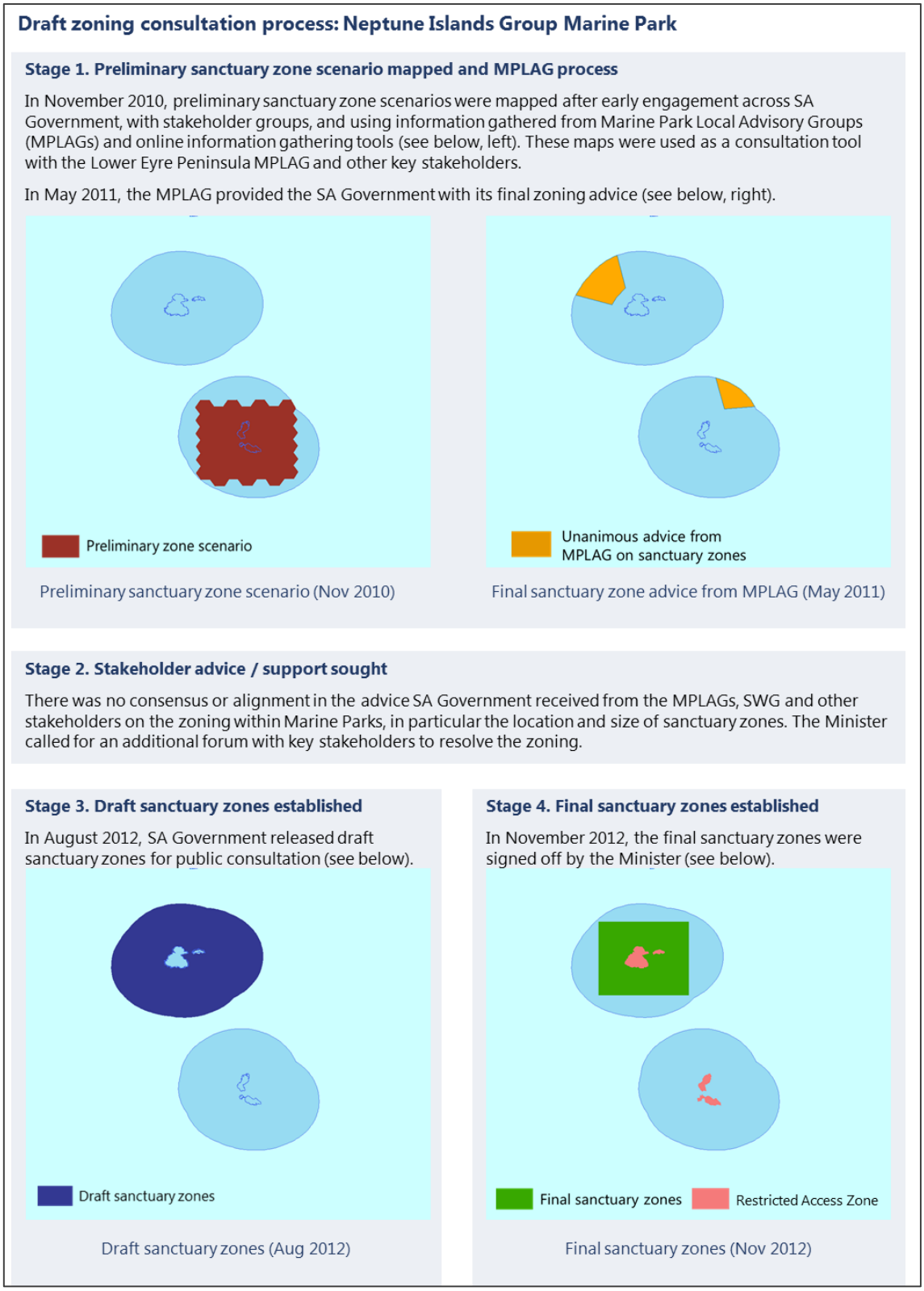
Source: APPENDIX 9

Figure 2-7 Draft zoning consultation process: Sir Joseph Banks Group Marine Park



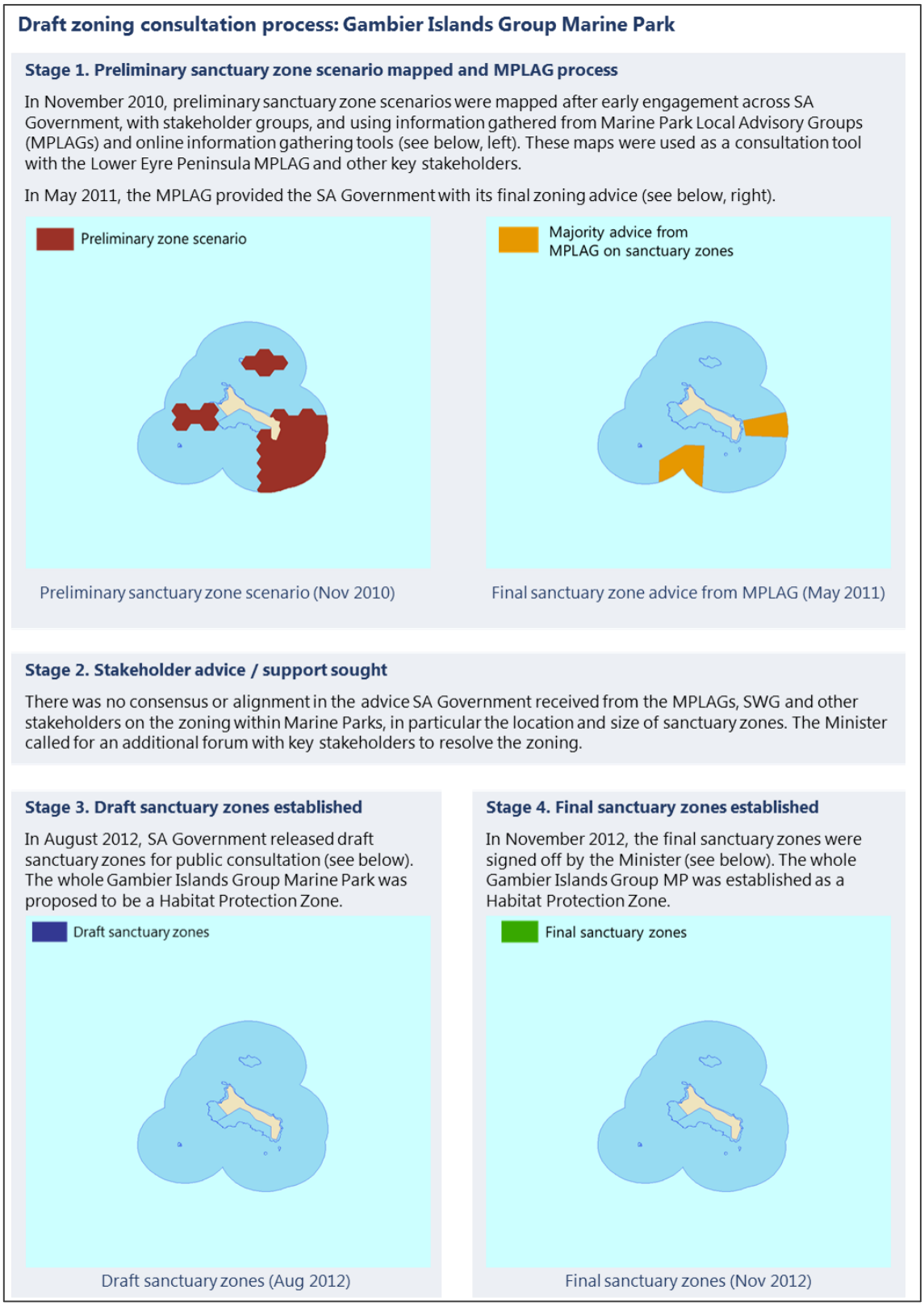
Source: APPENDIX 9

Figure 2-8 Draft zoning consultation process: Neptune Islands Group Marine Park



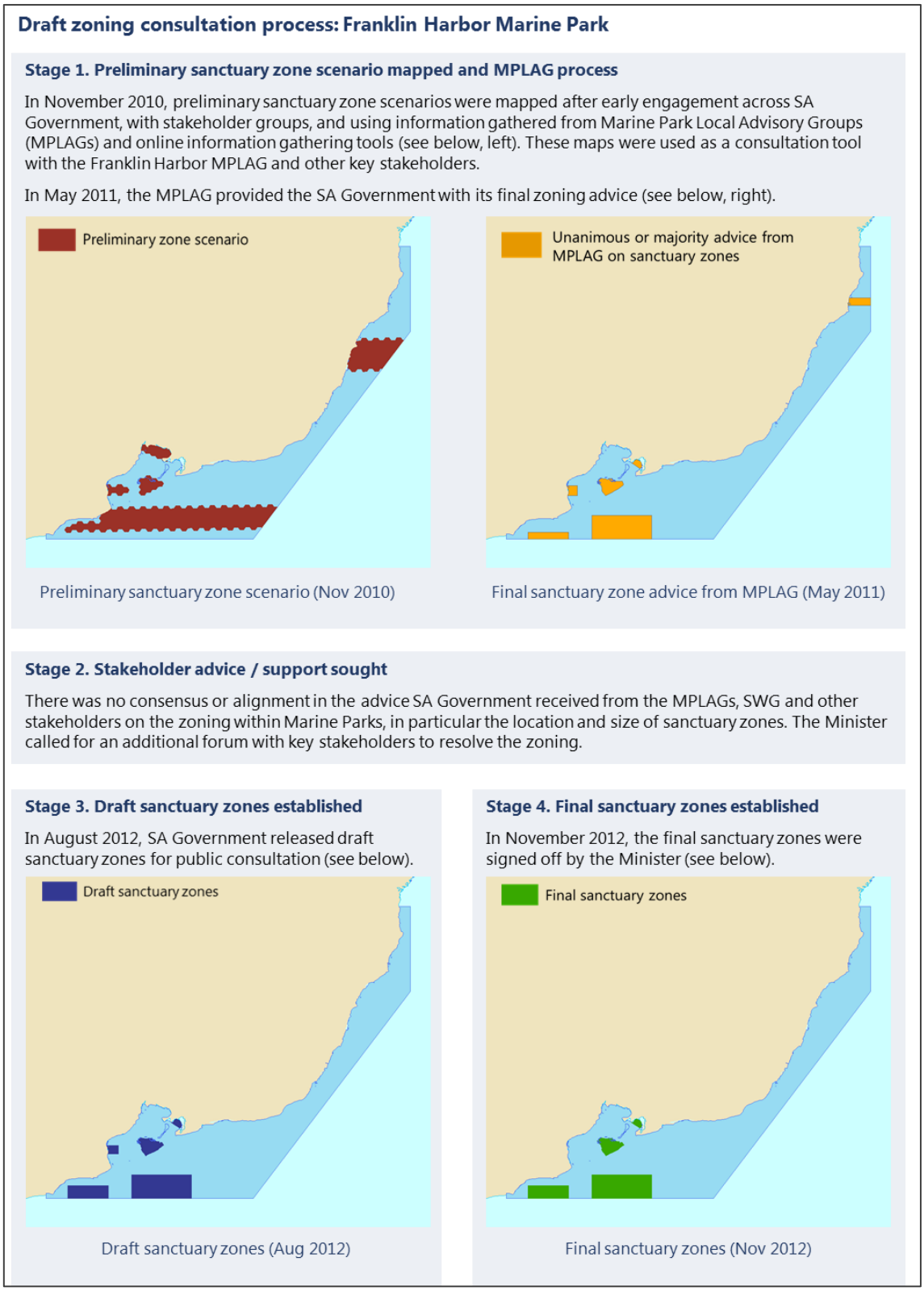
Source: APPENDIX 9

Figure 2-9 Draft zoning consultation process: Gambier Islands Group Marine Park



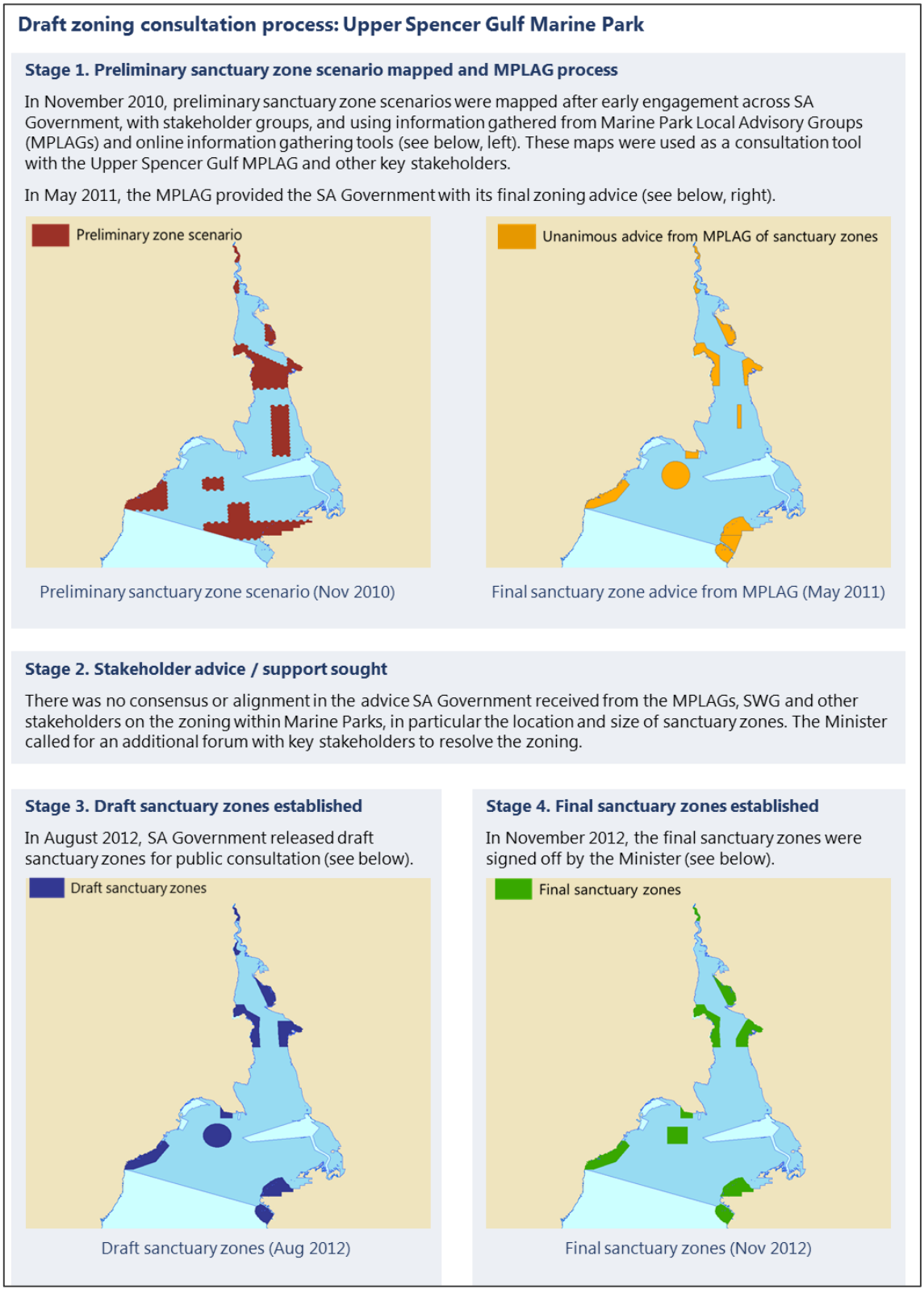
Source: APPENDIX 9

Figure 2-10 Draft zoning consultation process: Franklin Harbor Marine Park



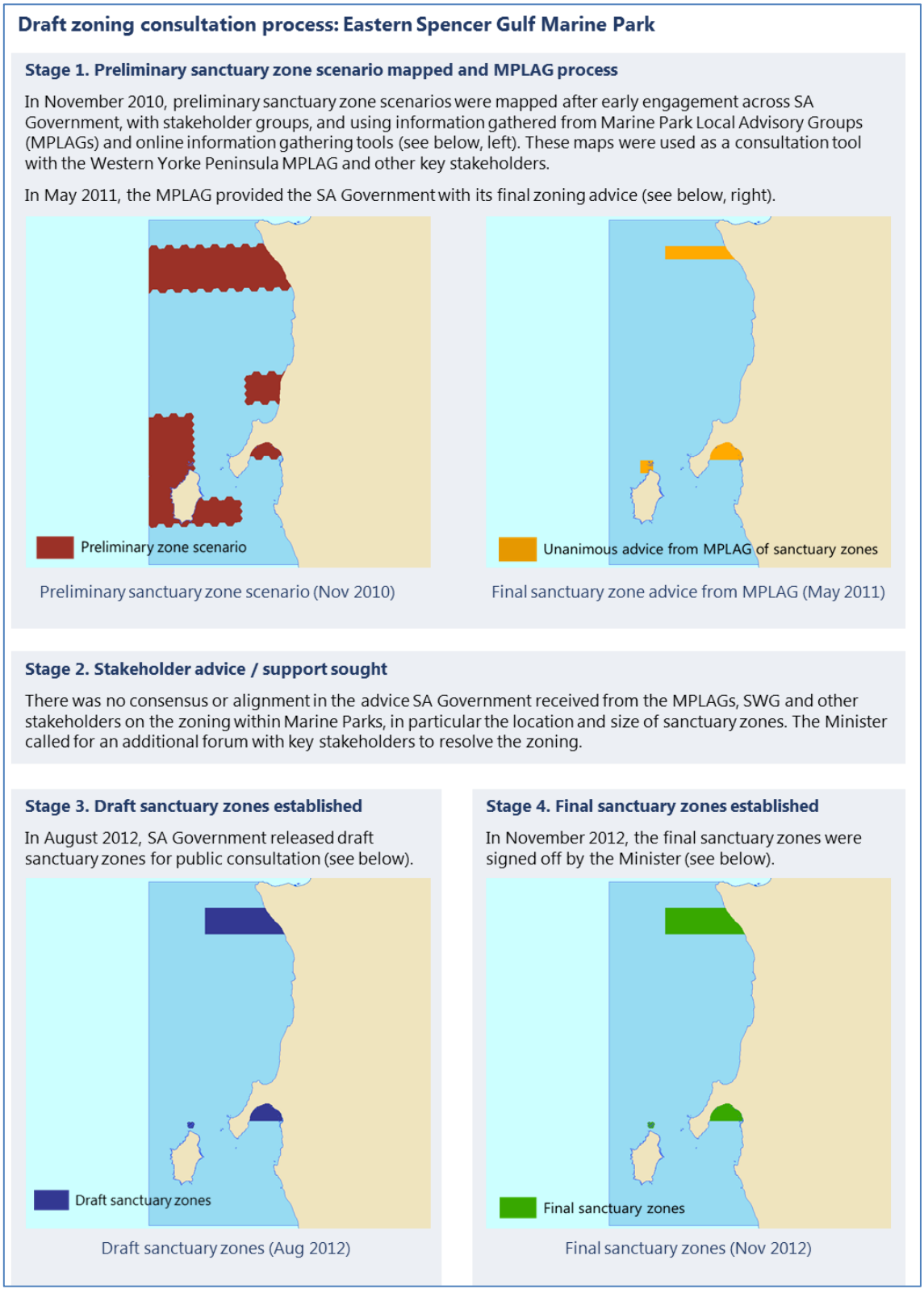
Source: APPENDIX 9

Figure 2-11 Draft zoning consultation process: Upper Spencer Gulf Marine Park



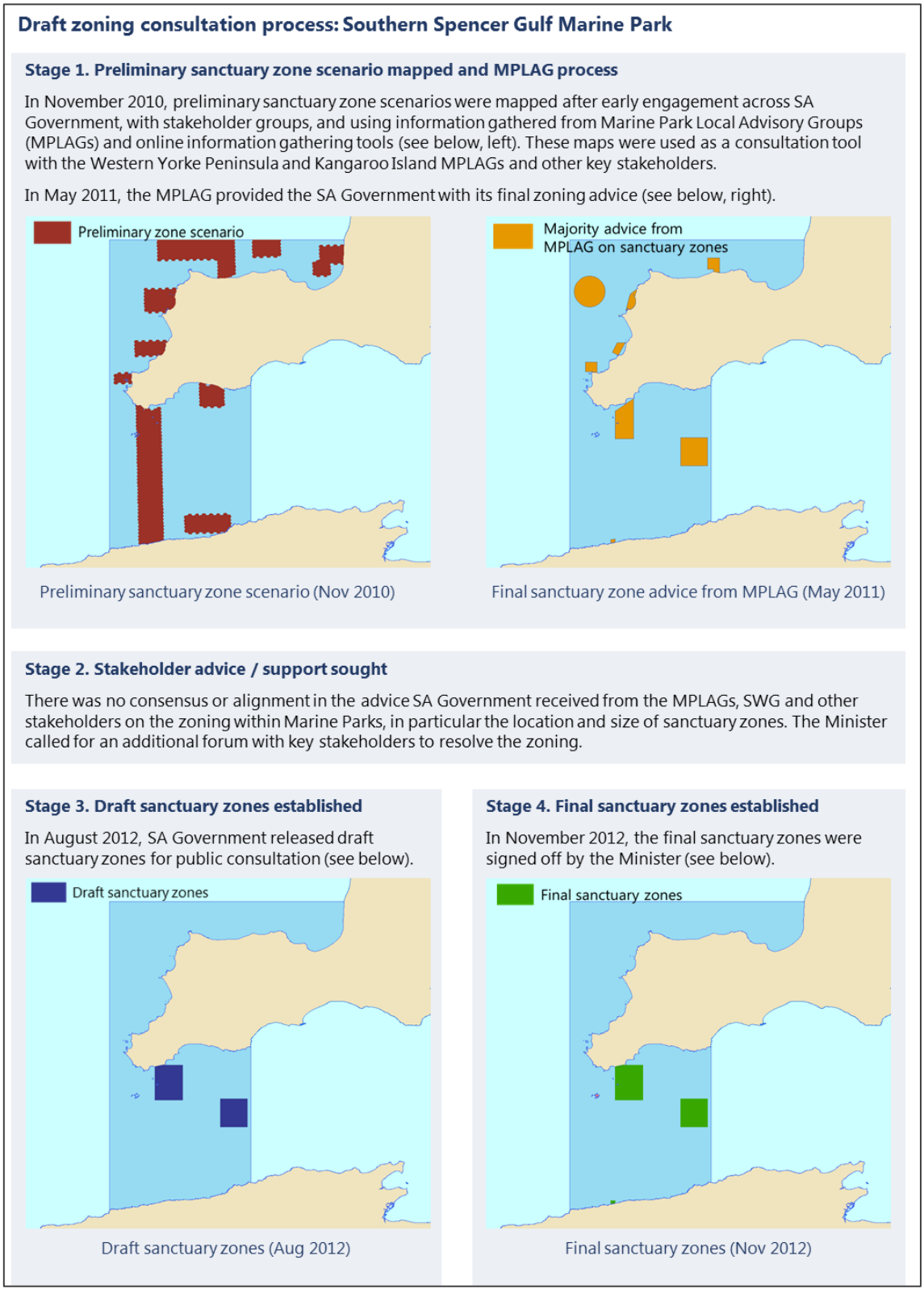
Source: APPENDIX 9

Figure 2-12 Draft zoning consultation process: Eastern Spencer Gulf Marine Park



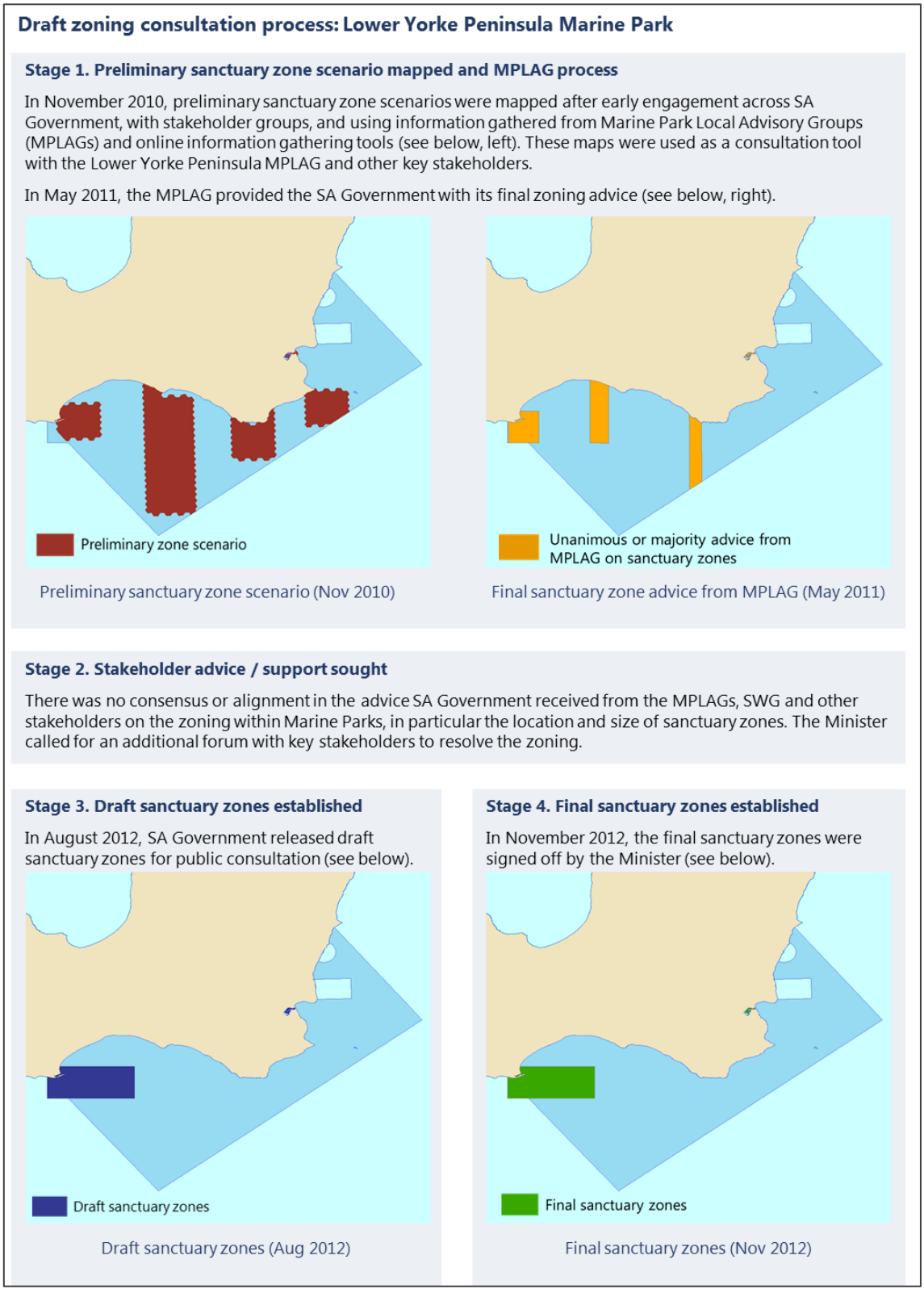
Source: APPENDIX 9

Figure 2-13 Draft zoning consultation process: Southern Spencer Gulf Marine Park



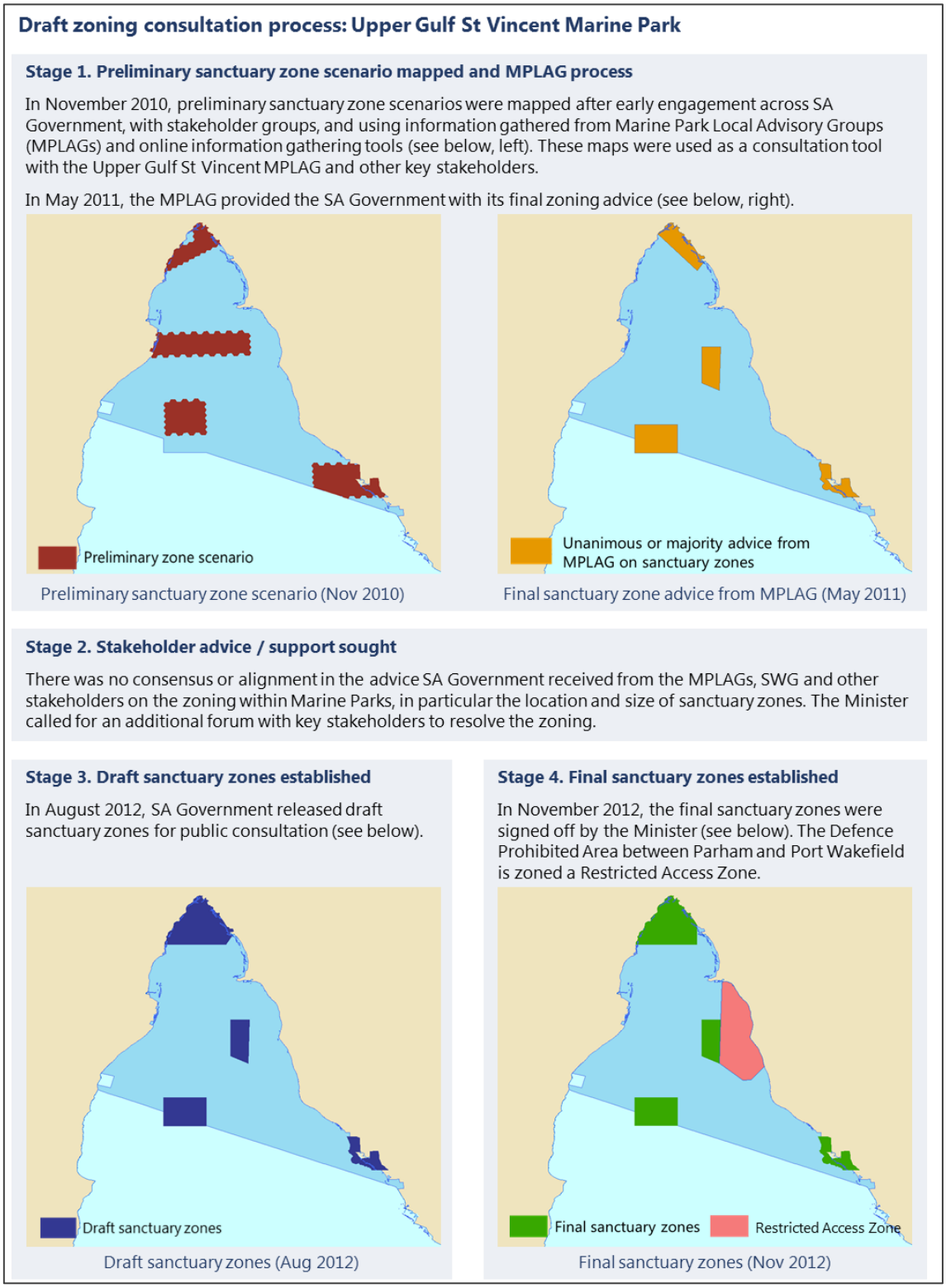
Source: APPENDIX 9

Figure 2-14 Draft zoning consultation process: Lower Yorke Peninsula Marine Park



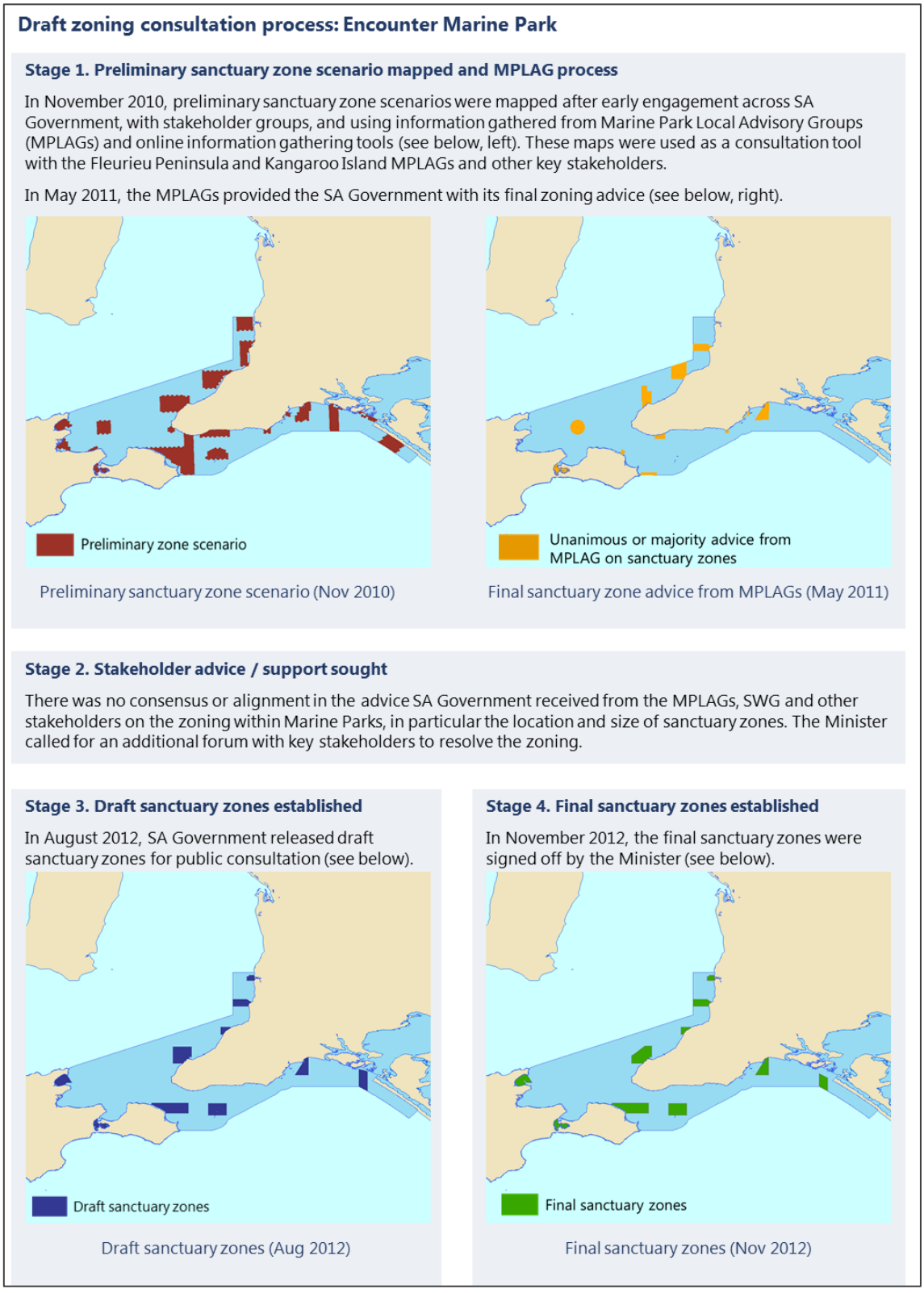
Source: APPENDIX 9

Figure 2-15 Draft zoning consultation process: Upper Gulf St Vincent Marine Park



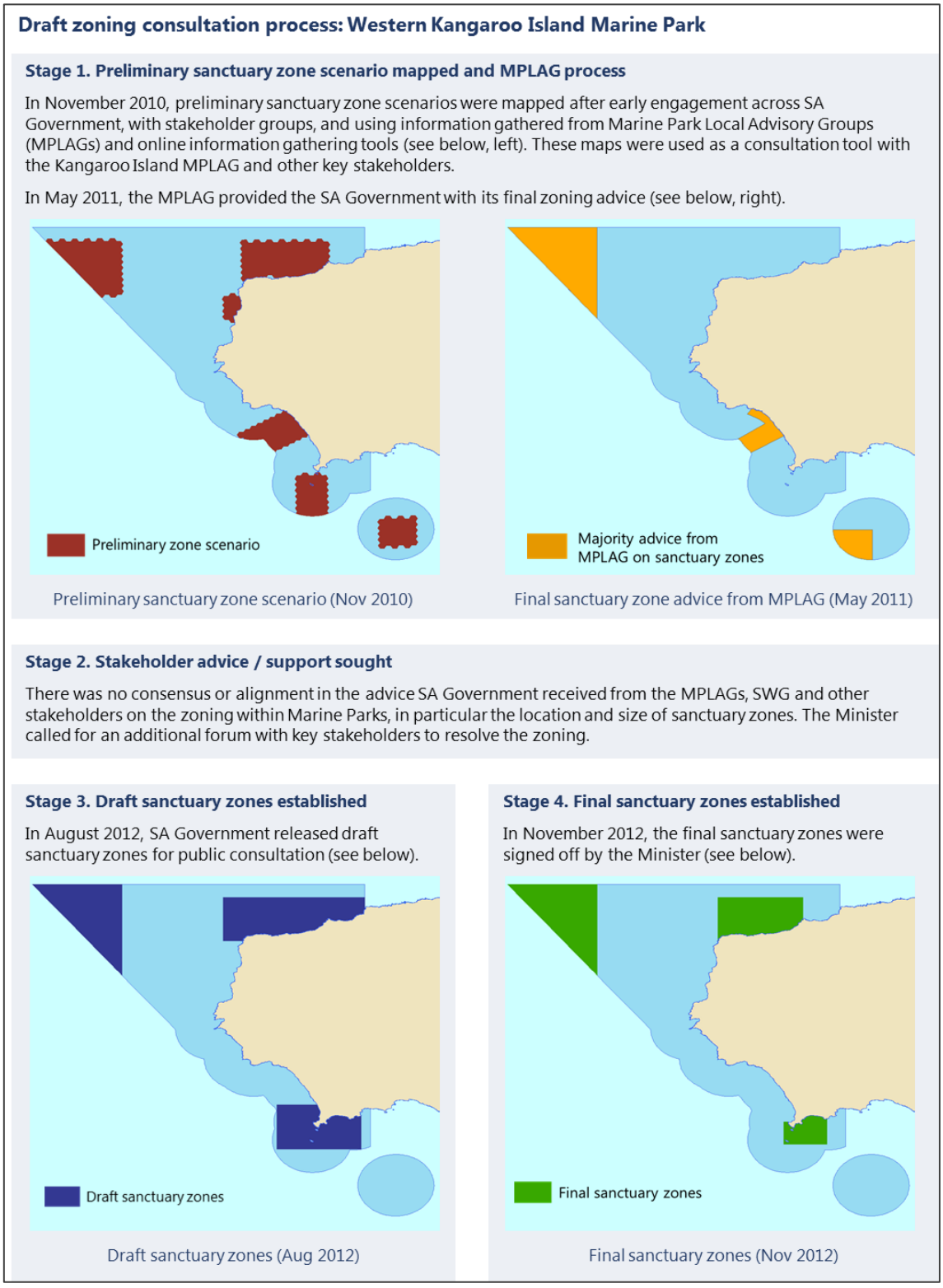
Source: APPENDIX 9

Figure 2-16 Draft zoning consultation process: Encounter Marine Park



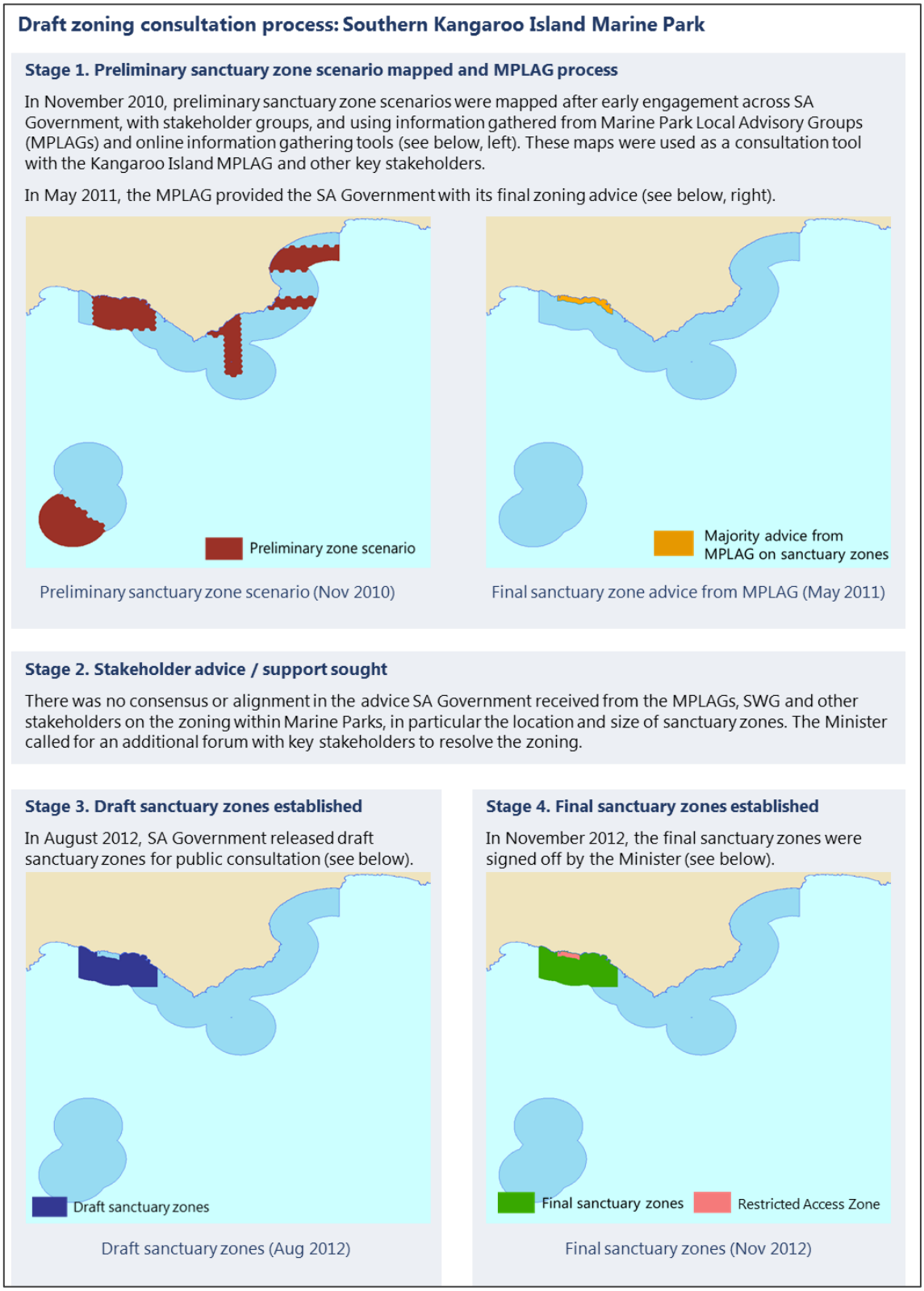
Source: APPENDIX 9

Figure 2-17 Draft zoning consultation process: Western Kangaroo Island Marine Park



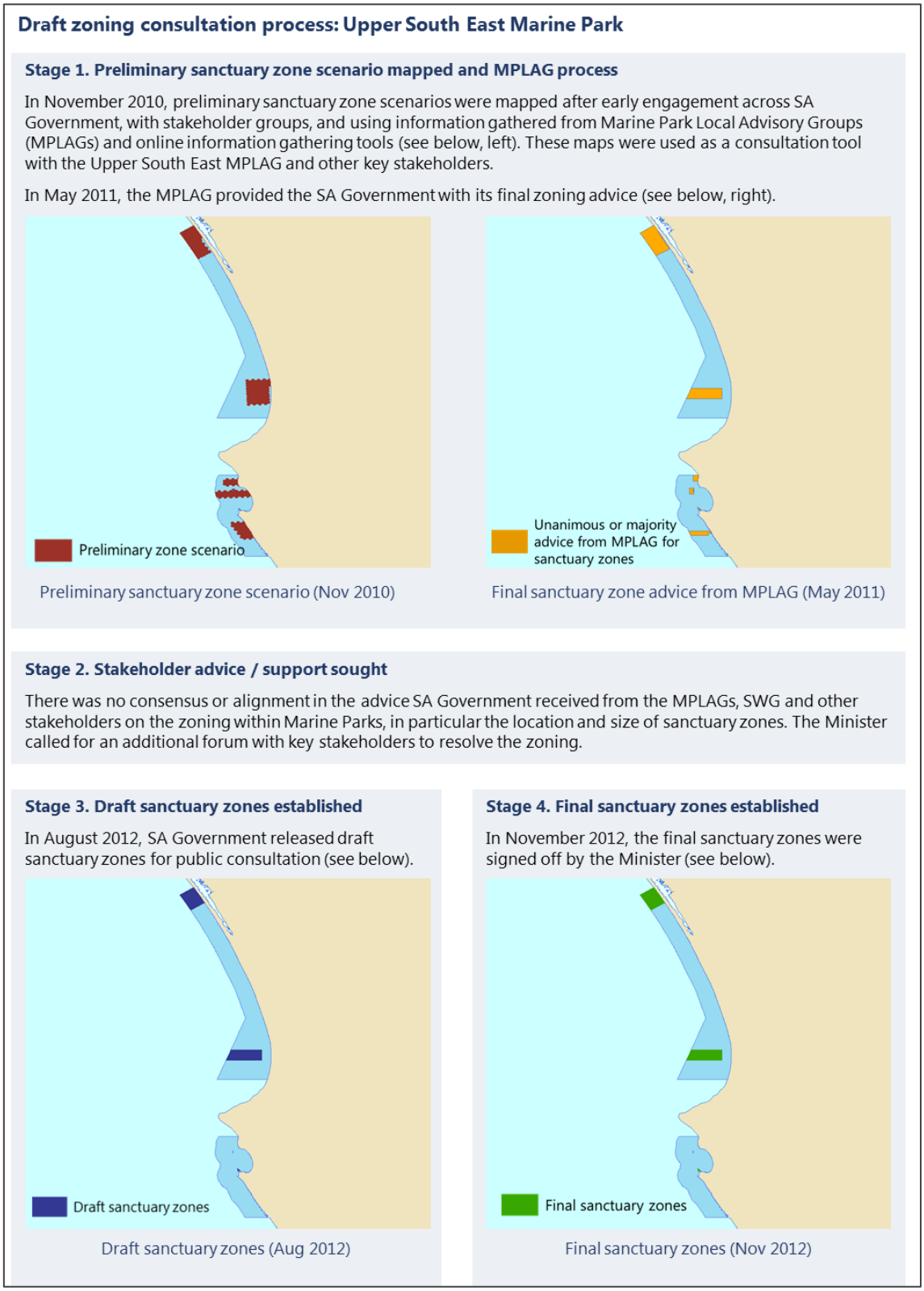
Source: APPENDIX 9

Figure 2-18 Draft zoning consultation process: Southern Kangaroo Island Marine Park



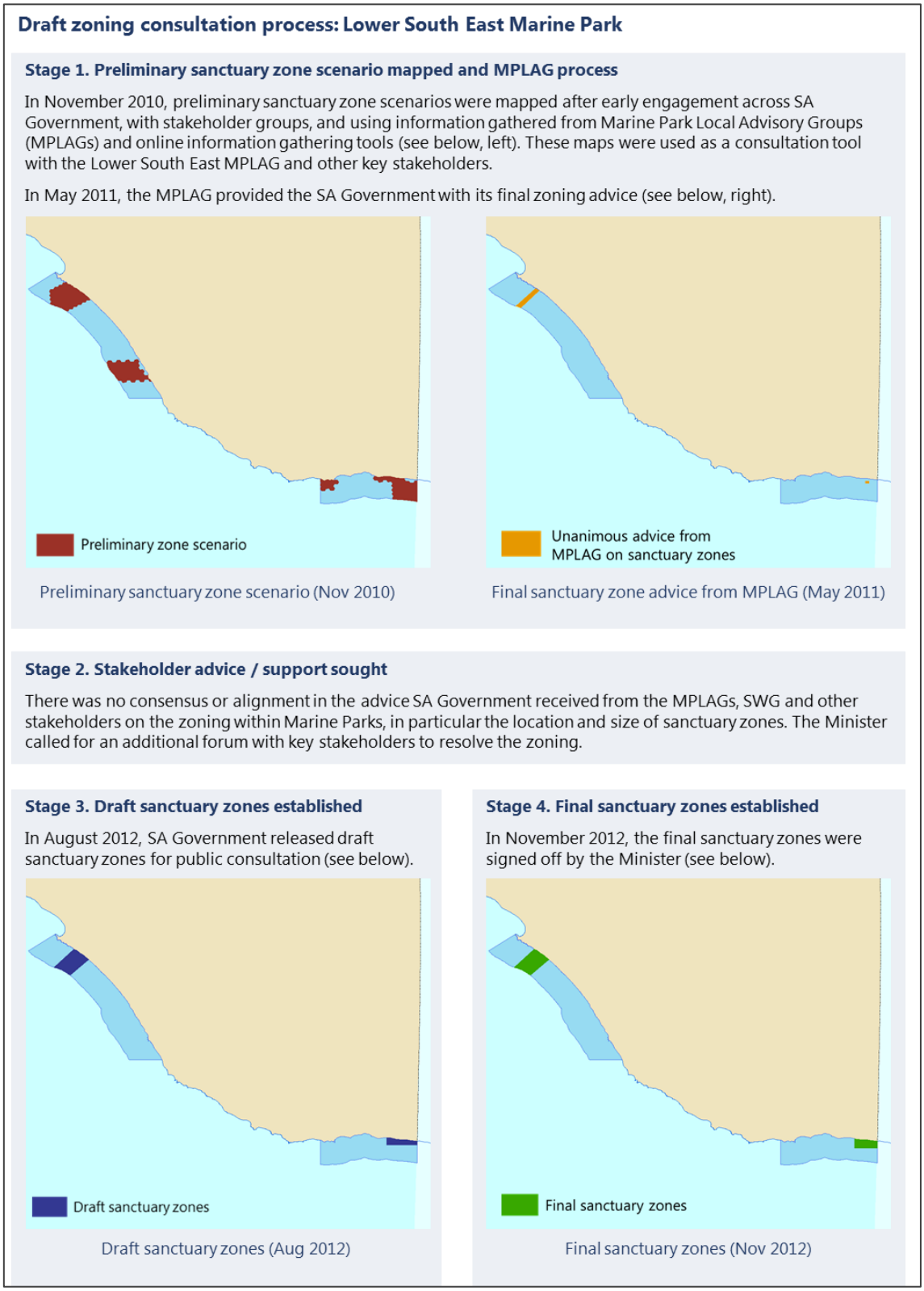
Source: APPENDIX 9

Figure 2-19 Draft zoning consultation process: Upper South East Marine Park



Source: APPENDIX 9

Figure 2-20 Draft zoning consultation process: Lower South East Marine Park



Source: APPENDIX 9

2.5 Discussion

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 SZs, and the zoning and management plans more generally, has been guided by 14 design principles, 7 biophysical principles[80], 7 community principles[81] (APPENDIX 7) and over 100 marine park policy commitments (Section 2.2.3). Extensive consultation with all sectors of government and recreational fishers, local council representatives, conservationists, commercial fishers and other community interest groups has contributed significantly to the zoning that is currently in place, which is broadly supported[82].

From the preliminary SZ scenarios provided to MPLAGS in 2010 to the final sanctuary zoning established in November 2012 (see Section 2.4.5), 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), which reflects the feedback received by the previous SA Government through the MPLAGs, submissions to the draft zoning, Scientific Advisory/Working Group, Marine Parks Council and Marine Parks Steering Committee. In all 19 marine parks there was a reduction in the area of SZs from the preliminary to final zoning (Figure 2-2 to Figure 2-20, Appendix Table 10-1) and a reduction in number of SZs in 16 marine parks. In the final zoning, The Gambier Islands Group Marine Park has no SZs (Figure 2-9).

The previous SA Government made policy commitments to avoid placing SZs in important recreational fishing areas and provided a number of information gathering and consultation mechanisms to identify important fishing areas. The previous SA Government made provision through SPAs to allow shore-based line fishing where SZs overlaid important shore-based fishing spots.

Some important fishing areas are no longer available through zoning to commercial fishers which was unavoidable to achieve a CAR system of marine parks. Measures were taken to reduce the impacts through initiatives such as the reduction in total area of SZs from draft to final zoning and the completion of the commercial fisheries voluntary catch/effort reduction scheme. For example, the change in estimated displaced commercial catch from the draft zoning in August 2012 to the final zoning in November 2012 was reduced from 1.38 per cent of the average annual catch (Bailey et al. 2012a) to 0.49 per cent (EconSearch 2014). The change in estimated value of the displaced commercial fishery catch/effort of the draft zoning in August 2012 to the final zoning in November 2012 was reduced from approximately 2.14 per cent

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

[81] 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

[82] 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).

(Bailey et al. 2012a) to 1.98 per cent of the total GVP for all fisheries (EconSearch 2014). Both estimates were below the previous SA Government's policy commitment of 'less than 5 per cent economic impact' on commercial fisheries.

Through the previous SA Government's policy framework for the management of displaced commercial fishing effort, the SA Marine Parks Commercial Fisheries Voluntary Catch/Effort Reduction Program undertook market-based buyback of fishing licences or adjustments of quotas of sufficient effort to avoid negative impacts on the affected commercial fisheries. The voluntary buybacks achieved through the program produced reductions in excess of the targeted amounts for all of the fisheries involved, and can be viewed as successful in its objectives.

However, as is expected, some fishing businesses have been more affected than others by local changes in access to traditional fishing grounds. The previous SA Government has made provision for affected businesses to seek compensation through regulations of the *Marine Parks Act 2007*.

3. MARINE PARKS NETWORK

3.1 Introduction to the Marine Parks Network

The previous SA Government developed the SARSMPA as part of the NRSMPA (ANZECC TFMPA 1998): "The primary goal of the NRSMPA is to establish and manage a CAR 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 Australia's biological diversity at all levels." The intent to provide a CAR network of marine parks in SA was guided by 14 design principles (Appendix 7).

The South Australian marine parks network is part of the Flindersian Province temperate waters of southern Australia which extend from southwest Western Australia through Bass Strait to southern New South Wales (Womersley 1981, 1990). The biodiversity and endemism[83] of this region is particularly evident in marine flora and invertebrate taxa such as bryozoans, ascidian, nudibranchs, molluscs and echinoderms (Womersley 1990, Shepherd 1991, Poore 1995, Lewis et al (1998). Within the Flindersian Province, approximately 1,155 species of macroalgae, 22 species of seagrasses, 600 species of fish, 110 species of echinoderms and 189 species of ascidians have been recorded (Shepherd 1991, Wilson and Allen 1987, Womersley 1990).

A recent (2013-2017) Great Australian Bight Research Program[84] (Baghurst et al -in press) has significantly expanded the known knowledge of the region, including the listing of hundreds of new species across a diverse range of taxa.

Temperate southern Australian waters have been geographically and climatically isolated for around 65 million years. Approximately 85 per cent of the known fish, 95 per cent of the mollusc and 90 per cent of echinoderm species are endemic (Poore 1995). The richness of the temperate flora is 50-80 per cent greater than in other comparable global regions. For these reasons, the temperate marine regions have been designated as the "Unique South" of Australia (Lewis et al 1998).

South Australia's marine environment, and associated coasts, have a complex set of many and diverse users, and they provide important and essential ecosystem functions. The coastal/marine environment is important economically to enterprises such as shipping, developers, mining and petroleum industries, seafood producers, researchers and tourism. It is also important socially and culturally for recreational use, spiritual connection, education and

[83] The situation in which a species is restricted to a particular geographic region as a result of factors such as isolation or in response to abiotic conditions (source: http://biodiversitya-z.org/content/endemism).

[84] The Great Australian Bight Research Program is a collaboration between BP, CSIRO, the South Australian Research and Development Institute (SARDI), the University of Adelaide, and Flinders University. The Program aims to provide a whole-of-system understanding of the environmental, economic and social values of the region; providing an information source for all to use.

enjoyment. Thus, the coastal/marine environment is central to the well-being of many Australians (DEWNR 2017a). In recognition of this complexity, the SARSMPA was developed over 10 years and was supported by a comprehensive governance and consultation framework (see Section 2).

In accordance with the objects of the *Marine Parks Act 2007*, marine parks provide for biodiversity conservation and public appreciation, and allow Ecologically Sustainable Development (ESD) and use of marine resources. 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. The zones have differing levels of restrictions; GMUZ – lowest level of restriction, through to HPZ, SZ and RAZ – highest level of restriction. Different types of SPA, which allow selected activities (such as shore-based recreational line fishing, transhipment, or harbour activities), are also designated in some of the parks.

Threats, marine parks and zoning

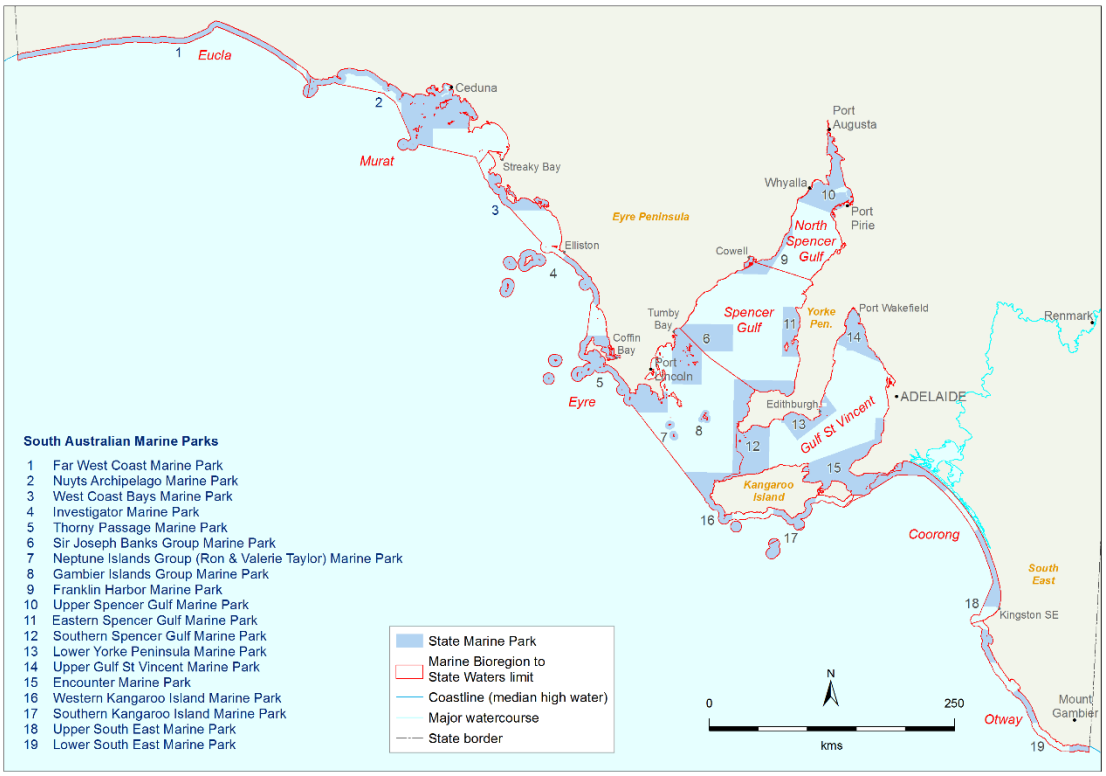
The South Australian Government has a range of tools for managing identified threats to the marine environment, including fisheries management and pollution controls. Marine parks complement existing management approaches by prioritising specific areas for conservation in order to protect them from both current and future threats. Marine parks (or marine protected areas) are recognised globally as the most effective tool to protect and conserve marine biodiversity from a range of threats. In Australia, the key threats to marine biodiversity are climate change, resource use, land-based impacts, biosecurity and pollution (Marine Biodiversity Decline Working Group 2008).

As per IUCN standards for marine protected areas and zone types, in South Australia's marine parks network, threats are managed by controlling the activities and uses that are consistent with the intention of each zone type:

- GMUZ—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 ESD and use;
- HPZ—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—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—being a zone primarily established so that an area may be managed by limiting access to the area.

Figure 3-1 lists the 19 marine parks that make up the SA marine park network and which bioregion they are located in.

Figure 3-1 South Australia's network of 19 marine parks showing marine park outer boundaries, 8 marine bioregions.



Source: APPENDIX 9

The marine parks network covers a total area of 26,937 km^2. Of this total area, 267 km^2 comprises coastal lands and islands and the remaining 26,670 km^2 covers 44 per cent of South Australia's state waters. The network includes 83 SZs and 26 RAZs (9 in state waters and 17 on land), comprising 5 per cent and 1 per cent of state waters, respectively. There are 59 HPZs and 42 GMUZs comprising 25 per cent and 14 per cent of state waters, respectively. The network also includes 52 SPAs which allow for harbour activities, transhipment, significant economic development and shore based recreational line fishing.

Table 3-1 summarises area statistics for the marine park network and Table 3-2 summarises the area and number of SZs and RAZs within the SAmarine park network.

Table 3-1 SA marine park network, area statistics

Marine park	Area – total (km^2)	Area – state waters (km^2)	Proportion – state waters (%)	Proportion – marine park network (%)
01 - Far West Coast	1,690	1,690	2.8%	6.3%
02 - Nuyts Archipelago	3,998	3,932	6.5%	14.8%
03 - West Coast Bays	788	779	1.3%	2.9%
04 - Investigator	1,184	1,181	2.0%	4.4%
05 - Thorny Passage	3,656	2,461	4.1%	9.2%
06 - Sir Joseph Banks Group	2,628	2,618	4.3%	9.8%
07 - Neptune Islands Group	146	142	0.2%	0.5%
08 - Gambier Islands Group	120	114	0.2%	0.4%
09 - Franklin Harbor	635	622	1.0%	2.4%
10 - Upper Spencer Gulf	1,606	1,528	2.5%	6.0%
11 - Eastern Spencer Gulf	784	784	1.3%	2.9%
12 - Southern Spencer Gulf	2,974	2,973	4.9%	11.0%
13 - Lower Yorke Peninsula	855	855	1.4%	3.2%
14 - Upper Gulf St Vincent	975	959	1.6%	3.6%
15 - Encounter	3,121	3,072	5.1%	11.6%
16 - Western Kangaroo Island	1,021	1,021	1.7%	3.8%
17 - Southern Kangaroo Island	673	672	1.1%	2.5%
18 - Upper South East	906	906	1.5%	3.4%
19 - Lower South East	360	360	0.6%	1.3%
Total	**26,937**	**26,670**	**44**%	**100**%

Table 3-2 Area and number of sanctuary zones and restricted access zones, SA marine park network

Marine park	Area – SZs and RAZs (km^2)	Proportion – marine park (%)	Number - SZ	Number - RAZ
01 - Far West Coast	1,306	77%	3	1
02 - Nuyts Archipelago	342	9%	9	
03 - West Coast Bays	71	9%	9	2
04 - Investigator	219	18%	3	
05 - Thorny Passage	98	3%	8	
06 - Sir Joseph Banks Group	172	7%	5	
07 - Neptune Islands Group	34	24%	1	
08 - Gambier Islands Group	0	0%	0	
09 - Franklin Harbor	70	11%	4	
10 - Upper Spencer Gulf	206	13%	9	
11 - Eastern Spencer Gulf	41	5%	3	
12 - Southern Spencer Gulf	146	5%	3	3
13 - Lower Yorke Peninsula	72	8%	2	
14 - Upper Gulf St Vincent	222	23%	4	1
15 - Encounter	282	9%	11	1
16 - Western Kangaroo Island	219	21%	3	
17 - Southern Kangaroo Island	80	12%	1	1
18 - Upper South East	87	10%	3	
19 - Lower South East	34	10%	2	
Total	**3,702**	**14%**	**83**	**9**

3.2 Far West Coast Marine Park

3.2.1 Park Description

The Far West Coast Marine Park covers 1,690 square kilometres within the Eucla Bioregion (Figure 3-1). It extends from the Western Australian border to the Tchalingaby sand hills. The entire area of the Far West Coast Marine Park is covered by a RAZ from 1 May to 31 October. For the remaining 6 months of the year, the Far West Coast Marine Park is covered by 3 SZs (about 42 per cent of the total park area), 2 HPZs (about 23 per cent) and 1 RAZ (about 35 per cent). The Far West Coast Marine Park accommodates whale watching tourism and commercial fishing. Shoreline fishing is allowed adjacent to Wilsons Bluff in the Bunda Cliffs SZ and adjacent to the Yatala Aboriginal Reserve near the Head of the Bight. Shoreline fishing is also allowed

between 1 May and 31 October for an extended section of the coast adjacent to Yatala Aboriginal Reserve, and adjacent to the Wahgunyah Conservation Park along Dog Fence Beach (Figure 3-2).

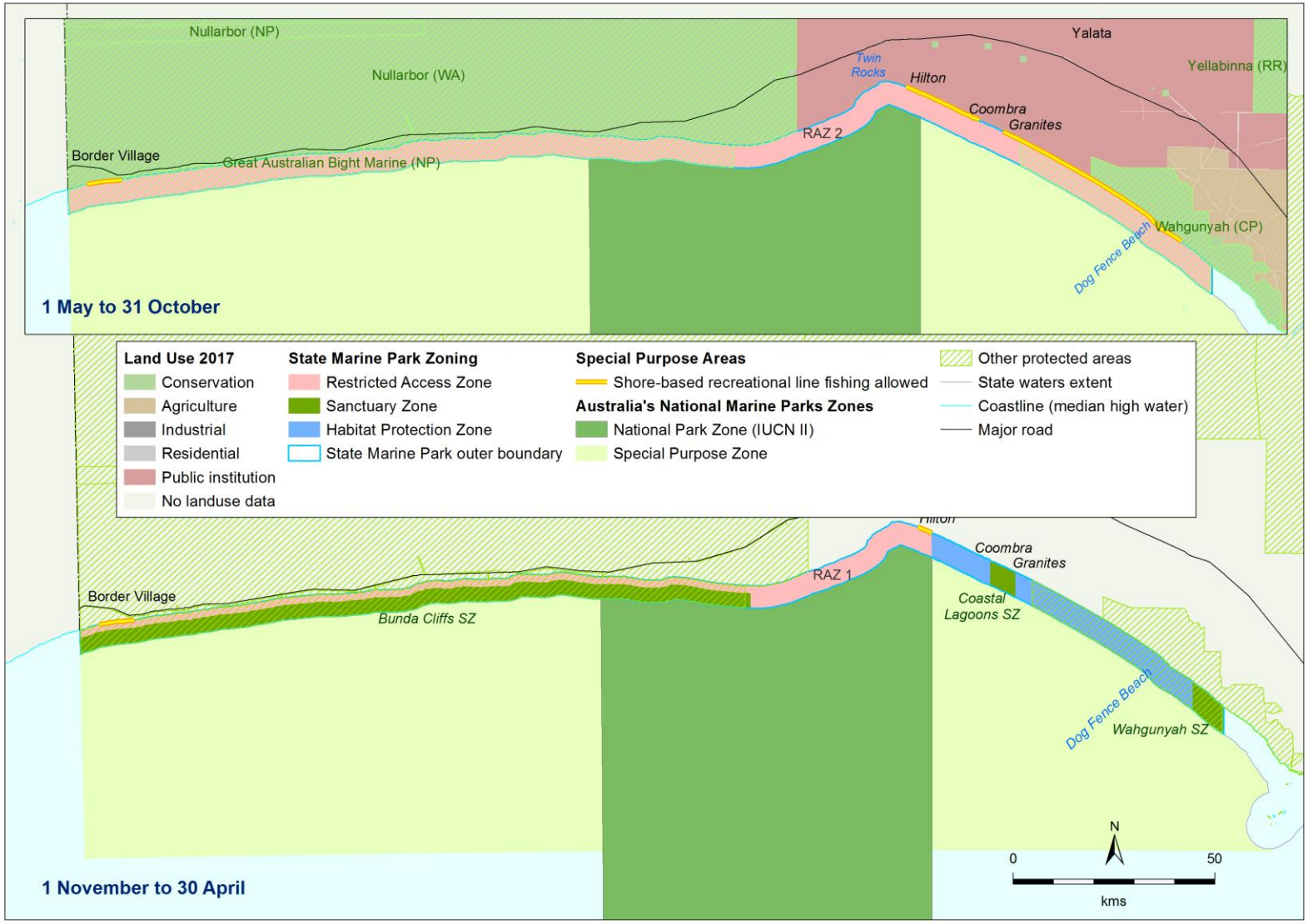
The Far West Coast Marine Park is adjacent to a remote and sparsely populated area of the state, which is dominated by agricultural land, vacant land and conservation areas (Figure 3-2).The Far West Coast Marine Park encompasses the Great Australian Bight Marine Park and is adjacent to the Nullarbor National Park, the Wahgunyah Conservation Park and the Yatala Indigenous Protected Area. The region experiences hot, dry summers and cool winters (Bureau of Meteorology 2015a. The annual freshwater runoff is 1,380 gigalitres (National Water Commission 2007).

In developing a CAR system of marine parks, habitats were used as key surrogates for broader biodiversity. Consideration was given to benthic habitat type and extent as well as shoreline habitat type and length (DEH 2009a). About 26 per cent of the benthic habitats of the Far West Coast Marine Park have been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-3).

The conceptual model of the Far West Coast Marine Park (Figure 3-4) summarises the ecological and socio-economic values, physical and socio-economic drivers, human-mediated pressures on the ecological values, the influence of the marine park on these pressures, and predictions of change (ecological and socio-economic) due to the marine park.

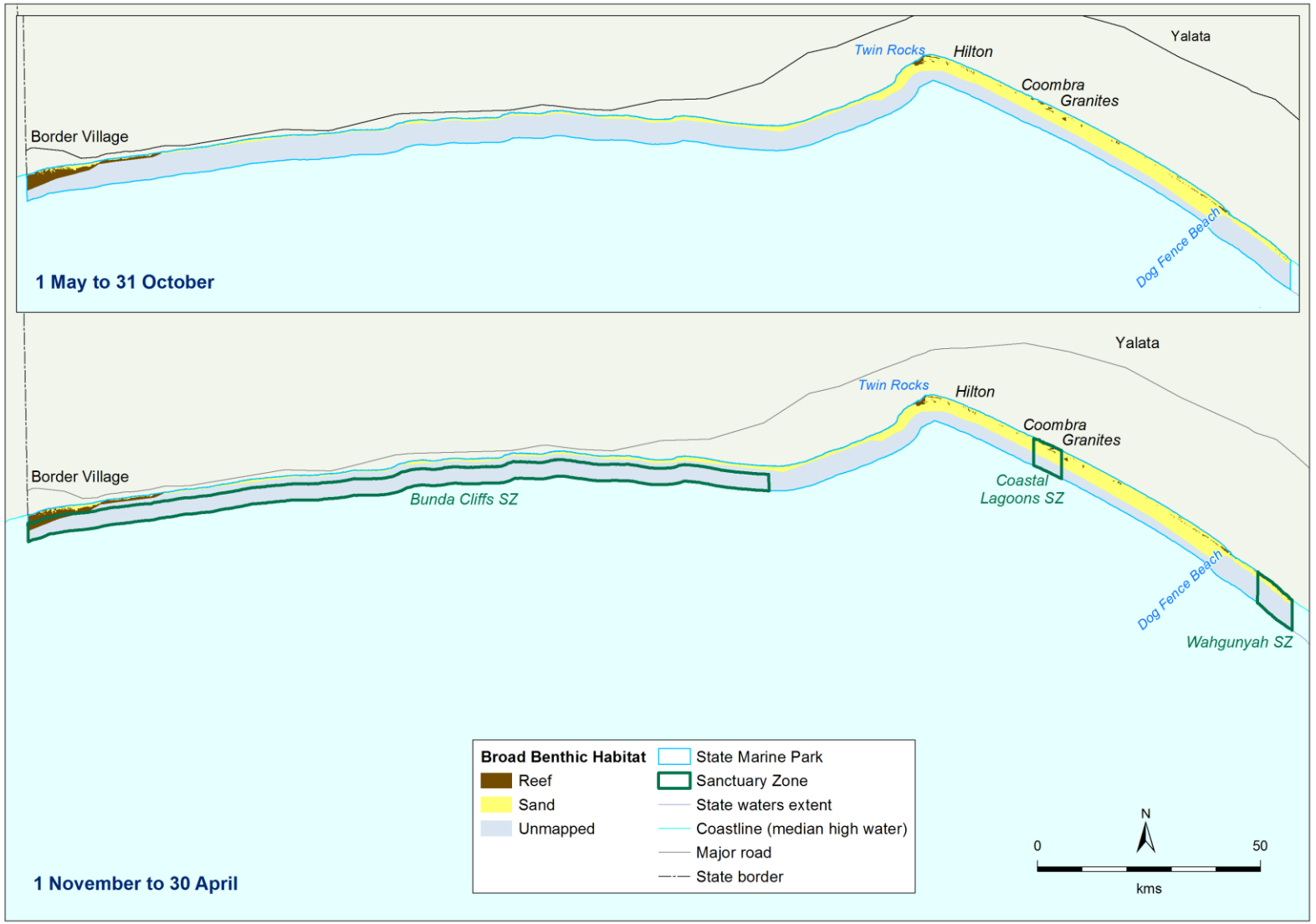
Section 3.2.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-2 Far West Coast Marine Park, land uses map



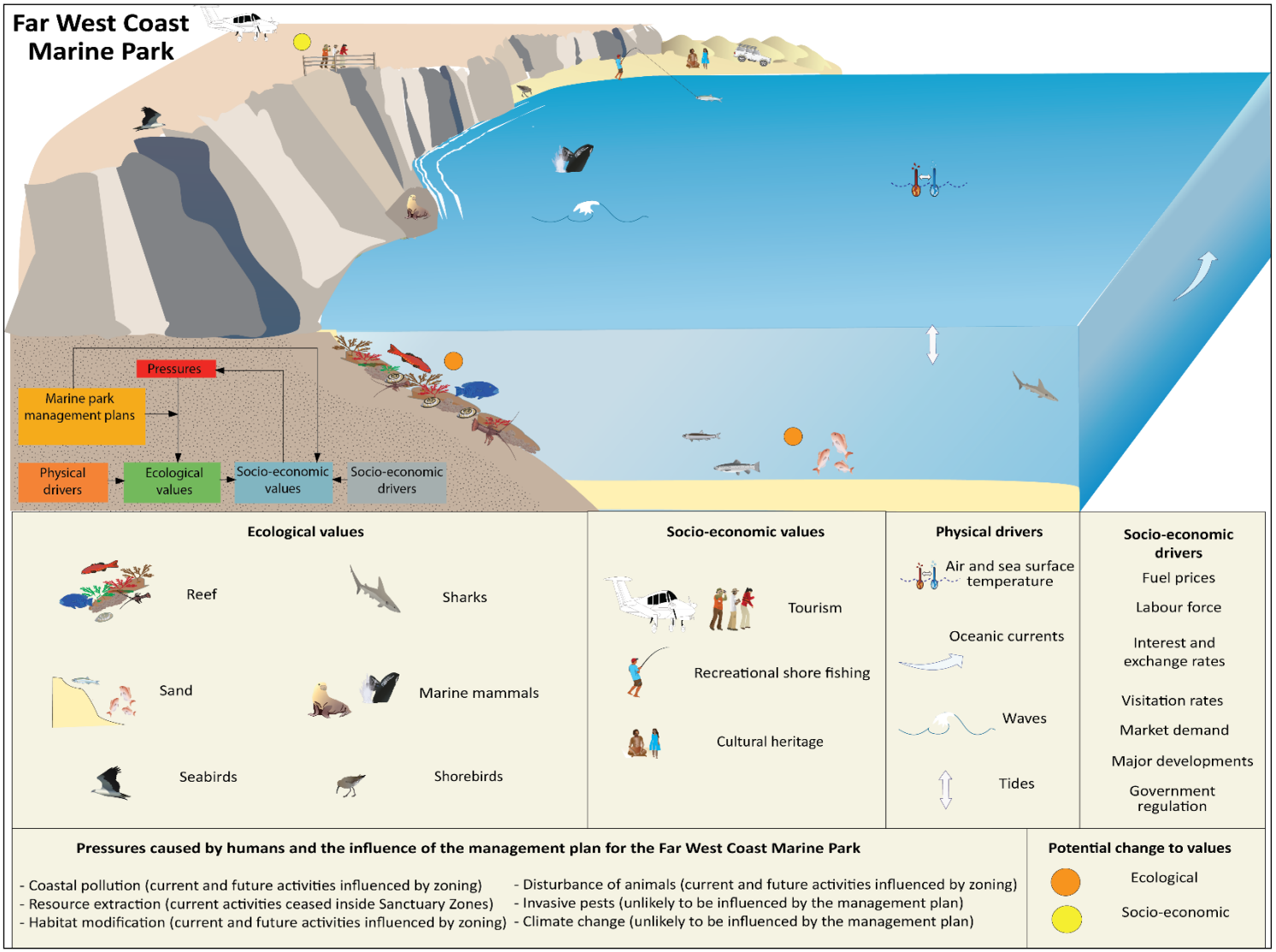
Source: APPENDIX 9

Figure 3-3 Far West Coast Marine Park, habitat map



Source: APPENDIX 9

Figure 3-4 Far West Coast Marine Park, conceptual model



Source: APPENDIX 9

3.2.2 Economic, social and environmental values of the Far West Coast Marine Park sanctuary zones

Bunda Cliffs Sanctuary Zone and Restricted Access Zone (SZ 1, RAZ 1)

1212 km² (SZ applies 1 November to 30 April (inclusive). The area is a RAZ from 1 May to 31 October (inclusive)).

MPLAG advice: Consistent

The Bunda Cliffs Sanctuary and RAZs are a South Australian icon. The zones form part of connected protected areas of international significance extending on land from the Nullarbor Wilderness Protection Area through the Far West Coast Marine Park and into the South-west Commonwealth Marine Reserves.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Sandy seafloor habitats, intertidal limestone platform reefs and subtidal reefs with depths from 0 - 50m. 200km of cobbled platform cliff shoreline habitats, exposed to high wave and wind energy. Sandy beach habitats exposed to moderate and high wind and wave energy.	**Important features:** Internationally significant southern right whale aggregation and nursery site. Breeding, haul out and feeding areas for the vulnerable Australian sea lion, and haul out sites for New Zealand fur seals. Home to large predators such as white sharks and killer whales as well as migratory blue, mako and whaler sharks. Seasonal habitat for migratory blue, sperm, humpback and minke whales. Habitat for dolphins including Risso's and bottlenose dolphins. Nesting sites for state endangered white-bellied sea eagle and state endangered osprey. Species of macroalgae considered to be endangered. High degree of 'naturalness' due to its isolation.	**Commercial fisheries:** The NZRL Fishery used the SZs within the Far West Coast Marine Park previously. There was minimal use by the Marine Scalefish and Charter Boat fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $62,000 from the NZRL Fishery (0.18% of fishery catch) and less than $1,000 each for the Marine Scalefish and Charter Boat fisheries. Based on the habitat mapping available for this park, it is likely that the majority of the displaced catch came from this SZ. **Tourism** Supports growing and internationally recognised nature-based tourism focused on whale watching at the Head of Bight.	Areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and part of the Far West Native Title Claim. Overlays the existing zoning (since 1998) of the Great Australian Bight Marine Park. Two SPAs allow for shore based recreational line fishing at the Merdayerrah Sandpatch and key fishing campsites to the east of the Head of Bight, including Hiltons and Bob's Kitchen.

Coastal Lagoons Sanctuary Zone (SZ 2)

39 km²((Applies 1 November to 30 April (inclusive). RAZ from 1 May to 31 October (inclusive)).

MPLAG advice: Moderate - Some dissenting views

The Coastal Lagoons SZ conserves part of a chain of coastal lagoons unique in South Australia. Long surf beaches are well known for the remote recreational fishing opportunities they provide and the SZ is carefully located between key recreational fishing campsites.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Coombra Lagoons are created by fringing reefs adjacent to the surf beaches. These reefs break the wave energy from the Southern Ocean and offer shelter for plants and animals. Sandy seafloor and limestone reefs which slope steeply into deep waters, creating distinctive habitats and associated biodiversity.	**Important features:** Corridor of habitats from the coast through to deep waters. Habitats for protected shorebirds. Mulloway are suspected to spawn near the shore. The warm Leeuwin Current provides habitat for some tropical species, such as southern bluefin tuna, mackerel, corals, sea stars and macroalgae.	**Commercial fisheries**: As discussed above (Bunda Cliffs SZ economic values section), the SZs in this marine park were of minor economic importance to the commercial fisheries. The NZRL Fishery was the principal fishery. Based on the habitat mapping available for this park (i.e. mostly sand), it is likely that relatively little of the displaced catch came from this SZ.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Supports Yalata community income derived from beach fishing access. Supports on-going surfing access. Recreational fishing adjacent to Jaxons, Geues, Coombra and Granites Campsites is unaffected.

	Coastal processes include autumn and winter down wellings and summer warm water plumes which are likely to support unique plant and animal communities not yet studied by scientists. High degree of 'naturalness' due to its isolation. Contains the only known seagrass beds in the park (Amphibolis antarctica-dominated seagrass beds). The area of highest inshore, marine floristic diversity (both macroalgae and seagrass) in the park.		
Wahgunyah Sanctuary Zone (SZ3) **56km² (Applies 1 November to 30 April (inclusive). RAZ from 1 May to 31 October (inclusive)).** **MPLAG advice:** Moderate - Some dissenting views *The Wahgunyah SZ is adjacent to the Wahgunyah Conservation Park and conserves remote, rarely accessed cliffs and surf beaches, with reefs in adjacent waters to 30m deep.*			
Environmental Values		**Economic Values**	**Social and Cultural Values**
CAR Habitats represented: Shoreline of cliffs and rocky headlands interspersed by surf beaches exposed to high wind and wave energy. Sandy seafloor and limestone reefs in waters between 0-30m deep.	**Important features:** Protected corridor of habitats from the coast to deep waters. Habitats for protected shorebirds and birds of prey such as state endangered osprey and state endangered white bellied sea eagle. The warm Leeuwin Current provides habitat for some tropical species, such as southern bluefin tuna, mackerel, corals, sea stars and macroalgae. Coastal processes include autumn and winter down wellings and summer warm water plumes which are likely to support unique plant and animal communities not yet studied by scientists. High degree of 'naturalness' due to its isolation.	**Commercial fisheries**: As discussed above (Bunda Cliffs SZ economic values section), the SZs in this marine park were of minor economic importance to the commercial fisheries. The NZRL Fishery was the principal fishery. Based on the habitat mapping available for this park (i.e. mostly sand), it is likely that relatively little of the displaced catch came from this SZ.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Supports Yalata community income derived from beach fishing access. Areas of importance for recreational fishing lie further west at Yalata Beach and Dog Fence Beach and are unaffected.

Sources: Baker 2004, Birdlife Australia 2015, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Mackay and Goldsworthy 2015, AWNRM Board 2011, DEWNR 2015a, Edyvane 2000, Edyvane 1998, Lothian 2005, Pidcock et al. 2003, Middleton and Bye 2007.

3.3 Nuyts Archipelago Marine Park

3.3.1 Park Description

The Nuyts Archipelago Marine Park is the largest marine park in South Australia (Figure 3-1), covering 3,998 square kilometres. Most of the park (about 97.5 per cent) lies within the Murat Bioregion, with the remainder in the Eucla Bioregion. The Nuyts Archipelago Marine Park extends from Nuyts Reef in the west to Point Brown in the east and includes the islands of the Nuyts Archipelago. The Nuyts Archipelago Marine Park includes 9 SZs (about 9 per cent of the total park area), 8 HPZs (about 47 per cent) and 5 GMUZs (about 45 per cent, Figure 3-5). The Nuyts Archipelago Marine Park accommodates various marine industries including shipping, commercial fishing and aquaculture. An SPA for harbour activities is situated in Thevenard, which is adjacent to Ceduna, and 2 SPAs for transhipment are located adjacent to the Isles of St Francis and off Point Fowler. The port of Thevenard lies outside the park boundary. Two SPAs that allow shore-based recreational line fishing are located at Nuyts Reef SZ and Barlows Beach SZ (Figure 3-5).

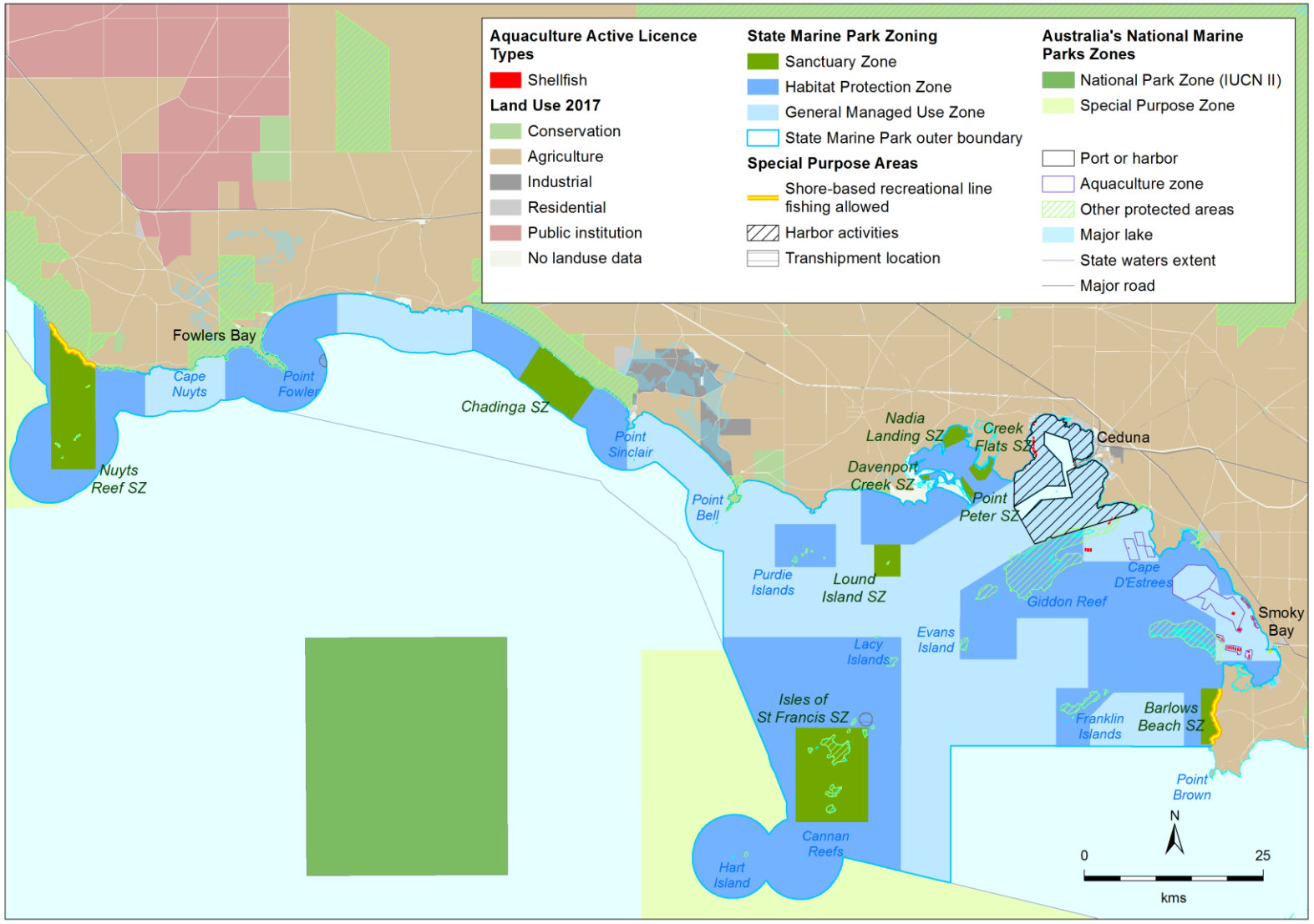
The Nuyts Archipelago Marine Park is adjacent to a remote and sparsely populated area of the state, which is dominated by agricultural land, vacant land and conservation areas (Figure 3-5). The largest population centres are Ceduna and Smoky Bay. The Nuyts Archipelago Marine Park is adjacent to numerous land conservation areas (Figure 3-5) including Fowlers Bay Conservation Park, Isles of St Francis Conservation Park, Sinclair Island Conservation Park, Nuyts Archipelago Conservation Park, Nuyts Reef Conservation Park, Wittelbee Conservation Park, Laura Bay Conservation Park, Chadinga Conservation Reserve and Point Bell Conservation Park and the Nuyts Archipelago Wilderness Protection Area. The region experiences hot, dry summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 1,380 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-6 and Figure 3-7 respectively.

About 19 per cent of the benthic habitats of the Nuyts Archipelago Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 10 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-6).

Section 3.3.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-5 Nuyts Archipelago Marine Park, land uses map



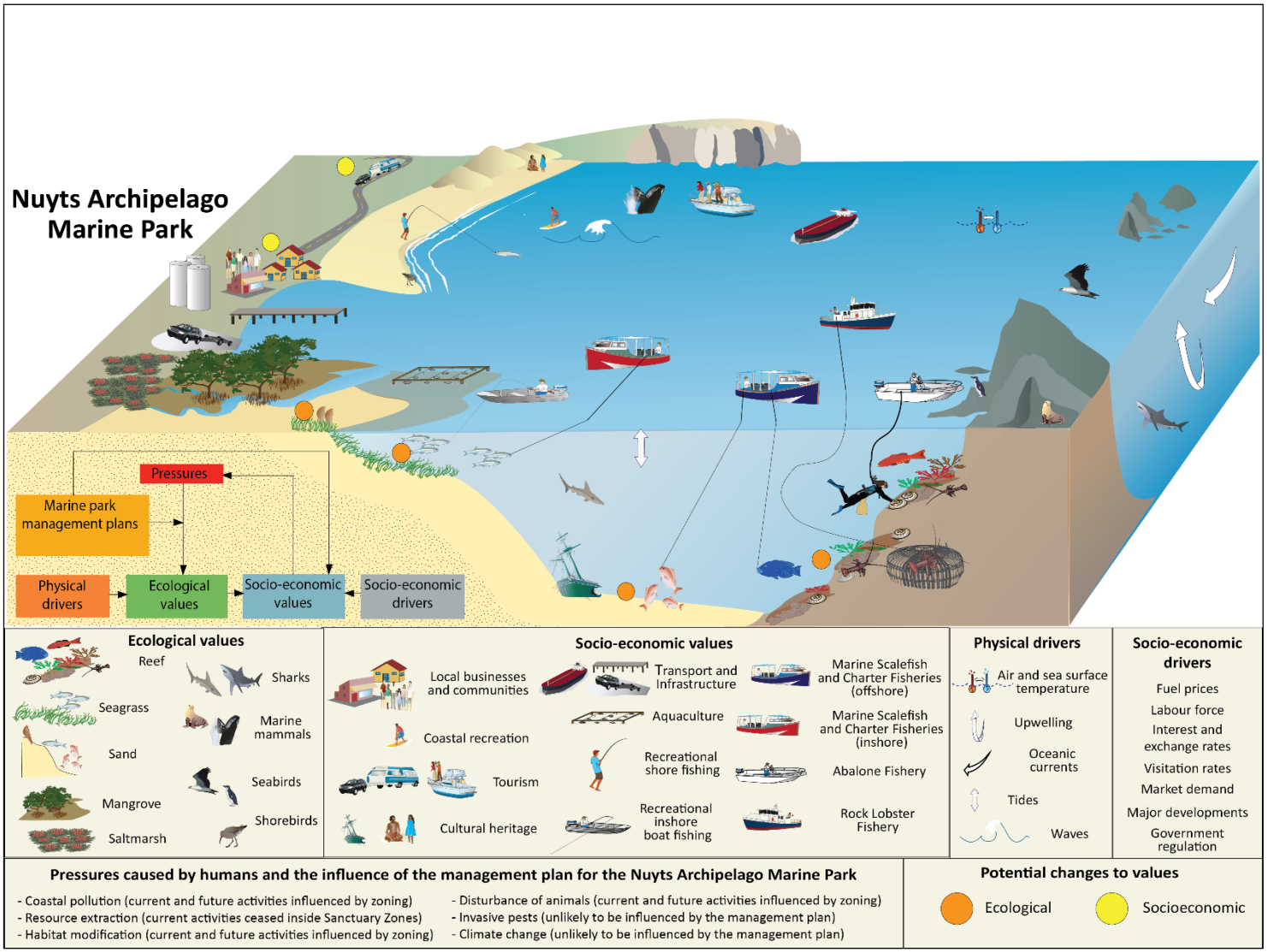
Source: APPENDIX 9

Figure 3-6 Nuyts Archipelago Marine Park, habitat map



Source: APPENDIX 9

Figure 3-7 Nuyts Archipelago Marine Park, conceptual model



Source: APPENDIX 9

3.3.2 Economic, social and environmental values of the Nuyts Archipelago Marine Park sanctuary zones

Nuyts Reef Sanctuary Zone (SZ 1)

105 km²

MPLAG advice: Non-support from 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.

The Nuyts Reef SZ conserves the largest example of a limestone reef in the Murat Bioregion. Together with the plant and animal communities it supports, the Nuyts Reef is an extremely valuable addition to South Australia's conservation estate. Located in remote waters off the far west coast, Nuyts Reef has experienced relatively low levels of fishing and other pressures and is considered to have retained many of its natural values. Shore-based recreational line fishing is provided for through a SPA.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented 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:** 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. Reef 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.	**Commercial fisheries**: 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 $82,000, 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).	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. A SPA accommodates shore-based recreational line fishing.

Chadinga Sanctuary Zone (SZ 2)

54 km²

MPLAG advice: Consistent

The Chadinga SZ conserves an extremely isolated section of high energy, dangerous coastline. This zone contains several sections of beach, bound by bluffs and backed by dunes highly exposed to the 2m swell. The surf zone is high energy and around 300m wide, with some sections of reef offshore from the beaches and bluffs. The only SZ that does not allow fishing along the mainland coast within this marine park.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Exposed fine-medium sandy beaches interspersed with medium cliffs and fronted by shoreline platform reefs and sandy seafloor habitats. As a precautionary measure, steeply sloping unmapped seafloor habitats over 30m in depth are included. It includes surf beach areas, shallow and deeper reef structures and soft bottom.	**Important features:** Shoreline and seafloor habitats exposed to high swell, wave and wind energy. Feeding, nesting and breeding areas for migratory shorebirds, whose habitats are required to be protected under international treaties. A transverse bar and rip system beach, with several offshore bars in places, supporting specific food webs.	**Commercial fisheries**: The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Nuyts Archipelago Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Nuyts Reef and Isles of St Francis SZs) is estimated to be approximately $199,000.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Little or no impact on recreational fishing.

	Ecological connections between the shore and deeper offshore waters. Conserves ecological connections with a nearby salt lake ecosystem. Adjacent to the Chadinga Conservation Reserve creating a protected corridor from the land to the sea. State endangered osprey breeding territory.	Based on the consistent support from the MPLAG, it is likely that relatively little of this displaced catch came from this SZ.	

Tourville Bay Sanctuary Zones (SZ3 to SZ6)

17km² in total

MPLAG advice: Consistent

Four small SZs have been located in Tourville Bay (Davenport Creek), one of only three estuaries in SA to be rated as near pristine. These zones conserve areas of mangrove forest and adjacent tidal mudflats, and the associated fauna and flora in one of the most pristine estuaries in SA.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: A diverse, sheltered wetland of samphire flats and mangroves around tidal channels, intertidal and subtidal seagrass, intertidal sandflats and subtidal sand with calcareous patch reefs. This Zone includes parts of the Eyre Peninsula's largest mangrove community and the most westerly mangroves in South Australia, which grow on a more sandy substrate, unusual for mangroves in SA and represents a slightly different ecosystem to other mangrove stands.	**Important features:** One of only three estuaries in SA rated as near pristine. The area is surrounded by salt lakes which are subject to flooding causing influxes of sediments and nutrients. Area includes one of the most important nurseries on Eyre Peninsula for western king prawn with a large number of prawn post-larvae located within these zones. Known nursery areas for species such as King George whiting, Western Australian salmon, Australian herring, southern sea garfish and yellow eye mullet, flathead, flounder, gummy, school and whaler sharks, eagle rays, smooth stingrays, western king prawn, blue swimmer crab, sand crab, razorfish, mud cockles and baitworm. Contains what is possibly Eyre Peninsula's widest diversity of resident coastal and sea birds as well as being an internationally important site for migratory shorebirds such as Grey Plover and Greenshanks, whose habitats are required to be protected under international treaties. Breeding nesting and feeding area for coastal and seabird species. A potential breeding site for bottlenose dolphins, with young dolphins regularly seen in the bay.	**Commercial fisheries:** The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Nuyts Archipelago Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Nuyts Reef and Isles of St Francis SZs) is estimated to be approximately $199,000. Based on the habitat mapping available for this park (i.e. mangroves and intertidal sand/seagrass), it is likely that relatively little of this displaced catch came from this SZ. **Tourism** Campsites adjacent. Zoning positioned to provide for high-use recreational fishing and camping at Davenport Creek.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Protects the culturally significant Aboriginal fish traps and occupation sites at Nadia Landing. Listed by the Australian Heritage Commission as an *Indicative Place,* meaning its inclusion on the *Register of the National Estate* may be forthcoming. Zoning positioned to provide for high-use recreational fishing and camping at Davenport Creek. Is complemented by a netting closure which extends from Point Bell to Point Brown.

Lound Island Sanctuary Zone (SZ7)

17km²

MPLAG advice: Consistent however, changed from circular shape to square for ease of compliance.

Lound Island SZ conserves the only inshore island of the Nuyts Archipelago Wilderness Protection Area to be protected within a SZ. The granite based island is home to breeding Australian sea lions which feed on the fish and invertebrates associated with the different habitats surrounding the island.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: This area includes granite and limestone reefs both deep and shallow. Exposed granite island with calcarenite cover and associated reef habitat.	**Important features:** A breeding, feeding and resting site for the threatened Australian sea lion. Birds of conservation concern which utilise this SZ include the fairy tern, buff-banded rail and the little penguin. Part of the Nuyts Archipelago Wilderness Protection Area.	**Commercial fisheries:** The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Nuyts Archipelago Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Nuyts Reef and Isles of St Francis SZs) is estimated to be approximately $199,000. Based on the habitat mapping available for this park (i.e. mostly sand), it is likely that relatively little of this displaced catch came from this SZ.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Has little or no impact on recreational fishing.

Isles of St Francis Sanctuary Zone (SZ8)

133km²

MPLAG advice: Non-support from the majority of members based on fishing issues.

The Isles of St Francis SZ is one of the largest SZs in South Australia's marine parks network and a hotspot for the diversity of sea life. An extremely isolated chain of islands in the Nuyts Archipelago Wilderness Protection Area. The extremely high abundance and diversity of reef fish in this area has been termed "the offshore island effect". The unusually high abundance of reef fish in this area has been hypothesised to be due to high local reef productivity, high carbon subsidy from the surrounding waters and low fishing pressure. This fish fauna of the St Francis Isles represent an example of what reef fish composition may have been like in some parts of South Australian coast, prior to heavy fishing pressure over the last few decades. This SZ is in effect an important refuge for reef fish species, which are more heavily fished along the mainland coast. The SZ protection ensures that this special place, with its extremely high diversity will be protected and will remain intact for future generations.

Environmental values		Economic Values	Social and cultural values
CAR Habitats represented: Along the shoreline rocky cliffs and sandy beaches are represented, and out to sea reef, seagrass meadows and sand habitats.	**Important features:** 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.	**Commercial fisheries**: 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 $668,000, 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).	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. Includes areas which are highly valued recreational diving sites within the Isles of St Francis and Nuyts Archipelago. This Zone has been designed to provide for the high-use recreational fishing sites at some of the more shore-ward islands such as Evans, Goat, St Peter and Franklin Islands.

	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 and harlequin fish. 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 haul out sites on St Francis, Masillon, Egg and Smooth Islands. Several species of rare and uncommon macroalgae. The area also protects populations of resident coastal shore birds as well as seabirds including state endangered osprey, 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 support populations of a range of fished species including 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.		
Barlows Beach Sanctuary Zone (SZ9) **17km²** **MPLAG advice:** Consistent, with minor amendment to straighten the western boundary for ease of compliance. *Barlows Beach SZ was designed by the Far West Local Advisory Group. It protects the biodiversity over a range of habitat types, including diverse macroalgae on reef and seagrass, which are important for many fish and invertebrate species.*			
Environmental values		**Economic values**	**Social and Cultural Values**
CAR Habitats represented: The shoreline of this SZ is made up of sandy beaches, cliffs and rock platforms of limestone and granite reef structure while in the shallow areas seagrass, soft-bottom habitat and limestone and granite reef can be found. Some of the habitats within this Zone in water 0 - 30m deep are yet to be mapped.	**Important features:** Unique features of this zone include a western facing headland, exposed to significant wind and wave energy and a well-defined granite reef plateau. Sea surface temperatures in the area range from 12°C in winter to more than 22.5°C in summer. The zone is influenced by seasonal inflows of cool, nutrient rich water that support a wide range of species. Macroalgae in the area provide an important habitat for juvenile abalone and smaller invertebrates (molluscs, bryozoans). Found within this zone are mature King George whiting, snapper and stingray species. Zone protects a variety of habitats including reefs and sea grasses that provide habitat and refuge for fish.	**Commercial fisheries:** The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Nuyts Archipelago Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Nuyts Reef and Isles of St Francis SZs) is estimated to be approximately $199,000. Based on the habitat mapping available for this park, it is likely that that the majority of this displaced catch came from this SZ. This SZ is located to provide for aquaculture zones and licenses to the north at Smoky Bay as well as heavy recreational fishing at Smoky Bay, Point Brown and St Mary Beach.	Includes areas of Aboriginal cultural significance for the Wirangu, Kokatha, Yalata Anangu and Mirning people and is part of the Far West Native Title Claim. The zone has a SPA to accommodate shore based recreational line fishing.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Mackay and Goldsworthy 2015, Shaughnessy et al. 1994, Baker and Edyvane 2003, Caton et al. 2011a, Caton et al. 2011b, Charlton et al. 2014, DEWNR 2015a, Lothian 2005, Middleton and Bye 2007, Scientific Working Group 2011.

3.4 West Coast Bays Marine Park

3.4.1 Park Description

The West Coast Bays Marine Park covers 789 square kilometres within the Eyre Bioregion (Figure 3-1) The West Coast Bays Marine Park extends from near Point Westall to Ricon Beach and includes Sceale, Venus and Baird Bays. The West Coast Bays Marine Park includes 2 RAZs (about 0.4 per cent of the total area of the park), 9 SZs (about 9 per cent), 2 HPZs (about 90 per cent) and 1 GMUZ (about 1 per cent, Figure 4). The West Coast Bays Marine Park accommodates various marine industries including commercial fishing and tourism. An SPA for harbour activities is located within Venus Bay. Shoreline fishing is allowed in the Sceale Bay SZ (Figure 3-8).

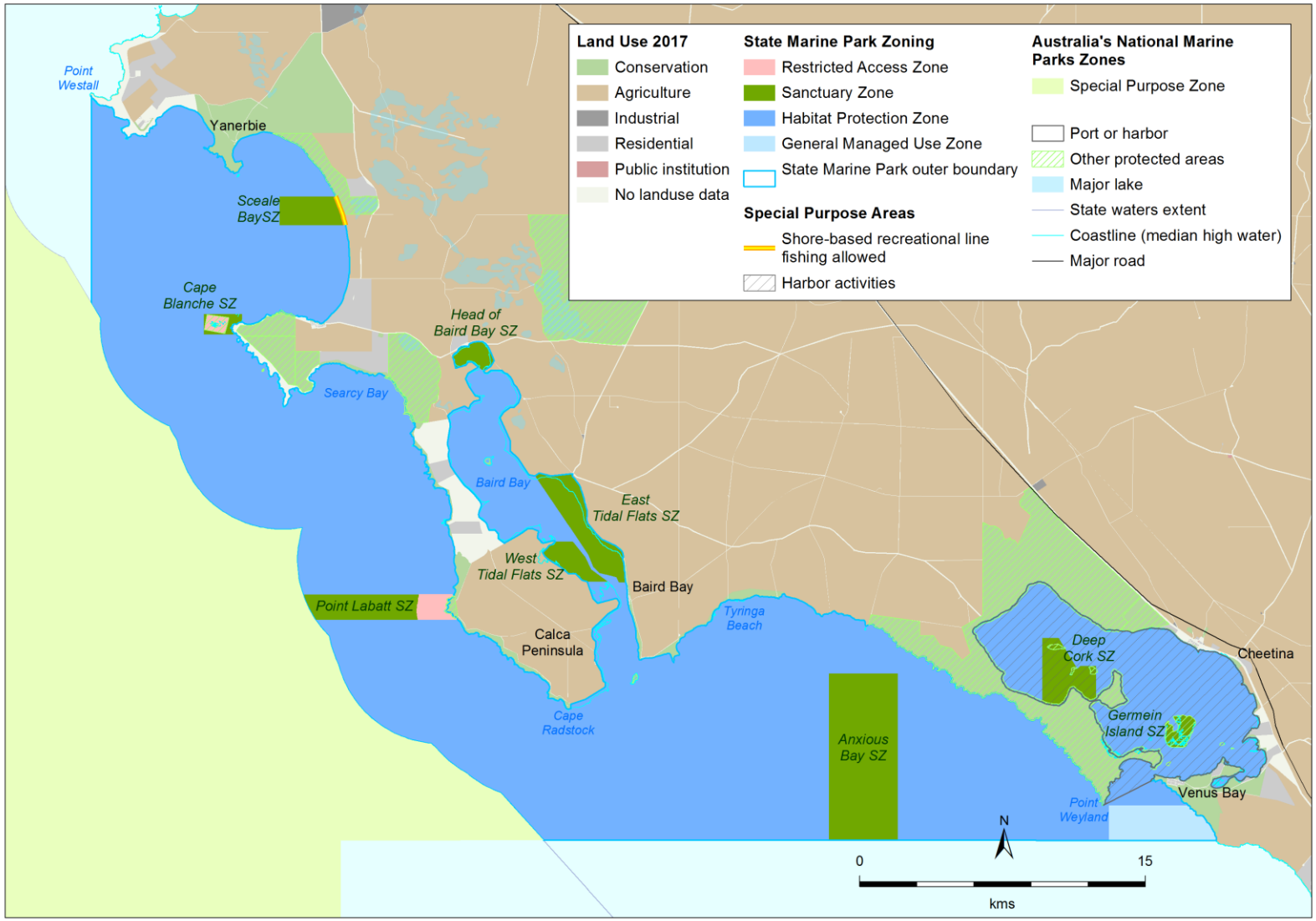
The West Coast Bays Marine Park is adjacent to a sparsely populated area of the state, which is dominated by agricultural land and conservation areas (Figure 3-8). There are small communities at Sceale, Venus and Baird Bays, and Yanerbie. The West Coast Bays Marine Park encompasses Nicholas Baudin Island, Baird Bay Island and Point Labatt Aquatic Reserve and is adjacent to the Sceale Bay, Point Labatt and Venus Bay Conservation Parks (Figure 3-8). The region experiences hot, dry summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 1,380 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-9 and Figure 3-10 respectively.

About 10 per cent of the benthic habitats of the West Coast Bays Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 17 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-9).

Section 3.4.2describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-8 West Coast Bays Marine Park, land uses map



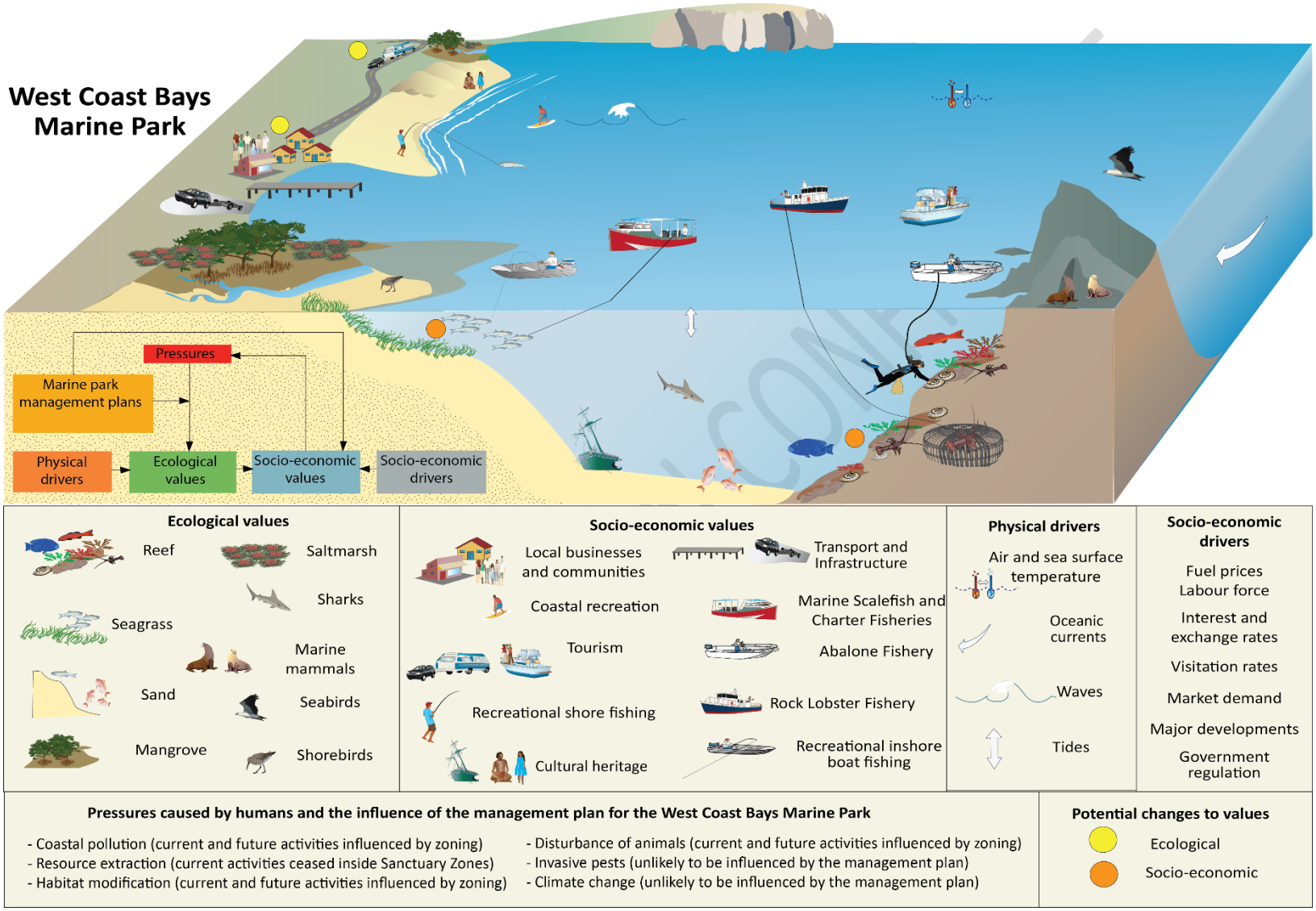
Source: APPENDIX 9

Figure 3-9 West Coast Bays Marine Park, habitat map



Source: APPENDIX 9

Figure 3-10 West Coast Bays Marine Park, conceptual model



Source: APPENDIX 9

3.4.2 Economic, social and environmental values of the West Coast Bays Marine Park sanctuary zones

Sceale Bay Sanctuary Zone (SZ 1)

5 km²

MPLAG advice: Consistent

The Sceale Bay SZ is positioned in the middle of Sceale Bay beach, a 20km long, white sandy surf beach backed by stable vegetated dune along the main part of the bay. The SZ conserves reef and sandy seafloor habitats and the many fish and invertebrates that live and breed here. Shore-based recreational fishing is allowed along the coastal boundary of the zone, minimising impacts on recreational activities.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Surf beach. Significant area of soft-bottom habitat transitions into deeper water habitats representing several depth classes. Provides for the transition of habitats from the surf zone to 3 km offshore (in places).	**Important features:** The sandy floor habitats cater for lifecycles of a wide variety of fished species including mulloway, whiting, flathead, salmon, snapper, sand crabs and gummy shark. Ecologically connected to Sceale Bay Conservation Park, establishing a protected corridor between the land and sea. The main part of the Bay is a 20km white sandy surf beach backed by a stable vegetated dune.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park (i.e. mostly sand) and the consistent MPLAG advice, it is likely that relatively little of the displaced catch came from this SZ.	Based on MPLAG advice which avoided offshore recreational fishing locations. Areas of particular importance for recreational fishing are maintained.

Cape Blanche Sanctuary Zone and Restricted Access Zone (SZ 2)

2 km²

MPLAG advice: Builds on majority MPLAG advice to connect the Island to mainland habitat and to provide greater protection to the Australian sea lion breeding colony.

The Cape Blanche SZ and RAZ encompasses the rocky headland of Cape Blanche, the exposed offshore island habitat of Nicolas Baudin Island and provides a protective corridor to the waters connecting the two geological features. This is a rugged and remote section of coastline, home to coastal raptors and the Australian sea lion colony at Nicholas Baudin Island.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Exposed high cliff shoreline, bedrock platforms and heavy limestone or calcarenite reef. Connects habitats from the mainland to the Island.	**Important features:** Australian sea lion and New Zealand fur seal breeding colony and haul out sites. Feeding and breeding area for the state endangered osprey. The Chain of Bays is a stronghold for this species in the state and is a critical area for their survival. Feeding location for the state endangered white-bellied sea eagle. Includes Nicolas Baudin Island Conservation Park and connected to Cape Blanche Conservation Park, establishing a protected corridor between the land and sea. An extensive amount of subtidal reef which with the associated macroalgae that grows on it provides habitat for fished species including southern rock lobster, Maori octopus, greenlip and blacklip abalone, purple sea urchin, sea sweep and western blue groper.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ. **Tourism:** Augments the nature tourism experience for visitors to the Cape Blanche Conservation Park.	Maintains access to most important recreational fishing areas.

Point Labatt Restricted Access and Sanctuary Zone (SZ3)

10km²

MPLAG advice: Consistent

The Point Labatt RAZ and SZ protects one of the largest mainland Australian sea lion breeding colonies. The RAZ overlays the Point Labatt Aquatic Reserve which had been in place for many decades. Contains a colony of the world's smallest live bearing sea star, the rare Parvulastra parvivipara or 'little patty', found only on the western Eyre Peninsula. From the elevated clifftop viewing platform, Australian sea lions, New Zealand Fur seals, and a variety of shorebirds may be observed in a visually spectacular setting.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: Cliff shoreline including granite outcrops, granite reef and heavy limestone or calcarenite reef habitats, exposed to strong wave and wind energy. Connected habitats encompass depth classes from the intertidal zone to 50+ metres.	**Important features:** Connected to Point Labatt Conservation Park, establishing a protected corridor between the land and sea. The granite outcrops on the shoreline, which contain granite pools and reefs are favoured feeding and resting sites for the Australian sea lion. One of the largest mainland breeding colonies of the vulnerable Australian sea lion, including a section of adjacent foraging grounds. New Zealand fur seal haul out site. Sightings of the rare Australian fur seal. Colony of the world's smallest live bearing sea star, the rare Parvulastra parvivipara or 'little patty', found only on the western Eyre Peninsula. Rare species of red macroalgae, Gigartina wheliae. Breeding site for the state endangered osprey and habitat for the state endangered white-bellied sea eagle. Included in the Directory of Important Wetlands. Rich macroalgae forests dominated by browns overlaying dense understoreys of red and green species. Blacklip and greenlip abalone, southern rock lobster, Maori octopus, turban shells, purple sea urchin, sea sweep, western blue gropper and sea stars inhabit the reef. Foraging habitat for seabird species such as albatross, gannet and petrels.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park, , the previous existence of a no-fishing aquatic reserve, and the consistent MPLAG advice, it is likely that relatively little of the displaced catch came from this SZ. **Tourism** A viewing platform is on the cliff top for visitors to observe the sea lion colony.	Public access, including all fishing, has been prohibited in the Point Labatt Aquatic Reserve for many years. Fishing further offshore is limited due to the exposure, depth and distance from boat ramps.

Baird Bay Sanctuary Zones (SZ4-SZ6)

14km² (SZ4 3km² SZ5 2km² SZ6 9km²)

MPLAG advice: Consistent

Baird Bay contains three SZs which protect the flood tide delta at the head of the bay and the tidal flats in the centre of the bay. All vitally important habitat for the shore and wader birds which inhabit this wetland of international significance.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented:	**Important features:**	**Commercial fisheries:**	Relatively low recreational or commercial fishing activity due to the shallow and constricted bathymetry and coastline.

(Top of Baird Bay) Sheltered cliffs, sheltered coarse sandy beaches and sheltered sand dune shorelines. Sparse and medium density seagrass and soft-bottom habitat. High (up to 16°) variation between summer and winter sea surface temperatures. Seasonally experiences high salinity, low nutrient waters associated with an inverse estuary. A shallow, flood tide delta and basin in a protected embayment. (Middle of Baird Bay) Sheltered bedrock platforms, coarse sandy beaches, mudflats, sand dunes and saltmarsh. Diverse benthic habitats in various depth classes including seagrasses, soft-bottom habitats, mud flats and saltmarsh communities, which are important breeding / nursery areas for a variety of fish and crustaceans. High (up to 16°) variation between summer and winter sea surface temperatures, and also seasonally experience high salinity, low nutrient waters associated with an inverse estuary. Fresh water seep, influencing marine processes. Influenced by oceanic processes compared with the top of Baird Bay.	(Top of Baird Bay) Large flood tide delta at the head of the Bay, with an inverse estuary with high salinity and low nutrients, which is rare on the Eyre Peninsula. Habitat and nesting sites for 19 species of water birds including gulls, terns, plovers, oystercatchers and cormorants, as well as raptors. Site for migratory birds with 10 species listed under international treaties. Included in the Directory of Important Wetlands. Habitat for endemic Venus pipefish and uncommon javelin pipefish. Spawning, breeding and nursery area for a wide variety of fish, sharks, rays and invertebrates such as western king prawns and southern calamari. A significant refuge for migratory waterbirds and shorebirds. There are some freshwater springs and soaks on the eastern side of the bay, some of which exit below sea level, and thus contribute towards a more estuarine environment than other sections of coastline in the region. Heavily influenced by seasonal fresh water input. (Middle of Baird Bay) This area is important foraging habitat for migratory birds with 10 species present in the area listed under international treaties. The tidal flats are spawning habitat for baitworm and a nursery site for western king prawn, baitworm and King George whiting.	The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park, it is likely that relatively little of the displaced catch came from this SZ.	Recreational fishing through the central boating channel is unaffected.

Anxious Bay Sanctuary Zone (SZ7)

32km²

MPLAG advice: Consistent

The Anxious Bay SZ conserves offshore deep water habitats and associated species. It is a wild, exposed place and forms a link between nearby SZs.

Environmental values		Economic Values	Social and cultural values
CAR Habitats represented: Large areas of unmapped habitat from the nearshore zone to -30m to greater than 50m deep.	**Important features:** Adjacent to one of the most southerly facing coastlines on western Eyre Peninsula, exposing it to oceanic swells, currents and upwelling plumes. Foraging habitat for seabird species such as albatross, gannet and petrels. White Sharks and Southern Right Whales frequent the area.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park and the consistent MPLAG advice, it is likely that relatively little of the displaced catch came from this SZ.	Access to areas of particular importance for recreational fishing is maintained.

	Home to species such as Southern rock lobster, tommy ruff, whaler shark, gummy shark, trevally and Western Australian salmon. Provides a link between nearby SZs.	Accommodates trawling grounds of the West Coast Prawn Fishery. Accommodates coastal reefs important to Rock Lobster and Abalone Fisheries.	

Deep Cork Sanctuary Zone (SZ8)

7km²

MPLAG advice: Consistent.

Venus Bay is a sheltered embayment in which many life forms can reproduce and a important nursery area for a wide variety of marine species

Environmental values		Economic values	Social and Cultural Values
CAR Habitats represented: Sheltered cliffs and sheltered coarse sandy beaches. Several calcarenite islands. Benthic habitats including macroalgae and invertebrate communities, soft-bottom habitat and seagrass communities in shallow waters (less than 10m). High (up to 16°) variation between summer and winter sea surface temperatures. Seasonally experiences high salinity, low nutrient waters associated with an inverse estuary. Bathymetric landforms associated with an estuarine system, such as a central basin, intertidal flats and tidal sandbanks.	**Important features:** Represents part of the most significant nursery for western king prawns on the west coast. One of the most important nursery areas on Eyre Peninsula for many species of fish, sharks (particularly gummy sharks), rays and invertebrates (prawns, crabs, scallops and cockles). Supports the inshore bottlenose dolphin. Foraging habitat for Australian sea lions. Has seasonally high salinity, low nutrient waters (inverse estuary processes due to high evaporation). Ecosystems also influenced by fresh, groundwater input., making it an important coastal bird breeding habitat. Several calcarenite islands providing breeding sites for sea and shore birds, including white-bellied sea eagles, pied and sooty oystercatchers, silver gulls, Pacific gulls and fairy terns. Rare estuarine seagrass, Ruppia, an important food source for coastal waterbirds, with several wader birds listed under international treaties utilising the SZ. Home to the endemic pipefish Stigmatopora venusensis sp. nov. which has a very limited distribution from Venus to Streaky Bay and is intolerant to sedimentation or macroalgae growth on its seagrass habitat. The uncommon sculptured seamoth, robust pipehorse, javelin pipefish, knife-snout pipefish and prickly pipefish. Seagrass is habitat for King George whiting and southern calamari.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. It is unclear what proportion of the displaced catch came from this SZ, but the MPLAG advice was consistent suggesting that fisheries sectors were not overly concerned. The SZ lies outside the range of where rock lobster and abalone fisheries would have operated.	Includes an 'occupation site complex' with Aboriginal middens, campsites, artefacts and a waterhole, and is culturally significant to the Wirangu people. Connected to Venus Bay Conservation Park, establishing a protected corridor between the land and sea, and builds on an existing netting closure. Located away from Port Kenny and Venus Bay townships and boat ramps and areas of high recreational fishing effort.

Germein Island Sanctuary Zone (SZ9)

2km²

MPLAG advice: Consistent.

The Germein Island SZ includes ecologically important mangrove and saltmarsh habitats.

Environmental values	Economic values	Social and Cultural values

CAR Habitats represented: Soft-bottom habitat (sand, mud, silt). Saltmarsh and mangroves. Tidal channels, sandbanks and intertidal flats associated with an estuarine system. Due to shallow nature of Bay waters, high (up to 16°) variation between summer and winter sea surface temperatures.	**Important features:** Nesting, roosting and foraging area for coastal birds. Venus Bay is one of the most important nursery areas on Eyre Peninsula for many species of fish, sharks, rays and invertebrates (prawns, crabs, scallops and cockles). Influenced by significant tidal exchange, and supports inverse estuarine processes. Seasonally exposed to fresh groundwater input.	**Commercial fisheries:** The Marine Scalefish, Western Zone Abalone and NZRL fisheries used the SZs within the West Coast Bays Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $211,000. Based on the habitat mapping available for this park, (i.e. mainly saltmarsh and mangrove), it is likely that relatively little of the displaced catch came from this SZ.	This Zone seeks to provide for the high intensity recreational fishing area in the mouth of the bay and at the channel junction.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 199b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, Caton et al 2011a, Caton et al. 2011b, DEWNR 2015a, Friends of Sceale Bay 2010, Lothian 2005, Middleton and Bye 2007, Roediger and Bolton 2008, Rumbelow et al. 2010, Scientific Working Group 2011.

3.5 Investigator Marine Park

3.5.1 Park Description

The Investigator Marine Park covers 1,185 square kilometres of the Eyre Bioregion (Figure 3-1). The Investigator Marine Park extends over four areas including the offshore islands of the Investigator Group and the area south of Elliston to near Point Drummond. The Investigator Marine Park includes 3 SZs (about 18 per cent of the total park area), 8 HPZs (about 71 per cent) and 5 GMUZs (about 11 per cent, Figure 3-11). The Investigator Marine Park accommodates various marine industries including commercial fishing and tourism.

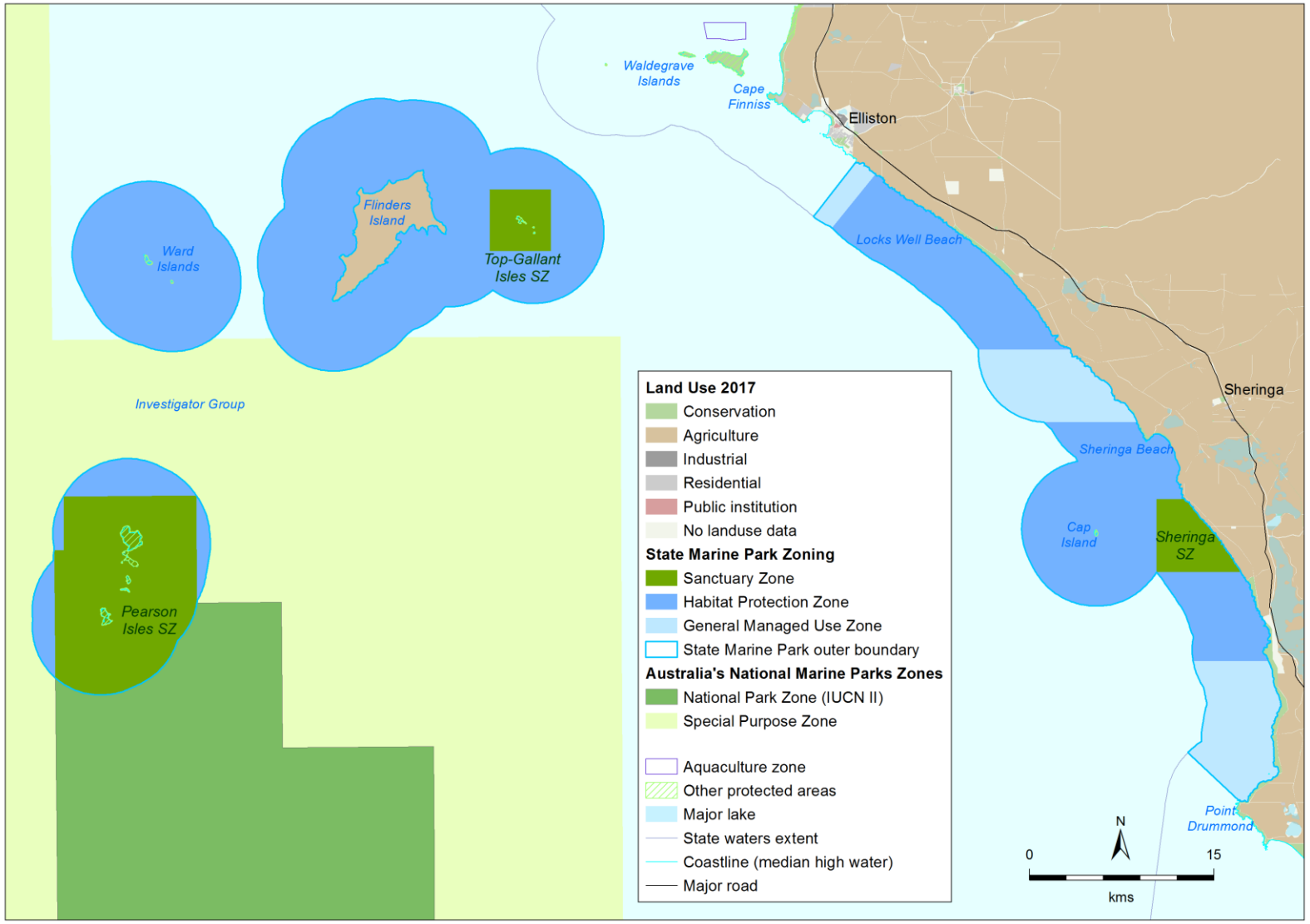
The Investigator Marine Park is adjacent to a remote and sparsely populated area of the state, which is dominated by agricultural land and conservation areas (Figure 3-11). There is a small community at Sheringa. The Investigator Marine Park overlaps the Cap Island Conservation Park and the Investigator Group Conservation Park. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 1,380 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-12 and Figure 3-13 respectively.

About 3 per cent of the benthic habitats of the Investigator Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 5 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-12).

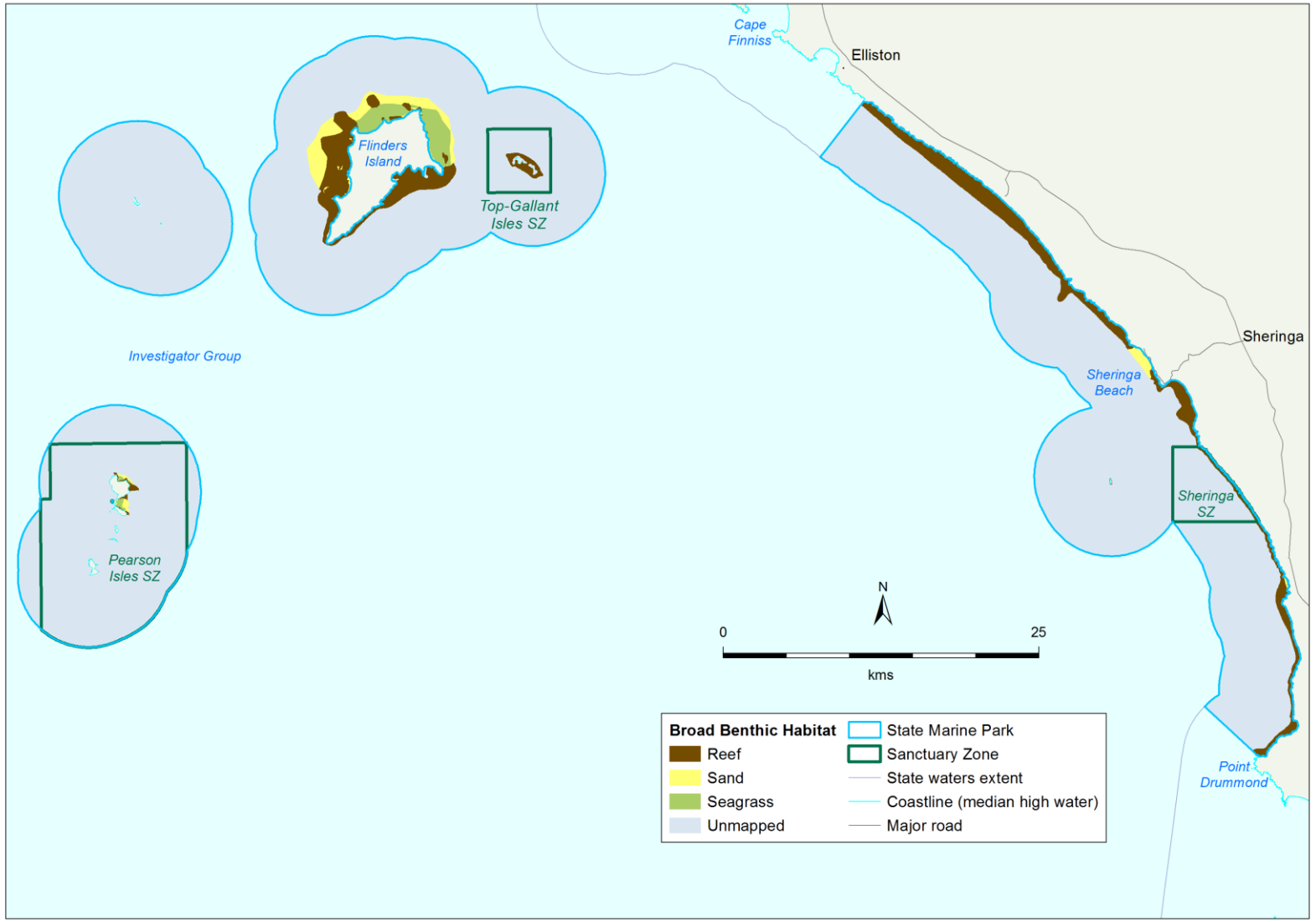
Section 3.5.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-11 Investigator Marine Park, land uses map



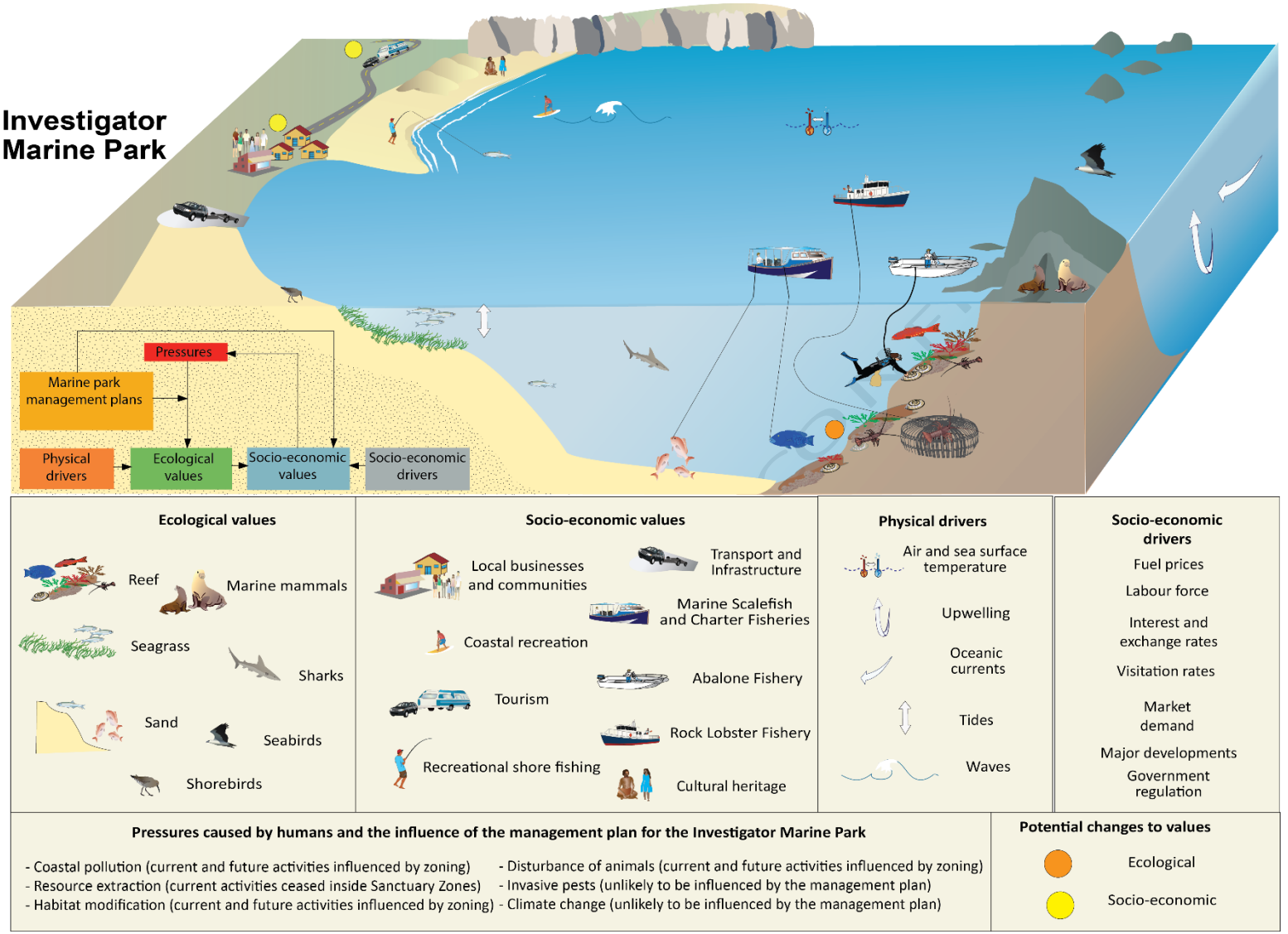
Source: APPENDIX 9

Figure 3-12 Investigator Marine Park, habitat map



Source: APPENDIX 9

Figure 3-13 Investigator Marine Park, conceptual model



Source: APPENDIX 9

3.5.2 Economic, social and environmental values of the Investigator Marine Park sanctuary zones

Top Gallant Isles Sanctuary Zone (SZ 1)

25 km²

MPLAG advice: Not supported by the majority, supported by a minority. Top Gallant Island was added following public consultation on the draft management plans. Many submissions recommended the inclusion of Top Gallant Island. To facilitate this and keep impact on the rock lobster fishery to a minimum, the SZ proposed at Cap Island (to the south east) was removed.

The Top Gallant Isles SZ conserves the islands and surrounding habitats as a complete ecological system. The Isles are recognised for the hundreds of caves, tunnels, and swim throughs created by eroding limestone reefs. These micro-habitats are home to numerous reef fish and an international recognised biodiversity of sessile invertebrates.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Exposed cliffs and reefs (including limestone reefs). Supported by strong currents between islands and localised upwellings of nutrient rich water. Unique physical form creates unusual habitats. The sheltered side has steep underwater slopes while the exposed side includes underwater ridges, canyons, caves and tunnels formed in the eroding limestone. Relatively warm, clear water and large swell with strong currents between the islands. Higher sea surface temperatures in winter than summer due to the influence of the Leeuwin Current.	**Important features:** One of the highest recorded levels of macroalgal species diversity in the world. High number of endemic and rare invertebrates. Exceptionally clear water, with significant light penetration and strong deep water swells. Only known location in the world for the unusual fish, the light-emitting golden roughy. High species diversity and abundance of fish, invertebrates, and ascidians. Haul out site for the vulnerable Australian sea lion. A number of scientific surveys conducted in and around this zone, providing baseline data to measure the effectiveness of implementing the zone. Recognised for having hundreds of caves and a vast array of fish species, including the Western Blue Groper, Western Blue Devil and Harlequin Fish – all species of conservation concern. The limestone reef ecosystems surrounding Topgallant Isles are very different to the biodiversity of the granite reefs surrounding the nearby Pearson Islands. Very high diversity of ascidians, with several species of ascidians endemic to this area alone. An abundance and variety of sessile invertebrates such as red, yellow and orange gorgonian corals, basket stars, sponges and numerous other temperate water invertebrates. Breeding colonies of white-faced storm petrels and short-tailed shearwater.	**Commercial fisheries:** The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Investigator Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Pearson Isles SZ) is estimated to be approximately $168,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of this remaining displaced catch came from this SZ.	Regarded as one of the best dive sites in the state. Minimal loss of recreational fishing grounds as the island is offshore from the mainland in exposed waters.

Pearson Isles Group (SZ 2)

165 km^2

MPLAG advice: Majority supported the inclusion only of Dorothee Island (southernmost island). A minority supported the inclusion of the whole island group

The Pearson Isles Group SZ is a place of outstanding conservation significance in South Australia's marine parks network. The complete island system, protected in its entirety by a SZ, harbours prolific marine life in the crystal clear water, amongst the boulders, caves and tunnels formed in the granite and limestone, the ecosystems within this SZs are ecologically unique.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Soft-bottom habitat, seagrasses and reef including granite and limestone. Extremely uncommon seagrass beds at depths of 25-30m due to the exceptionally clear water. Transition of habitats down steep slopes from shore to more than 50m deep. Sheltered beaches and tall cliffs. Relatively warm, clear water and large swell with strong currents between the islands. Higher sea surface temperatures in winter than summer due to the influence of the Leeuwin Current. Deep water travertine limestone reefs at 50m depths off of Pearson Island.	**Important features:** Pearson, Veteran and Dorothee Isles are geologically unique, being giant granite inselbergs (uncommon island mountains), The mountain of Pearson Island rises steeply out of the water to 200 metres above sea level. Exceptionally clear waters, with significant light penetration and strong, deep water swells. Abundance of large fishes, now less common in places more accessible to fishing. High species diversity including mature fish and invertebrates such as hard and soft corals, sponges, macroalgae, ascidians and echinoderms. Bird breeding colonies including white-faced storm petrels, little penguins and short-tailed shearwaters. Nesting sites for little penguin, white-faced storm petrel, Fairy Tern and the endangered white-bellied sea eagle. Site for migratory birds whose habitats are required to be protected under international treaties. New Zealand fur seals and the vulnerable Australian sea lion breeding and haul out sites on all Islands. Strongly influenced by the warm Leeuwin Current, which supports species more common in tropical waters. High degree of 'naturalness' due to its isolation. Uncommon rhodolith communities (popcorn coral or coralline red algae). Presence of large blue groper, weedy seadragon, western blue devil, rock lobster, large sponges, gorgonian corals and soft corals. Granite boulder reefs form large caverns, harbouring prolific fish and invertebrate species. Home to Australian sea lions, dolphins, weedy seadragons, and sponge and soft coral gardens, gorgonian corals. The granite reef ecosystem surrounding these islands are very different to the biodiversity of limestone reefs surrounding the nearby Topgallant Island SZ.	**Commercial fisheries:** The NZRL Fishery was the principal fishery that previously used the SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $597,000, principally from the NZRL (1.42% of fishery catch, GVP $562,000) and from Abalone (0.09% of catch) and Marine Scalefish (0.16% 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).	Location more than 60 kilometres offshore means it is not easily accessed by recreational fishers, so there was minimal loss of recreational fishing grounds.

Sheringa Sanctuary Zone (SZ3)

28km²

MPLAG advice: MPLAG members unanimously supported a larger SZ in this location. Following public consultation on the draft management plan, the area around Cap Island was removed in exchange for a SZ at Top Gallant Island. The removal of Cap Island reduced the impact on the rock lobster industry.

The Sheringa SZ conserves part of the Cap Island granite reef complex, which runs between the island and the mainland. It protects a representative sample of this habitat and its associated ecosystems within the Eyre Bioregion.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: Coastal calcarenite cliffs averaging 80m high, fronted in sections by rock debris and exposed to high wave and wind energy. Variety of reefs and soft bottom habitat. Transition of habitats from the coast to 6km offshore.	**Important features:** Influenced by upwellings of cold, nutrient rich water during summer and autumn which help support diversity and abundance of many species. Habitat for a range of fish and invertebrates including various life stages of rock lobster and abalone. Habitat for the vulnerable Australian sea lion.	**Commercial fisheries:** The NZRL, Western Zone Abalone and Marine Scalefish fisheries used the SZs within the Investigator Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Pearson Isles SZ) is estimated to be approximately $168,000. Due to a lack of catch data and benthic habitat mapping, it is unclear what proportion of the remaining displaced catch came from this SZ, however the SZ was created to reduce the impact on rock lobster around Cap Island. It is likely that Topgallant was relatively more important.	Avoids accessible beaches of high recreational fishing value such as Sheringa Beach.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, Baker et al. 2008, Bryars and Wear 2008, DEWNR 2015a, Lothian 2005, Middleton and Bye 2007, Scientific Working Group 2011.

3.6 Thorny Passage Marine Park

3.6.1 Park Description

The Thorny Passage Marine Park covers 2,472 square kilometres of the Eyre Bioregion. The Thorny Passage Marine Park extends from Frenchman Bluff in the west to Memory Cove in the east and includes the waters of lower Eyre Peninsula and Rocky and Greenly Islands. The Thorny Passage Marine Park includes 8 SZs (about 4 per cent of the total park area), 6 HPZs (about 67 per cent) and 5 GMUZs (about 29 per cent; Figure 3-14). The Thorny Passage Marine Park accommodates various marine industries including commercial fishing, aquaculture and tourism. Shoreline fishing is allowed in the Sleaford Bay SZ and along two areas of the Yangle Bay SZ. An SPA for harbour activities is located within Coffin Bay (Figure 3-14).

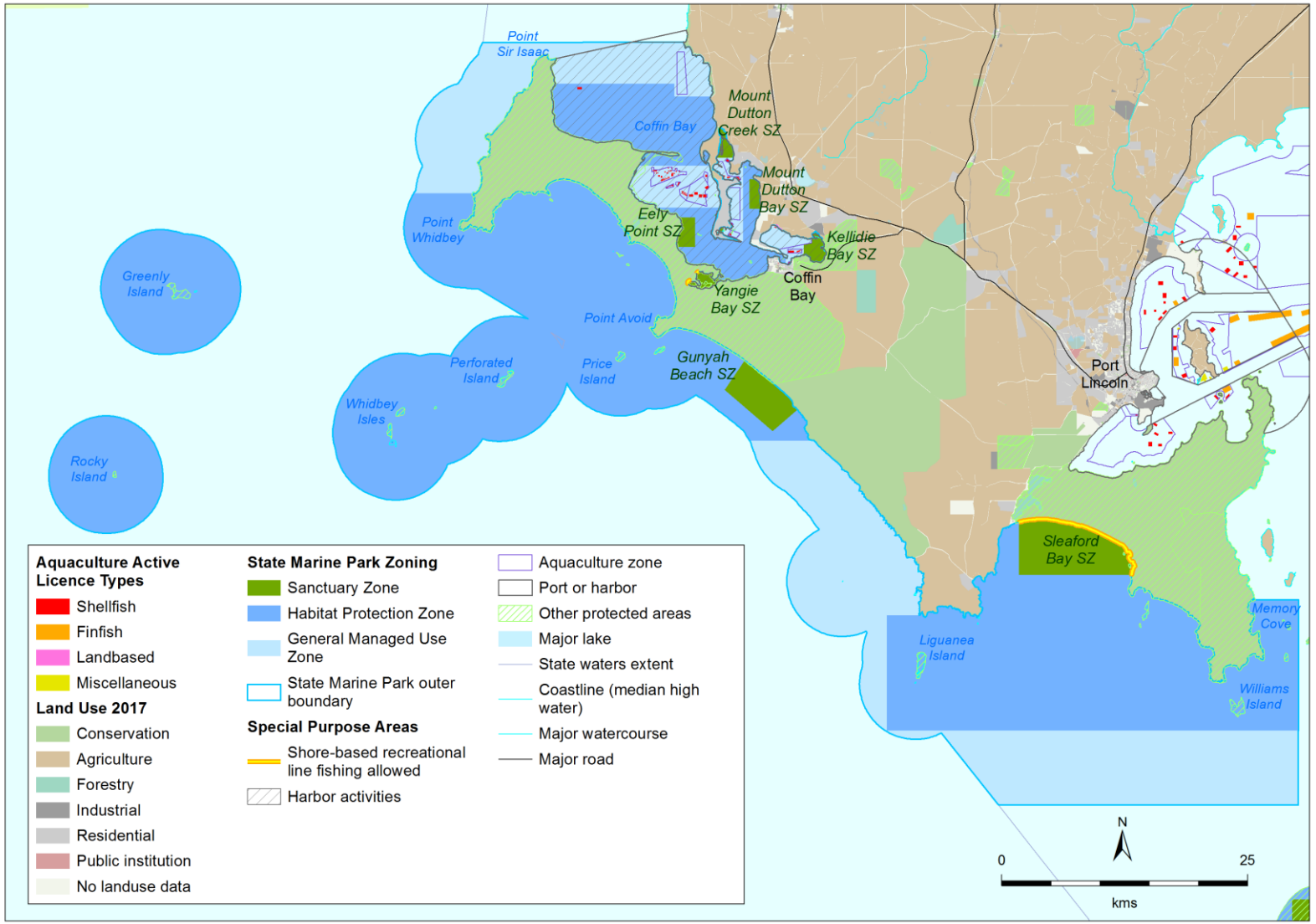
The Thorny Passage Marine Park is adjacent to a sparsely populated area of the State which is dominated by agricultural land, vacant land and conservation areas (Figure 3-14). The largest population centre adjacent to the Thorny Passage Marine Park is Coffin Bay, but Port Lincoln is about 10 kilometres to the north of the eastern part of the park. The Thorny Passage Marine Park overlaps Greenly Island and Rocky Island Conservation Parks, Whidbey Isles and Mount Dutton Bay Conservation Parks, and the islands associated with Lincoln National Park and Memory Cove Wilderness Area. The Thorny Passage Marine Park is adjacent to the Coffin Bay National Park, Lincoln National Park and Memory Cove Wilderness Protection Area and borders Kellidie Bay Conservation Park (Figure 3-14). The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-15 and Figure 3-16 respectively.

About 11 per cent of the benthic habitats of the Thorny Passage Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 8 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-15).

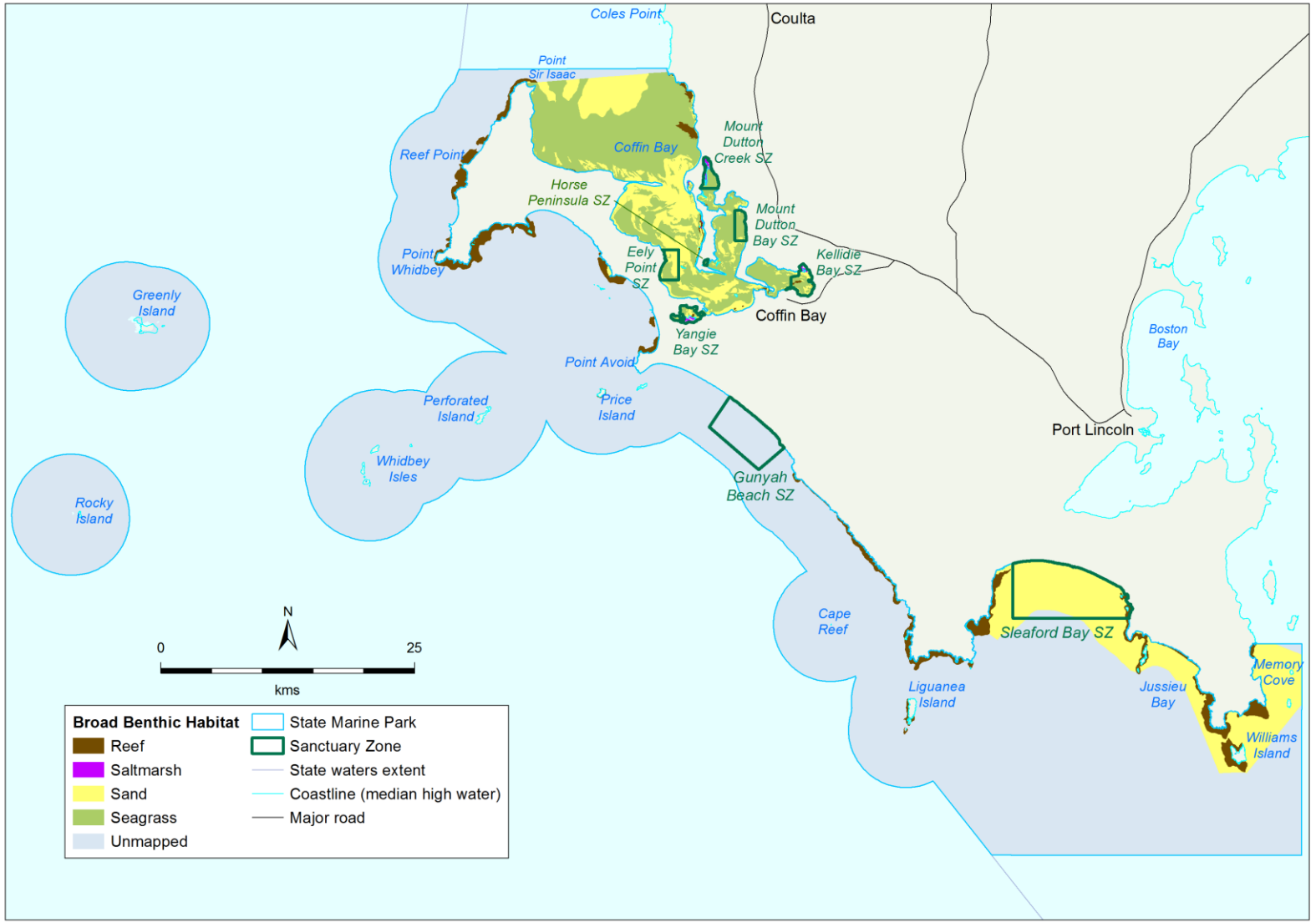
Section 3.6.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-14 Thorny Passage Marine Park, land uses map



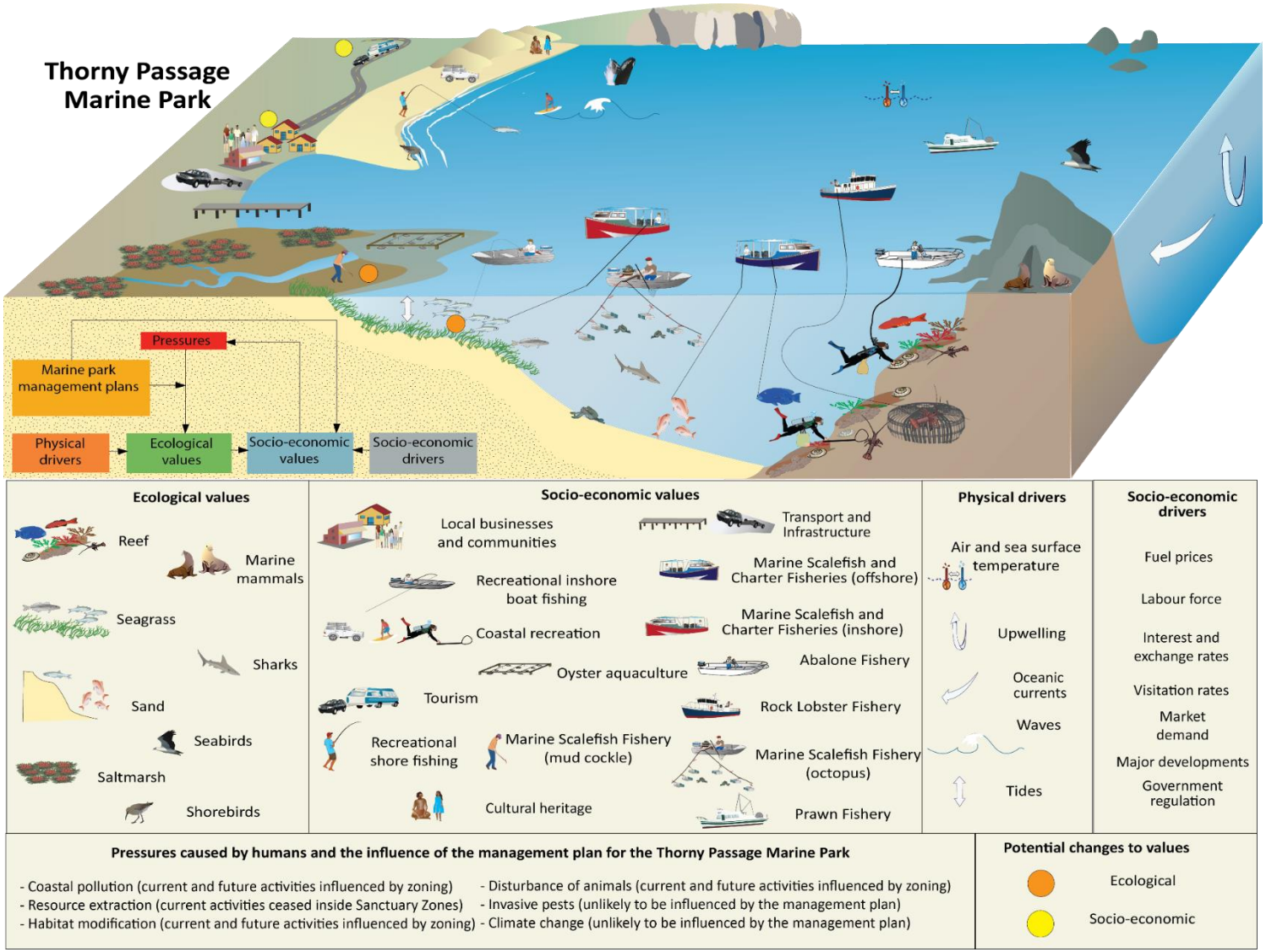
Source: APPENDIX 9

Figure 3-15 Thorny Passage Marine Park, habitat map



Source: APPENDIX 9

Figure 3-16 Thorny Passage Marine Park, conceptual model



Source: APPENDIX 9

3.6.2 Economic, social and environmental values of the Thorny Passage Marine Park sanctuary zones

Coffin Bay Sanctuary Zones (6 in total)

Coffin Bay is a unique part of South Australia's coastal and marine environment. It has 6 SZs within it that represent different parts of the Coffin Bay system. However, some general statements on values apply to each of these areas, and to Coffin Bay in general. These include:

The waters of the Coffin Bay system include Coffin Bay (the entrance bay), Port Douglas, Little Douglas, Dutton Bay, Yangie Bay and Kellidie Bay.

This system constitutes the largest estuarine system on Eyre Peninsula and the second largest in SA.

Coffin Bay Wetlands system, which is registered on the Directory of Important Wetlands and is also listed as a 'High Conservation Value Aquatic Ecosystem'.

Unvegetated soft bottom and seagrass beds provide spawning, breeding and nursery areas for a wide variety of fish (King George whiting, Australian salmon, tommy ruff, garfish flathead and flounder species) and invertebrates (sand crabs, octopus and scallops).

Coffin Bay is a regionally important nursery area for a wide range of fish of commercial and recreational importance.

Coffin Bay is also a Wetland of National Importance with its shallow sandy shores and saltmarshes providing food for local and migratory shorebirds, such as sanderling, grey plover, sooty oystercatcher and pied oystercatcher.

Coffin Bay is an extremely important stronghold for the newly discovered 'Burrunan Dolphin, a bottlenose species endemic to southern Australia, only living in small, genetically distinct and localised populations making them extremely susceptible to threats.

Nutrients from the seasonal upwelling outside the bay, infiltrate the bay, which contributes to the diverse range of coastal and marine life found in the bay.

Eely Point Sanctuary Zone (SZ 1)

5 km²

MPLAG advice: Consistent

The Eely Point SZ includes important habitat not represented in any other SZ within Coffin Bay. The rocks provide many species of fish with shelter. At a depth of a few metres, it represents the deepest water within SZ in Coffin Bay.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Intertidal habitats within this zone include sloping beach with intertidal sand flats, and sheltered, limestone ledges and low cliffs. Benthic habitats present in this zone include subtidal seagrass communities ranging from patchy to dense, bare sandy bottom, sandy bottom with scattered rocks (with macroalgae) and undercut limestone ledges which have formed caves and shallow rocky habitat	**Important features:** Unvegetated soft bottom and seagrass beds provide nursery areas for a wide variety of fish (King George whiting, Australian salmon, tommy ruff, garfish and trevally) and invertebrates (octopus and queen scallops). These small fish are preyed upon by various pelagic and benthic predators such as snook, flathead and dolphins. Caves at the base of the low limestone cliffs are populated by a wide variety of sessile organisms such as sponges, ascidians and corals, and inhabited by small fish and invertebrates. Juveniles of carnivorous reef fish species such as wrasse and moonlighter forage around the scattered rocks and algae while juvenile herbivores such as zebrafish, sweep and drummer inhabit the rock shelters. The beach is important habitat for resting seabirds and nesting resident shorebirds.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Coffin Bay already had a total closure to net fishing prior to SZ implementation. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. As rock lobster and abalone are not commercially fished within Coffin Bay, none of the displaced catch for these fisheries would have come from the SZs within Coffin Bay. Some impact on a commercial octopus fisher. This SZ is positioned to avoid commercial mud cockle effort to the south.	This SZ is positioned to avoid heavy recreational fishing effort and fishing effort by charter boat operators at the nearby The Brothers. Access to areas of particular importance for recreational fishing are maintained.

Yangie Bay (SZ 2)

3 km²

MPLAG advice: Consistent.

The Yangie Bay SZ is distinctive within Coffin Bay due largely to its isolation. The shallow, restricted mouth partially suppresses tidal excursion. The shoreline is very long compared to the shallow, water surface area and so diversity is greatest near the mouth and least in the innermost parts of the bay.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Intertidal habitats include intertidal seagrass, sandflats and mudflat, low energy sandy beach, wormshell beds and samphire dominated by saltmarsh. Subtidal habitats include shallow seagrass beds, soft bottom, low profile reef with macroalgae all in very shallow water.	**Important features:** The Zone includes a channel, sub-channel, basin and tidal sandbanks associated within an estuarine system, as well as the presence of an inshore island. Due to the shallow and protected nature of the bays, they experience significant summer / winter sea surface temperature fluctuations (up to 16°). The soft bottom and seagrass beds within Yangie Bay provide nursery area for a fish species such as King George whiting, yelloweye mullet, Western Australian salmon, Australian herring and southern garfish. These habitats are also important for invertebrate species such as the dumpling squid. A moderate diversity of small fish and invertebrate species are resident in the seagrass beds. They are preyed upon by larger species such as bluespotted flathead, pelicans and egrets. Ghost shrimp in the shallow sand of the mouth aerate the deeper layers of sand. This zone contains a nursery area for macro-invertebrates such as the western king prawn, sand crabs, mud cockles, octopus and scallop species. Gummy sharks, eagle and fiddler rays inhabit the mouth, particularly at night. The bay is important habitat for the newly discovered 'Burrunan Dolphin' who regularly forage in the area. The intertidal saltmarsh supports a diverse fauna of insects, worms and small crustaceans, providing a foraging habitat for fish at high tide and birds at low tide. Included in the Coffin Bay Wetlands system, which is registered on the Directory of Important Wetlands and is also listed as a 'High Conservation Value Aquatic Ecosystem'.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Coffin Bay already had a total closure to net fishing prior to SZ implementation. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. As rock lobster and abalone are not commercially fished within Coffin Bay, none of the displaced catch for these fisheries would have come from the SZs within Coffin Bay. This Zone has been designed to avoid marine scale fishing where possible.	Positioned to avoid heavy recreational fishing effort in other parts of Coffin Bay.

Kellidie Bay Sanctuary Zone (SZ3)

5km²

MPLAG advice: Consistent

The Kellidie Bay SZ is distinctive within Coffin Bay system due to its wide seasonal variations in temperature and salinity and seasonal freshwater inputs that make this a unique part of the Coffin Bay system and the ecology of this SZ reflects this.

<table>
<tr><th colspan="2">Environmental Values</th><th>Economic Values</th><th>Social and Cultural Values</th></tr>
<tr>
<td>CAR Habitats represented:

Intertidal habitats include sandflats and mudflats with sheltered saltmarsh, bedrock platform, intertidal seagrass beds (Ruppia) and invertebrate reef.

Benthic habitats include low profile rocky reef, a dense and patchy macroalgae community, dense and patchy seagrass communities and soft-bottom habitats. All habitats exist in shallow waters (< 10m).</td>
<td>Important features:

The bay experiences significant summer/winter sea surface temperature fluctuations. There is also fresh submarine groundwater discharge from benthic upwellings and seasonal freshwater input from Minniribbie and Merintha Creeks which in itself provides a harsh, but unique habitat for species such as sand goby.

Kellidie Bay experiences a summertime hypersaline environment (evaporation exceeds rainfall for at least 6 months of the year) with limited oceanic exchange (estimated > 150 days flushing time – although this requires further research to quantify).

Due to the shallow and protected nature of the bays, they experience significant summer/winter sea surface temperature fluctuations (up to 16°).

There is anecdotal evidence of higher order predator fish such as kingfish spawning in Kellidie Bay during spring (as they are known to spawn in similar conditions near Port Augusta).

Eagle rays court and give birth in the shallows of this zone.

The subtidal soft bottom and seagrass habitat are important for various species of fish (including whiting, flathead and flounder), sharks (including whaler, gummy) and rays (including eagle and fiddler) and invertebrates (western king prawn and octopus).

The mudflats and intertidal seagrass beds (Ruppia) are important habitat for small fish and invertebrate species, which are preyed upon by a large range of migratory and resident shorebirds and waterbirds. The Coffin Bay Coastcare Group has commissioned some research on this location (with its freshwater input) and its importance for these birds.

Part of the intertidal area in the zone is composed of an invertebrate reef of biogenic rock, not found anywhere else in the bay. It is composed of polychaete worm tubes, associated with the gastropod mollusc (worm shell) and calcifying algae, producing a porous rock, which is densely populated by the green alga Acetabularia. This provides a unique niche or ecosystem within this bay.</td>
<td>Commercial fisheries

This area was not fished commercially prior to SZ implementation.</td>
<td>Avoids heavy recreational fishing effort in the channels at the mouth of Kellidie Bay.

Access to areas of particular importance for recreational fishing are maintained.</td>
</tr>
</table>

Dutton Bay Sanctuary Zones (SZ4)

3km²

MPLAG advice: Consistent

The Dutton Bay SZ is unique among the Coffin Bay sanctuaries for the extensive inclusion of seagrass in a shallow protected area. This is a significant nursery for diverse fishes and useful habitat for dolphins.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The intertidal habitats within this zone include sheltered limestone cliffs and ledges and sheltered coarse sand beach on the southern aspect of the Tadpole Bay promontory. Subtidal habitats are all within shallow water and include extensive areas of seagrass varying from dense to medium to sparse, with sparse seagrass habitat being interspersed with algae and invertebrate communities as well as sandy bottom. The Zone represents a relatively uncommon north/south facing bay which is open to the predominant south westerly winds.	**Important features:** The extensive seagrass beds of Dutton Bay are represented in a substantial part of this SZ and harbour a great variety of small fish and invertebrates such as pipefish, weedfish, weed whiting and gobies. Larger fish inhabiting and visiting these seagrass beds and adjacent sandy areas include estuary catfish, worm eel, three species of flathead, snook, eagle and fiddler rays. These seagrass beds also provide a nursery area for several commercial and recreationally important species such as King George whiting, southern garfish and Western Australian salmon. Parts of the eroding limestone ledge have formed overhangs and caves that shelter coralline algae and a great diversity of invertebrate and fish species. These include juvenile and mature giant cuttlefish. Pods of the "Burrunan Dolphin" forage and breed in this area.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Coffin Bay already had a total closure to net fishing prior to SZ implementation. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. As rock lobster and abalone are not commercially fished within Coffin Bay, none of the displaced catch for these fisheries would have come from the SZs within Coffin Bay. Some impact on a commercial octopus fisher.	This SZ is located to provide for recreational fishing effort and to avoid the Dutton Bay shack areas.

Salt Creek Sanctuary Zone (SZ5)

3km²

MPLAG advice: Consistent

The Salt Creek SZ is unique in Coffin Bay as it includes a complex saltmarsh within which is a tidal creek. This is the most hypersaline environment in Coffin Bay as freshwater inputs are minimal, the water very shallow and flushing time prolonged by restriction at Bulldog Point, the tip of Horse Peninsula and Point Longnose. In this rather harsh environment, biodiversity is low, but the communities differ from those in other SZs..

Environmental values		Economic Values	Social and cultural values
CAR Habitats represented: Intertidal habitats within the zone include extensive saltmarsh and sandflats. Benthic habitats are all in shallow water environments and include; soft-bottom habitats and areas of sparse patchy seagrass. There is also a minor estuarine channel and flood plain delta, typical of an estuarine environment. The Zone represents a relatively uncommon north/south facing bay which is open to the predominant south westerly winds.	**Important features:** This area is a harsh hypersaline environment; the biodiversity of the area reflects this. The saltmarsh habitats house small crustaceans, insects and spiders. The tidal creek is inhabited by fish such as the sand goby, and small mouth hardyhead, while permitting access to larger predators such as the southern bluespotted flathead at high tide. The narrow beach is home to gastropods (sea snails) and crabs. The patchy seagrass beds are populated by sponges and ascidians with invertebrates living amongst these.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Coffin Bay already had a total closure to net fishing prior to SZ implementation. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. As rock lobster and abalone are not commercially fished within Coffin Bay, none of the displaced catch for these fisheries would have come from the SZs within Coffin Bay.	The zone avoids important recreational fishing areas close to the shacks along the Dutton Bay coast.

	Juvenile southern garfish, Western Australian salmon and King George whiting inhabit the slightly deeper waters of the zone.	Based on the habitat mapping available for this park and the shallow nature of this SZ, it is likely that relatively little of the displaced catch came from this SZ.	
Lower Horse Peninsula Sanctuary Zone (SZ6) **<1km²** **MPLAG advice:** Consistent.			
Environmental values		**Economic values**	**Social and Cultural Values**
CAR Habitats represented: The shoreline in this zone consists predominantly of sheltered cliffs and supratidal saltmarsh. Benthic habitats include limited patchy seagrass community and soft-bottom habitat in an extremely shallow water environment.	**Important features:** This zone is extremely small, so it does not contain many features and will probably have no benefit for the biodiversity of the area. The zone is within a sheltered part of the bay protected by Horse Peninsula. The seagrass and soft bottom habitat is likely to be inhabited by juvenile fish and invertebrate species common to Coffin Bay.	**Commercial fisheries:** This area was not fished commercially prior to SZ implementation.	A locally identified Aboriginal Heritage site. Protects a locally identified Aboriginal Heritage site (the reason the zone was placed there by the MPLAG).
Gunyah Beach Sanctuary Zone (SZ7) **31km²** **MPLAG advice:** Consistent. *The Gunyah Beach SZ represents one of the highest energy beaches in the State. It is also one of only three places in South Australia where the Goolwa cockle or pipi is found.*			
Environmental values		**Economic values**	**Social and Cultural values**
CAR Habitats represented: This SZ contains a long fine-medium sand beach with 300m sandbar / surf zone exposed to high wave energy which is backed by 10km wide active dunes. One of the highest energy beaches in the state. A small section to the south of medium height cliffs is protected in places by fronting low tide terrace. The benthic habitats are largely either soft-bottom habitats depth classes from the shoreline to approximately 30m+ deep.	**Important features:** There are a variety of shoreline processes (variances in wave energy, refraction, focus and steepness as well as sediment and nutrient supply and transport) due to the coastal topography (dune fields, headlands, cliffs, wave-cut platforms, beaches, coves). The SZ encompasses the transition of habitats from the coastal/intertidal zone to 3.5km offshore. This zone is in the immediate vicinity of summer/autumn coastal upwellings and as such is an area of high productivity and supports complex food webs. The waters in this zone are situated on one of the high energy dynamic stretches of exposed coastline in SA. Hooded Plovers and other resident shorebirds nest on the beach. Habitat for Goolwa cockle, sand crab and baitworm. Other species such as western Australian salmon, tommy ruff, yellow eye mullet, flathead, school shark, gummy shark and whaler shark frequent the surf beach and sandy bottom within the zone.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. Based on the change in estimated displaced catch between the draft and final zoning (see Ward et al. 2012a, b), it is likely that a significant proportion of the estimated displaced catch came from this SZ . Nonetheless, local knowledge and other habitat mapping suggests that the SZ is predominantly sand habitat unsuitable for rock lobster and abalone and this may be an overestimate. Avoids commercial cockle effort on the western end of Gunyah Beach.	This SZ is located to avoid recreational fishing effort (surf fishing and cockle collection) at the western end of Gunyah Beach and Almonta Beach.

	Foraging habitat for white shark, Australian sea lion, New Zealand fur seal and dolphins. The only beach in the state where a SZ is complemented by a Vehicle RAZ, implemented through the Coffin Bay National Park to protect shorebird habitat.		
Sleaford Bay Sanctuary Zone (SZ8) **32km²** **MPLAG advice:** Consistent. *The Sleaford Bay SZ represents important habitat for the endangered Southern Right Whale.*			
Environmental values		**Economic values**	**Social and Cultural values**
CAR Habitats represented: Detailed GEOswath mapping of this area indicates that the benthic habitat is mostly soft-bottom habitat with some fringing reef systems. The zone transitions form the shallows to deep waters providing connectivity between habitats of various depth classes, from the shallows out to 50+m depth. Two small islands and their surrounding habitats are also included within this zone providing for protection and connectivity of habitats between the islands and mainland.	**Important features:** This SZ has been positioned to contribute to protection of the aggregation and nursery habitat of the endangered Southern Right Whale. The waters in this area are considered to be a breeding and nursery area for school and gummy sharks, as well as feeding habitat for seabirds (shearwaters, terns, gulls and gannets). This Zone abuts a long, exposed sandy beach coastline and associated longshore sediment transport regime.	**Commercial fisheries:** The Western Zone Abalone, NZRL and Marine Scalefish fisheries used some of the SZs within the Thorny Passage Marine Park previously. There was minimal use by the Charter Boat Fishery. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $157,000. Based on the habitat mapping available for this park ((i.e. mostly sand unsuitable for rock lobster and abalone), it is likely that relatively little of the displaced catch came from this SZ.	A SPA accommodates shore-based recreational line fishing.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2010, Caton et al 2011a, Caton et al. 2011b, DEWNR 2015a, Lothian 2005, Middleton and Bye 2007, Rumbelow et al. 2010, Scientific Working Group 2011.

3.7 Sir Joseph Banks Group Marine Park

3.7.1 Park Description

The Sir Joseph Banks Group Marine Park covers 2,627 square kilometres in lower western Spencer Gulf (SG) (Figure 3-1). Fifty-four per cent of the park lies within the Eyre Bioregion, with the remainder in the SG Bioregion. The Sir Joseph Banks Group Marine Park is adjacent to Tumby Bay and extends southwards, offshore from Boston Bay, and includes the islands of the Sir Joseph Banks Group and Dangerous Reef. The Sir Joseph Banks Group Marine Park includes 1 RAZ (less than 0.01 per cent of the total park area), 5 SZs (about 7 per cent), 2 HPZs (about 47 per cent) and 4 GMUZs (46 per cent; Figure 4). The SIR JOSEPH BANKS GROUP MARINE PARK accommodates various marine industries including commercial fishing, aquaculture and tourism.

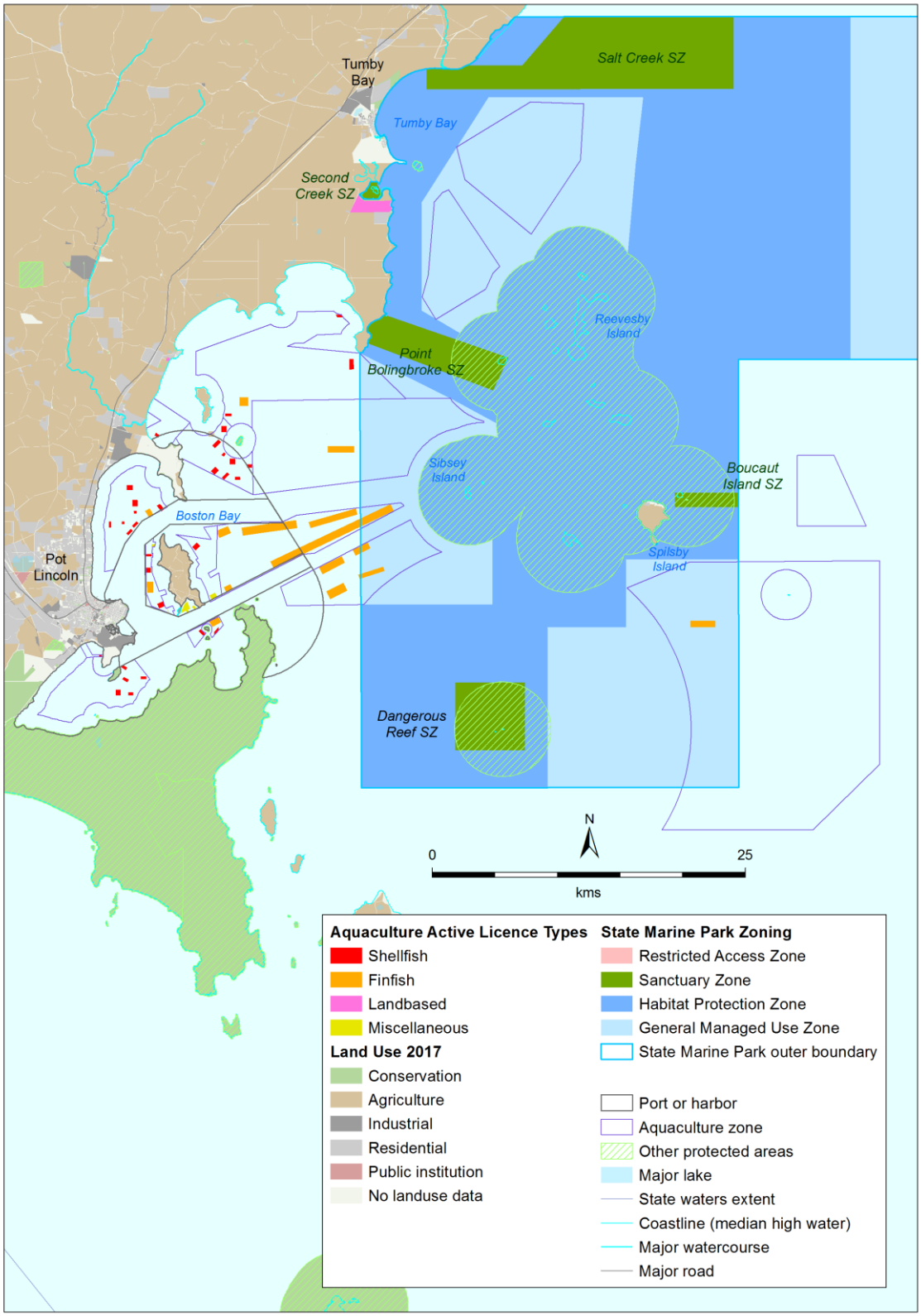
The Sir Joseph Banks Group Marine Park is adjacent to a sparsely populated area of the state, which is dominated by agricultural land and conservation areas (Figure 3-17). The largest population centre is Tumby Bay. The Sir Joseph Banks Group Marine Park encompasses Sir Joseph Banks Group Conservation Park, Tumby Bay Conservation Park and is adjacent to Tumby Bay which is a wetland of national importance (Figure 3-17). The region experiences hot, dry summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-18 and Figure 3-19 respectively.

About 10 per cent of the benthic habitats of the Sir Joseph Banks Group Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 13 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-18).

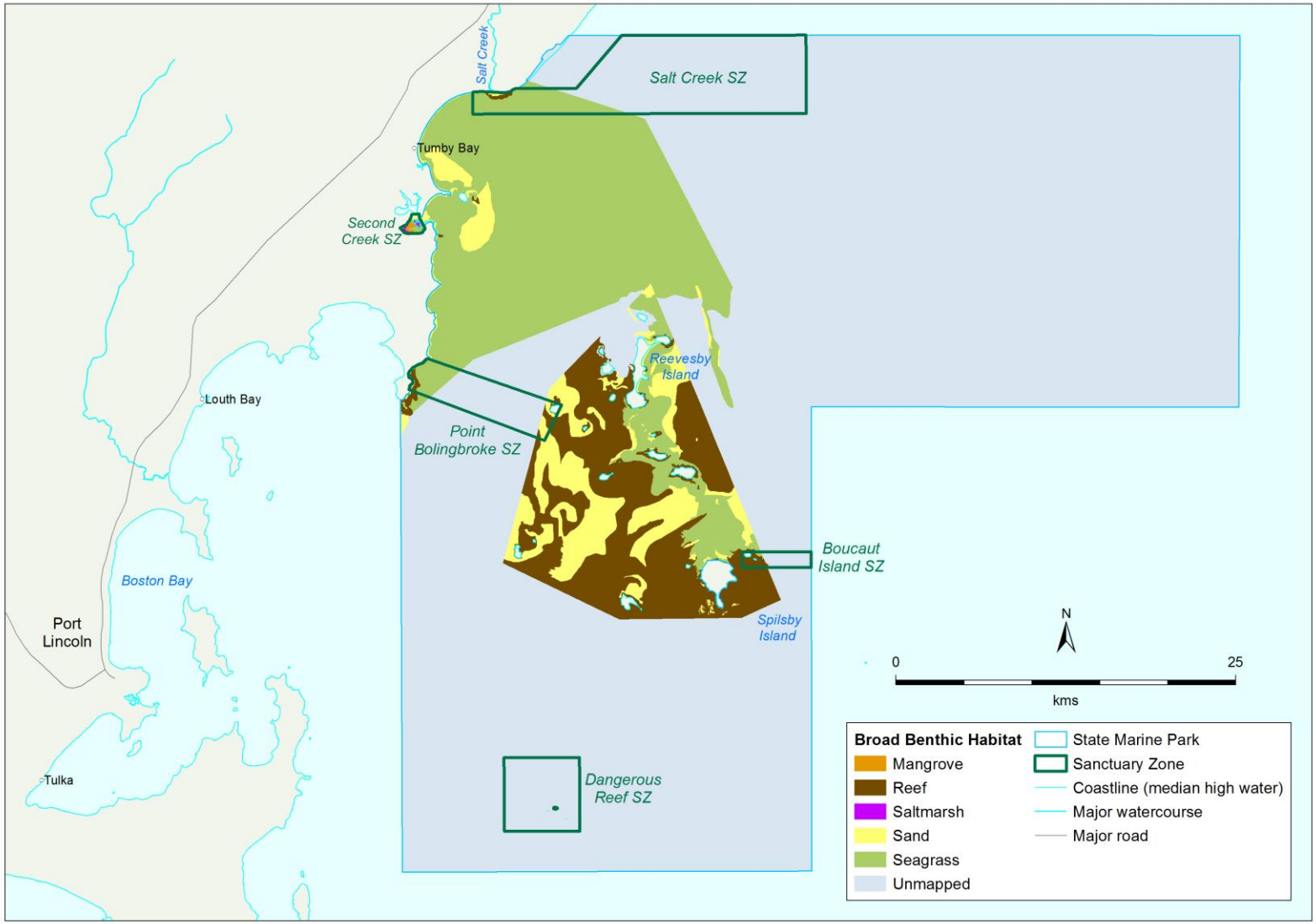
Section 3.7.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-17 Sir Joseph Banks Group Marine Park, land uses map



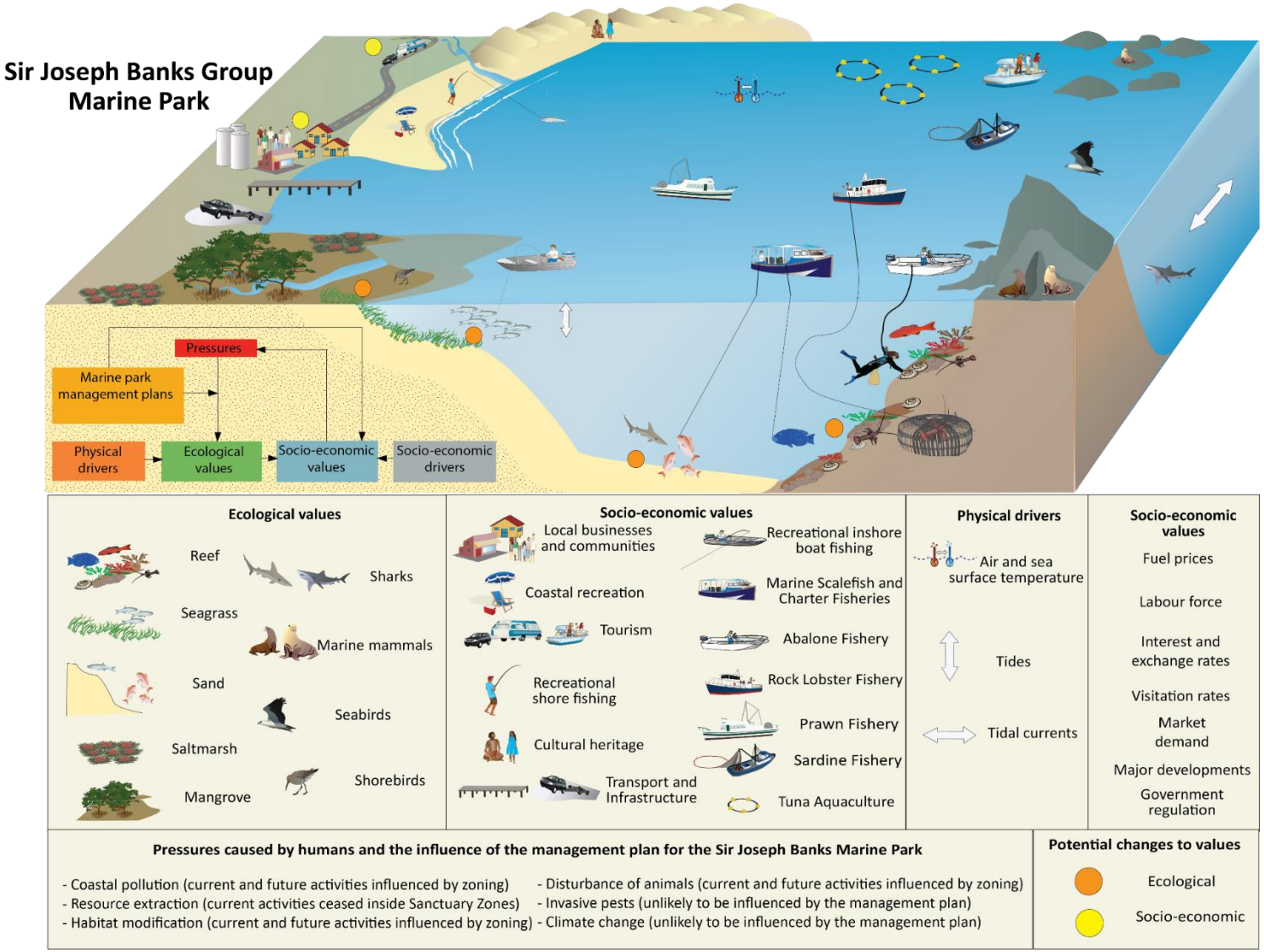
Source: APPENDIX 9

Figure 3-18 Sir Joseph Banks Group Marine Park, habitat map



Source: APPENDIX 9

Figure 3-19 Sir Joseph Banks Group Marine Park, conceptual model



Source: APPENDIX 9

3.7.2 Economic, social and environmental values of the Sir Joseph Banks Group Marine Park sanctuary zones

Salt Creek Sanctuary Zone (SZ 1)

105 km²

MPLAG advice: Consistent

The Salt Creek SZ protects the ecosystem extending from the Salt Creek estuary mouth, across the sandflats and then out to the seagrass beds, providing a protective corridor for this important breeding and nursery ground for many fish and invertebrate species.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Intertidal habitats within this zone include a tidal creek with tidal flats, with a wide sand delta at the mouth of the creek. Moving offshore, the benthic habitats include sandy bottom and seagrass ranging from dense to sparse as the water increases in depth.	**Important features:** Salt Creek is the main estuary (extending 2km inland – although the SZ does not include the estuary above median high water) in the Tumby Bay area, and part of the Tumby Bay Wetland of National Importance. At least 5 migratory coastal bird species listed under international migratory treaties and other resident coastal waders use the Tumby Bay area (including Salt Creek) for roosting and feeding (e.g. Pacific golden plover, grey plover, eastern curlew, sharp-tailed sandpiper and ruddy turnstone). Migratory shorebird habitat is required to be protected under international treaties. The range of habitats within this SZ are important for different parts of the lifecycle of many fish and invertebrates of recreational and commercial importance. The Zone is located in a transition area between the Spencer and Eyre Bioregions meaning there is a mix of the 2 different types of bioregions, creating a different niche than occurs in these bioregions alone. The sea surface temperatures in this Zone are typically in the mid 20°Cs for summer and low 10°Cs in winter, representing a large fluctuation in sea surface temperature. It is representative of waters in the northern part of the Group that are sheltered from southerly winds, but exposed to northerly breezes. Habitat for different life stages of blue swimmer crab, razorfish, king scallop, queen scallop, yellowfin whiting, snook, southern calamari, southern sea garfish, yellow eye mullet, baitworm, western king prawn, school whiting, western Australian salmon, tommy ruff, flathead, flounder, King George whiting, sand crab, snapper and red mullet. Common and bottlenose dolphins foraging habitat.	**Commercial fisheries:** The principal fishery that previously used the SZ was the Sardine Fishery. Small amounts of activity occurred in the Marine Scalefish, Prawns, Abalone, Blue Crab and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $13,000, from the Marine Scalefish (0.02% of fishery effort) Fisheries. Displaced catch from the Abalone Fishery was estimate to be minimal (less than 0.01%) while displaced catch and effort in the Charter Boat and Blue Crab Fisheries were confidential but would be minimal (less than $1,000 for Blue crab and $12,000 for Charter Boats for the entire marine park). Historical catch/effort from the Sardine (1.11% of fishery catch) and SG Prawn (less than 0.01% of fishery effort) fisheries was deemed, under the previous SA Government policy, to be redistributable and therefore does not represent lost income to these fisheries.	Avoids heavier recreational fishing effort closer to Tumby Bay and along Salt Creek Beach/Bergs Beach.

Second Creek Sanctuary Zone (SZ 2)

2 km²

MPLAG advice: Consistent

The Second Creek SZ protects an important fish and invertebrate nursery and represents the only mangrove area within SZ in this marine park.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented An area of shallow water and low wave energy, with prevailing offshore winds and low exposure to swell. Tidal creeks and channels with sandy flats adjacent to an extensive mangrove and saltmarsh system.	**Important features:** Part of the Tumby Bay Wetland of National Importance and one of three tidal creeks which form the intertidal wetland in the area. At least 5 migratory coastal bird species listed under international migratory treaties and other resident coastal waders use the Tumby Bay area (including Second Creek) for roosting and feeding (e.g. Pacific golden plover, grey plover, eastern curlew, sharp-tailed sandpiper and ruddy turnstone). Migratory shorebird habitat is required to be protected under international treaties. The zone also contains important habitat for resident coastal wader birds and seabirds. Habitat for different life stages of blue swimmer crab, western king prawn, baitworm, school whiting, western Australian salmon, tommy ruff, southern sea garfish, yellow eye mullet, flathead, flounder, King George Whiting.	**Commercial fisheries:** It is unlikely that commercial fisheries utilised this zone prior to SZ implementation.	This SZ is positioned to avoid areas of medium recreational fishing effort within Second Creek (such as the creek mouth) This zone has been designed to avoid salmon hole, a popular fishing spot within Second Creek

Point Bolingbroke Sanctuary Zone (SZ3)

30km²

MPLAG advice: Consistent

The Point Bolingbroke SZ protects a corridor from the mainland to an offshore island. This area has an amazing diversity of habitats including uncommon rhodolith beds, invertebrate reef and seagrass.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The zone transitions from a sandy beach at Point Bolingbroke, through reef patches and seagrass, across sandy bottom with invertebrates and rhodoliths communities, to rich invertebrate beds and reef (including sponges) and reefs rich in macroalgae surrounding Kirkby Island found in the zone. Soft-bottom, granite reef and dense seagrass in shallow water transitioning to deeper habitats including seagrass. This SZ represents an offshore island, Kirkby, and the surrounding island habitat is included in this zone, reefs in the area are mainly covered with brown canopy macroalgae (seaweed) with a high abundance of red macroalgae on shallow reefs in the area. Kirkby Island is a domed granite island (with a calcarenite and calcrete layer) with no points or bays. There are shoals close to the NW and NE sides.	**Important features:** Rich invertebrate reef and sponge garden on the NNW side of Kirkby Island. Uncommon rhodolith beds (coralline red algae or popcorn coral). An important area for resident coastal wader birds. The Zone contains important nesting and roosting habitat for seabirds and resident and migratory coastal waders including some listed under international treaties. Endemic or rare invertebrates (bivalves, octopus, ascidians, nudibranchs) occur in the area. Relatively strong SG current running between the mainland and Kirkby Island. The zone includes reef fish habitat. Habitat for the endangered coastal stingaree, which is endemic to South Australia.	**Commercial fisheries:** The Sardine, Marine Scalefish, Charter and Western Zone Abalone fisheries used the SZs within the Sir Joseph Banks Marine Park previously. There was minimal use by the NZRL and SG Prawn fisheries. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Salt Creek SZ) is estimated to be approximately $108,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of this remaining displaced catch came from this SZ. It is recognised that this Zone is in an area for the scalefish and sardine industry. Based on publicly available information every effort has been made to minimise the impact of this Zone on those activities.	This Zone avoids areas of high recreational fishing effort further north at Thuruna, Redcliff and Trinity Haven. It also avoids Secret Rock, which is just outside the northern boundary, but Quilty Rock is inside the zone.

Coastline with differing areas of exposure (exposed, moderate and sheltered) and shore type (sandy beach and shoreline rock platform). This Zone links sandy and rocky shores with reef, seagrass and bare sand of various depths.	The black cowrie, a specimen shell of conservation concern is found in the sandy reef and sponge habitat surrounding Kirkby Island. Protects the transition from the mainland out to the offshore island. One of only 2 islands of the 20 island group protected within a SZ. Breeding habitat for Cape Barren Goose, Rock parrot, vulnerable fairy tern. Habitat for different life stages of southern rock lobster, sea sweep, western blue groper and purple sea urchin. A wide range of fish species frequent this SZ.		

Boucaut Island Sanctuary Zone (SZ4)

6km²

MPLAG advice: Consistent

The Boucaut Island SZ represents part of the Sir Joseph Banks Group of Islands and includes some of the only deep water (30m+) habitat found within SZ in the whole SG.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: Island habitat transitioning to deeper waters, greater than 30+m. Rocky outcrop – seal rock. Reef habitat, mixed with patchy soft sediment (and seagrass habitats). Potential rhodilth habitat, surveyed rhodiliths 150m north of SZ boundary.	**Important features:** One of the few areas of deep water habitat (30m+) within SZs within SG, due to the importance of SG deep water as prawn fishery habitat. Haul out site for the vulnerable Australian sea lion. Connection between Boucaut Island and Seal rock. Local community recognised dolphin breeding site (no scientific evidence to support this as yet). One of only 2 islands of the 20 island group protected within a SZ. Uncommon rhodoliths (popcorn coral) found within the zone. A wide range of fish species frequent this SZ.	**Commercial fisheries:** The Sardine, Marine Scalefish, Charter and Western Zone Abalone fisheries used the SZs within the Sir Joseph Banks Marine Park previously. There was minimal use by the NZRL and SG Prawn fisheries. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Salt Creek SZ) is estimated to be approximately $108,000. Based on the habitat mapping available for this park and the relatively small size of this SZ, it is likely that a small proportion of this displaced catch came from this SZ.	The SZ is complemented by the inclusion of areas of the Sir Joseph Banks Group Conservation Park. Avoids areas of heavy recreational fishing around Spilsby Island.

Dangerous Reef Sanctuary Zone (SZ5)

30km²

MPLAG advice: Consistent

The Dangerous Reef SZ protects the largest breeding colony of Australian sea lions in the world, and a recognised aggregation site for white sharks.

Environmental values		Economic Values	Social and cultural values
CAR Habitats represented: This SZ contains significant deep water, low profile platform reef surrounded by soft-bottom and dense sea grass habitat incorporating a component of offshore island habitat.	**Important features:** Dangerous Reef supports the largest breeding colony of the vulnerable Australian sea lion in the world. Dangerous Reef is a recognised aggregation area for the vulnerable white shark.	**Commercial fisheries:** The Sardine, Marine Scalefish, Charter and Western Zone Abalone fisheries used the SZs within the Sir Joseph Banks Marine Park previously. There was minimal use by the NZRL and SG Prawn fisheries.	Some impact on recreational fishing

Dangerous Reef is a chain of four large rocks (composed of granite and pegmatite), as surface exposures of an isolated inselberg ridge. The rocks are whitewashed with guano.	This Zone is located in the transition zone between the SG and the open ocean creating strong seasonal temperature and salinity differentials which have a large impact on the ecology of the area. The Zone is an important seabird breeding site and habitat for resident and migratory coastal shorebirds such as ruddy turnstone, red-necked stint and sooty oystercatchers. Migratory shorebird habitat is required to be protected under international treaties. The reef in this area is dominated by brown macroalgae (seaweed – such as Sargassum spp. and Scaberia agardhii). Habitat for southern rock lobster, sea sweep, western blue groper and purple sea urchin.	Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Salt Creek SZ) is estimated to be approximately $108,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of this remaining displaced catch came from this SZ. **Tourism** A potential area for ecotourism.	

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, Baker 2009, Caton et al 2011a, Caton et al. 2011b, DEWNR 2015a, Lothian 2005, Rumbelow et al. 2010, Scientific Working Group 2011.

3.8 Neptune Islands Group (Ron and Valerie Taylor) Marine Park

3.8.1 Park Description

The Neptune Islands Group (Ron and Valerie Taylor) Marine Park covers 146 square kilometres in offshore waters of the Eyre Bioregion, south of SG (Figure 3-1), The Neptune Islands Group Marine Park is in two sections, each extending approximately 2 nautical miles from the South and North Neptune Islands (Figure 3-20). The Neptune Islands Group Marine Park includes 2 RAZs (on land, about 2 per cent of the total park area), 1 SZ (about 24 per cent) and 2 HPZs (about 74 per cent; Figure 3-20). The Neptune Islands Group Marine Park accommodates marine industries including tourism and commercial fishing.

The Neptune Islands Group Marine Park includes the Neptune Islands Conservation Park. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in

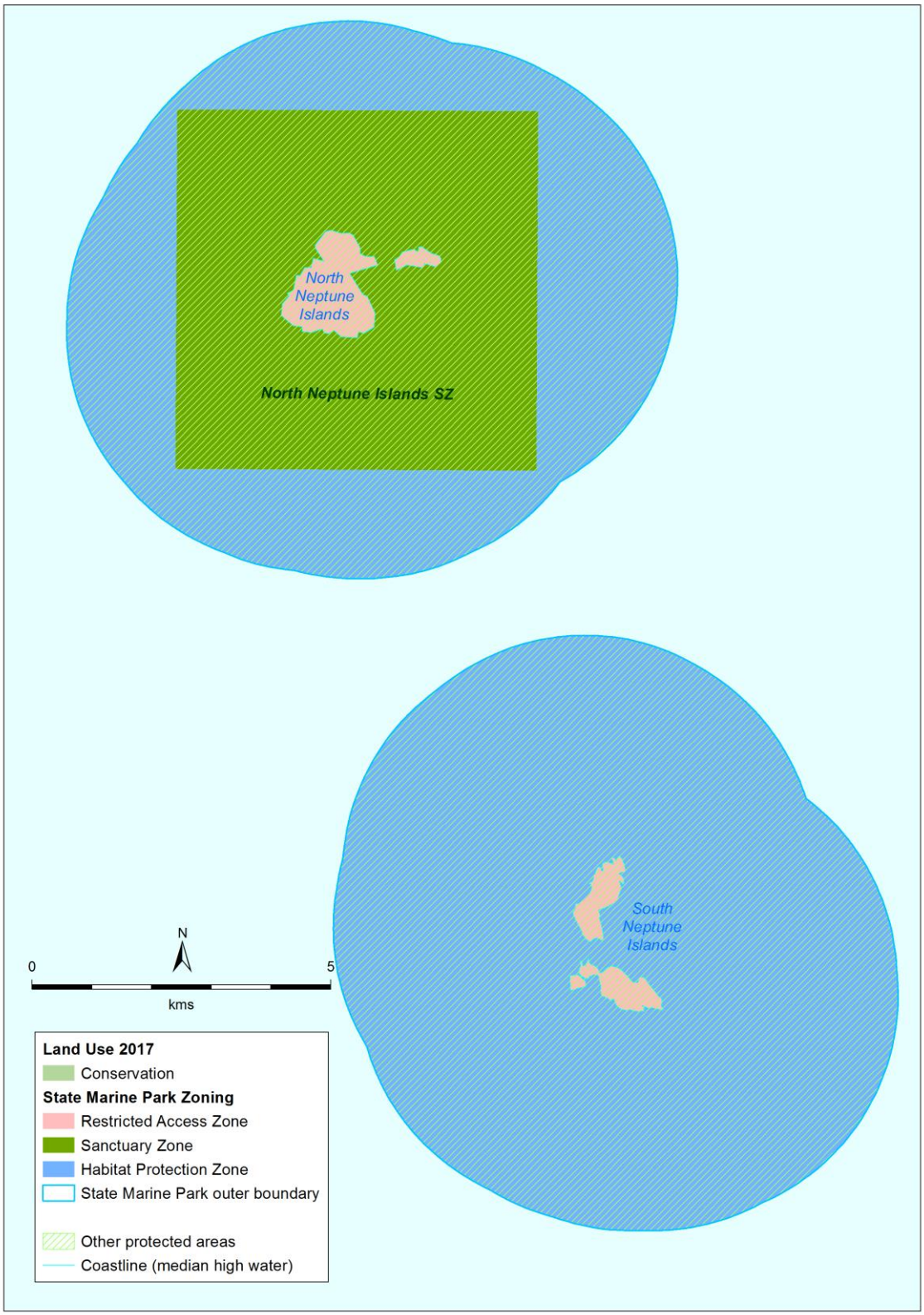
Figure 3-21 and Figure 3-22 respectively.

About 2 per cent of the benthic habitats of the Neptune Islands Group Marine Park have been mapped at a broad scale (1:100,000) using satellite imagery. This mapping is all within the North Neptune Islands SZ, accounting for about 11 percent of that zone (

Figure 3-21).

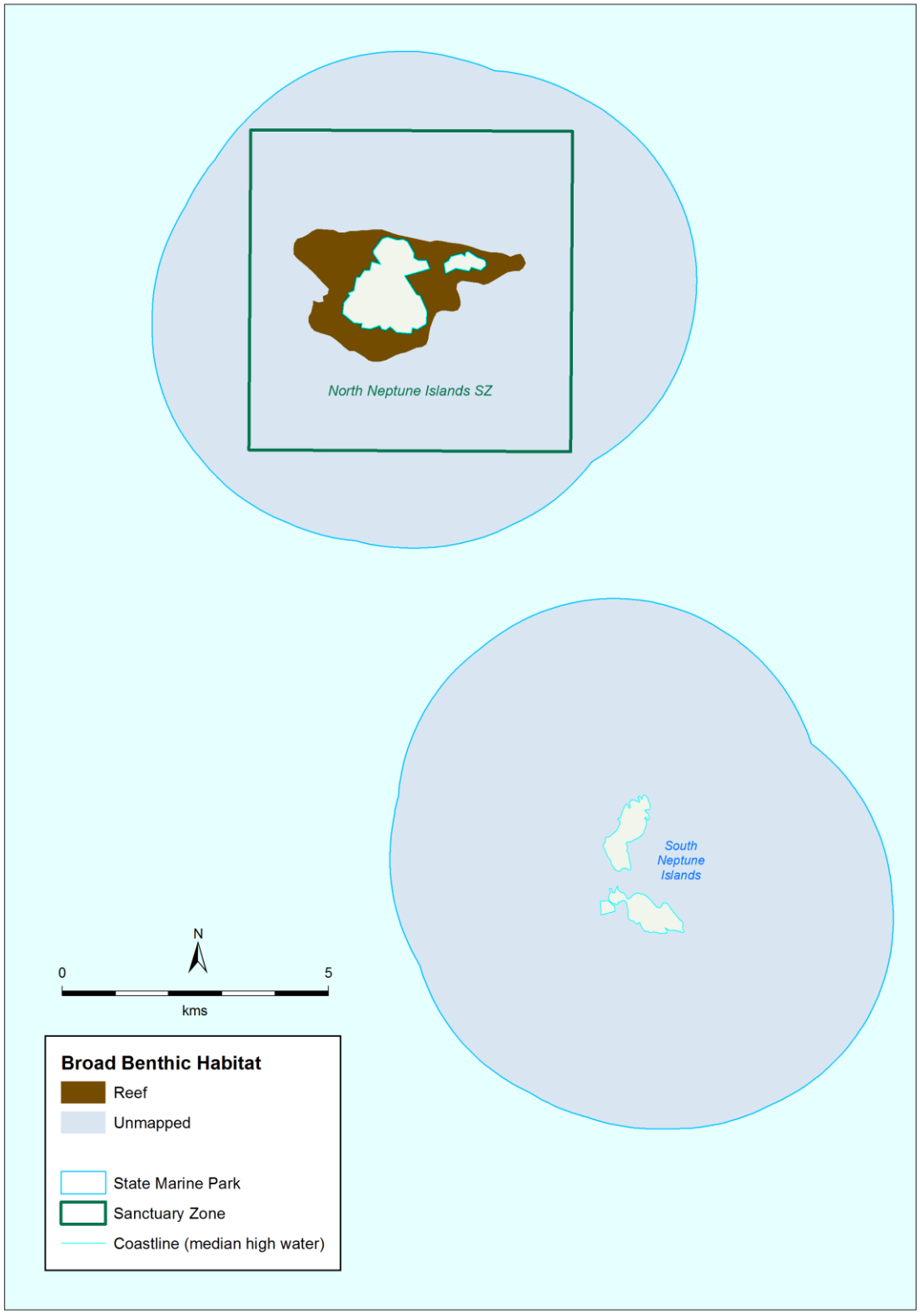
Section 3.8.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-20 Neptune Islands Group Marine Park, land uses map



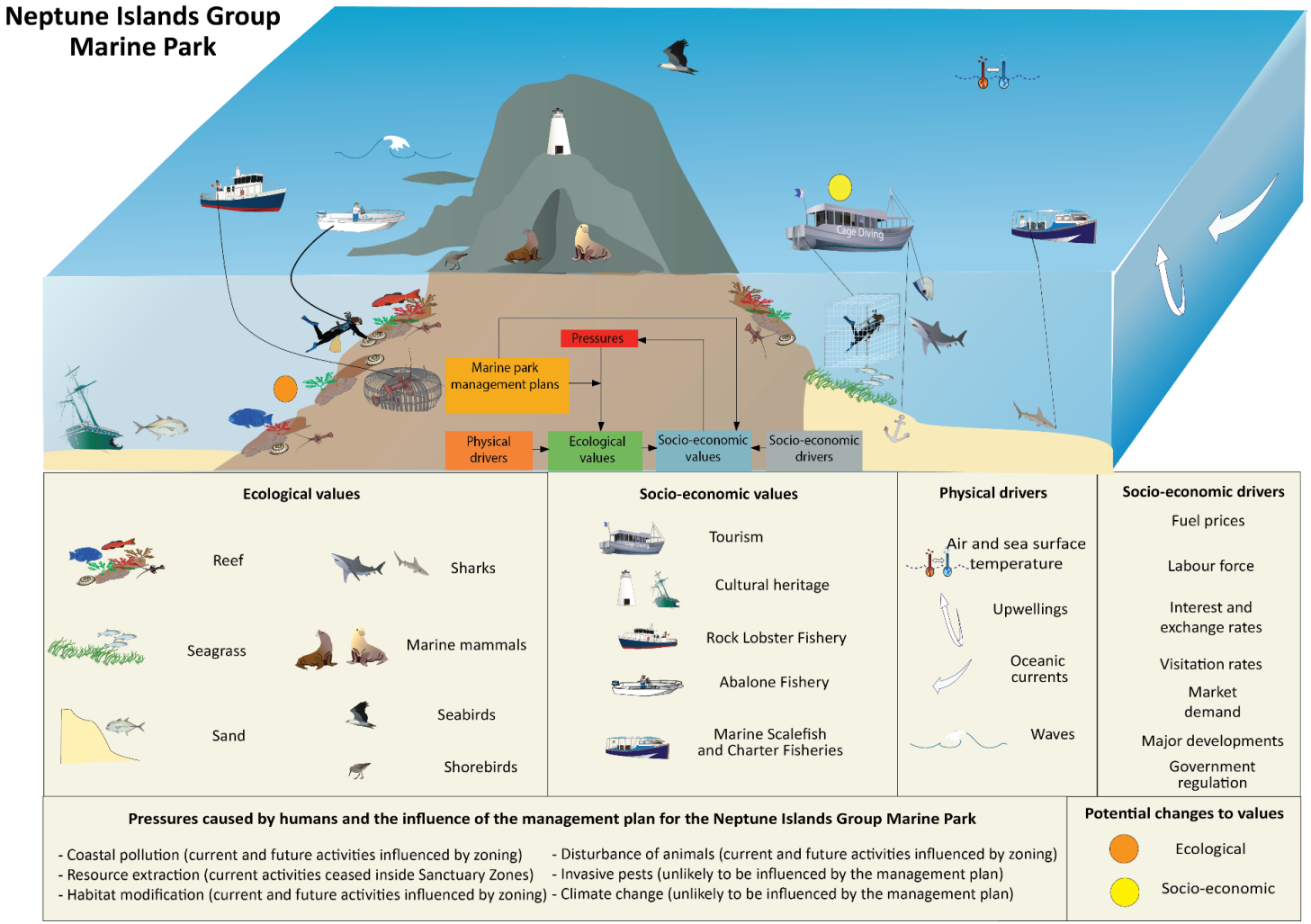
Source: APPENDIX 9

Figure 3-21 Neptune Islands Group Marine Park, habitat map



Source: APPENDIX 9

Figure 3-22 Neptune Islands Group Marine Park, conceptual model



Source: APPENDIX 9

3.8.2 Economic, social and environmental values of the Neptune Islands Group (Ron and Valerie Taylor) Marine Park sanctuary zone

North Neptune Island Sanctuary Zone (SZ 1)

36 km²

MPLAG advice: Not supported by the majority, who suggested a small SZ in the waters to the NW of the north island and to the NE of the south island. Minority advice suggested a portion of the NW side of the island to be included in SZ. This zone is an outcome of the stakeholder forum, and was supported by the conservation sector through draft Management Plan consultation.

The North Neptune Island SZ is the location for the world renowned Great White Shark cage diving and ecotourism industry. It protects the habitat and prey for this species and the remainder of the ecosystem in the area.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This SZ represents exposed, offshore island habitat with exposed cliffs and rocky shores moving into deeper water. 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:** World renowned hot spot for the vulnerable white shark, that aggregate at the islands and forage in the area for seals. 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. Habitat for different life stages of southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, western blue groper and sea sweep.	**Commercial fisheries**: The main fisheries that previously used the SZ was the NZRL and Western Zone Abalone Fisheries. Abalone catches from this region are classed as low importance. There was minimal use by the Marine Scalefish and Charter Boat fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be $468,000, 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. This Zone is located to provide for commercial fishing (rock lobster, abalone, marine scale) at the southern islands. **Tourism** An existing ecotourism site and one of the few locations in the world where people can view the white shark from under the water. An existing ecotourism site which can use the marine park and SZ as a selling point.	This SZ includes the northern islands of the Neptune Islands Conservation Park, an existing Restricted Access area under the NPWS Act 1972, creating a protected corridor between land and sea. The islands are also listed on the Register of the National Estate in recognition of their importance as seabird breeding sites as well as the colonies of New Zealand fur seals and the vulnerable Australian sea lion.

Sources: Baker 2004, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, DEWNR 2015a, Lothian 2005, Middleton and Bye 2007.

3.9 Gambier Islands Group Marine Park

3.9.1 Park Description

The Gambier Islands Group Marine Park covers 120 square kilometres in the Eyre Bioregion, at the mouth of SG (Figure 3-1). The Gambier Islands Group Marine Park consists of a single HPZ which surrounds Wedge Island, North Island, South West Rock and Peaked Rocks (Figure 3-23). The Gambier Islands Group Marine Park accommodates marine industries including tourism and commercial fishing.

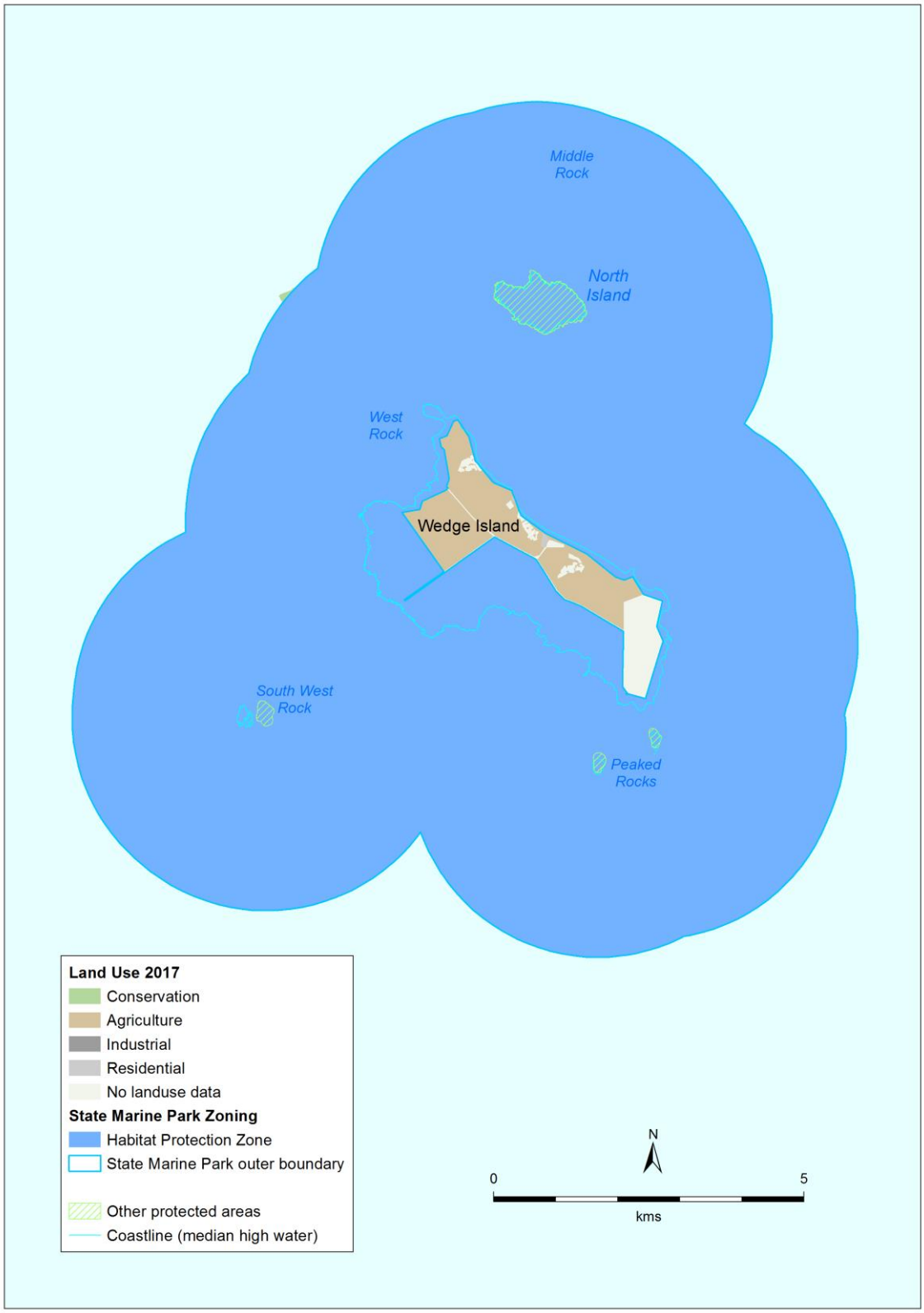
The Gambier Islands Group Marine Park includes the Gambier Islands Conservation Park. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-24 and Figure 3-25 respectively.

About 15 per cent of the benthic habitats of the Gambier Islands Group Marine Park have been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-24).

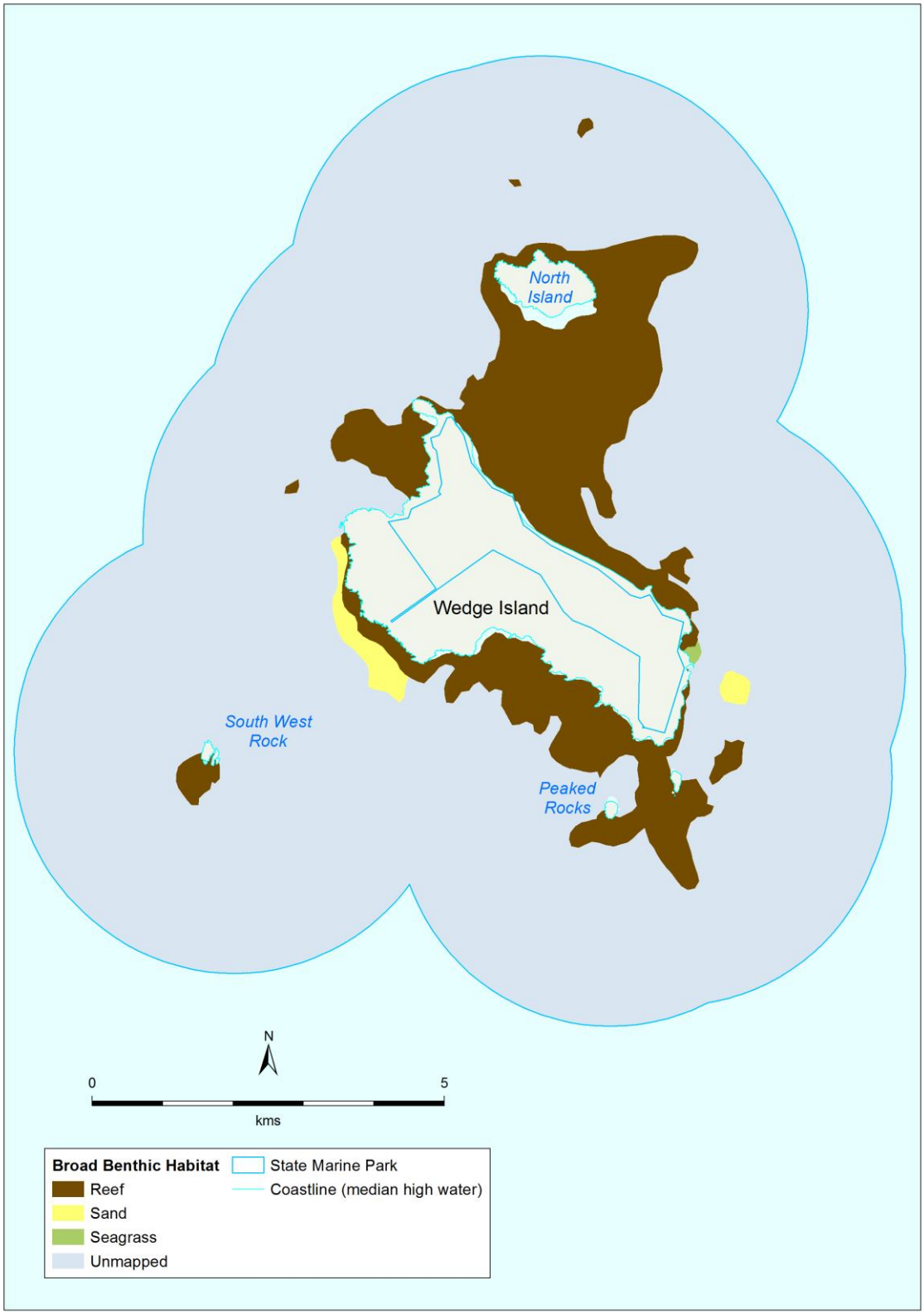
As the Gambier Islands Group Marine Park does not have any sanctuary zoning, there is no section describing the economic, social and environmental values of the marine park SZs.

Figure 3-23 Gambier Islands Group Marine Park, land uses map



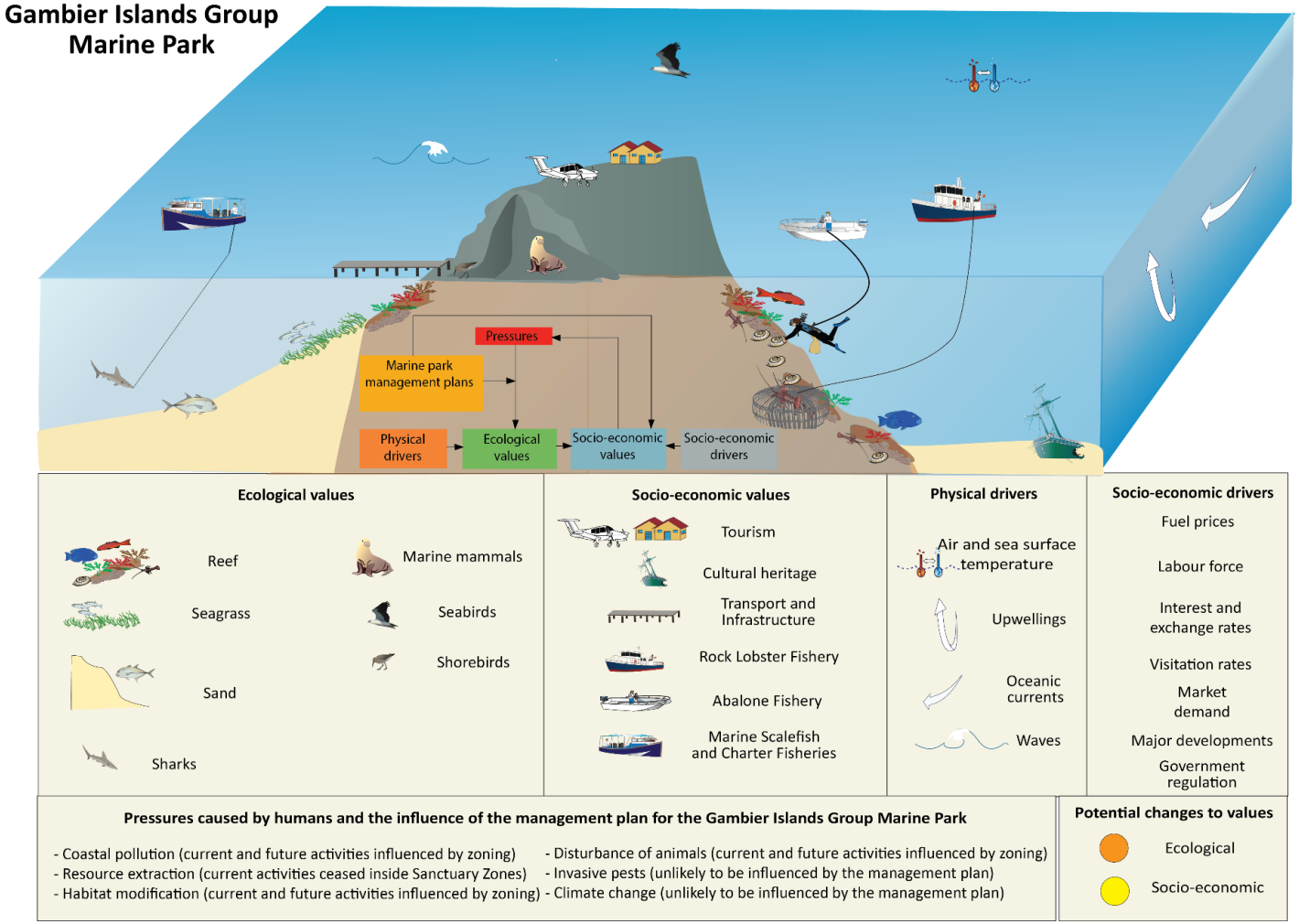
Source: APPENDIX 9

Figure 3-24 Gambier Islands Group Marine Park, habitat map



Source: APPENDIX 9

Figure 3-25 Gambier Islands Group, conceptual model



Source: APPENDIX 9

3.10 Franklin Harbor Marine Park

3.10.1 Park Description

The Franklin Harbor Marine Park covers 636 square kilometres and is located on the central western side of SG. About 45 per cent of the Franklin Harbor Marine Park is within the Northern SG Bioregion, with the remainder in the SG Bioregion. The Franklin Harbor Marine Park extends from Gibbon Point to the northern end of Munyaroo Conservation Park. The Franklin Harbor Marine Park includes 4 SZs (about 11 per cent of the total park area), 2 HPZs (about 58 per cent) and 2 GMUZs (about 31 per cent; Figure 3-26). The Franklin Harbor Marine Park accommodates various marine industries including commercial fishing, aquaculture and tourism. There is an SPA for harbour activities adjacent to Cowell, overlapping Picnic Creek SZ and part of Franklin Harbour SZ. There is an SPA for submarine cables and pipelines adjacent to Shoalwater Point and two SPAs for transhipment offshore from Lucky Bay (Figure 3-26).

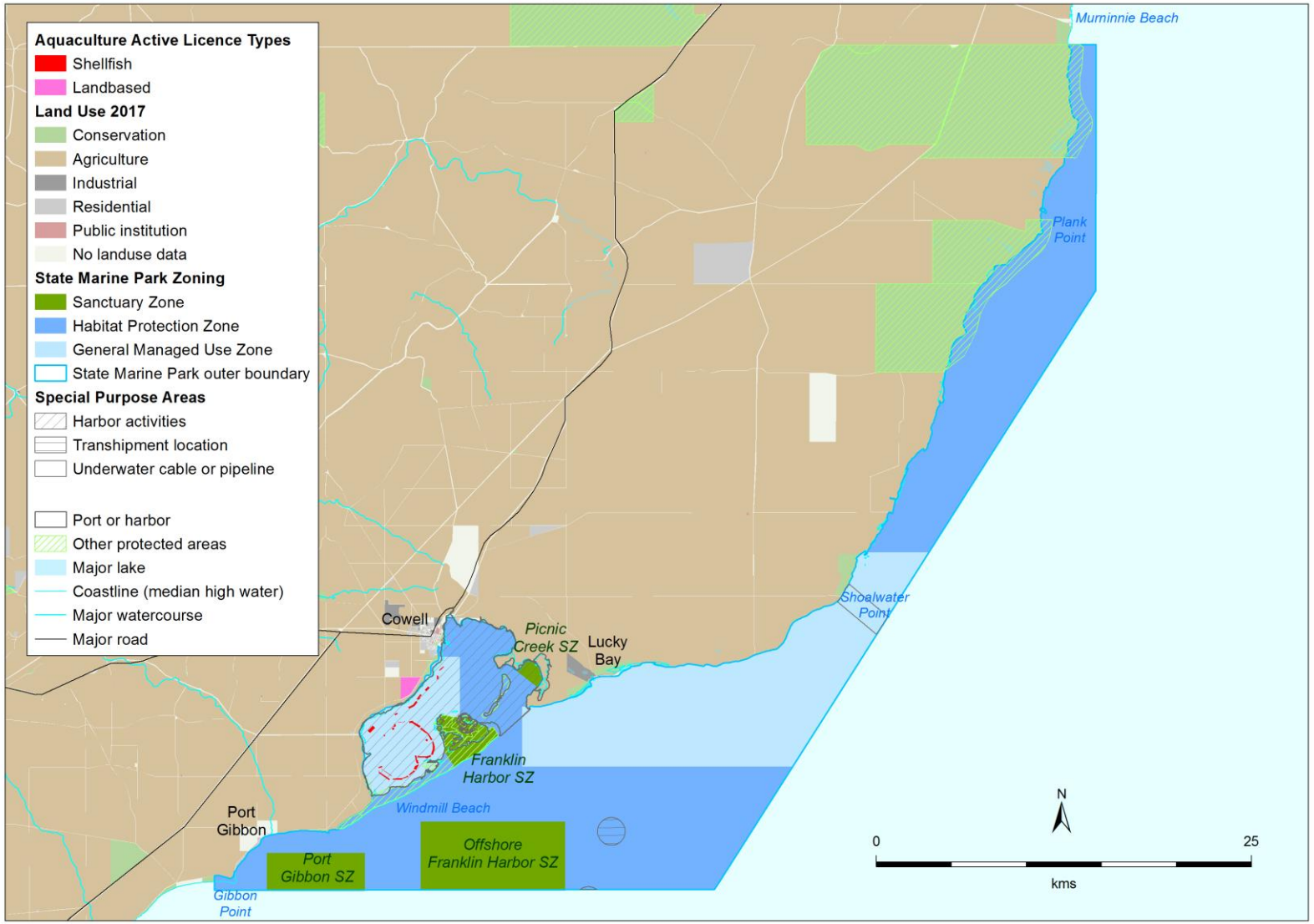
The Franklin Harbor Marine Park is adjacent to a remote and sparsely populated area of the state, which is dominated by agricultural lands and conservation areas (Figure 3-26). The largest population centre is Cowell. The Franklin Harbour Marine Park is adjacent to Franklin Harbor Conservation Park, Munyaroo Conservation Park and Munyaroo Conservation Reserve. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-27 and Figure 3-28 respectively.

About 62 per cent of the benthic habitats of the Franklin Harbor Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 12 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-27).

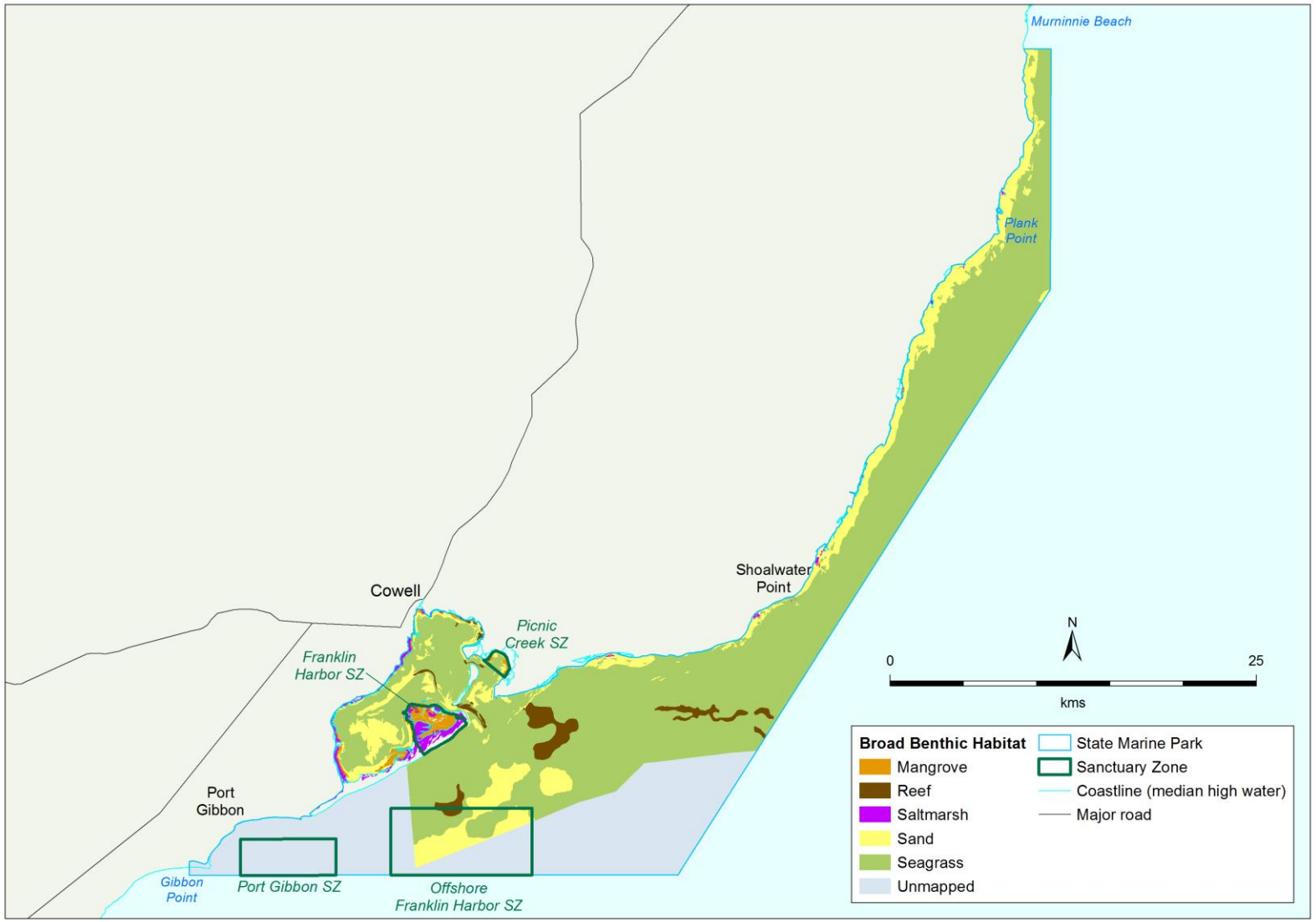
Section 3.10.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-26 Franklin Harbor Marine Park, land uses map



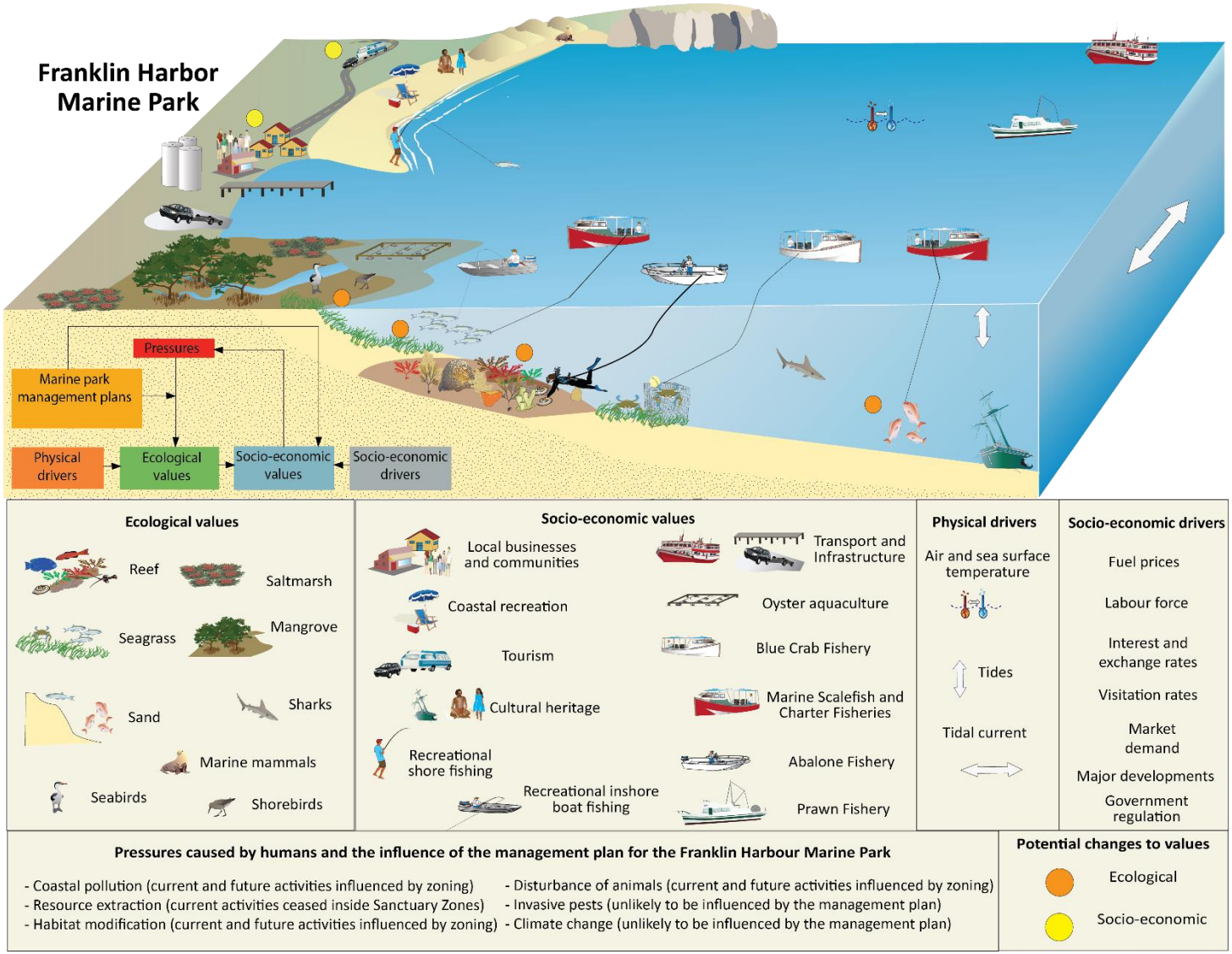
Source: APPENDIX 9

Figure 3-27 Franklin Harbor Marine Park, habitat map



Source: APPENDIX 9

Figure 3-28 Franklin Harbor Marine Park, conceptual model



Source: APPENDIX 9

3.10.2 Economic, social and environmental values of the Franklin Harbor Marine Park sanctuary zones

Picnic Creek Sanctuary Zone (SZ 1)

2 km²

MPLAG advice: Consistent

The Picnic Creek SZ was designed by the local community due to the local importance of its biodiversity. It provides important protection to many parts of the food chain which occur within Franklin Harbor.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented The area is shallow and includes saltmarsh, mangrove and mudflats. Subtidally, there are patches of bare sand, macroalgae on sand and seagrass.	**Important features:** The bay represents an important small embayment, part of the Franklin Harbor, Wetland of National Importance. The intertidal saltmarsh, mangroves and mudflats move into subtidal sandy bottom, macroalgae on sandy bottom and seagrass, which together form an important ecosystem and nursery for many species of recreational and commercial importance. This area is important for coastal and migratory shorebirds and seabirds. The mix of habitats are used by different life stages of a range of species including baitworm, King George whiting, blue swimmer crab, western king prawn, yellow fin whiting, western Australian salmon, tommy ruff, southern sea garfish, razorfish, and yellow eye mullet. Tidal flats are important homes to many invertebrates within the sand, which the shore and wader birds feed on.	**Commercial fisheries:** The Marine Scalefish, SG Prawn and Charter Boat fisheries used the SZs within the Franklin Harbor Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $59,000. Based on the habitat mapping available for this park and the relatively small size of this SZ, it is likely that relatively little of the displaced catch came from this SZ.	No impact on recreational fishers.

Germein Point Sanctuary Zone (SZ 2)

8 km²

MPLAG advice: Consistent

The Germein Point SZ protects an extensive amount of mangrove and tidal creeks, which are vitally important nursery areas to many fish species. The habitat protected within this ensures the protection for part of one of the most important nurseries for King George whiting in South Australia.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Mangrove, saltmarsh and tidal creeks. Sheltered waters within Franklin Harbor are considered to be a component of nursery grounds This Zone is representative of the central part of Franklin Harbor representing an extensive mangrove system with intertidal creeks and associated saltmarsh habitat	**Important features:** This Zone is representative of the central part of Franklin Harbor representing an extensive mangrove system with intertidal creeks and associated saltmarsh habitat. Sheltered waters within Franklin Harbor are considered to be a component of nursery grounds. Franklin Harbour is one of the most important nurseries for King George whiting in South Australia, with tagged whiting from this area recorded near Port Neill, Tumby Bay, Sir Joseph Banks Group and Port Lincoln bays.	**Commercial fisheries:** The Marine Scalefish, SG Prawn and Charter Boat fisheries used the SZs within the Franklin Harbor Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $59,000. Based on the habitat mapping available for this park, it is likely that relatively little of the displaced catch came from this SZ.	No impact on recreational fishers. The zone has been designed to hug the mangroves on the eastern side to avoid popular recreational fishing sites in the Franklin Harbor entrance channels. Windmill Beach is also not included within the SZ so as not to impact on this popular recreational fishing site.

	The SZ is an important breeding area for resident coastal shore birds. This Zone is complemented by the inclusion of part of the Franklin Harbor Conservation Park, protecting ecological linkages across land and sea. Franklin Harbor Conservation Park is on the Register of the National Estate in recognition of its role in preserving mangrove and saltmarsh habitat and the role of the islands within the park as safe roosting and feeding sites for seabirds, this zone adds to the protection of these habitats. The mix of habitats are used by different life stages of a range of species including baitworm, King George whiting, blue swimmer crab, western king prawn, yellow fin whiting, western Australian salmon, tommy ruff, southern sea garfish, razorfish, and yellow eye mullet.		

Port Gibbon Sanctuary Zone (SZ3)

16km²

MPLAG advice: Consistent

The Port Gibbon SZ protects an important habitat for the different life stages of many recreationally and commercially important species, but in shallower water than the Port Gibbon zone. Uncommon species such as the weedy seadragon and sculptured seamoth occur within the zone. It provides an important link between the SZs within Franklin Harbor and those offshore. It also provides a protective corridor between the shallower inshore waters within this zone, where smaller fish will reside to the deeper offshore waters of the Offshore Franklin Harbor SZ where the larger fish will reside.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: This Zone represents unmapped areas at different depth classes, dense and medium seagrass at different depths as well as some rocky reefs of moderate exposure dominated by macroalgae.	**Important features:** Foraging habitat for the small Australian sea lion colony which haul out at Point Gibbon. Weedy seadragon habitat Habitat for the uncommon sculptured seamoth, a fish of conservation concern. The seagrass is spawning habitat for blue swimmer crab, razorfish, southern calamari, king scallop, queen scallop, southern sea garfish and snook and nursery habitat for blue swimmer crab, southern calamari, southern sea garfish, razorfish, king scallop and queen scallop. The reef is spawning habitat for southern calamari and purple sea urchin and nursery habitat for purple sea urchin, southern calamari, King George whiting, snapper, western Australian salmon, tommy ruff, trevally and sea sweep. This zone represents shallower water habitat than the Offshore Franklin Harbor SZ. This zone links with the Offshore Franklin Harbor SZ, providing a protective corridor for the movements of different life stages of many fish species between different habitats and depths of water.	**Commercial fisheries:** The Marine Scalefish, SG Prawn and Charter Boat fisheries used the SZs within the Franklin Harbor Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $59,000. Based on the habitat mapping available for this park and the relative size of the SZ, it is likely that a significant proportion of the displaced catch came from this SZ.	No impact on recreational fishers as it has been designed to avoid popular recreational fishing sites closer inshore to Port Gibbon. An area in between this SZ and the adjacent Offshore Franklin Harbor SZ was left open to avoid recreational fishing grounds.

Offshore Franklin Harbor Sanctuary Zone (SZ4)

44km²

MPLAG advice: Consistent

The Offshore Franklin Harbor SZ protects an important habitat for the different life stages of many recreationally and commercially important species, but in deeper water than the Port Gibbon zone. Uncommon species such as the weedy seadragon and sculptured seamoth occur within the zone. It provides an important link between the SZs within Franklin Harbor and those offshore. It also provides a protective corridor between the deeper offshore waters within this zone and the shallower waters within the Port Gibbon SZ. It also provides a protective corridor between the shallower offshore waters within the zone, where larger fish will reside to the shallower inshore waters of the Port Gibbon SZ where the smaller fish will reside.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: This Zone represents unmapped areas at different depth classes, dense and medium seagrass at different depths as well as some rocky reefs of moderate exposure dominated by macroalgae.	**Important features:** Foraging habitat for the small Australian sea lion colony which haul out at Point Gibbon. Weedy seadragon habitat Habitat for the sculptured seamoth a fish of conservation concern. The seagrass is spawning habitat for blue swimmer crab, razorfish, southern calamari, king scallop, queen scallop, southern sea garfish and snook and nursery habitat for blue swimmer crab, southern calamari, southern sea garfish, razorfish, king scallop and queen scallop. The reef is spawning habitat for southern calamari and purple sea urchin and nursery habitat for purple sea urchin, southern calamari, King George whiting, snapper, western Australian salmon, tommy ruff, trevally and sea sweep. This zone represents deeper water habitat than the Port Gibbon SZ. This zone links with the Port Gibbon SZ, providing a protective corridor for the movements of different life stages of many fish species between different habitats and depths of water.	**Commercial fisheries:** The Marine Scalefish, SG Prawn and Charter Boat fisheries used the SZs within the Franklin Harbor Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $59,000. Based on the habitat mapping available for this park and the relative size of the SZ, it is likely that a significant proportion of the displaced catch came from this SZ.	No impact on recreational or charter fishers as the zone has been designed to avoid the popular fishing site “The Aquarius”. An area in between this SZ and the adjacent Port Gibbon SZ was left open to avoid recreational fishing grounds.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Caton et al. 2011a, Caton et al. 2011b, DEWNR 2015a, Lothian 2005, Rumbelow et al.2010, Scientific Working Group 2011.

3.11 Upper Spencer Gulf Marine Park

3.11.1 Park Description

The Upper Spencer Gulf Marine Park covers 1,602 square kilometres within the North SG Bioregion (Figure 3-1). The Upper Spencer Gulf Marine Park extends from the southern end of the Whyalla-Cowleds Landing Aquatic Reserve on the western side of SG to Jarrold Point on the eastern shore, and northwards to the uppermost reaches of SG beyond Port Augusta. The Upper Spencer Gulf Marine Park includes 9 SZs (about 13 per cent of the total park area), 3 HPZs (about 32 per cent) and 2 GMUZs (about 55 per cent; Figure 3-29). The Upper Spencer Gulf Marine Park accommodates various marine industries including shipping, commercial fishing, aquaculture and fishing-based tourism. There are 4 SPAs for harbour activity which are situated adjacent to Port Pirie, Port Bonython, Whyalla and Port Augusta including the Head of Gulf SZ. An SPA for submarine cables and pipelines is situated near Douglas Point and extends across the Gulf. SPAs for significant economic development are situated: between Douglas Bank and Yatala Harbour Aquatic Reserves; adjacent to Whyalla, including the Fairway Bank, Cuttlefish Coast and Cowleds Landing SZs; and adjacent to Port Pirie, including the Port Davis and Fisherman Creek SZs. The ports of Whyalla and Port Pirie lie outside the park boundary. Shoreline fishing is allowed adjacent to Black Point in the Cuttlefish Coast SZ (Figure 3-29).

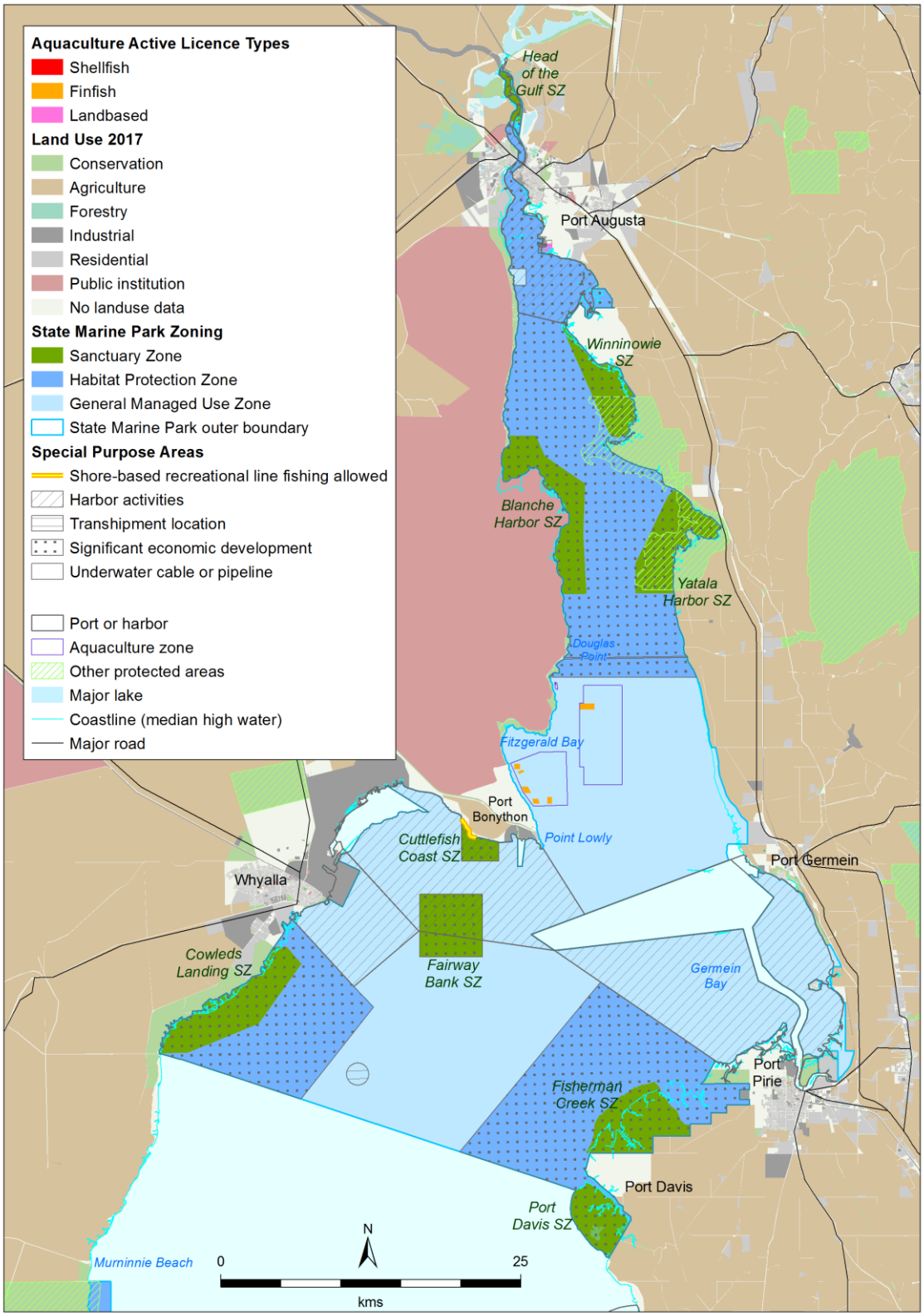
The Upper Spencer Gulf Marine Park is adjacent to sparsely populated areas interspersed with industrial towns (Figure 3-29). The largest population centres are Port Augusta, Port Pirie and Whyalla. The Upper Spencer Gulf Marine Park is adjacent to Winninowie Conservation Park and includes Blanche Harbour-Douglas Bank, Yatala Harbour and Whyalla-Cowleds Landing Aquatic Reserves. The region experiences hot, dry summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-30 and Figure 3-31 respectively.

About 85 per cent of the benthic habitats of the Upper Spencer Gulf Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. A further 15 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-30).

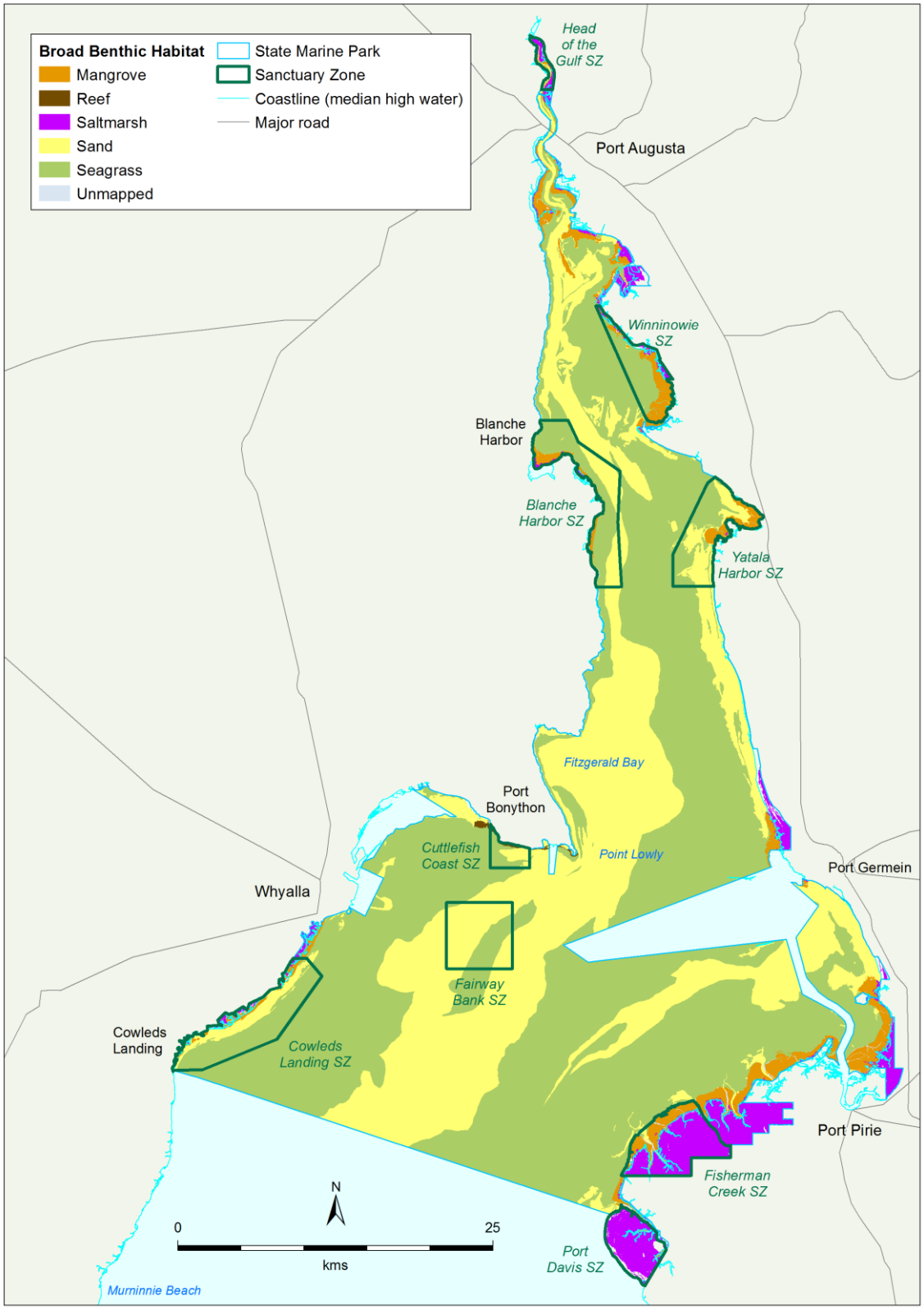
Section 3.11.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-29 Upper Spencer Gulf Marine Park, land uses map



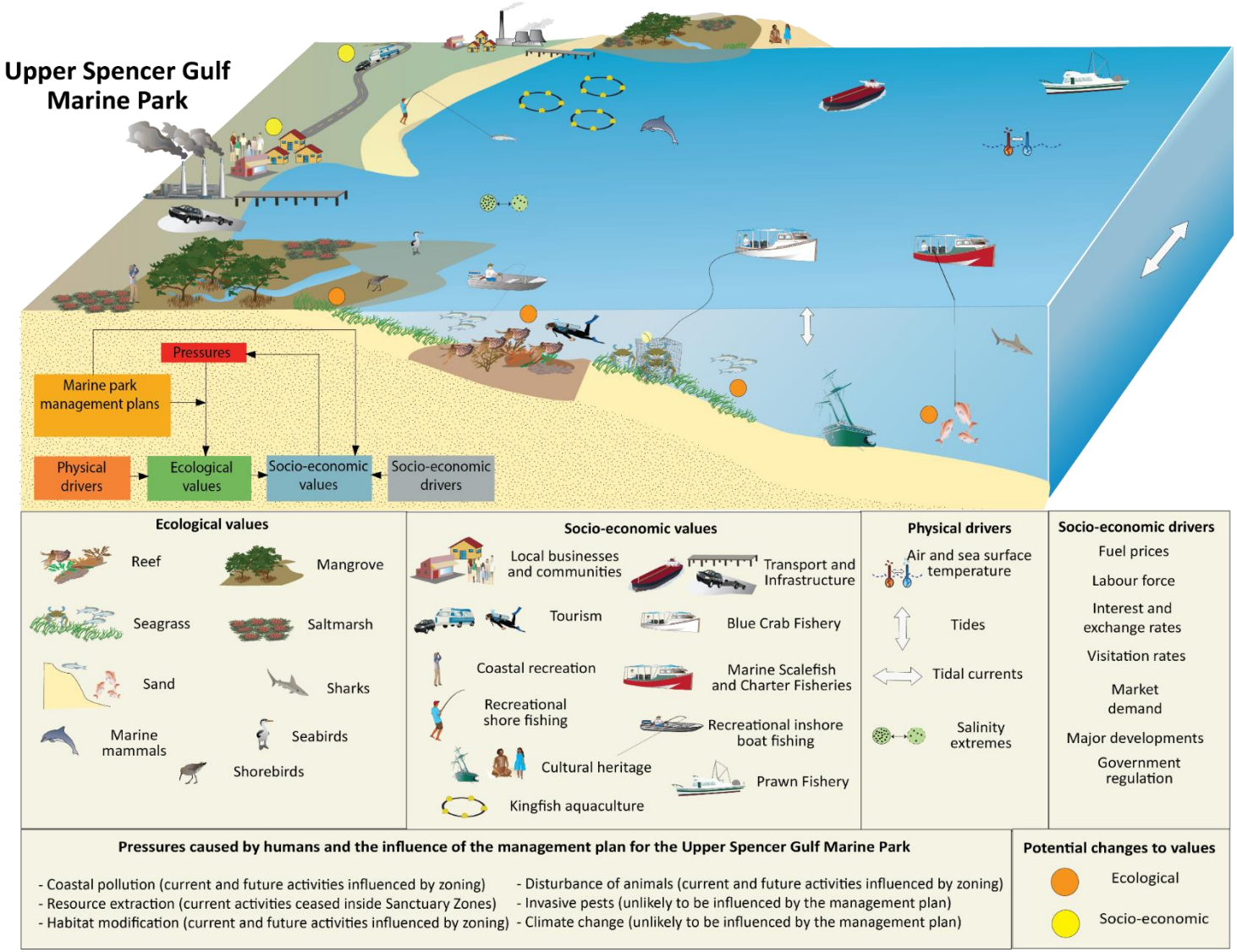
Source: APPENDIX 9

Figure 3-30 Upper Spencer Gulf Marine Park, habitat map



Source: APPENDIX 9

Figure 3-31 Upper Spencer Gulf Marine Park, conceptual model



Source: APPENDIX 9

3.11.2 Economic, social and environmental values of the Upper Spencer Gulf Marine Park sanctuary zones

Head of Gulf Sanctuary Zone (SZ 1)

3 km²

MPLAG advice: Consistent

The Head of Gulf SZ protects the unique saline and large tidal range environments of the Upper Spencer Gulf.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This sheltered coastline includes saltmarsh habitats fronted by mangroves and tidal sand and mud flats.	**Important features:** This SZ includes the most saline waters of the Gulf. The mangrove habitats within this Zone provide important breeding, nursery and feeding grounds for several commercial fish, prawn and crab species. The northern boundary of the Zone lies adjacent to the salt works conservation area (Crown Land), establishing a protected corridor between the land and sea. The head of the SG has the largest tidal range in South Australia, reaching nearly 3m. The majority of the Zone is overlayed by the Upper SG wetland of national importance. The Zone overlays part of the Port Augusta Complex estuary extent.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and the small size of the SZ, it is likely that relatively little of the displaced catch came from this SZ. **Tourism Value** The Zone will preserve the area for education, appreciation and recreation including existing ecological tourism operations. The Zone is overlaid by SPAs for Harbors and Significant Economic Development	Native Title claims for the Nukunu and Barngarla people are located over this Zone. The SZ was designed to avoid important fishing areas adjacent to and south of Port Augusta Complements a range of recreational activities while having minimal impact on recreational fishing

Winninowie Sanctuary Zone (SZ 2)

20 km²

MPLAG advice: Slight variation from unanimous MPLAG advice to incorporate cadastral boundaries

The Winninowie SZ conserves marine habitats representative of the Upper SG region. Provides for connectivity between land and sea. It incorporated the existing Winninowie Aquatic Reserve.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented The area is characterised by a system of tidal creeks bordered by mangroves and sand and mud flats backed by saltmarsh habitats. This SZ contains six seagrass species (four of which have warm water origins due to the high summer water temperatures only found in the upper reaches of the gulf) and two algal species including a red algae.	**Important features:** Large communities of razorfish and hammer oysters. The saltmarsh, mangrove and sand/mud flat habitats provide important nesting and feeding grounds for resident shorebirds, while migratory shorebirds, whose habitats are protected under international treaties, use the area for feeding. This Zone is a potential nursery site for King George whiting. The Zone is completely within the Upper SG wetland of national importance. The northern part of the Zone includes part of the Port Augusta Complex estuary.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and that it was already an existing aquatic reserve, it is likely that relatively little of the displaced catch came from this SZ. A SPA for Significant Economic Development overlays the Zone.	A Native Title claim for the Nukunu people is located over this zone. The Zone was designed to avoid important fishing areas in the deeper waters of Flinders Channel which is located to the west of the zone. The southern end of the Zone lies adjacent to the edge of the Chinaman Creek boat channel to allow for boat launching and fishing. The Zone was designed to provide for the coastal shacks in the Chinaman Creek area.

	The mangrove forests in this area are considered to be one of the largest undisturbed stands of mangroves remaining in South Australia.		

Blanche Harbour Sanctuary Zone (SZ3)

33km²

MPLAG advice: Consistent

The Blanche Harbour SZ protects mangroves, intertidal sand and seagrass environments which provide important nursery habitats. It incorporated the existing Blanche Harbour-Douglas Bank Aquatic Reserve and extends the protected area seaward to include the unique mega-ripple environment in the middle of the gulf.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The coastline of the SZ includes sheltered coarse sand beaches, mixed beaches, intertidal sand/mud flats and areas of mangroves backed by saltmarsh habitats. Soft-bottom habitats and cobble interspersed with extensive seagrass meadows in waters to 10m make up the habitats within this Zone. The Zone is partially overlayed by the Upper SG wetland of national importance.	**Important features:** The Zone was designed to incorporate large sand waves located in the middle of the gulf, just off Middle Bank. The saltmarsh, mangrove and sand/mud flat habitats provide important nesting and feeding grounds for resident shorebirds, while migratory shorebirds, whose habitats are protected under international treaties, use the area for feeding. The Zone includes a sponge garden community located in the middle of the gulf in close proximity to the sand waves. This Zone is a potential nursery site for King George whiting. Mangrove-seagrass habitats are known nursery areas for species such as King George whiting, yellow fin whiting, blue swimmer crab and western king prawn. Part of the Blanche Harbor estuary extent is included within this Zone. The area contains the mobile sea pen Virgularia mirabilis. The zone is known to contain the Southern Potbelly/Pot-bellied Seahorse Hippocampus bleekeri. The habitats within this zone are part of the Directory of Important Wetlands.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and that the area was previously mostly within an aquatic reserve, it is likely that relatively little of the displaced catch came from this SZ. The Zone avoids commercial haul net fishing grounds. A SPA (for Significant Economic Development) overlays the Zone.	A Native Title claim for the Barngarla people is located over this Zone. The SZ overlaid the existing Blanche Harbour-Douglas Point Aquatic Reserve. Two protected shipwrecks, the Alpha and Apollo are located within this Zone. Complements a range of recreational activities while having minimal impact on recreational fishing

Yatala Harbour Sanctuary Zone (SZ4)

29km²

MPLAG advice: The zone varies from unanimous MPLAG advice by expanding further into the Gulf by approximately 2km and increasing the angle of the northern boundary to accommodate activities associated with the Miranda shack area.

The Yatala Harbour SZ conserves a variety of upper gulf habitats. It overlays the already existing Yatala Harbour-Upper SG Aquatic Reserve.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The coastline of this SZ includes sheltered coarse sand beaches, intertidal sand/mud flats and areas of mangroves backed by saltmarsh habitats.	**Important features:** The saltmarsh, mangrove and sand/mud flat habitats provide important nesting and feeding grounds for resident shorebirds, while migratory shorebirds, whose habitats are protected under international treaties, use the area for feeding.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries.	A Native Title claim for the Nukunu people is located over this Zone. The SZ overlays the Yatala Harbor-Upper SG Aquatic Reserve and includes part of Winninowie Conservation Park.

Soft-bottom habitats and cobble interspersed with extensive seagrass meadows make up the habitats within this Zone. The majority of the Zone is overlayed by the Upper SG wetland of national importance.	Mangrove-seagrass habitats are known nursery areas for species such as King George whiting, yellow fin whiting, blue swimmer crab and western king prawn. Abandoned nests of the state endangered white bellied sea eagle have been located within the mangroves in this SZ. The habitats within this zone are part of the Directory of Important Wetlands.	Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and that the area was previously mostly within an aquatic reserve, it is likely that relatively little of the displaced catch came from this SZ. The Zone avoids commercial haul net fishing grounds. A SPA (for Significant Economic Development) overlays the Zone.	The Zone has been positioned south of Red Cliff Point to avoid popular fishing grounds off the point and shack sites at Miranda.

Cuttlefish Coast Sanctuary Zone (SZ5)

6km²

MPLAG advice: Slight variation from draft zoning with unanimous MPLAG advice to accommodate across Government consultation. In this situation the zone was moved further west to accommodate future shipping infrastructure development.

The Cuttlefish Coast SZ partially protects the internationally important spawning aggregation of Giant Cuttlefish. The SZ overlays part of the existing fisheries management cuttlefish exclusion zone.

Environmental values		Economic Values	Social and cultural values
CAR Habitats represented: Rocky reef, soft-bottom habitats interspersed with macroalgae and seagrass meadows. The coastline habitats are predominantly bedrock platform.	**Important features:** The SZ includes a section of the giant cuttlefish breeding ground. The Zone contains the vulnerable red algae known as Pterothamnion flexile. This zone contains a portion of the only reef habitat located in the Upper SG. The area supports a population of small specimens of the cowrie *Zoila friendii therites*, a species of conservation concern.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and that the zone is within a previous existing closure area for cuttlefish fishing, it is likely that relatively little of the displaced catch came from this SZ. **Tourism** Snorkelling and/or diving with the cuttlefish The Zone is overlayed by SPAs for Harbors and Significant Economic Development.	A Native Title claim for the Barngarla people is located over this zone. The Zone includes areas that have been indicated to be of importance for recreational fishing and scuba diving. A SPA accommodates shore-based recreational line fishing near Black Point. Highly valued by the local community, scuba divers and scientists.

Fairway Bank Sanctuary Zone (SZ6)

27km²

MPLAG advice: Consistent.

The Fairway Bank SZ protects subtidal seagrass habitats.

Environmental values		Economic values	Social and Cultural Values
CAR Habitats represented: The offshore waters of upper SG are included in the Zone. This area includes seagrass and subtidal sand habitat.	**Important features:** The Zone contains nursery areas for snapper. Supports a large seagrass meadow, below 6m depth the seabed is characterised by coarse gravelly sand and bedforms	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000.	A Native Title claim for the Barngarla people is located over a large portion of this Zone. The Zone was designed to avoid inshore boating and fishing around Pt Lowly and Whyalla.

		Based on the habitat mapping available for this park, it is likely that relatively little of the displaced catch came from this SZ. The zone is overlayed by SPAs for Harbors and Significant Development.	

Cowleds Landing Sanctuary Zone (SZ7)

38km²

MPLAG advice: Consistent.

The Cowleds Landing SZ overlays the already existing Whyalla-Cowleds Landing Aquatic reserve. This zone protects mangroves and seagrasses which are important nursery areas.

Environmental values		Economic values	Social and Cultural values
CAR Habitats represented: Sheltered mixed beaches, interspersed with mangroves and saltmarsh habitats. The Zone contains soft bottom habitat and extensive beds of seagrass up to 10m deep.	**Important features:** Areas of saltmarsh located above median high water are included in this SZ to ensure the protection of ecological linkages across the land and marine environment. The seagrass habitat provides important nursery, breeding and feeding grounds for blue swimmer crabs, western king prawns, whiting, garfish and numerous other species. The Zone contains a particularly important nursery area for snapper. 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. Contains samphire flats which are flushed by extremely high spring tides, intertidal mangroves, intertidal sand and mud flats and subtidal seagrass meadows.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park and that the area was previously mostly within an aquatic reserve, it is likely that relatively little of the displaced catch came from this SZ. A SPA (for Significant Economic Development) overlays the Zone	A Native Title claim for the Barngarla people is located over this Zone This Zone includes the protected shipwreck the Rooganah The Zone avoids important fishing areas on the beaches adjacent to Whyalla and the shacks at Cowleds Landing. The Zone covers the Whyalla-Cowleds Landing Aquatic Reserve

Port Davis Sanctuary Zones (SZ8 and SZ9)

49km² (31km² and 18km²)

MPLAG advice: Consistent.

The Port Davis SZs conserve regionally significant sheltered environments which provide important nursery habitats for fish and bird species.

Environmental values		Economic values	Social and Cultural values
CAR Habitats represented: These Zones are dominated by an extensive area of intertidal saltmarsh habitat, dissected by a network of tidal creeks lined by mangrove. A small area of seagrass beds and soft bottom habitats is also included.	**Important features:** The saltmarsh and mangrove habitats in these Zones provide breeding, feeding and nursery areas for a range of bird and fish species. The tidal creeks and estuaries in these Zones have been identified as coastal wetlands of national importance. The mangrove and seagrass habitats provide a nursery area for species such as King George whiting, yellow fin whiting, snapper, blue swimmer crab and western king prawn.	**Commercial fisheries:** The Charter Boat and Marine Scalefish fisheries used the SZs within the Upper Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn and Blue Crab fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	A Native Title claim for the Nukunu people is located over these zones These SZs were designed to avoid important recreational fishing areas adjacent to, and south of Port Pirie, including First, Second, Third and Fourth Creeks. The Zones have been designed to provide for fishing at the Port Davis estuary.

	Mangrove forests in this zone are reported to be used by the spawning adults and post larvae of mud cockles	May displace some commercial power-haul net fishing, the Zones overlay some waters less than 5m, which may affect commercial haul net fishing A SPA for Significant Economic Development overlays the Zones	

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Hall 2008, Hall 2010, Hall 2012, Lothian 2005, Rumbelow 2010, Scientific Working Group 2011.

3.12 Eastern Spencer Gulf Marine Park

3.12.1 Park Description

The Eastern Spencer Gulf Marine Park covers an area of 784 square kilometres on the eastern side of the SG bioregion (Figure 3-1). The Eastern Spencer Gulf Marine Park extends from just north of Port Rickaby northwards to Cape Elizabeth. The Eastern Spencer Gulf Marine Park includes 3 SZs (about 5 per cent of the total park area), 2 HPZs (about 54 per cent) and 3 GMUZs (about 41 per cent, Figure 3-32). The Eastern Spencer Gulf Marine Park accommodates various marine industries including commercial fishing, tourism and aquaculture. Shoreline fishing is allowed in the Cape Elizabeth SZ (Figure 3-32).

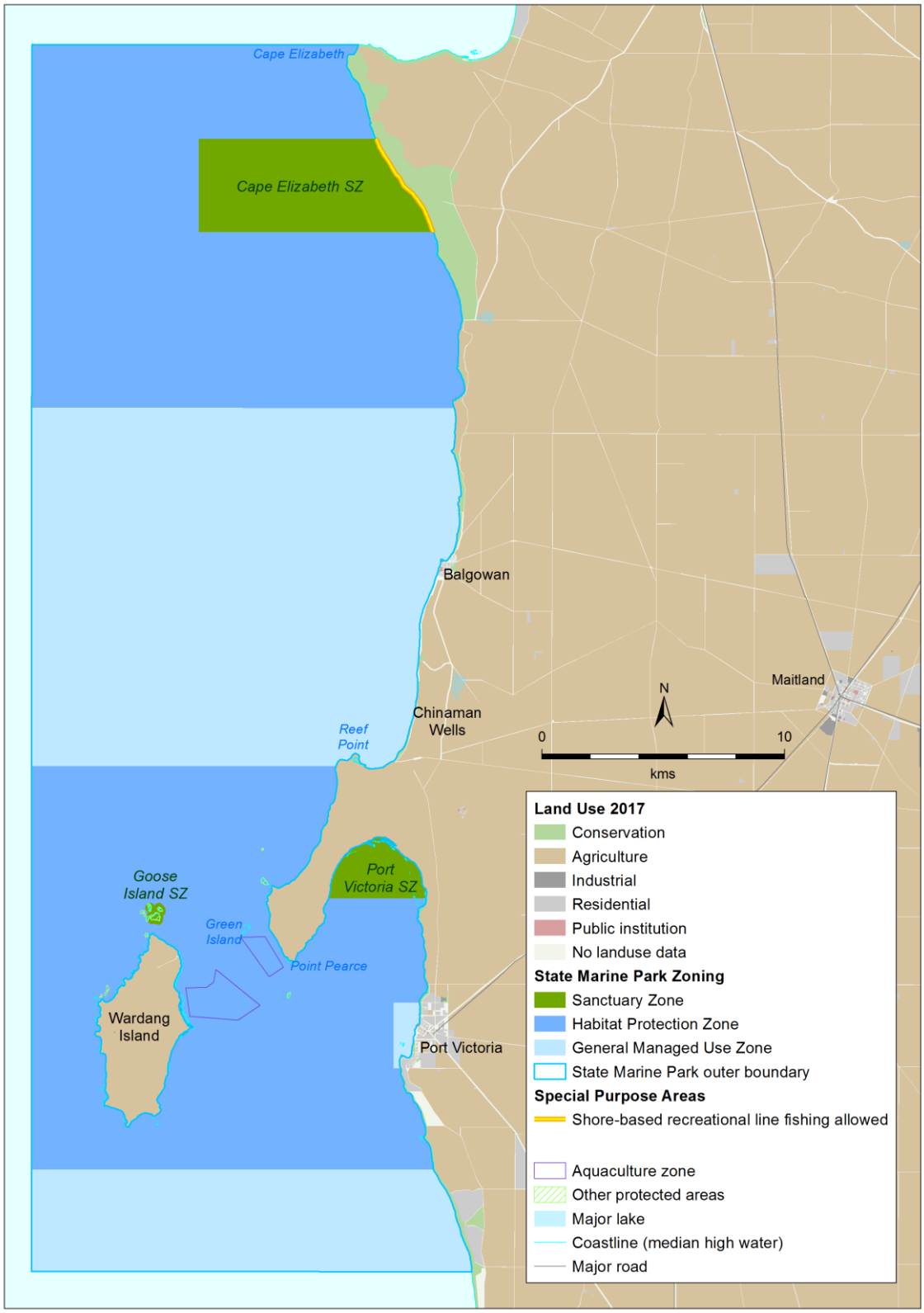
The Eastern Spencer Gulf Marine Park is adjacent to a remote and sparsely populated area of the state, which is dominated by agricultural and vacant land (Figure 3-32). The largest population centre is Port Victoria. The Eastern Spencer Gulf Marine Park encompasses the islands and waters of Goose Island Conservation Park and Goose Island Aquatic Reserve. This region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-33 and Figure 3-34 respectively.

About 34 per cent of the benthic habitats of the Eastern Spencer Gulf Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (Figure 3-33).

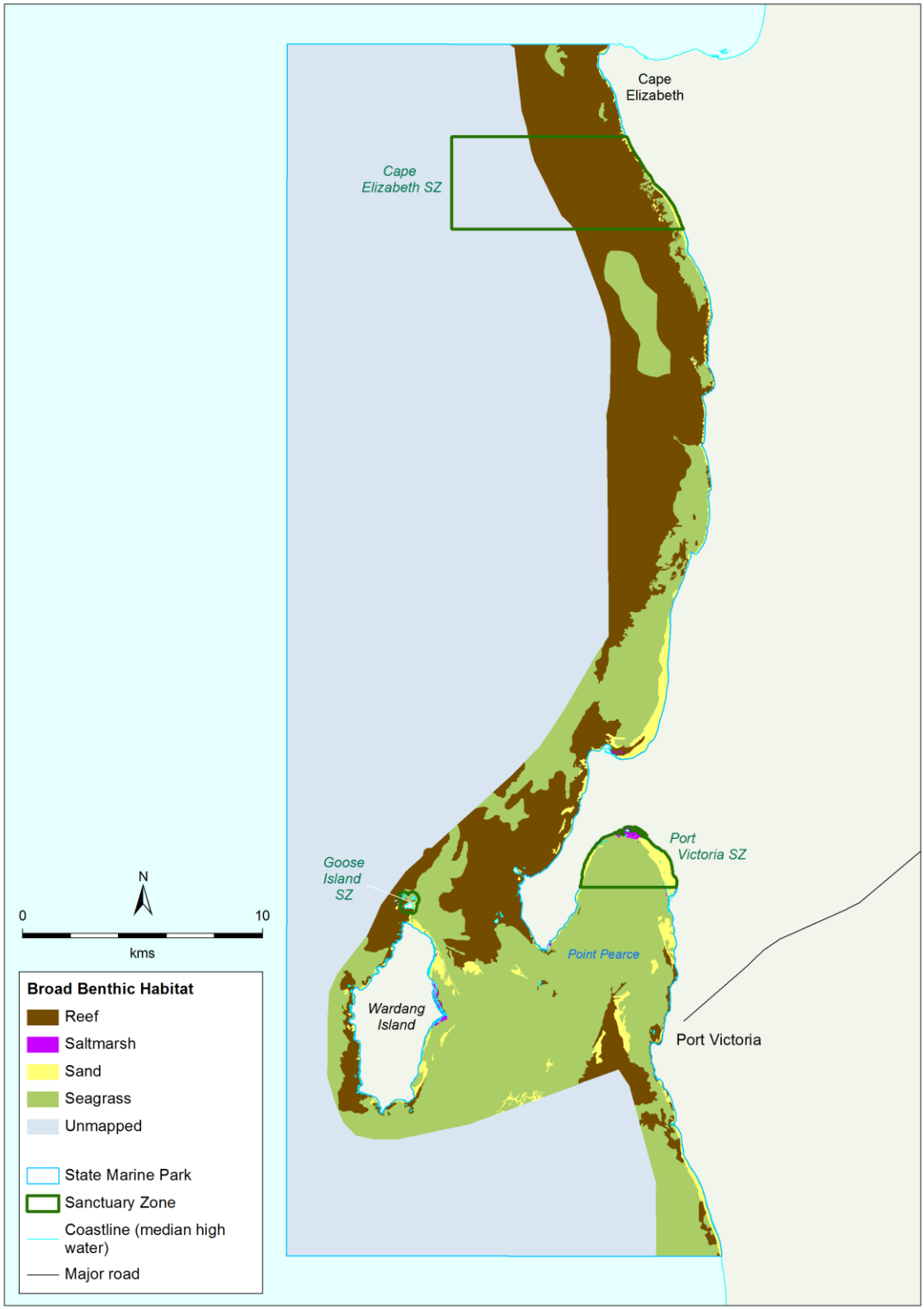
Section 3.12.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch are based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-32 Eastern Spencer Gulf Marine Park, land uses map



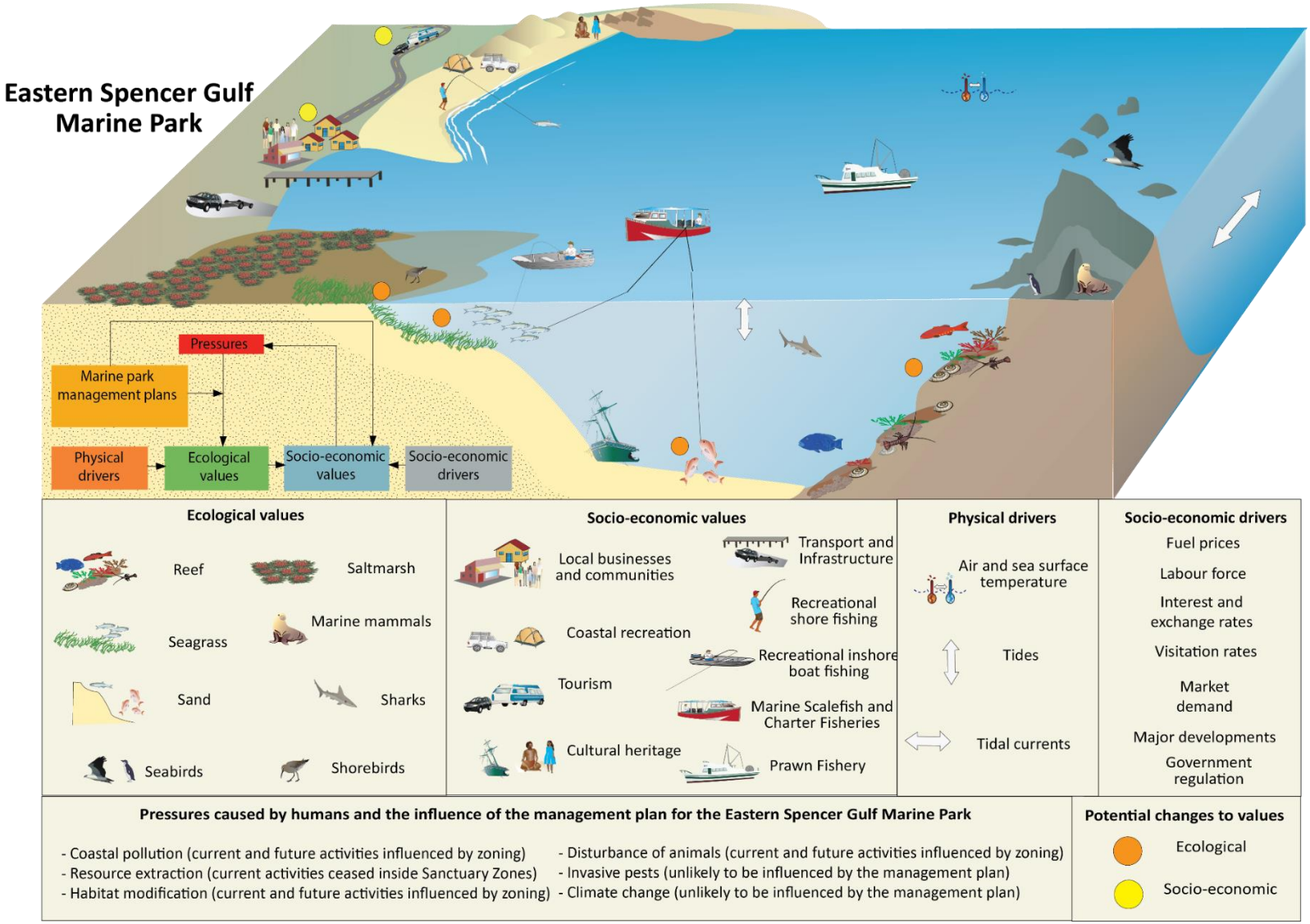
Source: APPENDIX 9

Figure 3-33 Eastern Spencer Gulf Marine Park, habitat map



Source: APPENDIX 9

Figure 3-34 Eastern Spencer Gulf Marine Park, conceptual model



Source: APPENDIX 9

3.12.2 Economic, social and environmental values of the Eastern Spencer Gulf Marine Park sanctuary zones

Cape Elizabeth Sanctuary Zone (SZ 1)

33 km²

MPLAG advice: The Zone extends the unanimously supported MPLAG zone south, effectively doubling the area of the zone (from 15 km2 to 33 km2).

The Cape Elizabeth SZ conserves some of the most northerly reef on the Eastern side of SG. It protects a representative sample of this habitat and its associated ecosystems within the SG Bioregion.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Limestone reefs located along this section of west facing coastline provide valuable habitat for resident reef fish species such as the western blue devil, which is a species of conservation concern.	**Important features:** This Zone includes sheltered to moderately exposed coarse sand beaches leading out into a mixture of rocky reef, seagrass beds or soft-bottom habitats in shallower waters. Deeper water habitats in the 10-30m range, which are yet to be mapped, are also included. The shallow subtidal of this zone consists of dissected patch reef and sand with vegetated patches further seaward. The reef habitats are reported to provide habitat for one or more life stages of King George Whiting, Snapper, Western Australian Salmon, Yellow-eye mullet and several other commercially important species. The reef habitats are reported to provide habitat for one or more life stages of Southern calamari, giant cuttlefish, greenlip abalone and purple sea urchin. Cape Elizabeth is amongst a list of key areas in South Australia for wading birds.	**Commercial fisheries:** The MSF used the SZs within the Eastern Spencer Gulf Marine Park previously. There was minimal use by the Charter Boat, Central Zone Abalone and Sardine fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	An Indigenous Land Use Agreement (ILUA) exists adjacent to the Zone which has been considered in final management plans. A Native Title Claim for the Narungga Nation overlays most of the Zone The SZ avoids the popular camping and fishing areas along the coast north of Balgowan. An SPA along the entire coastal length of the zone provides for recreational beach fishing.

Port Victoria Bay Sanctuary Zone (SZ 2)

7 km²

MPLAG advice: Consistent

The Port Victoria Bay SZ conserves sheltered saltmarsh and seagrass habitats. It protects a representative sample of this habitat and its associated ecosystems within the SG Bioregion..

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Coastal saltmarsh flanked by tidal flats with shallow seagrass beds (up to 10 metres deep) and areas of soft-bottom habitats (less than 1 km2).	**Important features:** Coastal saltmarsh flanked by tidal flats with shallow seagrass beds (up to 10 metres deep) and areas of soft-bottom habitats (less than 1 km2). Includes the only area of saltmarsh (0.4 km2) within a SZ in this marine park. The seagrass habitats provide habitat for razorfish and nursery area for species such as King George whiting, western Australian salmon and southern sea garfish.	**Commercial fisheries:** The MSF used the SZs within the Eastern Spencer Gulf Marine Park previously. There was minimal use by the Charter Boat, Central Zone Abalone and Sardine fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park, it is unlikely that a significant proportion of the displaced catch came from this SZ.	An Indigenous Land Use Agreement (ILUA) exists adjacent to the Zone which has been considered in final management plans. A Native Title Claim for the Narungga Nation overlays the Zone. The SZ was designed to avoid important fishing areas around Port Victoria and to the west of Point Pearce. This Zone was designed to provide for the coastal shacks around Point Pearce.

	The saltmarsh provides important feeding grounds for migratory shorebirds whose habitats are required to be protected under international treaties		
Goose Island Sanctuary Zone (SZ3) **1km²** **MPLAG advice:** Consistent *The Goose Island SZ includes the Goose Island Aquatic Reserve and Conservation Park. It conserves a representative sample of reef and seagrass habitat and their associated ecosystems within the region.*			
Environmental Values		**Economic Values**	**Social and Cultural Values**
CAR Habitats represented: Reefs within the SZ provide habitat for an abundance of resident reef fish. The Zone includes the Goose Island Group which 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	**Important features:** Shoreline of the Islands is unmapped. Rocky reef, in some areas dominated by large brown algae (fucoid algae), to 10m on the western side, seagrass and bare sand to 10m on northern and eastern side. Included in the Zone is Goose Island Aquatic Reserve and Conservation Park, which includes White Rock and provides an important haul-out site for a small population of Australian sea lions which are listed as vulnerable. Goose Island provides habitat for migratory Great Knot, the rock parrot, fairy tern and hooded plover. The reef habitats are reported to provide habitat for one or more life stages of King George Whiting, Snapper, Western Australian Salmon, Yellow-eye mullet and several other commercially important species. The reef habitats are reported to provide habitat for one or more life stages of Southern calamari, giant cuttlefish, greenlip abalone and purple sea urchin.	**Commercial fisheries:** The MSF used the SZs within the Eastern Spencer Gulf Marine Park previously. There was minimal use by the Charter Boat, Central Zone Abalone and Sardine fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $37,000. Based on the habitat mapping available for this park, it is likely that relatively little of the displaced catch came from this SZ.	A Native Title Claim for the Narungga Nation overlays most of the Zone. The SZ avoids the popular, sheltered fishing grounds on the north east side of Wardang Island. The Zone avoids important fishing areas south of Wardang Island. The Zone is located to avoid popular recreational fishing areas in the coastal waters around the township of Port Victoria, the jetty and boat ramp.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, DEWNR 2015a, Lothian 2005, Rumbelow 2010, Scientific Working Group 2011.

3.13 Southern Spencer Gulf Marine Park

3.13.1 Park Description

The Southern Spencer Gulf Marine Park covers 2,972 square kilometres and spans transition zones of 3 marine bioregions: SG, Eyre and GSV (Figure 3-1). The region extends around the eastern tip of the Yorke Peninsula and across to the central north coast of Kangaroo Island. There are 3 SZs, which cover about 5 per cent, 3 HPZs (about 53 per cent), 3 GMUZs (about 43 per cent) and 3 RAZ (less than 1 per cent, Figure 3-35). The Southern Spencer Gulf Marine Park accommodates various marine industries including commercial fishing, charter fishing, tourism and aquaculture. Recreational shoreline fishing is allowed in the Chinamans Hat SZ near the Chinamans Hat Island. There is an SPA for harbour activities between Hardwicke Bay and Point Souttar (Figure 3-35).

The Southern Spencer Gulf Marine Park is adjacent to agricultural lands and a number of small coastal towns. The largest centre in this region is located inland at Warooka. The marine park overlays the whole Althorpe Islands Conservation Park and parts of Innes National Park, Leven Beach Conservation Park and the Western River Wilderness Area. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-36 and Figure 3-37 respectively.

About 22 per cent of the benthic habitats of the Southern Spencer Gulf Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 2 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-36).

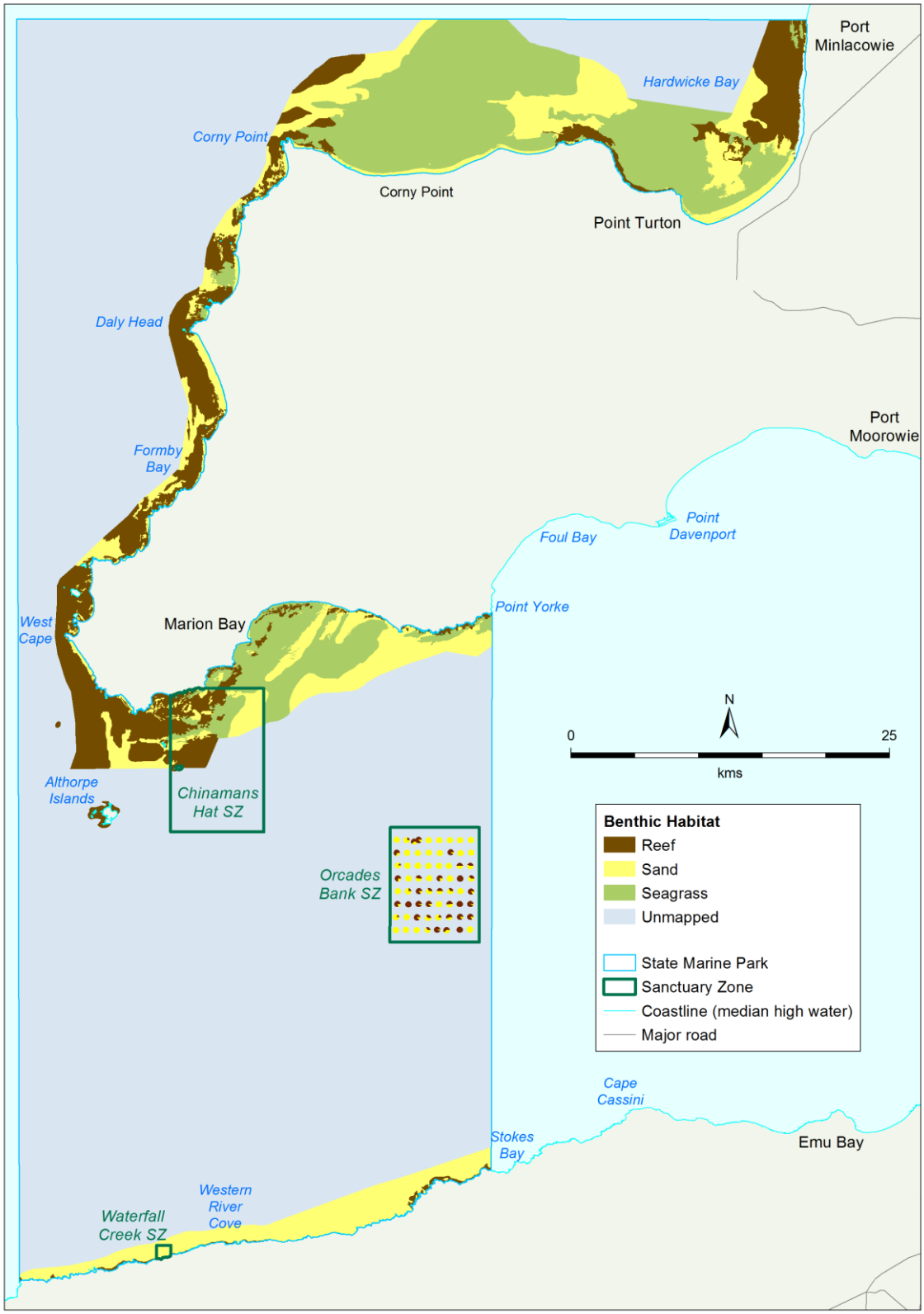
Section 3.13.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-35 Southern Spencer Gulf Marine Park, land uses map



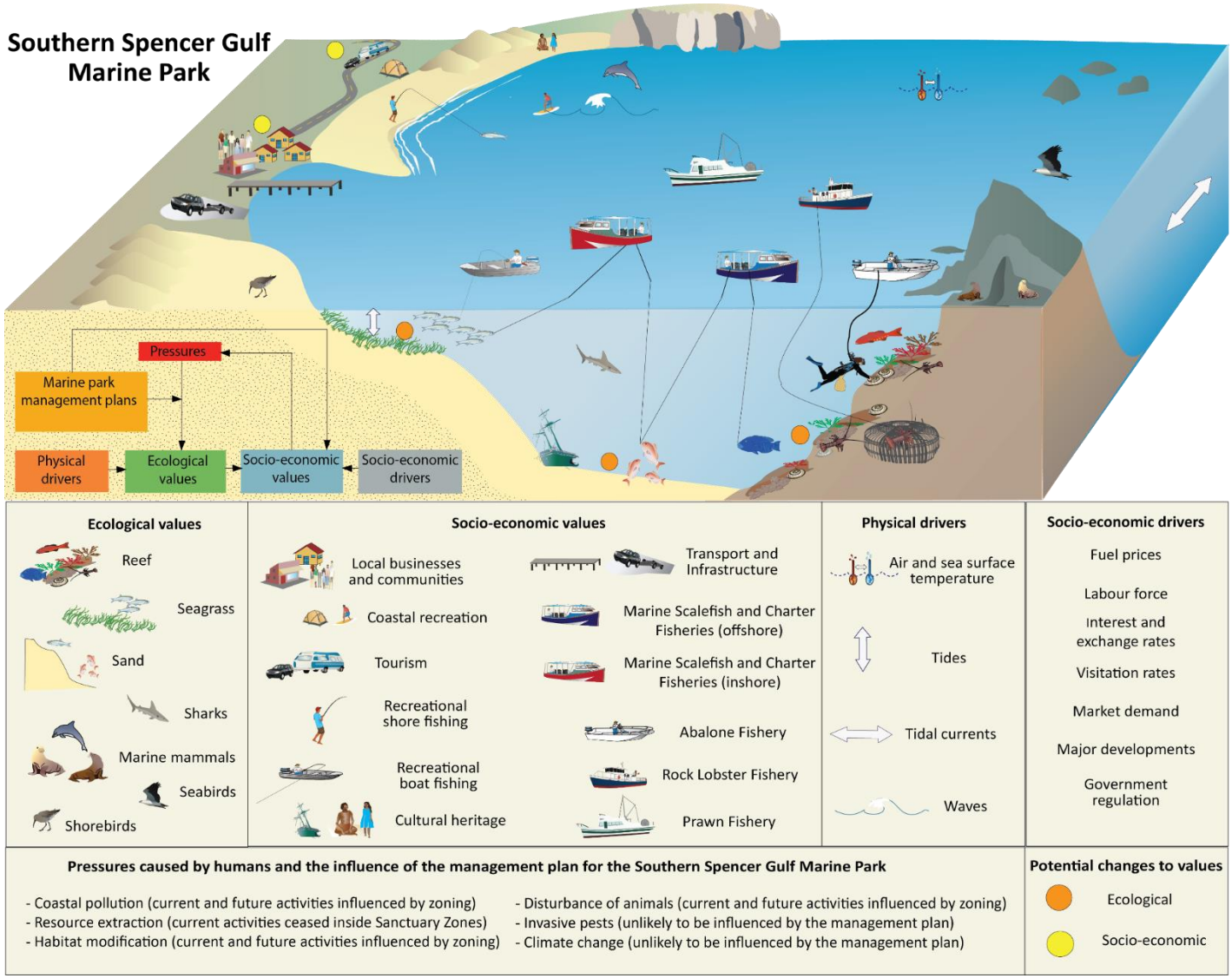
Source: APPENDIX 9

Figure 3-36 Southern Spencer Gulf Marine Park, habitat map



Source: APPENDIX 9

Figure 3-37 Southern Spencer Gulf Marine Park, conceptual model



Source: APPENDIX 9

3.13.2 Economic, social and environmental values of the Southern Spencer Gulf Marine Park sanctuary zones

Chinaman's Hat Sanctuary Zone (SZ-1) and Restricted Access Zone (RAZ-1)

81 km²

MPLAG advice: extends the majority supported MPLAG zone inshore to meet the YP coast and to the east.

The Chinaman's Hat SZ is the only SZ off Yorke Peninsula in this marine park. It protects a corridor from the mainland out to sea and includes an offshore island. This zone represents a diversity of habitats and associated species for this region.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This SZ represents a variety of habitats including near-shore rocky reefs (platforms, ledges, boulders and caves), seagrass beds and soft-bottom habitats extending from the coast to 30m deep. The shoreline includes a coarse sand beach, coastal cliffs and bedrock platforms	**Important features:** The Zone lies adjacent to existing protected area Innes National Park on Yorke Peninsula establishing a protected corridor between the land and sea. Seal Island: haul out for Vulnerable Australian sea lions, breeding colony of New Zealand fur seals, nesting site for Fairy terns and Little penguins, two reef monitoring sites. The inshore reefs of Yorke Peninsula and Seal Island provide habitat for resident reef fish species including the western blue groper and the harlequin fish. The reefs support a high species diversity of red macroalgae comparable with the diverse nutrient rich upwelling regions. The habitats in this zone have high species diversity of fish. The reefs in the area contain the uncommon coralline red algal species Amphiroa gracilis. Ascidian species that are either endemic or uncommon to SA (Leptoclinides sp. 3; Eudistoma constrictum) have been recorded at Chinamans Hat Island. Chinmans Hat Island and Seal Island have reported breeding colonies of Little Penguins.	**Commercial fisheries:** The NZRL, Sardine and Charter Boat fisheries used the SZs within the Southern Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn, Marine Scalefish and Central Zone Abalone fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $165,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	This zone has been designed to accommodate shore fishing along Chinaman's Beach (with an SPA located there) and to avoid all popular recreational fishing locations around the toe of Yorke Peninsula

Orcades Bank Sanctuary Zone (SZ 2)

63 km²

MPLAG advice: Consistent

The Orcades Bank SZ protects an offshore reef system and recognised King George Whiting spawning ground. This zone is the only zone in the middle of Investigator Strait.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Rocky reef at -10 to -30m and soft-bottom habitats	**Important features:** Undulating hills of limestone reef with 10-15m relief colonised by algal forests and schooling and site attached fish species. Recognised spawning ground for King George whiting	**Commercial fisheries:** The NZRL, Sardine and Charter Boat fisheries used the SZs within the Southern Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn, Marine Scalefish and Central Zone Abalone fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $165,000.	Minimal impact on recreational fishing Strong community support for this zone

		Based on the habitat mapping available for this park, it is likely that a relatively small proportion of the displaced catch came from this SZ.	
Waterfall Creek Sanctuary Zone (SZ3) **1km²** **MPLAG advice:** Minority MPLAG support for this zone, and for larger versions of this zone *The Waterfall Creek SZ conserves a representative sample of reef habitat and associated species from the North Coast of Kangaroo Island. It provides a complementary protective corridor from the land to sea.*			
Environmental Values		**Economic Values**	**Social and Cultural Values**
CAR Habitats represented: The Kangaroo Island shoreline in this Zone is dominated by high cliffs with a boulder beach at the eastern end. The near-shore environment consists of fringing rocky reefs with soft-bottom habitats extending offshore.	**Important features:** Known habitat for reef attached fish such as Western blue groper and Harlequin fish, as well as Leafy Seadragons. The vulnerable white-bellied sea eagle nests on a rocky outcrop along the shore Existing reef monitoring site within the zone Adjacent to Western River Wilderness Area forming a protected corridor from land to sea.	**Commercial fisheries:** The NZRL, Sardine and Charter Boat fisheries used the SZs within the Southern Spencer Gulf Marine Park previously. There was minimal use by the SG Prawn, Marine Scalefish and Central Zone Abalone fisheries. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $165,000. Based on the habitat mapping available for this park and the relatively small size of this SZ, it is likely that a relatively small proportion of the displaced catch came from this SZ.	Minimal impact on recreational fishers

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, DEWNR 2015a, Lothian 2005, Rumbelow et al. 2010, Scientific Working Group 2011, Shepherd et al 2009.

3.14 Lower Yorke Peninsula Marine Park

3.14.1 Park Description

The Lower Yorke Peninsula Marine Park covers 855 square kilometres within the GSV Bioregion (Figure 3-38). The Lower Yorke Peninsula Marine Park is located around the heel of Yorke Peninsula (Figure 3-1), from Point Davenport Conservation Park to near Stansbury, and includes Troubridge Island. There are 2 SZs (about 8 per cent of the total park area), 1 HPZ (about 77 per cent), and 1 GMUZs (about 14 per cent, Figure 3-38). The Lower Yorke Peninsula Marine Park accommodates various marine industries including shipping, commercial fishing, tourism, charter boats and aquaculture. There are two SPAs for harbour activities, one located off Port Giles and the other situated between Wool Bay and Stansbury. An SPA for anchoring is located next to the Coobowie Bay Aquatic Reserve (Figure 3-38). The ports at Klein Point and Port Giles lie outside the park boundary.

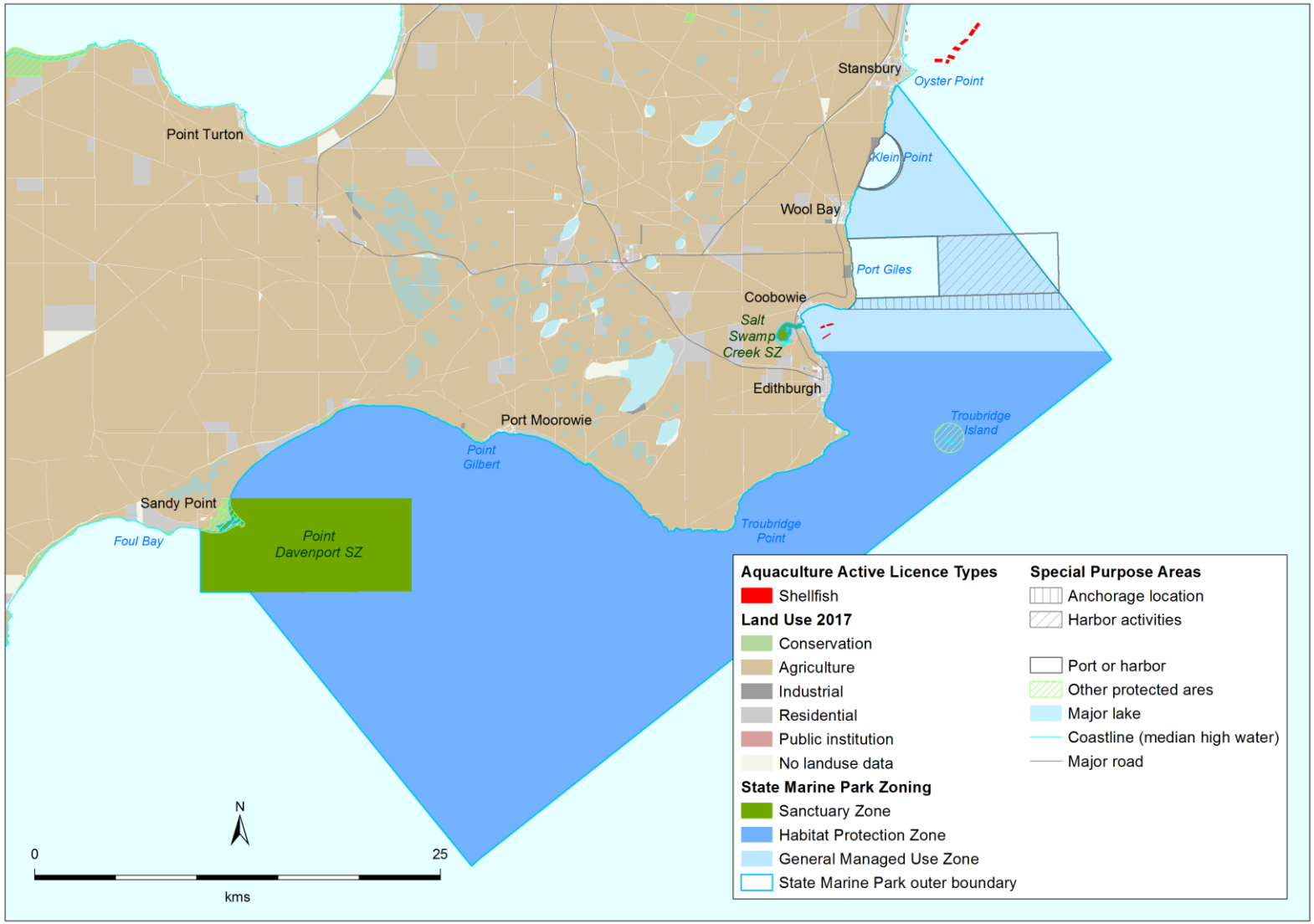
The Lower Yorke Peninsula Marine Park is adjacent to agricultural lands and a number of small coastal towns. The largest inland centre is Yorketown. This marine park also overlays Coobowie Bay and Troubridge Hill Aquatic Reserves, Troubridge Island Conservation Park and partially overlays Point Davenport Conservation Park (Figure 3-38). The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-39 and Figure 3-40 respectively.

About 36 per cent of the benthic habitats of the Lower Yorke Peninsula Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (Figure 3-39).

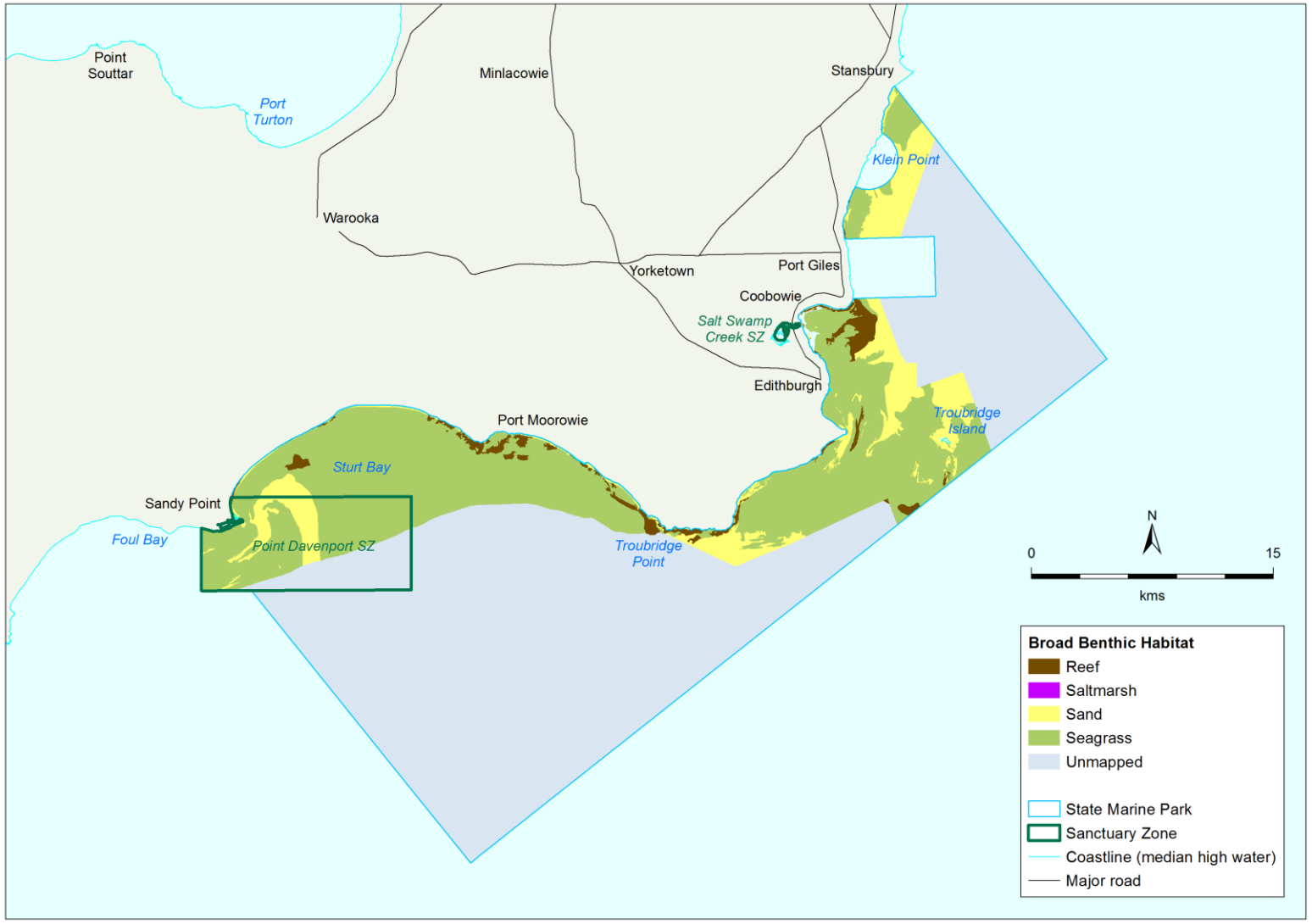
Section 3.14.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-38 Lower Yorke Peninsula Marine Park, land uses map



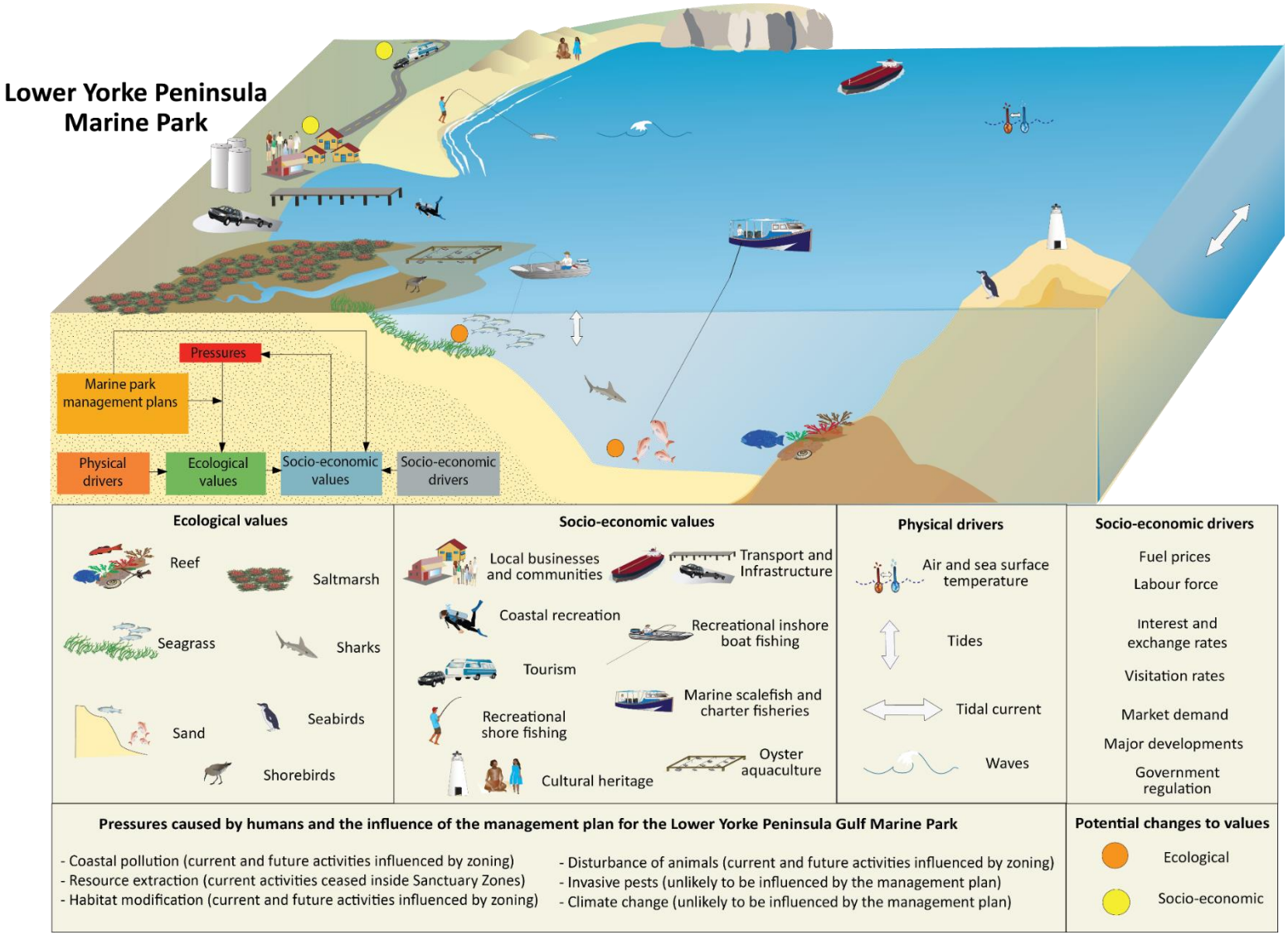
Source: APPENDIX 9

Figure 3-39 Lower Yorke Peninsula Marine Park, habitat map



Source: APPENDIX 9

Figure 3-40 Lower Yorke Peninsula Marine Park, conceptual model



Source: APPENDIX 9

3.14.2 Economic, social and environmental values of the Lower Yorke Peninsula Marine Park sanctuary zones

Point Davenport Sanctuary Zone (SZ-1)

71 km²

MPLAG advice: Unanimous MPLAG support for a smaller zone, not extending as far into Sturt bay

The Point Davenport SZ conserves estuary and seagrass habitats. It provides a protective corridor from land to sea..

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented The Point Davenport estuary which includes flood plains and saltmarsh habitat. Shoreline is dominated by coarse sandy beaches plus intertidal seagrass inside the estuary mouth Transition from estuary to the sea including shallow seagrass, soft-bottom habitat and pockets of deep seagrass (at 10 to 30m deep).	**Important features:** The Point Davenport estuary provides important nursery habitat for numerous fish species. The SZ lies adjacent to the Point Davenport Conservation Park, establishing a protected corridor between land and sea. The Port Davenport Conservation Park is a rare stranded tidal lagoon and a wetland of national importance. Important for resident and migrating wader species	**Commercial fisheries:** There was minimal use by the Marine Scalefish, Charter Boat and Central Zone Abalone fisheries of the SZs within the Lower Yorke Peninsula Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $10,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	The SZ was designed to avoid important recreational fishing locations in Sturt Bay

Salt Swamp Creek Sanctuary Zone (SZ 2)

1 km²

MPLAG advice: Consistent

The Coobowie Inlet SZ conserves important nesting and feeding grounds for shorebirds. The SA overlays part of the existing Coobowie Aquatic Reserve..

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Inlet dominated by an intertidal algal flat surrounded by saltmarsh and mud flats	**Important features:** The saltmarsh 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. Recorded Fairy tern breeding site	**Commercial fisheries:** The SZ was not utilised by commercial fishers prior to SZ implementation.	The SZ was designed to avoid coastal shacks and beach fishing at Coobowie

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, DEWNR 2015a, Fotheringham and Coleman 2008, Lothian 2005, Rumbelow et al. 2010, Scientific Working Group 2011.

3.15 Upper Gulf St Vincent Marine Park

3.15.1 Park Description

The Upper Gulf St Vincent Marine Park covers 950 square kilometres within the GSV Bioregion (Figure 3-1). The Upper Gulf St Vincent Marine Park lies north of a line from Parara Point to the northern end of Port Gawler Beach. The Upper Gulf St Vincent Marine Park includes 1 RAZ which covers about 9 per cent, 4 SZs (about 14 per cent), 1 HPZ (about 74 per cent) and 2 GMUZs (about 3 per cent, Figure 3-41). Shoreline fishing is allowed adjacent to Port Arthur in the Clinton Wetlands SZ. The Upper Gulf St Vincent Marine Park accommodates various marine industries including shipping, and commercial fishing. There are two SPAs for harbour activity, the first is situated adjacent Port Wakefield and Port Price and includes the Clinton Wetlands SZ and the second is adjacent to Ardrossan (Figure 3-41). The Port of Ardrossan lies outside the park boundary).

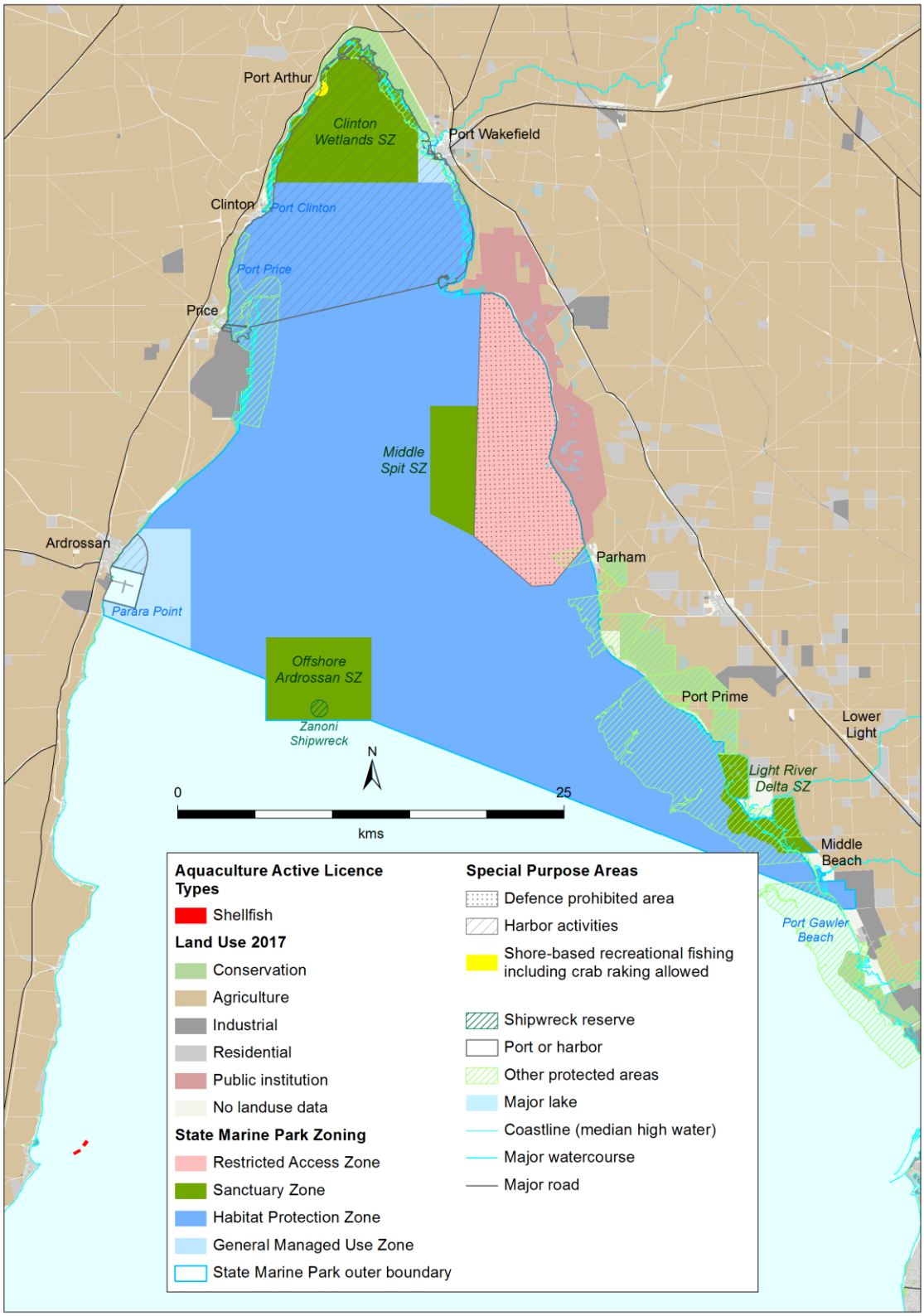
The Upper Gulf St Vincent Marine Park is adjacent to agricultural lands and a number of small coastal towns (Figure 3-41). The largest population centres are Port Wakefield and Ardrossan. The Upper Gulf St Vincent Marine Park partially overlaps Wills Creek Conservation Park and Clinton Conservation Park (Figure 4), The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-42 and Figure 3-43 respectively.

About 96 per cent of the benthic habitats of the Upper Gulf St Vincent Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (Figure 3-42).

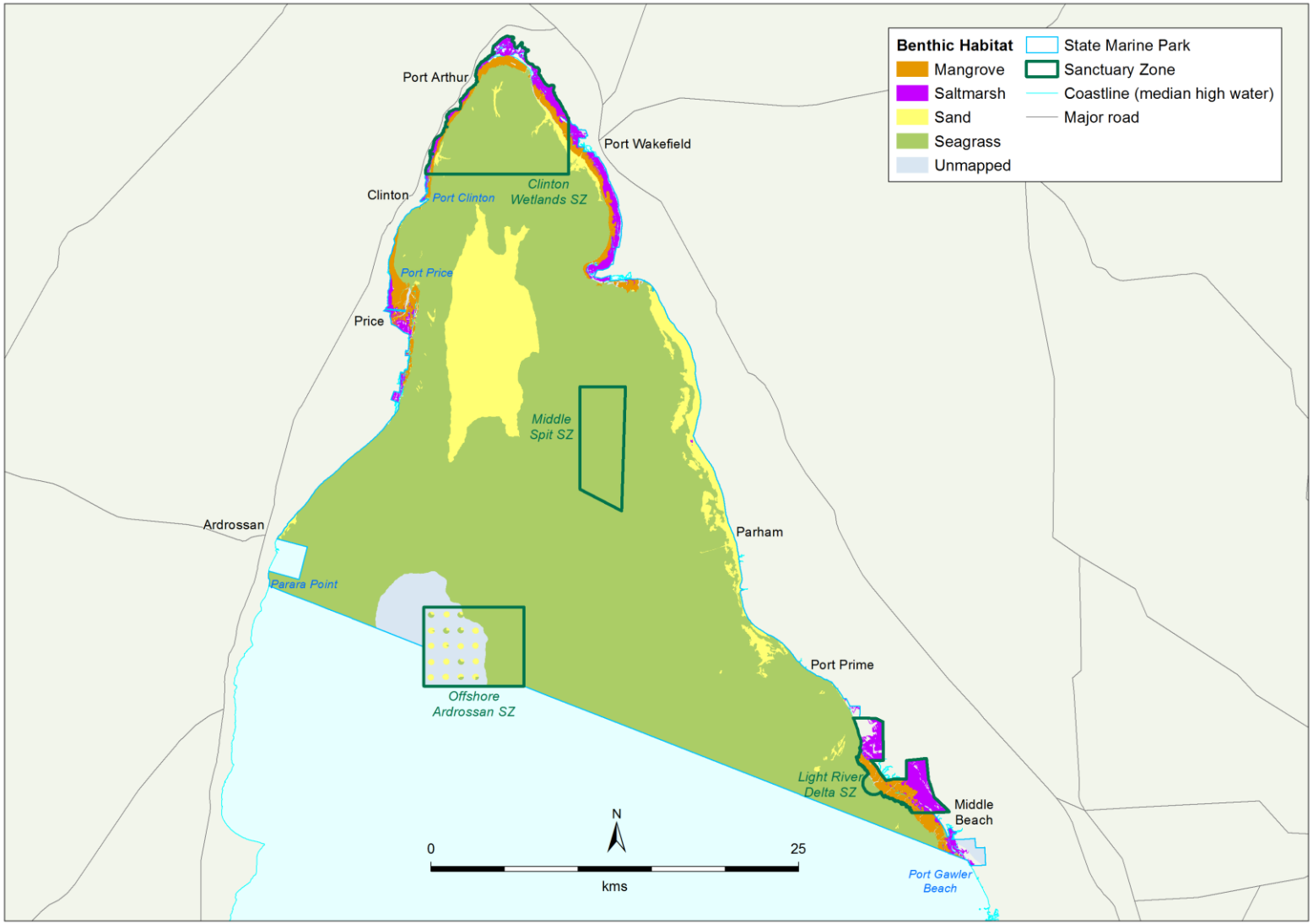
Section 3.15.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-41 Upper Gulf St Vincent Marine Park, land uses map



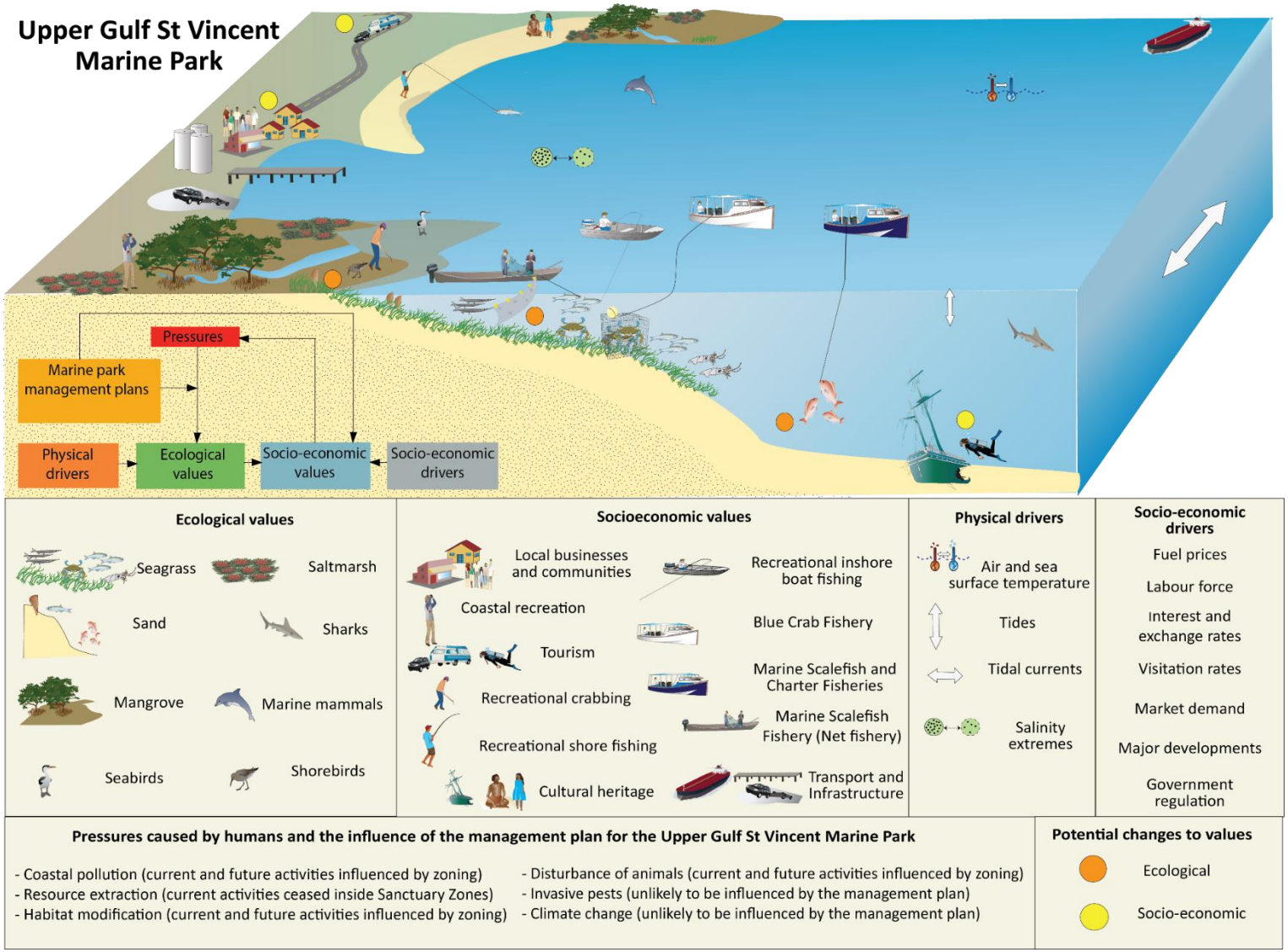
Source: APPENDIX 9

Figure 3-42 Upper Gulf St Vincent Marine Park, habitat map



Source: APPENDIX 9

Figure 3-43 Upper Gulf St Vincent Marine Park, conceptual model



Source: APPENDIX 9

3.15.2 Economic, social and environmental values of the Upper Gulf St Vincent Marine Park sanctuary zones

Clinton Wetlands Sanctuary Zone (SZ 1)

59 km²

MPLAG advice: There was majority MPLAG support for a smaller zone in this location parallel to the eastern shore of the gulf.

The Clinton Wetlands SZ conserves important nursery habitats for fish and crustaceans. Includes significant undisturbed saltmarsh and provides a protective corridor from land to sea.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This zone represents 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:** 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.	**Commercial fisheries:** 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 $485,000, 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).	The Zone was designed to provide for recreational crab and beach fishing at Port Arthur with a SPA located there.

Middle Spit Sanctuary Zone and Restricted Access Zone (SZ 2, RAZ 1)

110 km²

MPLAG advice: Consistent

The Middle Spit SZ adjoins the existing Defence Prohibited Area which was overlaid with a RAZ. It conserves important nursery habitat for fish and crustaceans.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented The shoreline in the RAZ is comprised mainly of shell grit beaches fronted by intertidal sand flats and seagrass with a small amount of mangrove at the northern extent of the zone.	**Important features:** The mangrove and seagrass habitats provide an important nursery, breeding and feeding habitat for blue swimmer crabs, western king prawns, whiting, garfish, snapper and numerous other species.	**Commercial fisheries:** The MSF was the principal fishery that previously used the Upper Gulf St Vincent marine park with some minor use by the Blue Crab and Charter Boat Fisheries.	A Kaurna peoples' Aboriginal Native Title Claim exists over the coastline of the Defence Prohibited Area Minimal impact to recreational fishing

The seaward extent of the zones is dense shallow seagrass meadows to 10m deep.	The saltmarsh, mangrove and intertidal habitats located adjacent to the Defence Prohibited Area 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. Habitat for the uncommon and endemic Magpie Fiddler Ray. Seagrasses in this zone provide important habitat for pipefish, weedfish and cardinal fish.	Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Clinton Wetlands SZ) is estimated to be approximately $86,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of this remaining displaced catch came from this SZ.	
Offshore Ardrossan Sanctuary Zone (SZ3) **37km²** **MPLAG advice:** Consistent *The Offshore Ardrossan SZ includes the shipwreck the Zanoni and conserves an important spawning area for snapper.*			
Environmental Values		**Economic Values**	**Social and Cultural Values**
CAR Habitats represented: Seagrass beds and soft-bottom habitats Unmapped habitats located in waters up to 20m deep.	**Important features:** This Zone includes the deepest waters of the park towards the centre of the gulf. The zone extends the marine park boundary to include the Zanoni Shipwreck Reserve which is a popular dive site. The Zone contains a significant spawning area for snapper. The Zanoni has been described as a haven for many forms of marine life, including, schools of snapper and trevally, various rays and sharks species and various species of soft corals and sponges.	**Commercial fisheries:** The MSF was the principal fishery that previously used the Upper Gulf St Vincent marine park with some minor use by the Blue Crab and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Clinton Wetlands SZ) is estimated to be approximately $86,000. Based on the habitat mapping available for this park, it is likely that that a significant proportion of this remaining displaced catch came from this SZ.	The Zone was designed to avoid popular recreational fishing areas adjacent to Ardrossan.
Light River Delta Sanctuary Zone (SZ4) **16km²** **MPLAG advice:** Consistent *The Light River Delta SZ conserves regionally uncommon mixed freshwater/saltwater habitat. It protects important saltmarsh, mangrove and seagrass habitats which provide nursery and feeding grounds for a range of birds and a fish.*			
Environmental values		**Economic values**	**Social and Cultural values**
CAR Habitats represented: The zone is dominated by intertidal habitats from saltmarsh flats to mangroves to intertidal seagrass Sheltered mixed sand beaches and bare sand flats are found at the northern extent of the zone. The zone includes the mouth of the Light River estuary	**Important features:** Mangroves and saltmarshes surrounding the Light River Delta are one of the most ecologically intact systems in the State. Saltmarsh habitats support significant populations of the nationally and state listed vulnerable plant – the bead glasswort. This area is recognised as a wetland of national importance. The saltmarsh, mangrove and intertidal habitats provide important nesting and feeding grounds for resident and migratory shorebirds The mangrove and seagrass habitats provide an important nursery, breeding and feeding habitat for blue swimmer crabs,	**Commercial fisheries:** The MSF was the principal fishery that previously used the Upper Gulf St Vincent marine park with some minor use by the Blue Crab and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this marine park excluding the focus SZ (Clinton Wetlands SZ) is estimated to be approximately $86,000. Based on the habitat mapping available for this park, it is likely that relatively little of this remaining displaced catch came from this SZ.	The Zone was designed to avoid popular recreational fishing grounds adjacent to Port Prime and Middle Beach

	western king prawns, whiting, garfish, snapper and numerous other species. High tidal range producing a large intertidal zone. The Light River Delta is a regionally uncommon habitat of mixed freshwater/saltwater wetland, providing habitat for both freshwater and saltwater species and plants. The Light River Delta is considered to be one of the few key habitats for the Samphire Thornbill.		

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Fotheringham and Coleman 2008, Lothian 2005, Rumbelow et al. 2010, Scientific Working Group 2011.

3.16 Encounter Marine Park

3.16.1 Park Description

The Encounter Marine Park covers 3,119 square kilometres of the GSV and Coorong Bioregions (Figure 3-1). It extends from southern metropolitan Adelaide waters around the Fleurieu Peninsula and past the Murray Mouth to the Coorong coast. At its western boundary, the marine park includes all waters of Backstairs Passage and the eastern shores of Kangaroo Island. There are 11 SZs, which cover about 9 per cent, 7 HPZs (about 61 per cent), 7 GMUZs (about 30 per cent) and 1 RAZ (less than 1 per cent, Figure 3-44). Shoreline fishing is allowed in the Port Noarlunga Reef and the Encounter Bay SZs. There are 6 SPAs for harbour activities situated adjacent to Rapid Bay, Cape Jervis, Kingscote, Penneshaw, Victor Harbor and American River. An SPA for submarine cables and pipelines is situated near Cape Jervis and extends to Kangaroo Island. An SPA for Murray Mouth Dredging is situated adjacent to Mundoo Island (Figure 3-44).

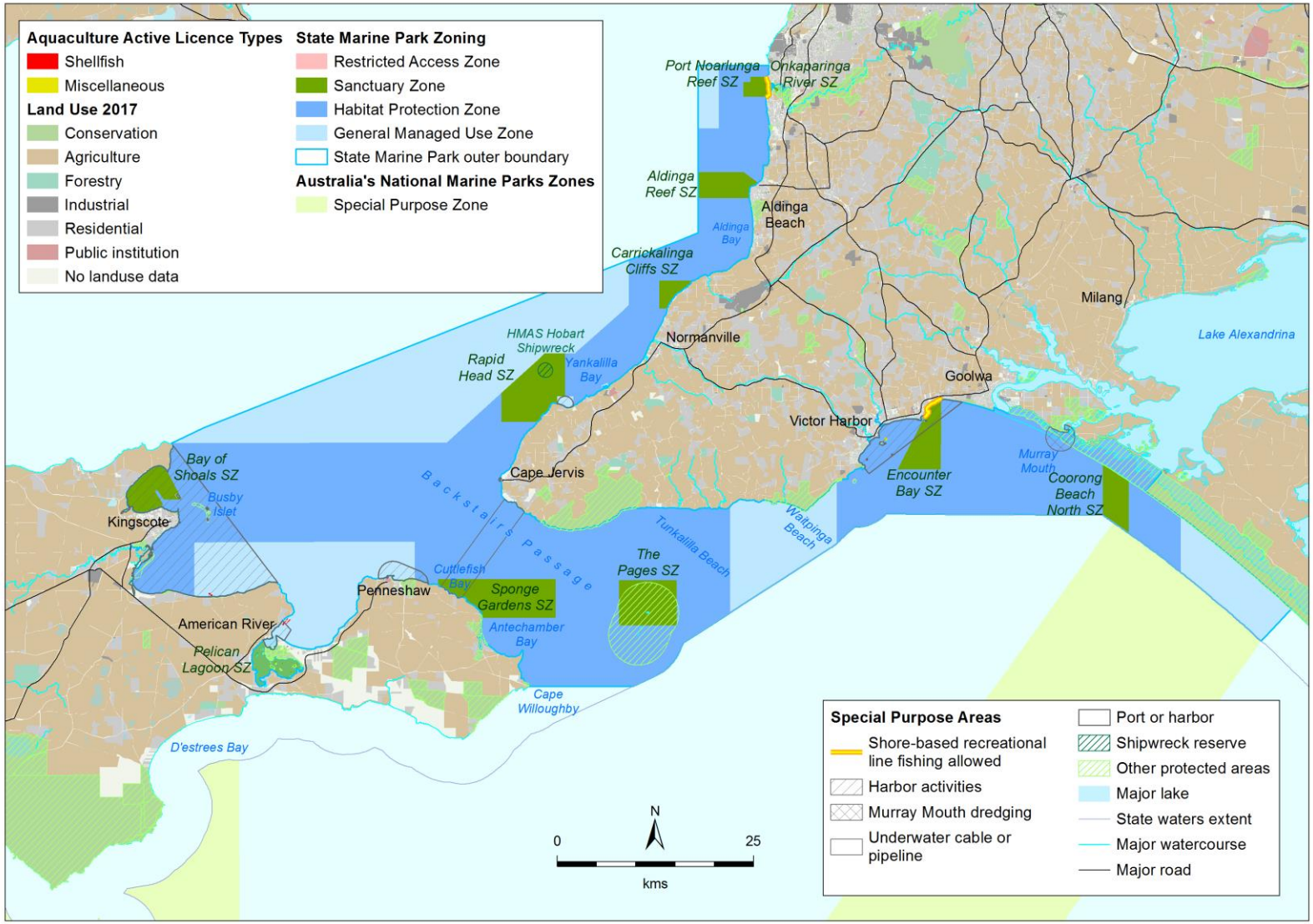
Land use adjacent to the Encounter Marine Park includes agricultural and residential. The largest population centres are Noarlunga, Aldinga and Victor Harbor. The Encounter Marine Park marine park overlaps or is adjacent to a number of other protected areas, including the Coorong National Park; Beatrice Islet, Busby Islet, Cape Willoughby, Deep Creek, Baudin, Lashmar, Newland Head, Pelican Lagoon, Pullen Island, West Island, Nepean Bay, Moana Sands and the Pages Islands Conservation Parks and the Granite Island and Onkaparinga River Recreation Parks (Figure 3-44). The Aldinga Reef and Port Noarlunga Aquatic Reserves overlap the marine park. This region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres in the GSV Region and 28,850 gigalitres in the Coorong Region (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-45 and Figure 3-46 respectively.

About 14 per cent of the benthic habitats of the Encounter Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 17 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-45).

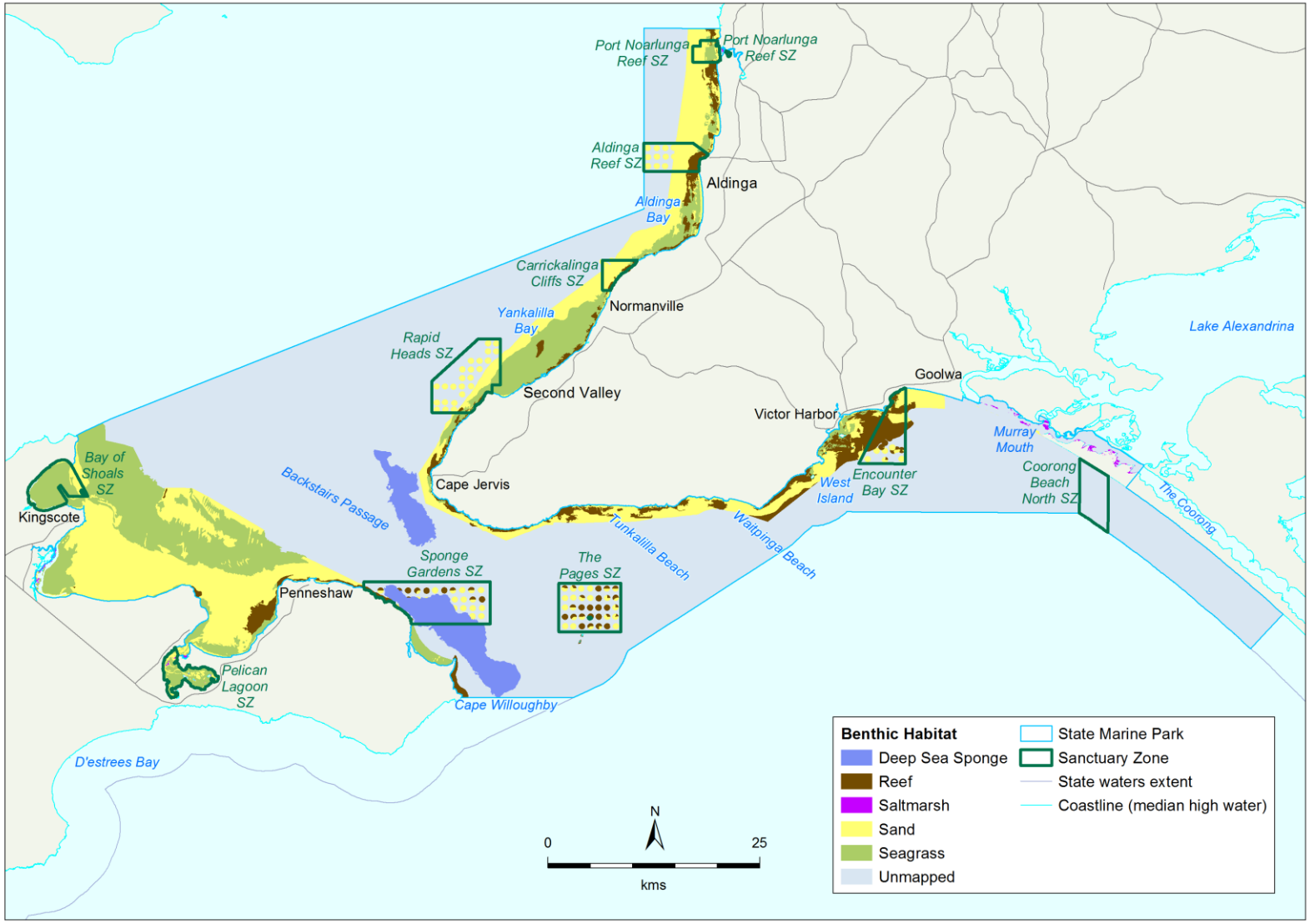
Section 3.16.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-44 Encounter Marine Park, land uses map



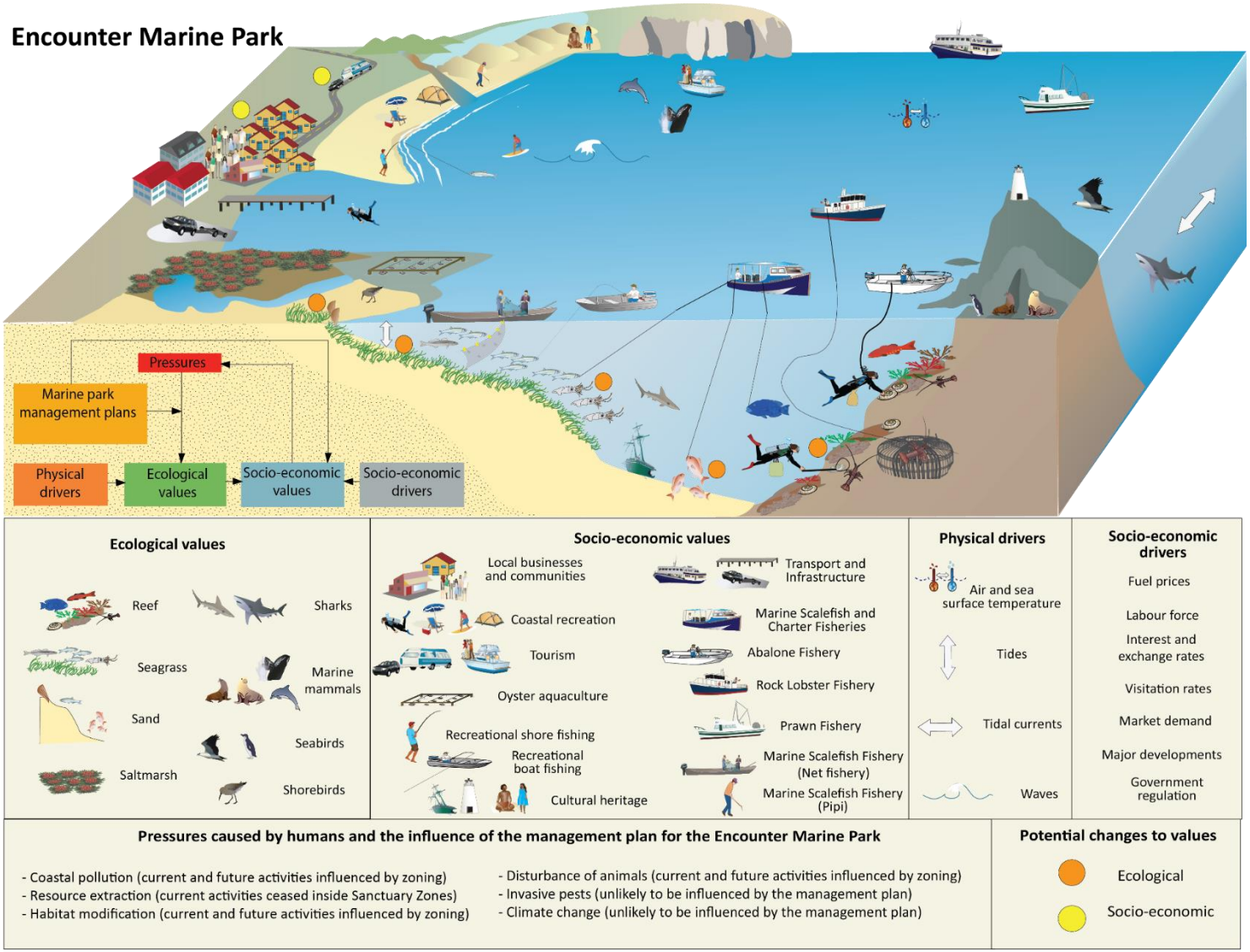
Source: APPENDIX 9

Figure 3-45 Encounter Marine Park, habitat map



Source: APPENDIX 9

Figure 3-46 Encounter Marine Park, conceptual model



Source: APPENDIX 9

3.16.2 Economic, social and environmental values of the Encounter Marine Park sanctuary zones

Onkaparinga Wetland Sanctuary Zone (SZ 1)

Less than 1 km²

MPLAG advice: Consistent with MPLAG advice (majority support), with some dissenting views.

Onkaparinga Wetland SZ includes part of an important samphire wetland and estuary that is habitat for a range of birds and a fish nursery.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented The predominant habitats found in the lower Onkaparinga River estuary include samphire flats, intertidal seagrass and algal beds.	**Important features:** Regionally significant estuarine habitat. This area is a breeding and nursery area for many commercially and ecologically significant fish species. It is also an important resting and feeding region for birds such as black swans, spoonbills, black wing stilts, dotterels and cormorants. The samphire habitat within the Onkaparinga Estuary is the only example of this community type south of Adelaide along the eastern shores of GSV.	**Commercial fisheries:** No previous use of this SZ by commercial fisheries. **Tourism** Walking trails allow visitors to view the birdlife.	No impact on recreational fishing. This zone provides an educational nature experience where birds, wetlands and estuaries can be studied. Within a Native Title Claim area.

Noarlunga Reef Sanctuary Zone (SZ 2)

7 km²

MPLAG advice: No final advice provided. Subsequent community advice informed the draft zoning proposal, which was finalised through public consultation on draft management plans.

Noarlunga Reef SZ protects South Australia's most popular scuba diving location. An aquatic reserve was established in 1971 in the area and the Zone extends the protected area seaward while still allowing fishing from the jetty and beach.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The zone is characterised by a barrier limestone reef complex. It is semi-exposed and deeper on the seaward side and has shallower sheltered waters on the landward side. This area also contains seagrass meadows between 5 and 15m deep. Sandy seafloor inshore and some shallow seagrass protected by the reef.	**Important features:** A significant barrier reef system. Strongly influenced by discharges from the Onkaparinga River. Only soft-sediment, large macro algae beds at medium depths in SZs in Encounter Marine Park. Focus site for marine park monitoring program, with historical baseline information.	**Commercial fisheries:** The MSF, Charter Boat, NZRL and Central Zone Abalone fisheries previously used some of the SZs within the Encounter Marine Park. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs) is estimated to be approximately $54,000. Based on the habitat mapping available for this park, it is likely that a small proportion of this remaining displaced catch came from this SZ. **Tourism** Supports tourism and diving industries	Noarlunga Reef SZ protects South Australia's most popular scuba diving location. An aquatic reserve was established in 1971 in the area and the Zone extends the protected area seaward while allowing fishing from the jetty and beach. Overlays part of Port Noarlunga Reef and Onkaparinga Estuary Aquatic Reserves. Popular near Adelaide location for beach and marine recreation and tourism. Important snorkelling and scuba diving destination, including diver training. Site of 12-stop underwater trail. Focus site for Reef Watch citizen science program. Aquatic education classes conducted by the Port Noarlunga Aquatic Centre. A SPA provides for shore-based recreational line fishing.

			Fishing from Port Noarlunga jetty and the artificial tyre reef not affected. Within a Native Title Claim area. Connects people with nature through recreation and tourism.

Aldinga Reef Sanctuary Zone (SZ 3)

22 km²

MPLAG advice: Consistent with MPLAG advice (majority support), with some dissenting views.

Aldinga Reef SZ includes one of the best scuba diving sites near Adelaide. Aldinga Reef Aquatic Reserve has protected the reef from all extractive activities since 1971.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: Inshore rocky reefs and offshore soft-bottom in depths to 30m. Significant reef 'drop-off' and abundant marine life. Sandy beaches with small sections of cliffs fronted by rock platforms.	**Important features:** Protected from extractive activities for over 40 years. Scientific research demonstrates high diversity and abundance of marine life compared with other non-protected reefs in the region. Overlays aquatic reserve and extends protected area seaward. Home to many species of reef fish including western blue devil and harlequin fish. Focus site for marine park monitoring program, with historical baseline information available. The drop-off area of the reef habitat supports a rich and abundant sessile fauna, such as sponges, and also gorgonians and other invertebrate groups Aldinga reef is one of few sites where the toxic sponge *Neofibularia mordens* is found. Reefs in the area have been reported to be used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leatherjacket species, Snook, Western Blue Groper, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks.	**Commercial fisheries:** The MSF, Charter Boat, NZRL and Central Zone Abalone fisheries previously used some of the SZs within the Encounter Marine Park. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs) is estimated to be approximately $54,000. Based on the habitat mapping available for this park, it is likely that a proportion of this remaining displaced catch came from this SZ.	Iconic scuba diving destination. Focus site for citizen science with intertidal monitoring site established by the Flinders University. Adelaide and Mount Lofty Ranges NRM Board and Reef Watch and a subtidal monitoring site for Reef Life Survey established by the University of Tasmania. Accommodates recreational fishing outside the zone. Within a Native Title Claim area. Aldinga Reef SZ includes one of the best scuba diving sites near Adelaide. Aldinga Reef Aquatic Reserve has protected the reef from all extractive activities since 1971. Focus site for the longstanding collaborative reef monitoring project involving several universities and state government agencies across the southern coast of Australia. Highly valued by the local community, scuba divers and scientists.

Carrickalinga Cliffs Sanctuary Zone (SZ 4)

8 km²

MPLAG advice: Multiple MPLAG proposals received. Final zone taken from majority MPLAG advice, with refinements tested by public consultation.

The Carrickalinga Cliffs SZ includes shallow reefs fringing visually spectacular cliffs. Research has shown the site supports the highest diversity of reef fish recorded anywhere in southern Australia.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented: High coastal cliffs and headlands with rocky shorelines and fringing deep reefs.	**Important features:** Only example of a semi-sheltered rocky shoreline inside GSV Reefs at this location support an unusually high diversity of fish species.	**Commercial fisheries:** The MSF, Charter Boat, NZRL and Central Zone Abalone fisheries previously used some of the SZs within the Encounter Marine Park.	Provides for popular recreational fishing around Myponga, off Carrickalinga beach and Yankalilla Bay. Popular site for kayaking, snorkelling and scuba diving. Within a Native Title Claim area.

Platform reefs and seagrass patches inshore give way to soft bottom down to 20m deep.	Focus site for marine park monitoring program, with historical baseline information available. Reefs in the area have been reported to be used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leather-jacket species, Snook, Western Blue Groper, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks.	Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs) is estimated to be approximately $54,000. Based on the habitat mapping available for this park, it is likely that a proportion of this remaining displaced catch came from this SZ.	Complements a range of recreational activities while having minimal impact on recreational fishing.

Rapid Head Sanctuary Zone (SZ 5)

50 km^2

MPLAG advice: Multiple MPLAG suggestions received. The final zone is derived from MPLAG advice (minority support), with refinements based on industry advice and tested by public consultation.

Rapid Head SZ conserves a variety of habitats and species. It provides an important ecological stepping stone linking species of the lower gulf with those of the open southern ocean coastline.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented The coastline is moderately-exposed with cliffs, rocky headlands and rocky shores. Inshore reefs give way to seagrass meadows and sandy plains. Significant deep water seagrass (up to 20 m deep).	**Important features:** Habitat for the protected leafy sea dragon. Backed by Rapid Head cliffs. Highly diverse in invertebrates. Focus site for marine park monitoring program, with historical baseline information available. Reefs in the area have been reported to be used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leatherjacket species, Snook, Western Blue Groper, Southern Calamari, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks.	**Commercial fisheries:** The Charter Boat, Marine Scalefish and GSV Prawn Fisheries were the principal fisheries that previously used the SZ. There was some minor use by the Central Zone Abalone and Blue Crab Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $71,000, principally from the Charter Boat (0.79% of fishery effort) and Marine Scalefish (0.08% of fishery effort) fisheries. Displaced catch from the Central Zone Abalone Fishery was confidential but would be minimal (less than $19,000 for the entire marine park). **Tourism** Supports recreational diving tours mianly to the Ex-HMAS Hobart shipwreck.	Provides recreational fishing around Rapid Bay Jetty and boat fishing at Yankalilla Bay. No vehicle access to most of the coastline. The Ex-HMAS Hobart Shipwreck Reserve is popular for recreational diving. Within a Native Title Claim area. Provides for most areas of importance for recreational fishing in the region.

Encounter Sanctuary Zone (SZ 6)

29 km^2

MPLAG advice: Consistent with majority MPLAG advice.

The Encounter SZ protects part of the nationally significant Encounter Bay whale aggregation area.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: The shoreline is predominantly rocky with a small section of sandy beach at the western end of the zone. Offshore habitats are rocky reefs and soft-bottom habitats across a range of depths and tidal exposures. Deeper water reefs are periodically exposed or buried by shifting sands, creating dynamic habitats.	**Important features:** Part of the *vulnerable* southern right whale aggregation area supporting annual mating and birthing activities. Pullen Island Conservation Park is an exposed granite outcrop and habitat for seabirds including Little penguins, Silver gulls and Crested terns. Focus site for marine park monitoring program, with historical baseline information available.	**Commercial fisheries:** The MSF, Charter Boat, NZRL and Central Zone Abalone fisheries previously used some of the SZs within the Encounter Marine Park. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs) is estimated to be approximately $54,000.	Bashams Beach is a whale watching hotspot supporting significant tourism. The zone was proposed by members of the Victor Harbor/Goolwa Sea Rescue Squadron and avoids important recreational and commercial fishing locations. A SPA provides for shore-based recreational line fishing. Within a Native Title Claim area.

		Based on the habitat mapping available for this park, it is likely that a proportion of this remaining displaced catch came from this SZ. **Tourism** Protects a major tourism drawcard for the region and has minimal impact on recreational fishing.	Protects a whale aggregation area of national importance as well as a range of habitats for other marine species

Coorong Beach North Sanctuary Zone (SZ7)

22 km²

MPLAG advice: MPLAG advice (majority support) recommended no SZs in the upper Coorong area, primarily due to concerns about impact on the commercial pipi fishery. Minority advice received to establish a SZ. The final zoning was developed with other advice from community and industry subsequent to the MPLAG process and was tested through public consultation.

The Coorong North SZ conserves marine habitats representative of the unique Coorong region.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented Inshore sandy seafloor in the high wave energy zone, noted for mulloway, salmon and shark species. Deeper sandy seafloor and reefs up to 30m deep.	**Important features:** Covers the full extent of state waters from low water mark Only conservation area protecting northern Coorong marine ecosystems. No northern Coorong beaches are in a SZ.	**Commercial fisheries:** The MSF, Charter Boat, NZRL and Central Zone Abalone fisheries previously used some of the SZs within the Encounter Marine Park. Historically, the total gross value of displaced catch in this marine park excluding the focus SZs (Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs) is estimated to be approximately $54,000. Based on the habitat mapping available for this park, it is likely that relatively little of this remaning displaced catch came from this SZ.	Culturally valuable to Ngarrindjeri people and is included in a Native Title Claim. Line fishing and Pipi collection are accommodated as the zone begins at low water. Public access to this Zone is limited, either via boating to the Younghusband Peninsula and then walking across dune system or by 4WD through either Tea Tree Crossing or 42 mile crossing, many kilometres to the south. Under current Coorong National Park management arrangements, this section of the ocean beach is closed to vehicle access, apart from licensed fishers working in that area, for the period Oct 24th to Dec 24th annually for the Hooded Plover breeding season. Due to limited access, recreational fishing in this area is relatively low.

Bay of Shoals Sanctuary Zone (SZ 8) and Restricted Access Zone (RAZ 1)

25 km²

MPLAG advice: Multiple MPLAG suggestions received. The final zone is derived from MPLAG advice (minority support) and tested through public consultation.

The Bay of Shoals SZ conserves a regionally significant sheltered embayment, providing important nursery habitats for a wide range of fish and other species.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Extensive seagrass meadows dominate the bay from the shoreline to 5m deep. Sand and mudflats support cockle and razorfish beds Sheltered coarse sand beach surrounds the bay.	**Important features:** Large shallow bay with natural channels protected by a tidally exposed sandbar including Busby and Beatrice Islets. Dense seagrass meadows support a range of fish and invertebrates including cryptic species like pipefish and Leafy sea dragons. Recognised nursery area for King George whiting	**Commercial fisheries:** The MSF previously used the SZ. Historically, the total gross value of displaced catch in this SZ is estimated to be $13,000 from the MSF (0.05% of fishery effort). Displaces commercial power-haul net fishing which was allowed in the Bay between 1 April and 31 December. Provides for commercial line fishing in Nepean Bay. Some commercial	Provides for popular recreational fishing around Kingscote boat ramp. Minimal impact on local recreational fishing as priority sites are accommodated.

	Busby Islet Conservation Park protects nesting seabirds and is a Wetland of National Importance. The state endangered osprey and state endangered white-bellied sea eagle nest on the southern shoreline (although the latest survey found that the sea-eagle nest had been abandoned). This zone has recorded to contain the green macroalgae *Cladophora aegagropilioidea* which reportedly has a limited range and has been listed as potentially threatened. The seagrass meadows in this zone are reported to provide habitat for spawning adult Southern Sea Garfish and Snook. Bay of Shoals is also reported to provide a nursery area for Western King Prawn and nursery and feeding areas for crabs and other crustacean species.	line fishers have indicated support for this measure, which they believe will benefit other fishing throughout Nepean Bay.	

Pelican Lagoon Sanctuary Zone (SZ 9)

16 km^2

MPLAG advice: Consistent with MPLAG advice (unanimous support).

Pelican Lagoon SZ protects a regionally significant nursery for many species and is a haven for a wide range of birds. The SZ overlays the existing Pelican Lagoon Aquatic Reserve.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented: Shallow seagrass and soft bottom habitat. Strong tidal channel provides habitat for sponges and other filter feeders. Shoreline characterised by Intertidal seagrasses, tidal flats, saltmarshes.	**Important features:** Only sheltered coastal lagoon in the Encounter Marine Park. Wetland of National Importance. Overlays and slightly extends the Pelican Lagoon Aquatic Reserve in which fishing has been restricted since 1971 Nursery habitat for numerous fished species including King George whiting, salmon and southern calamari. Site for resident and migratory seabirds and shorebirds. The state endangered osprey nests on the eastern island	**Commercial fisheries** No previous use by commercial fishing, as commercial fishing prohibited since 1971 in Pelican Lagoon Aquatic Reserve. **Tourism** Adds to Kangaroo Island's nature-based tourism assets and is highly valued by the community.	Significant tourism asset enjoyed by kayakers, bird watchers and nature lovers. No impact on recreational fishing as recreational fishing prohibited since 1971 in Pelican Lagoon Aquatic Reserve.

Sponge Gardens Sanctuary Zone (SZ 10)

60 km²

MPLAG advice: Multiple MPLAG proposals received. Final zone derived from MPLAG advice (minority support) and tested through public consultation.

Sponge Gardens SZ includes one of two deep water trenches containing gardens of huge sponges sustained by the strong Backstairs Passage currents.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented	**Important features:**	**Commercial fisheries:** The Charter Boat Fishery was the principal fishery that previously used the SZ. There was some use by the Marine Scalefish, NZRL and Central Zone Abalone Fisheries.	Avoids popular fishing areas around Penneshaw and Antechamber Bay. Recreational use is relatively low due to the strength of the currents.

Fringing reefs have been mapped along the shoreline to 10 m deep. The majority of the deeper waters of Backstairs Passage in this SZ are yet to be mapped for habitats. Shoreline consists of moderately exposed high cliffs (greater than 50m), many of which continue to drop steeply into deep water.	Only two deep water trenches (>50m) have been mapped in state waters. The zone contains a section of one trench. Sponges in these trenches grow much larger than usual, up to 1m in diameter due to the nutrient-rich fast currents moving past. A diversity of species associated with the sponge gardens including snapper, blue devil fish, brittle stars, cowries, magpie perch and rock lobster. Other filter feeding animals such as gorgonian corals, bryozoans and ascidians thrive in the fast currents adjacent to shore where they would otherwise be outcompeted by large algae such as kelp, for the light. The fringing reefs are habitat for Western Blue groper, Harlequin fish and Western Blue devils. Strong tides and currents through Backstairs Passage determine larval dispersal patterns and provide important ecological linkages in Encounter Marine Park. The steep depths and strong currents close to shore provide ideal conditions for the growth of sessile invertebrate fauna and result in distinct invertebrate dominated community types that are uncommon at the bioregional scale. A number of red macroalgal species of nationally recognised limited range have been recorded on reefs in this zone.	Historically, the total gross value of displaced catch in this SZ is estimated to be at least $152,000, principally from the Charter Boat (1.70% of fishery effort), Marine Scalefish (0.19% of fishery effort and NZRL (0.08% of fishery catch) Fisheries. Displaced catch and effort from the Central Zone Abalone Fishery was confidential but would be minimal (less than $19,000 for the entire marine park). **Tourism** Important area for local marine nature based tourism operations.	

The Pages Sanctuary Zone (SZ 11) and Restricted Access Zone (RAZ 2)

42 km^2

MPLAG advice: Consistent with MPLAG advice (minority support), with boundaries modified for ease of navigation.

The Pages SZ and RAZ protect North Pages Island, accommodating commercial and recreational fishing around the South Pages Island and Reef.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented Two discrete granite outcrops surrounded by fringing rocky reef. High coastal wave energies. Exposed offshore rocky reef systems.	**Important features:** Only offshore islands in Encounter Marine Park. Islands provide habitat for approximately one quarter of the world population of the *vulnerable* Australian sea lion, part of South Australia's third-largest breeding colony. The Pages is a recognised aggregation area for the *Vulnerable* white shark . Overlays part of the Pages Conservation Park establishing a protected corridor from the land to the sea. Reefs are reported to provide habitat for Sea Sweep and Western Blue Groper.	**Commercial fisheries** The MSF was the principal fishery that previously used the SZ. There was some use by the Charter Boat and Central Zone Abalone Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $31,000, principally from the Marine Scalefish (0.09% of fishery effort) and Charter Boat (0.20% of fishery effort) Fisheries. Displaced catch and effort from the Central Zone Abalone Fishery was confidential but would be minimal (less than $19,000 for the entire marine park).	Recreational fishing was historically low due to the remoteness of the islands and exposed offshore location, however, in recent years increasing numbers of larger recreational and charter boats are accessing the area pursuing tuna, salmon and other species. Recreational fishers can continue to fish the South Pages via commercial charter and larger private vessels.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, Baker 2009, Caton et al. 2009, Cook and Coleman 2009, Copley 1996,DEWNR 2015a, Fotheringham and Coleman 2008, Lothian 2005, Maguire and Mead 2015,Rumbelow et al. 2010, Scientific Working Group 2011, Shepherd et al 2009, Wiebkin 2011.

3.17 Western Kangaroo Island Marine Park

3.17.1 Park Description

The Western Kangaroo Island Marine Park covers an area of 1,020 square kilometres within the Eyre Bioregion (Figure 3-1). The Marine Park extends to the north and south west of the island between Cape Forbin and Sanderson Bay. There are 3 SZs, which cover about 21 per cent, and 2 HPZs (about 79 per cent, Figure 3-47). The Western Kangaroo Island Marine Park accommodates various marine industries including commercial fishing and tourism.

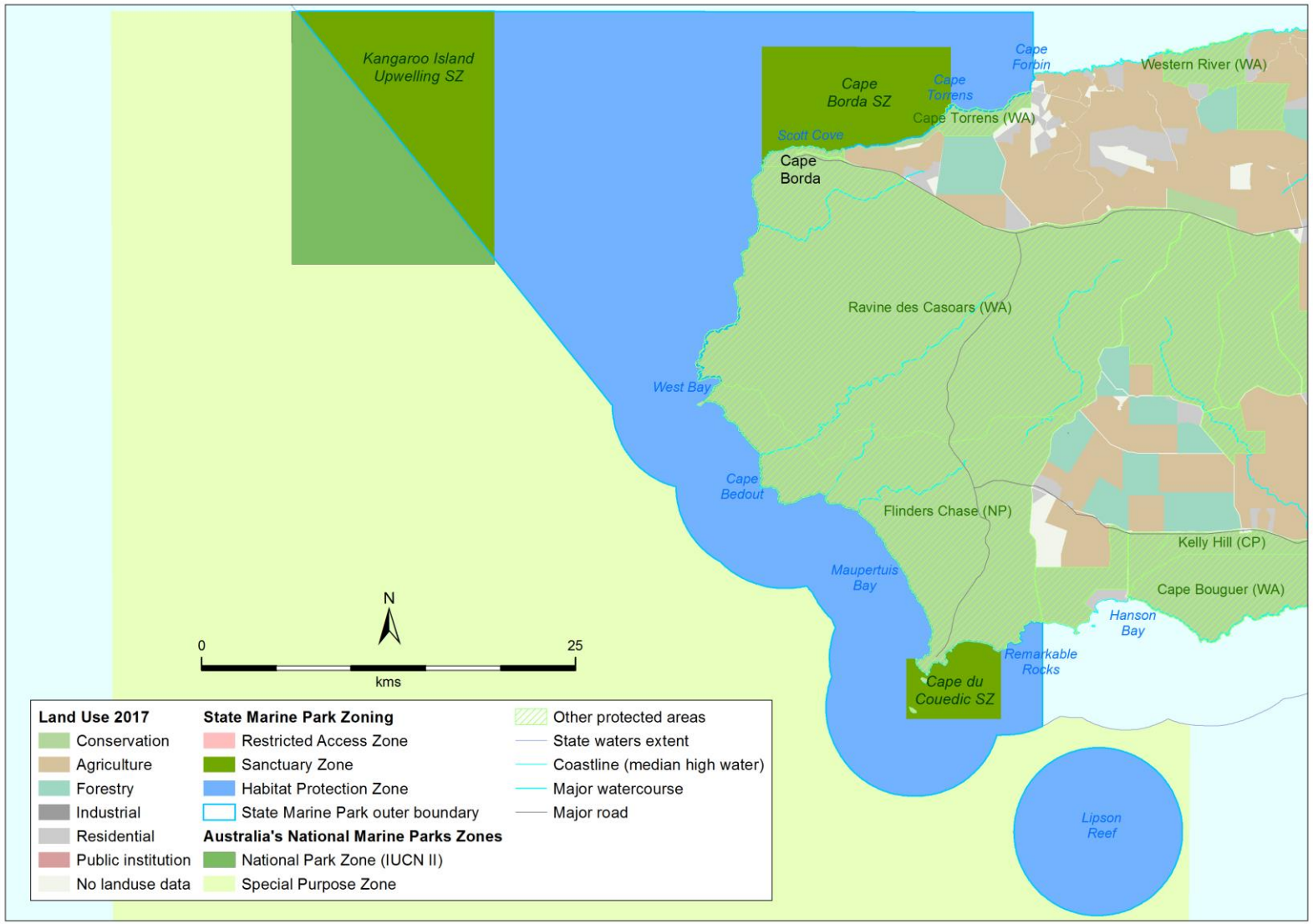
The Western Kangaroo Island Marine Park is located adjacent to a sparsely populated region dominated by conservation parks. The largest populated town centre near the Western Kangaroo Island Marine Park is Kingscote. The Western Kangaroo Island Marine Park is located adjacent to the Flinders Chase National Park and partially overlays the Ravine des Casoars and Cape Torrens Wilderness Protection Areas (Figure 3-47). The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-48 and Figure 3-49 respectively.

About 17 per cent of the benthic habitats of the Western Kangaroo Island Marine Park have been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-48).

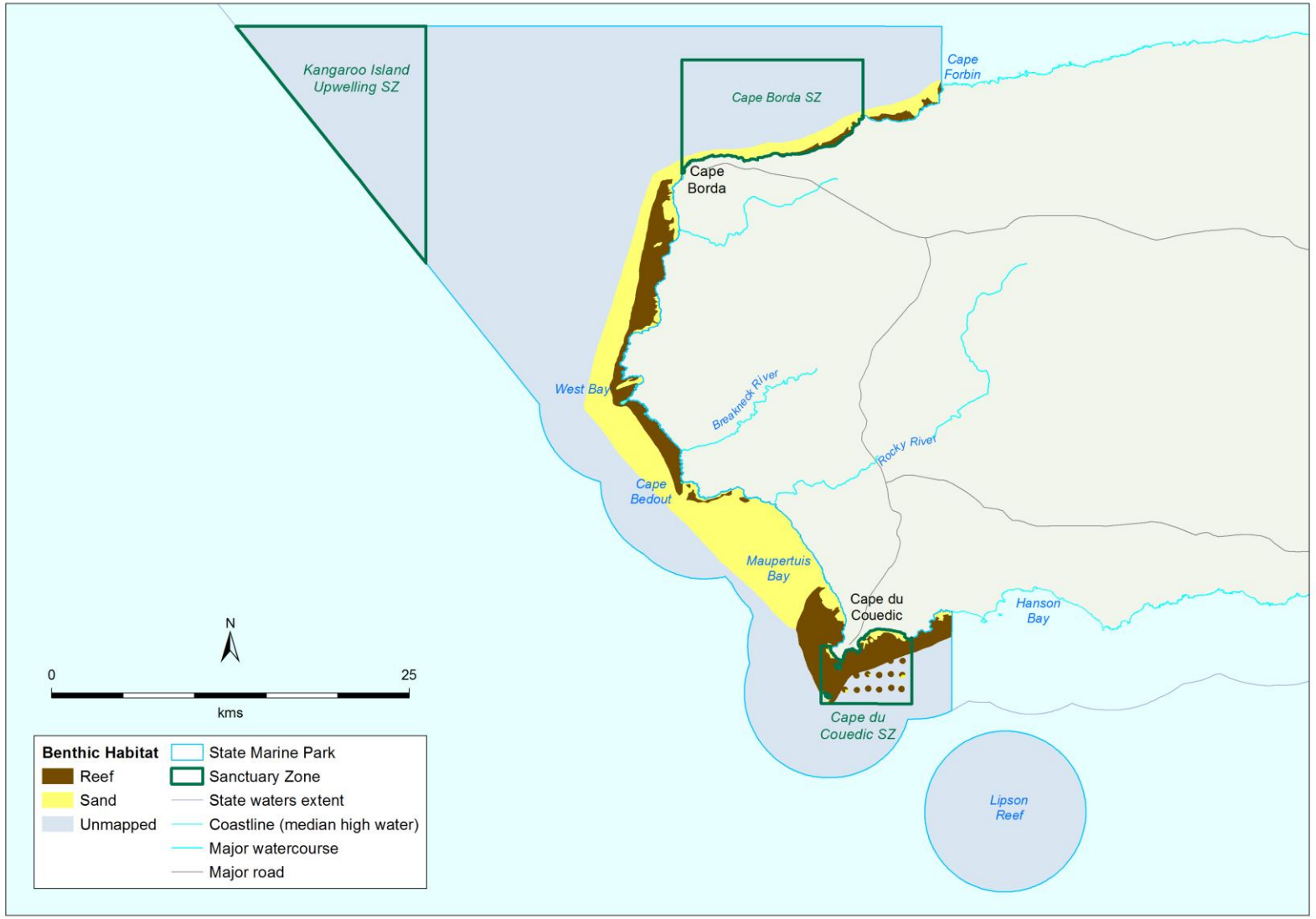
Section 3.17.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-47 Western Kangaroo Island Marine Park, land uses map



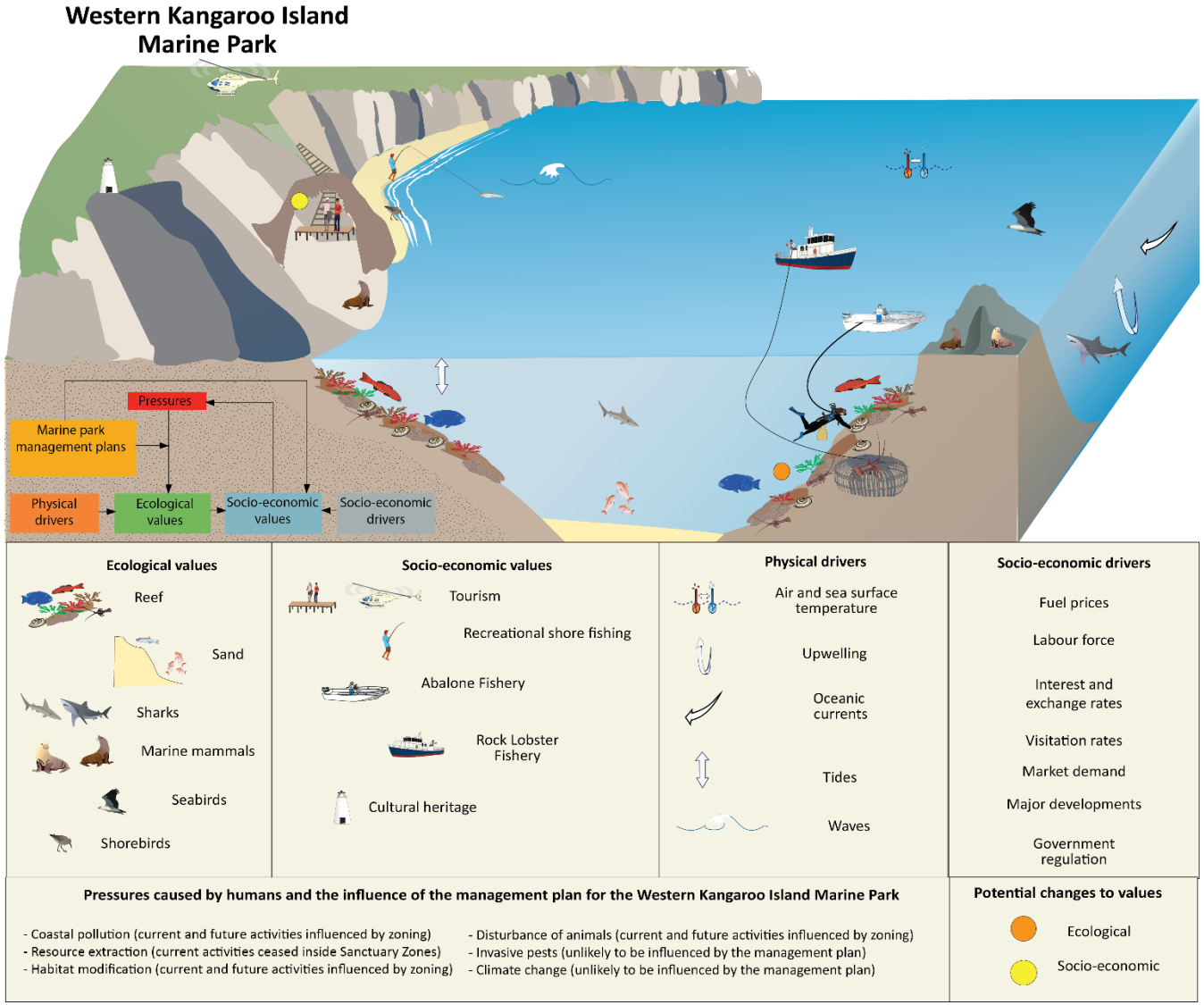
Source: APPENDIX 9

Figure 3-48 Western Kangaroo Island Marine Park, habitat map



Source: APPENDIX 9

Figure 3-49 Western Kangaroo Island Marine Park, conceptual model



Source: APPENDIX 9

3.17.2 Economic, social and environmental values of the Western Kangaroo Island Marine Park sanctuary zones

Cape Borda Sanctuary Zone (SZ 1)

82 km²

MPLAG advice: Modified from MPLAG advice (minority support) and tested through public consultation.

The Cape Borda SZ conserves threatened species habitats and near shore deep water habitats. The area is known for its outstanding natural beauty and is backed by wilderness, national parks and some of the highest coastal cliffs in Australia.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented The majority of this zone is characterised by deep water habitats (deeper than 50m) within 1 kilometre of shore. The nearshore habitat comprises of predominantly exposed bedrock platform reef backed by cliffs up to 200m high and a 700m boulder beach. Other habitats include sandy seafloors sloping steeply into deep waters.	**Important features:** The near shore reef system is important habitat for long lived site-attached fish including western blue groper, harlequin fish, and western blue devils. This site is also an important haul out area for Australian sea lion. This zone is a nesting area for the state endangered white-bellied sea eagle. Two reef monitoring sites contribute to long term monitoring. The reefs in this zone contain a high diversity of benthic macro algae, a key species in reef ecosystems.	**Commercial fisheries:** The NZRL Fishery was the principal fishery that previously used the SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $58,000, from the NZRL ($42,000), Charter Boat ($14,000), Marine Scalefish ($1,000) and Abalone ($1,000) Fisheries. Displaced catch from the Sardine Fishery was confidential but would be minimal.	This zone is adjacent to Ravine des Casoars and Cape Torrens Wilderness Areas and Flinders Chase National Park. This establishes a protected corridor from land to sea. Recreational fishing generally occurs further east and is unaffected. The area is known for its exceptional natural beauty and wilderness areas and has some of the highest coastal cliffs in Australia.

Kangaroo Island Upwelling Sanctuary Zone (SZ 2)

110 km²

MPLAG advice: Consistent with MPLAG advice (majority support).

The Kangaroo Island Upwelling SZ conserves deep open water habitats of western Investigator Strait

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented This zone encompasses deep water habitats (50m+) at the western entrance to Investigator Strait.	**Important features:** This zone is exposed to major ocean currents and strong swells. The zone receives important upwelling of cold nutrient-rich waters from beyond the continental shelf important for productivity. This area is also adjacent to a Commonwealth marine protected area SZ.	**Commercial fisheries:** The Sardine Fishery previously used the SZ. There was minimal use by the Charter Boat, NZRL and Marine Scalefish fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be $4,000 (from the Charter Boat, NZRL and Marine Scalefish fisheries).	Recreational fishing is minimal due to remoteness of this location.

Cape du Couedic Sanctuary Zone (SZ 3) and Restricted Access Zone (RAZ 3)

28km2

MPLAG advice: Modified from MPLAG advice (minority support) and tested through public consultation.

The Cape du Couedic SZ is a biodiversity hotspot within the marine parks network. Adjacent to the internationally renowned Admiral's Arch and the Flinders Chase National Park, it has outstanding conservation value and is visited by tens of thousands of tourists each year.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented:	**Important features:**	**Commercial fisheries:**	Minimal impact on recreational fishing.

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.	Complex food webs are influenced by seasonal upwelling creating a nutrient-rich environment. This zone contains highly productive near shore waters which support seabirds, fur seals, whales, abalone, rock lobster and a large diversity of fish species. This area is an Australian sea lion breeding and 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.	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 $659,000, distributed between the Abalone ($217,000), Rock Lobster ($441,000), Marine Scalefish ($2,000) and Charter Boat (confidential) Fisheries. Displaced effort from the Charter Boat Fishery was confidential but would be minimal. **Tourism** Tourism is important to Kangaroo Island's economy. Admiral's Arch and Remarkable Rocks are two of South Australia's most internationally recognised tourist drawcards. Adds significant value to nature-based tourism at Admiral's Arch and Remarkable Rocks.	Protected corridor from Flinders Chase National Park (including Casuarina Islets) to the sea. Conserves an iconic place with outstanding environmental features and biodiversity.

Sources: Baker 2004, Birdlife Australia 2015, Bryars 2003, Edyvane 1999b, Goldsworthy and Page 2009, Goldsworthy and Page 2010, Shaughnessy et al. 1994, DEWNR 2015a, Fotheringham and Coleman 2008, Lothian 2005, Middleton and Bye 2007.

3.18 Southern Kangaroo Island Marine Park

3.18.1 Park Description

The Southern Kangaroo Island Marine Park covers an area of 673 square kilometres and overlaps part of the Eyre and Coorong Bioregions (Figure 3-1). The Southern Kangaroo Island Marine Park covers the south eastern portion of the island from D'Estrees Bay to the western end of the Seal Bay Conservation Park. A separate, offshore component of the Southern Kangaroo Island Marine Park includes North Rock, Young Rock and South West Rock. There is 1 RAZ which covers about 1 per cent, 1 SZ (about 11 per cent) and 2 HPZs (about 88 per cent, Figure 3-50). The Southern Kangaroo Island Marine Park accommodates various marine industries including commercial fishing and tourism.

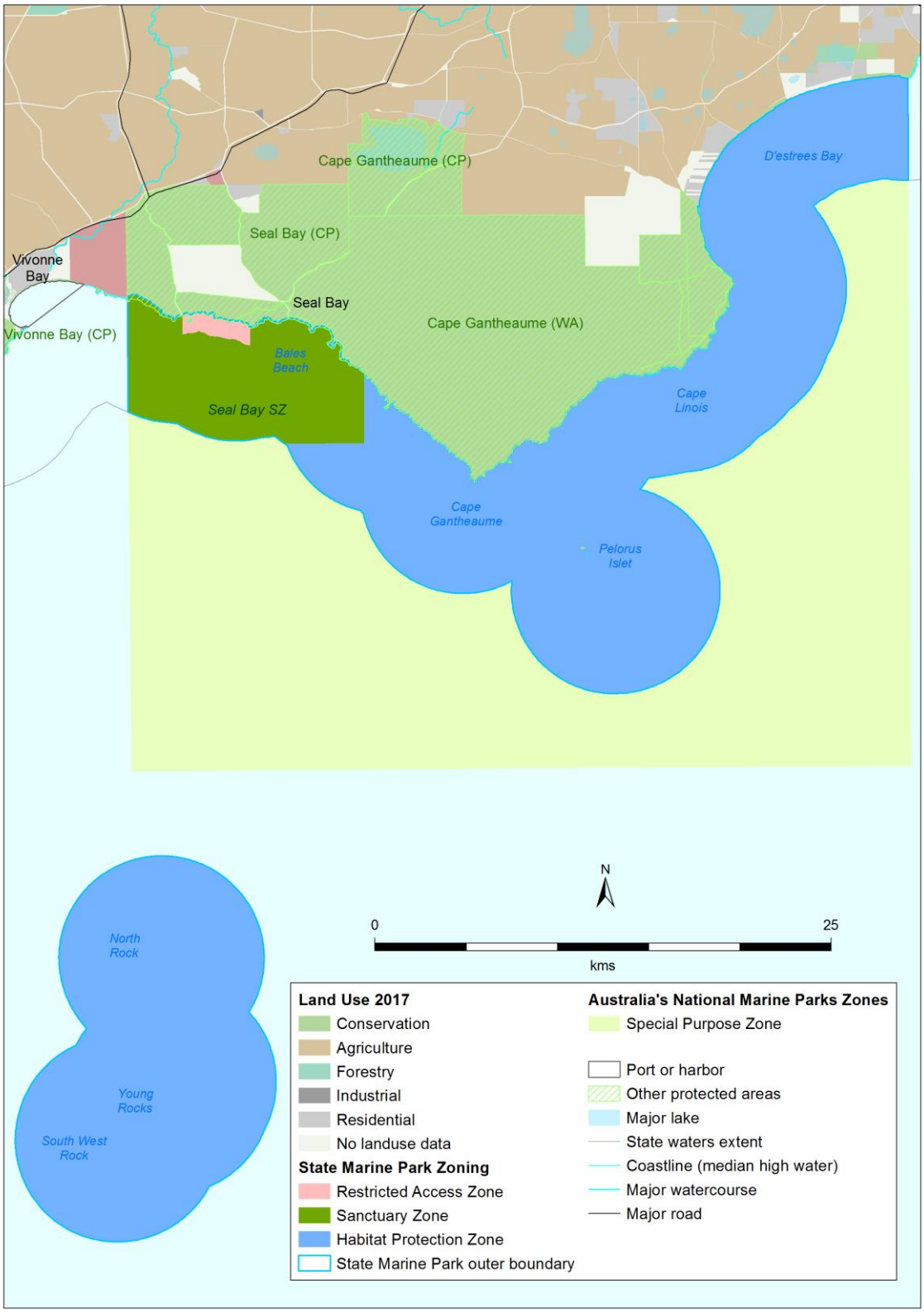
The Southern Kangaroo Island Marine Park is located adjacent to a sparsely populated region dominated by agricultural lands and conservation parks. The largest populated town centre near the Southern Kangaroo Island Marine Park is Kingscote. The Southern Kangaroo Island Marine Park is located adjacent to the Cape Gantheaume Wilderness Protection Area and Seal Bay Conservation Park (Figure 3-50). The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 760 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-51 and Figure 3-52 respectively.

About 29 per cent of the benthic habitats of the Southern Kangaroo Island Marine Park, including about two thirds of the Seal Bay SZ, have been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-51).

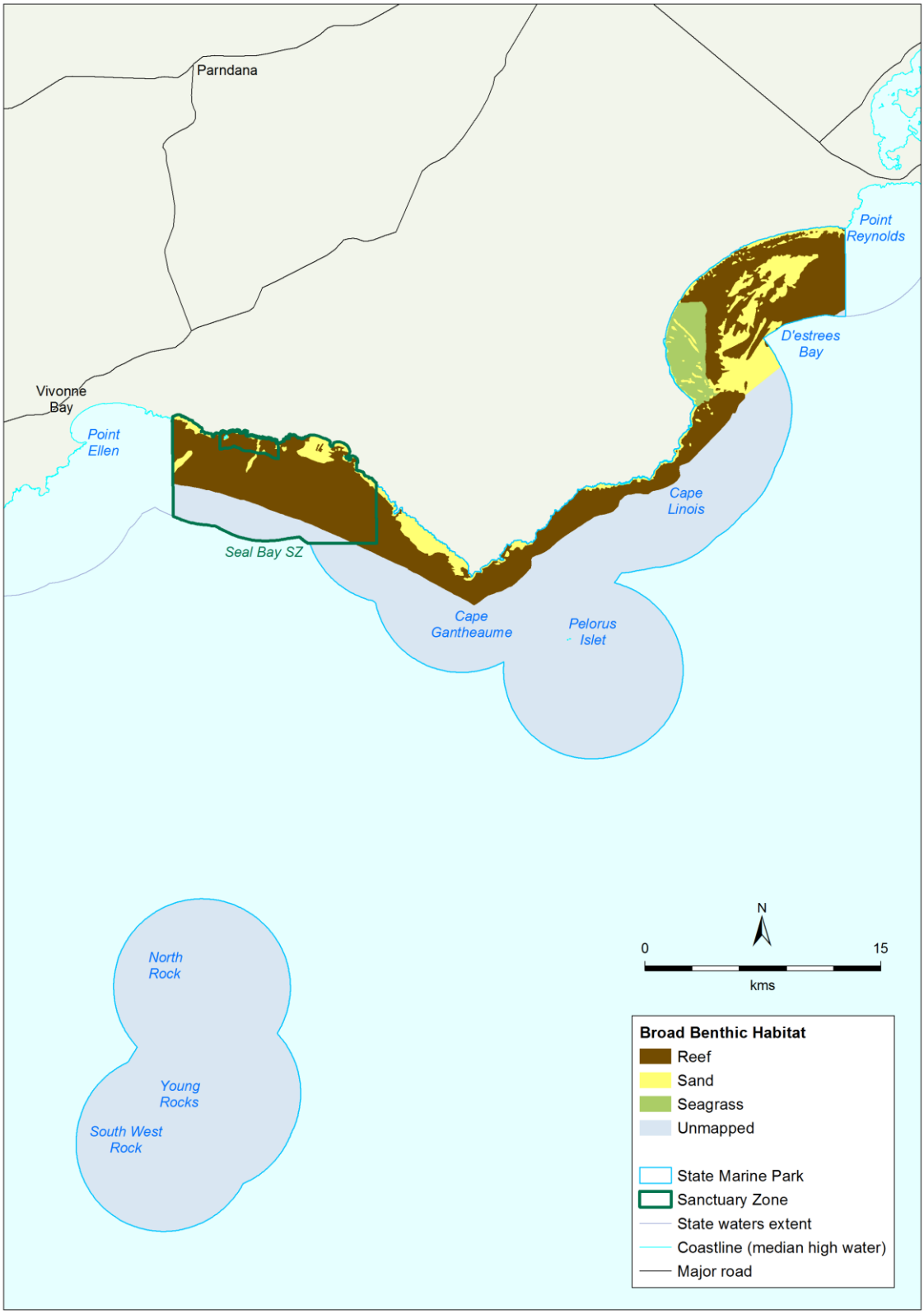
Section 3.18.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-50 Southern Kangaroo Island Marine Park, land uses map



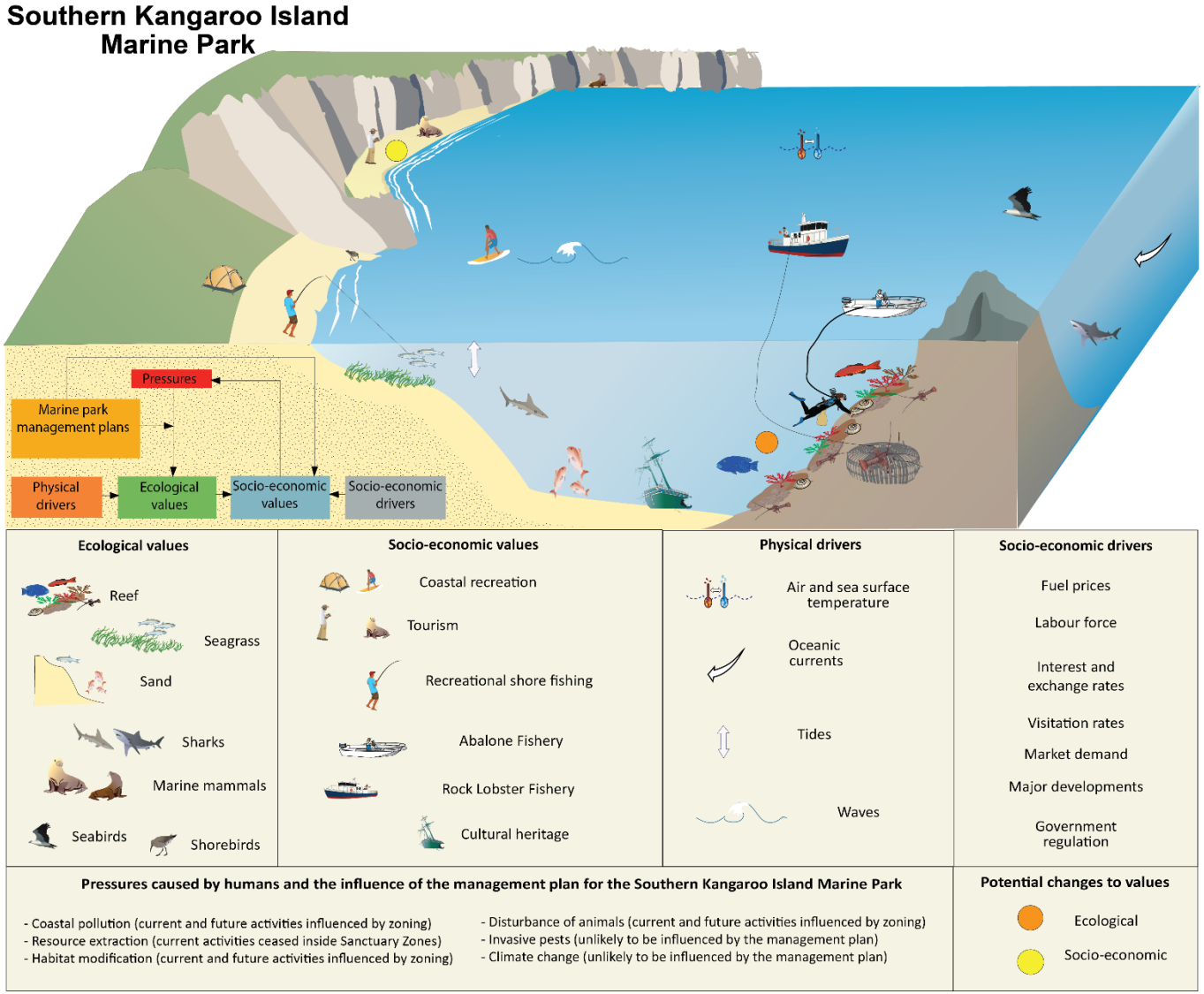
Source: APPENDIX 9

Figure 3-51 Southern Kangaroo Island Marine Park, habitat map



Source: APPENDIX 9

Figure 3-52 Southern Kangaroo Island Marine Park, conceptual model



Source: APPENDIX 9

3.18.2 Economic, social and environmental values of the Southern Kangaroo Island Marine Park sanctuary zones

Seal Bay Sanctuary Zone (SZ 1) and Restricted Access Zone (RAZ 1)

80 km²

MPLAG advice: Kangaroo Island MPLAG advice was to only overlay the existing Seal Bay and Bales Beach Aquatic Reserves

Seal Bay SZ and RAZ conserve a significant Australian sea lion colony and foraging grounds.Overlays existing Seal Bay and Bales Beach Aquatic Reserves.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This zone contains characteristic rocky reef habitats to 50m and soft-bottom habitat close to shore. Other features of the zone include exposed cliffs, sheltered bays, bedrock platforms and sandy beaches backed by dunes.	**Important features:** The 4th largest Australian sea lion breeding colony in the state is located in this zone. It is considered at high risk due to decreasing pup survival and interaction with fisheries. This zone also protects Australian sea lions as they travel between foraging grounds and the breeding colony. This zone is an important foraging ground for seabirds such as state endangered white-bellied sea eagle, white-faced storm petrel and state endangered osprey.	**Commercial fisheries** The NZRL and Central Zone Abalone fisheries previously used the SZ (outside of the existing Aquatic Reserves). There was minimal use by the MSF. Historically, the total gross value of displaced catch in this SZ is estimated to be approximately $142,000, distributed between the Abalone ($16,000), Rock Lobster ($125,000) and Marine Scalefish (less than $1,000) Fisheries. Shark gill netting is excluded from an 18km radius around Seal Bay beach. **Tourism:** Of the 148,000 overnight visitors to Kangaroo Island each year, about 70 per cent visit Seal Bay.	Adjacent to Seal Bay Conservation Park and the Cape Gantheaume Wilderness Protection Area establishing a corridor from the land to the sea. Overlays and extends Seal Bay and Bales Beach Aquatic Reserves.

Sources: Baker 2004, Birdlife Australia 2015, Edyvane 1999b, Goldsworthy and Page 2009, DEWNR 2015a, Fotheringham and Coleman 2008, Lothian 2005, Middleton and Bye 2007.

3.19 Upper South East Marine Park

3.19.1 Park Description

The Upper South East Marine Park covers an area of 906 square kilometres and overlaps both the Coorong and Otway Bioregions (Figure 3-1). The Upper South East Marine Park is divided into two sections and covers the areas 11 kilometres north of Tea Tree Crossing to the Maria Creek outlet in Kingston (Coorong bioregion), and from Wright Bay to the northern most point of Stinky Bay (Otway Bioregion). There are 3 SZs which cover about 10 per cent, 4 HPZs (about 45 per cent) and 2 GMUZs (about 45 per cent, Figure 3-53). The Upper South East Marine Park accommodates various marine industry including commercial fishing and tourism. An SPA for harbour activities is situated adjacent to Robe and includes the Cape Dombey SZ. An SPA for aquaculture is located off long beach in the Lacepede Bay SZ (Figure 3-53).

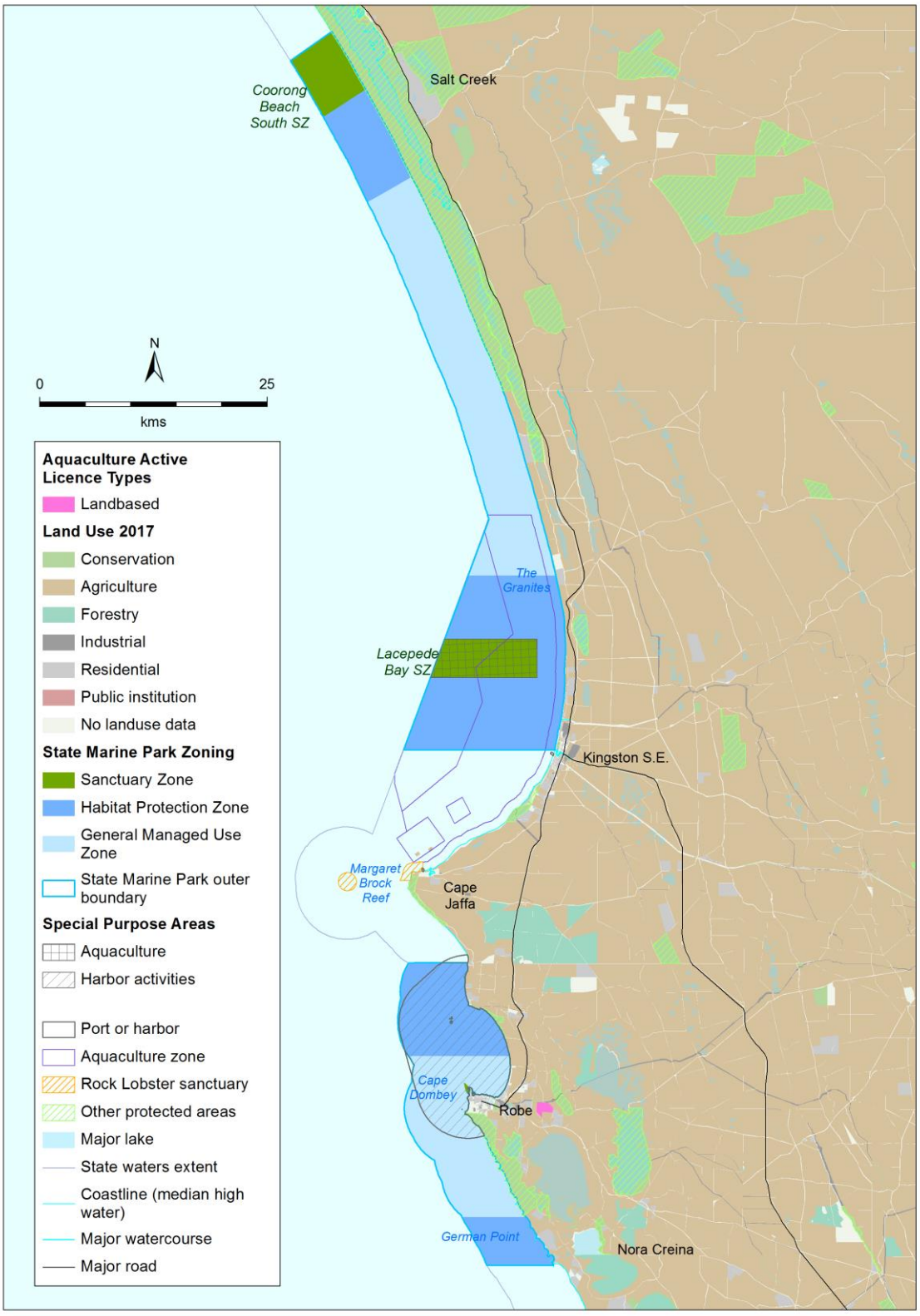
The Upper South East Marine Park is adjacent to conservation parks and coastal towns. The largest population centres are Robe and Kingston. The Upper South East Marine Park is adjacent to several land conservation areas (Figure 3-53) including the Coorong National Park, Little Dip Conservation Parks and Guichen Bay Conservation Parks, and includes the Baudin Rocks Conservation Park. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a). The annual freshwater runoff is 28,850 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-54 and Figure 3-55 respectively.

About 49 per cent of the benthic habitats of the Upper South East Marine Park Upper South East Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 10 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-54).

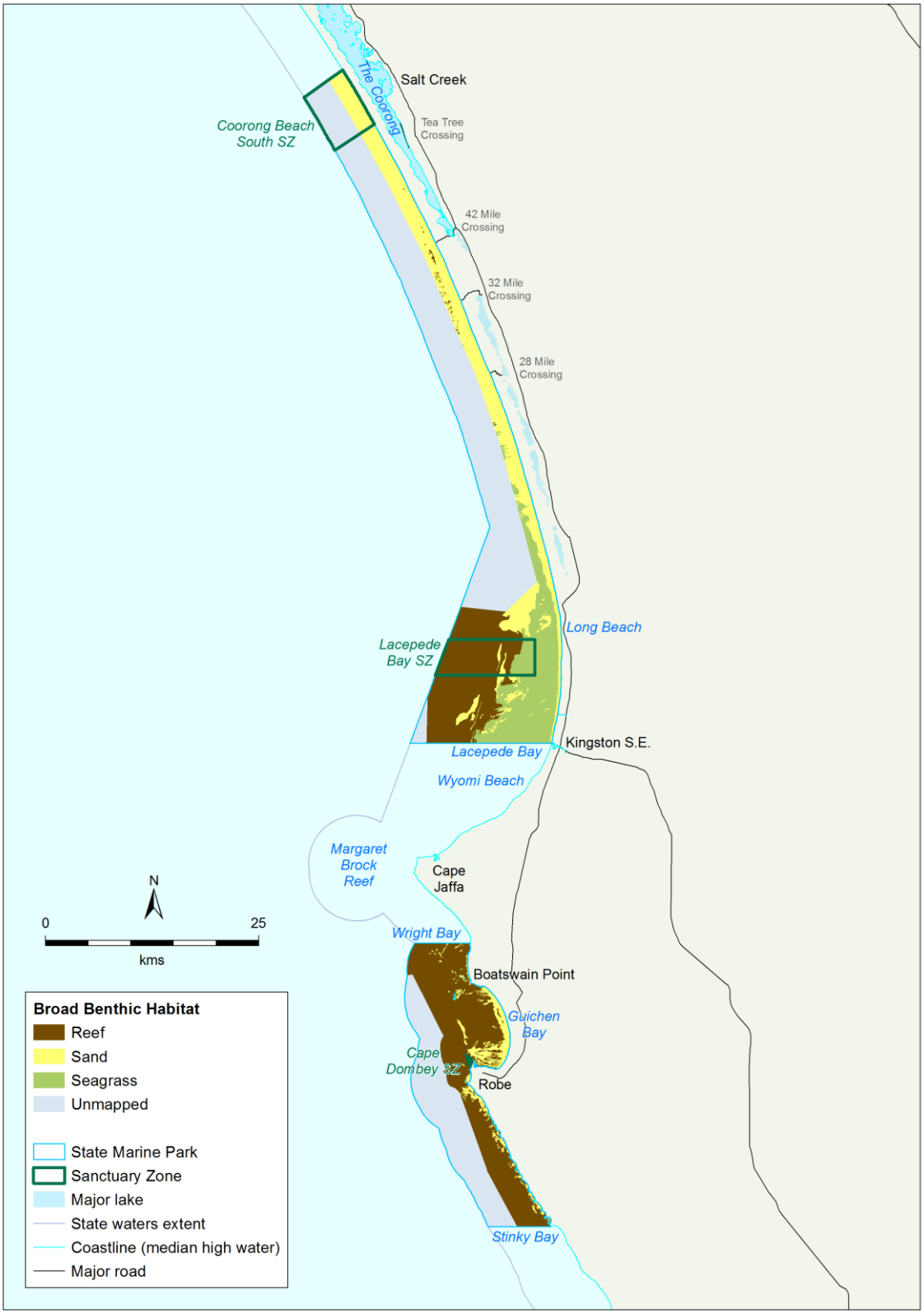
Section 3.19.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-53 Upper South East Marine Park, land uses map



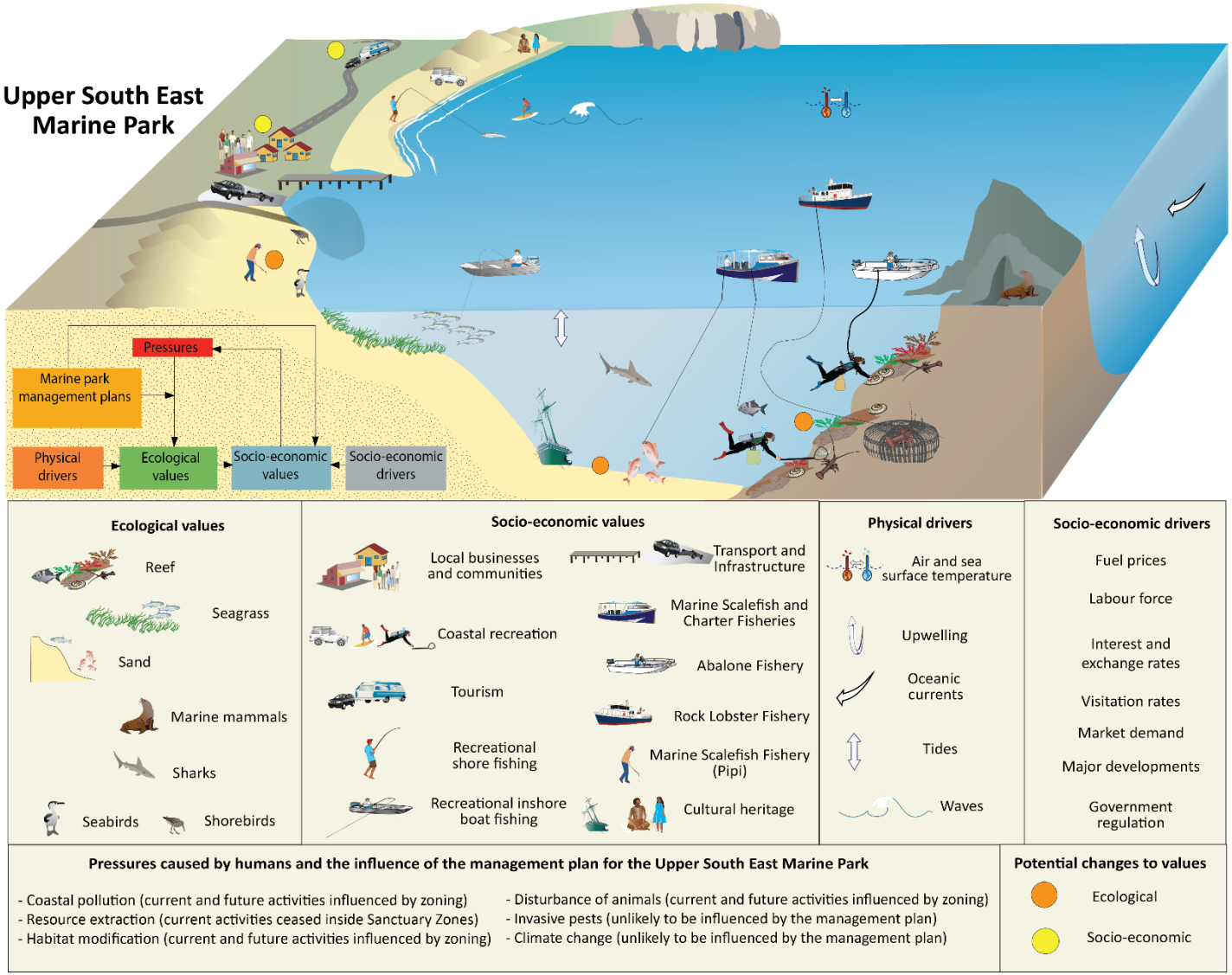
Source: APPENDIX 9

Figure 3-54 Upper South East Marine Park, habitat map



Source: APPENDIX 9

Figure 3-55 Upper South East Marine Park, conceptual model



Source: APPENDIX 9

3.19.2 Economic, social and environmental values of the Upper South East Marine Park Marine Park sanctuary zones

Coorong Beach South Sanctuary Zone (SZ 1)

40 km²

MPLAG advice: General consistency with MPLAG advice with slight variation. This zone 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 Coorong Beach SZ conserves part of one of the world's highest energy beaches.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented: This zone is predominately comprised of exposed fine-medium sand beach, soft-bottom habitat and habitats that are yet to be mapped.	**Important features:** 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. This zone protects a part of the longest continuous high energy dissipative beach in the southern hemisphere. The Zone encompasses a pathway area for Southern Right Whales.	**Commercial fisheries:** 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. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $33,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ. **Tourism:** This Zone has been designed to avoid the annual Kingston Fishing Competition.	This SZ considers the diversity of marine uses and accounts for recreational fishers by providing for shore based fishing for 4km north from Tea Tree Crossing. 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. This zone was designed to take avoid important recreational fishing locations near Tea Tree Crossing and towards 42 Mile Crossing. 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 zone is within a Native Title Claim area.

Lacepede Bay Sanctuary Zone (SZ 2)

46 km²

MPLAG advice: Consistent with undivided MPLAG advice.

The Lacepede Bay SZ conserves the only representative sample of seagrass in the South East.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented This area encompasses representative samples of variety of benthic habitats and the eco-tones between these habitats. The habitats located within this zone include: rocky reef; seagrass; soft-bottom habitat and some sea floor habitats which are yet to be mapped.	**Important features:** This SZ is important as it contains a representative sample of the only area seagrass within SZs in the Upper South East Marine Park. The seagrass meadows in Lacepede Bay are the largest meadows outside of the Gulfs and are important nursery areas for fished and non-fished marine species. The Zone falls within a known migratory route for southern right whales. This zone contains a high species diversity of benthic macro algae including regionally uncommon assemblages of marine plants.	**Commercial fisheries:** 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. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $33,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ. This SZ was designed to avoid significant commercial fishing locations near The Granites	The region is of inherent cultural value to the Ngarrindjeri and the creation of SZs will contribute to the well-being of both the region and the Ngarrindjeri people. The Coorong is of significant cultural importance to the Ngarrindjeri. This Zone is within a Native Title Claim area. This SZ was designed to avoid significant recreational fishing locations near The Granites. This Zone commences 3km off shore to accommodate shore based fishers and near shore boat fishing.

		An aquaculture zone extends over this area but no licences have been issued. A SPA (for Aquaculture) overlays the zone. **Tourism:** The Annual Kingston Lions Club Fishing Competition occurs along the Coorong Ocean beach.	
Cape Dombey Sanctuary Zone (SZ 3) <1 km² (0.4 km²) **MPLAG advice:** Consistent with majority MPLAG support. *The Cape Dombey SZ conserves a sample of the EPBC listed threatened ecological community of Giant Kelp Macrocystis.*			
Environmental Values		**Economic Values**	**Social and Cultural Values**
CAR Habitats represented: This Zone contains representative samples of medium high profile reef to 10m and exposed cliff environments	**Important features:** This zone encompasses the Giant Kelp *Macrocystis* which is listed as a threatened ecological community. High diversity of macroalgae, reef fish and invertebrates	**Commercial fisheries:** 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. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $33,000. Based on the habitat mapping available for this park and the relatively small size of this SZ, it is unlikely that a significant proportion of the displaced catch came from this SZ. The Zone is overlayed with a SPA (for Harbors).	This zone contains existing reef monitoring sites for baseline information and ongoing monitoring for Marine Park Performance Assessment. Strong community support, existing community monitoring site (pilot). Adjacent the township of Robe, excellent educational site located at a popular town lookout (The Obelisk).

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.

3.20 Lower South East Marine Park

3.20.1 Park Description

The Lower South East Marine Park covers an area of 360 square kilometres within the Otway Bioregion (Figure 3-1). It is divided into two sections, the first from Cape Buffon to Admella Beach and the second from Port MacDonnell Bay, just west of French Point, to the Victorian border. The Lower South East Marine Park includes 2 SZs (about 10 per cent of the total park area), 3 HPZs (about 41 per cent) and 2 GMUZs (about 49 per cent, Figure 3-56). The Lower South East Marine Park accommodates various marine industries including commercial fishing and tourism. An SPA for harbour activities is situated in the north of the park (Figure 3-56). The port of Port MacDonnell lies outside the park boundary. An SPA that allows shore-based recreational line fishing extends along the coastal length of the Piccaninnie Ponds SZ (Figure 3-56).

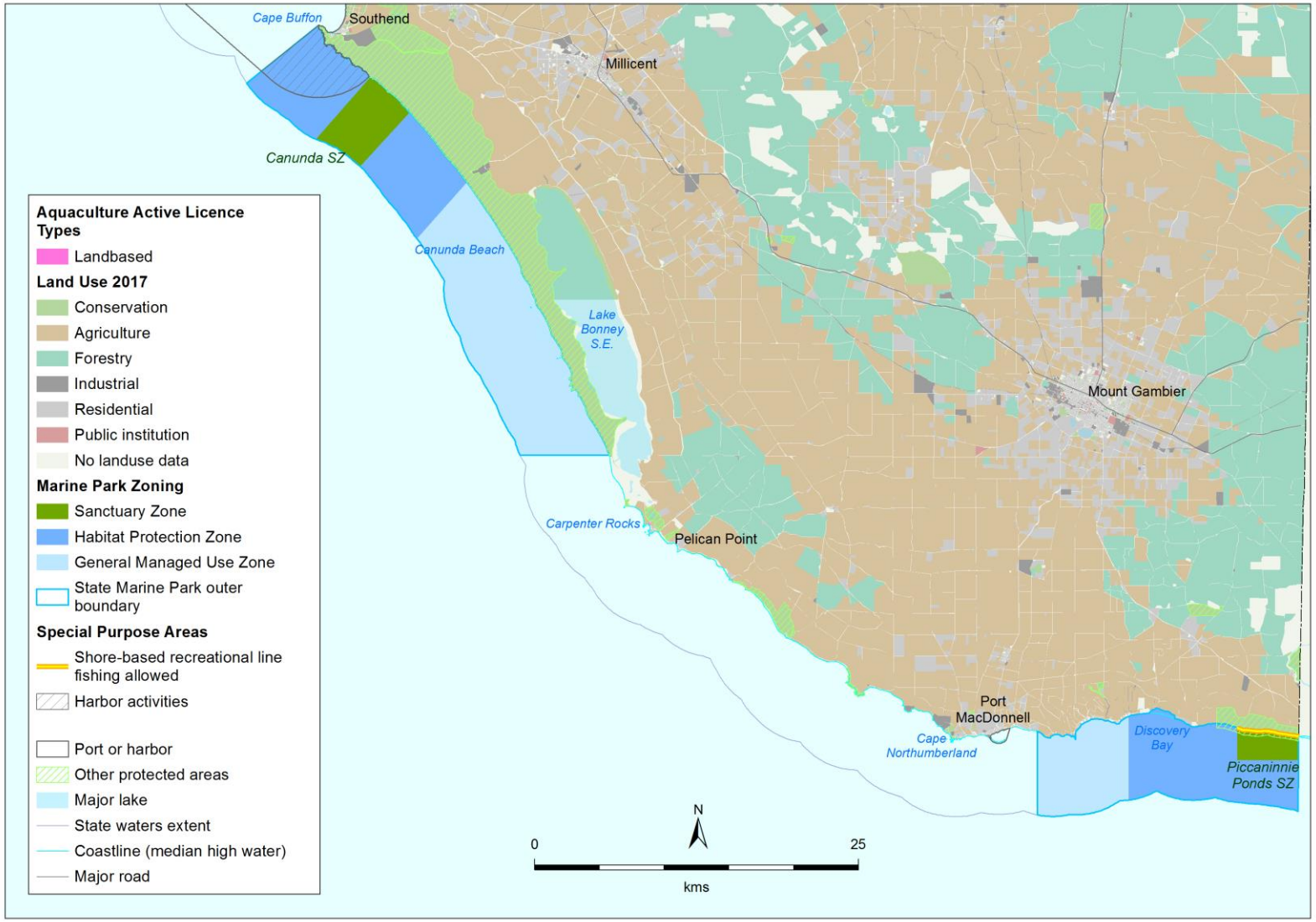
The Lower South East Marine Park is adjacent to a moderately populated area that includes agriculture and metropolitan regions (Figure 3-56). The two largest population centres are located inland at Mount Gambier and Millicent. The Lower South East Marine Park is adjacent to Canunda National Park and partially overlays the Piccaninnie Ponds Conservation Park (Figure 3-56). The sand dunes at Brown Bay are also included within the parks. The region experiences warm summers and cool winters (Bureau of Meteorology 2015a) freshwater runoff is 28,850 gigalitres (National Water Commission 2007).

As discussed in Section 3.2.1, a habitat map and conceptual model of the marine park is provided in Figure 3-57 and Figure 3-58 respectively.

About 68 per cent of the benthic habitats of the Lower South East Marine Park have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys. An additional 2 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (Figure 3-57).

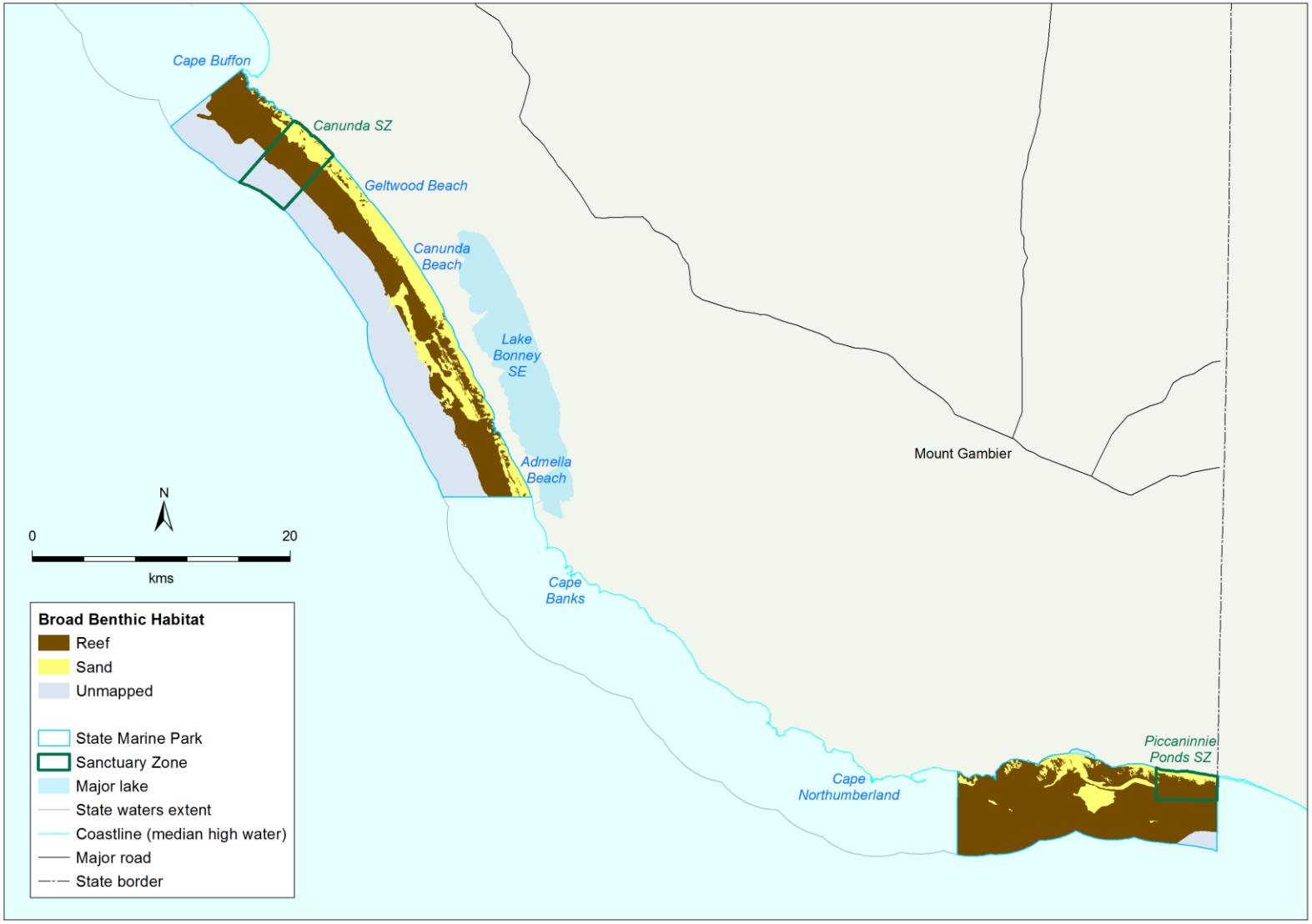
Section 3.20.2 describes the economic, social and environmental values of the marine park SZs, and is based on information provided by DEW. Estimates of displaced catch is based on analysis by SARDI (Ward et al., 2012 and data by special request).

Figure 3-56 Lower South East Marine Park, land uses map



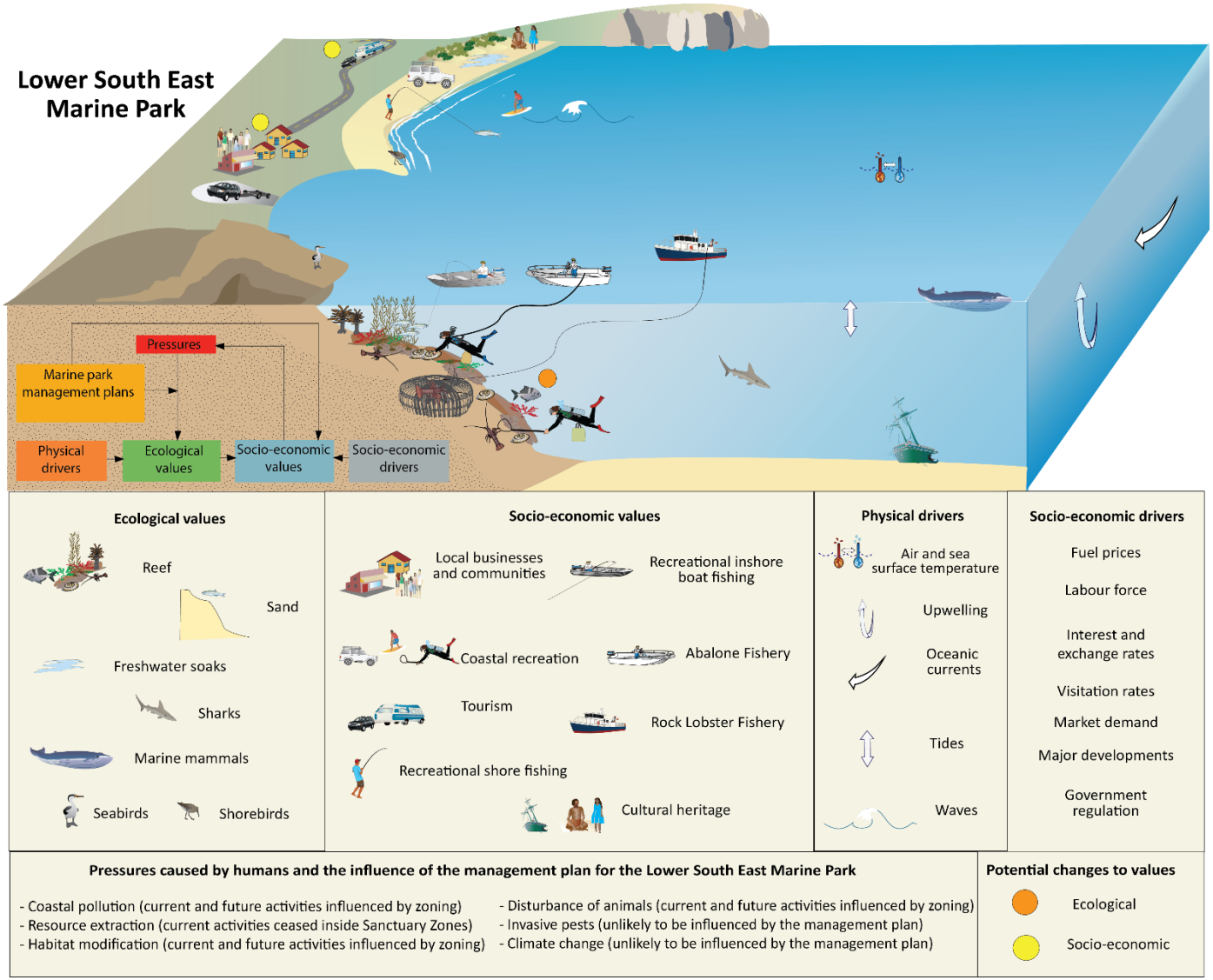
Source: APPENDIX 9

Figure 3-57 Lower South East Marine Park, habitat map



Source: APPENDIX 9

Figure 3-58 Lower South East Marine Park, conceptual model



Source: APPENDIX 9

3.20.2 Economic, social and environmental values of the Lower South East Marine Park Marine Park sanctuary zones

Canunda Sanctuary Zone (SZ 1)

24 km²

MPLAG advice: The Zone extending southwards from Geltwood Beach was unanimously supported by the MPLAG, with recommendation to significantly increase the area of the Zone from approximately 6km² to 24km².

The Canunda Zone conserves a variety of habitats and species. It provides a protective corridor between land and sea.

Environmental Values		Economic Values	Social and Cultural Values
CAR habitats represented This Zone comprises of characteristic examples of sea bed habitats including low profile rocky reef and soft sediment bottom habitat at a variety of depths. The shoreline encompassed is made up of exposed fine-medium sandy beach and lesser expanses of medium cliff and rocky outcrops. As a precautionary measure this Zone contains unmapped habitats at 10m-30m and 30m-50m depths.	**Important features:** This area provides important foraging and feeding habitat for shorebirds like the red capped plover. High energy surf beaches with steep offshore gradients exist in this location. Blue Whales are known to aggregate in this area.	**Commercial fisheries:** There was use by the Southern Zone Rock Lobster Fishery of the SZs within the Lower South East Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $330,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	The Zone neighbours a portion of the Canunda National Park establishing a protected corridor from the land to the sea. The design of this zone considers recreational shore based fishers, covering only 4kms of shoreline along the ocean beach. SAMPIT suggested this Zone is high use recreational fishing areas.

Piccaninnie Ponds Sanctuary Zone (SZ 2)

10 km²

MPLAG advice: The MPLAG delivered undivided support for a small zone (0.3km²) over the freshwater springs in the sea floor. The final zone is significantly larger (at approximately 10km²) to include a broader variety of habitats.

The Piccaninnie Springs SZ includes the unique freshwater springs. It protects important nesting areas for shorebirds as well as a variety of habitats and species.

Environmental Values		Economic Values	Social and Cultural Values
CAR Habitats represented This area comprises of a representative sample of exposed fine-medium sandy beach. The Zone includes characteristic examples of shallow (0-10m) sea floor habitats including rocky reef and soft-bottom environments. This Zone is important as it contains the largest area of shallow water rocky reef (0 - 10m) within a SZ in this Marine Park.	**Important features:** The SZ intersects part of the Piccaninnie Ponds Karst Wetlands RAMSAR site. The Zone contains significant numbers of internationally listed migratory species such as ruddy turnstone and sanderling whose habitats are required to be protected under international treaties. Beaches in this Zone are significant for shorebirds and contain important nesting areas for the vulnerable hooded plover and other local shorebirds such as the endangered little tern, rare pied oyster catcher and red necked stints. The beach habitat adjacent to Piccaninnie Ponds Conservation Park are ecologically important as they contain freshwater springs which are a unique feature in the Lower South East Marine Park. The Zone falls within a known aggregation area for blue whales.	**Commercial fisheries:** There was use by the Southern Zone Rock Lobster Fishery of the SZs within the Lower South East Marine Park previously. Historically, the total gross value of displaced catch in this marine park is estimated to be approximately $330,000. Based on the habitat mapping available for this park, it is likely that a significant proportion of the displaced catch came from this SZ.	Four-wheel drive access is available through the Piccaninnie Ponds Conservation Park. The Zone connects to the Piccaninnie Ponds Conservation Park establishing a protected passage from the land to the sea. This Zone considers the diversity of marine uses by accommodating shore based fishers within sections of the Piccaninnie Ponds Conservation Park through the provision of a SPA along the full coastal length of the Zone. Minimal impact on recreational fishing

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.

3.21 Discussion

The South Australian Government has a range of tools for managing identified threats to the marine environment, including fisheries management and pollution controls. Marine parks complement existing management approaches by prioritising specific areas for conservation in order to protect the biodiversity within them from both current and future threats.

As described in Section 3.1, 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.

As noteded earlier (section 3.1), 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'. Recent research by the Great Australian Bight Research Program, further confirms this observation. This was the justification for inclusion of many of the areas designated as SZs and in particular the Far West Coast, Nuyts Archipelogo and Western Kangaroo Island Marine Parks.

Many of the SZs (and adjacent RAZs) include key sites for a range of threatened and protected species:

- There are 51 Australian sea lion breeding sites in SA with 23 of these included within 12 SZs/RAZs.
- There are 39 long nose fur seal breeding sites in SA with 12 of these included within 5 SZs/RAZs.
- There are 4 Australian fur seal breeding sites in SA with 1 of these included within 1 SZ/RAZ.
- There are 44 osprey nesting sites in SA with 8 of these included within or adjacent to 7 SZs/RAZs.
- There are 73 white-bellied sea eagle nesting sites in SA with 10 of these included within or adjacent to 8 SZs/RAZs.
- There are 4 recognised white shark aggregation sites in SA with all of these included within SZs/RAZs.
- There are 4 recognised southern right whale aggregation sites in SA with 3 of these included within SZs/RAZs.

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. Table 3-3 provides a summary of the habitat types and their representation within the SA marine park network.

Table 3-3 Habitats, Marine park network[a]

Habitat	GMUZ	HPZ	SZ	RAZ	Total
Benthic (km^2)					
Reef	455	1,009	266	37	1714
Seagrass	1,313	2,557	324	72	4,266
Sand	972	1,437	278	167	2,466
Mangrove	22	39	41	1	102
Saltmarsh	4	13	14	<1	33
Not mapped	5,414	9,730	1,982	41	16,188
Shoreline (km of coastline)					
Reef	258	653	112 (21)	209	1,233 (21)
Seagrass	71	53	68	-	191
Sand	406	819	121 (38)	49 (13)	1,417 (51)
Mangroves	150	267	261	2	681
Saltmarsh	26	72	55	-	153

[a] Total area of benthic habitats excludes land, including islands and includes coastal waters only. Bracketed numbers for shoreline habitats show length of coastline where shoreline fishing is allowed within SZs. Shoreline habitats are not available for islands.

[b] Sums may not add up to totals due to rounding.

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.8.2).

In addition to the primary objective of biodiversity conservation, in accordance with the objects of the *Marine Parks Act 2007,* marine parks assist with public appreciation, and assist with ecologically sustainable development and use of marine resources. 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). SZs aim to afford the highest level of biodiversity protection and consequently also have the highest level of use restriction.

The final locations and size of the 83 SZs were generally a compromise between the inclusion of environmental values needed to attain a CAR system and accommodating existing users including commercial and recreational fishers. Consequently, most of the 83 SZs had majority support from the MPLAGs and resulted in no or relatively little displaced commercial or recreational fishing effort. Nonetheless, a small proportion of the SZs did not have support from the various commercial fishing sectors. Based upon estimated displaced catch (current section

and Section 4) and predictions of change for fished species due to the cessation of fishing (Bailey et al. 2012a), it is estimated that 15, 12, 11, and 15 SZs of the total of 83 SZs were deemed to be of value for the Rock Lobster, Abalone, Marine Scalefish and Charter Boat fisheries, respectively.

Estimates of displaced catch are available for the 12 focus SZs and at a park scale for the other SZs. Table 3-4 summarises the GVP for the 12 focus SZs relative to the total of the 83 SZs to provide some indication of the importance of the 12 SZs to the various fisheries.

Table 3-4 Gross value of the historic commercial fisheries catch and effort in marine park SZs ($'000)

Marine Park	Sanctuary Zone	Sardines	Prawns [a]	Abalone	Rock Lobster [b]	Marine Scalefish	Blue Crab	Charter Boat	Total [c]
Nuyts Archipelago	Nuyts Reef	0	0	34	44	5	0	*	**82**
Nuyts Archipelago	Isles of St Francis	0	0	451	175	41	0	*	**668**
Investigator	Pearson Isles	0	0	22	562	13	0	*	**597**
Neptune Islands	North Neptune Island	0	0	44	417	3	0	4	**468**
Sir Joseph Banks Group	Salt Creek	196	1	0	0	12	*	*	**209**
Upper Gulf St Vincent	Clinton Wetlands	0	0	0	0	485	*	*	**485**
Encounter	Rapid Head	0	18	*	0	19	*	35	**71**
Encounter	Bay of Shoals	0	0	1	0	12	0	0	**13**
Encounter	Sponge Gardens	0	0	*	33	45	0	74	**152**
Encounter	The Pages	0	0	*	0	22	0	9	**31**
Western Kangaroo Island	Cape Borda	*	0	1	42	1	0	14	**58**
Western Kangaroo Island	Cape du Couedic	0	0	217	441	2	0	*	**659**
	Total of 12 SZs	**196**	**19**	**770**	**1,712**	**659**	**0**	**136**	**3,492**
	Share of Fishery GVP	**0.82%**	**0.04%**	**2.79%**	**1.42%**	**2.90%**	**0.00%**	**3.64%**	**1.38%**
	Other 71 SZs	146	40	374	939	458	8	103	2,069
	Total of 83 SZs	**342**	**59**	**1,144**	**2,651**	**1,118**	**8**	**239**	**5,561**
	Share of Fishery GVP	**1.43%**	**0.13%**	**4.15%**	**2.19%**	**4.91%**	**0.10%**	**6.39%**	**2.20%**
	Fishery GVP 2016/17	23,847	46,271	27,557	120,929	22,757	8,143	3,738	**253,242**

[a] Spencer Gulf and West Coast Prawn and Gulf St Vincent Prawn Fisheries

[b] Northern Zone and Southern Zone Rock Lobster Fisheries

[c] Excludes Lakes and Coorong and Miscellaneous Fisheries

* Confidential data

Note that 2.20 per cent GVP share of total historic catch includes Srdine and Prawn fisheries catches. Excluding theses catches, the GVP share of historic catch is 2.0 per cent.

Source: Ward et al. 2012, EconSearch analysis.

The Sardine, Prawn and Blue Crab effort, which were below 2 per cent of fishery effort, were able to be redistributed and were not lost to these fisheries. The catches from the Abalone, Rock Lobster, Marine Scalefish and Charter Boat fisheries were removed from each fishery through the previous SA Government's Catch/Effort Reduction Program. The removed catches represented 2.0 per cent of the total fisheries GVP (Table 3-4).

The Isles of St Francis SZ in Nuyts Archipelago Marine Park was important[85] to the Western Zone Abalone Fishery and the Cape du Couedic SZ in the Western Kangaroo Island Marine Park was a moderately important[86] fishing ground to the Central Zone Abalone Fishery (Table 3-4). These two SZs represented 58 per cent of the removed Abalone catch.

The Pearson Isles (Investigator Marine Park), North Neptune Island (Neptune Islands Group Marine Park) and Cape du Couedic (Western Kangaroo Island Marine Park) SZs were important to the NZRL Fishery. Nuyts Archipelago SZ in the Nuts Archipelago Marine Park was moderately important to the Rock Lobster Fishery. These four SZs represented 60 per cent of the removed Rock Lobster catch (Table 3-4).

Clinton Wetlands SZ (Upper Gulf St Vincent Marine Park) was important to the MSF (43 per cent of removed fishery effort).

Relatively few of the 83 SZs currently have tourism operators that directly utilize the SZ or which operate adjacent to the SZ. Nonetheless, there are some notable exceptions; tourism for whale watching at the Head of Bight which is associated with The Bunda Cliffs SZ (and adjacent RAZ), tourism associated with the cuttlefish spawning aggregation within the Cuttlefish Coast SZ near Whyalla, tourism for Australian sea lions at Seal Bay on Kangaroo Island which is adjacent to the Seal Bay SZ (and adjacent RAZ), tourism for seals at Admirals Arch on Kangaroo Island which is adjacent to the Cape du Couedic SZ, organized tours for swim with seals and dolphins in the Bay of Shoals and Sponge Gardens SZs on Kangaroo Island, and dive tours to the Ex-HMAS Hobart within Rapid Head SZ and Aldinga Reef within Aldinga Reef SZ on Fleurieu Peninsula. No tour operators have commenced because of the existence of a SZ, however, all operations that utilize them benefit from the existence of the SZ in some way.

Recreational fishing was mostly accommodated in the zoning with areas of heavy use being avoided and 16 SPAs to allow for shore-based fishing being provided within SZs and RAZs. Many of the SZs have social and cultural values such as for recreational activities (non-fishing), wilderness value, scientific use, and community support. Recreational activities such as boating and kayaking were unaffected by the implementation of SZs, while diving experiences have been enhanced by the existence of SZs.

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

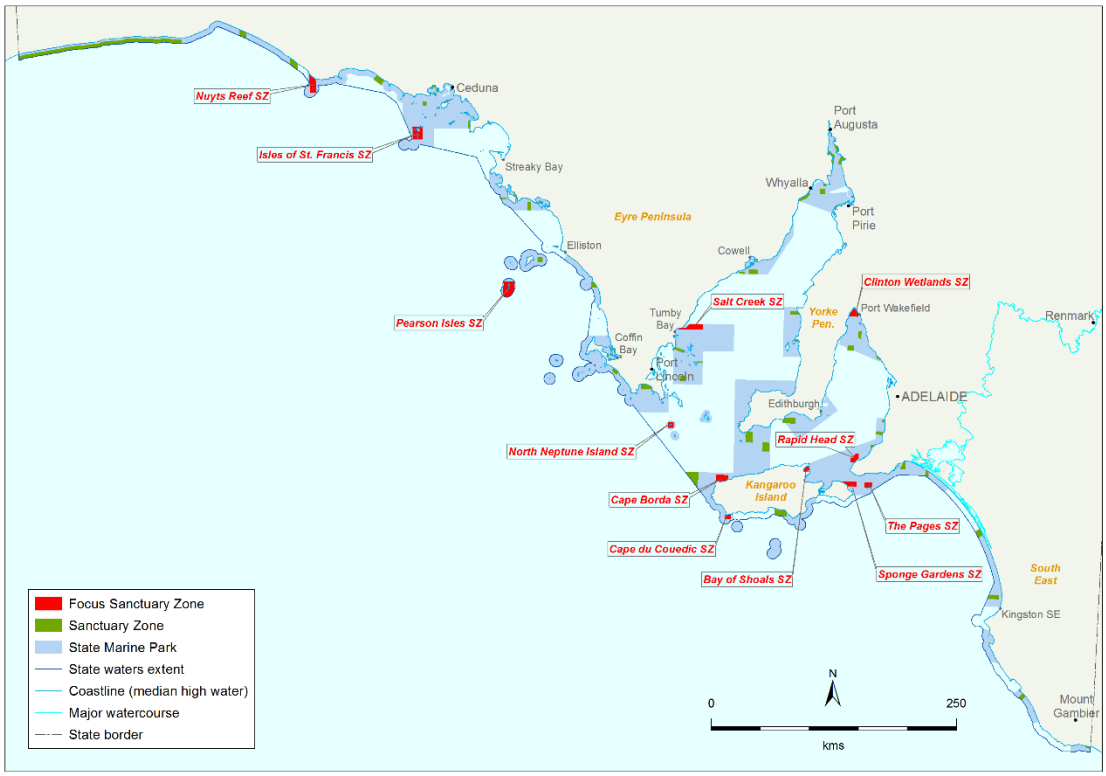
[86] Historic average annual catch between $100,000 and $400,000 GVP.

4. FOCUS SANCTUARY ZONES

As part of the SA Government's election commitment, a review is being undertaken of the 12 SZs that were nominated for redesignation as part of the Marine Parks (SZs) Amendment Bill 2014. This section provides a summary of the environmental, economic and social values of the focus SZs under (i) existing arrangements and under (ii) changed arrangements. A detailed assessment is provided in APPENDIX 2. The 12 focus SZs are listed in Figure 4-1, and they are:

- Nuyts Reef and Isles of St Francis SZs, Nuyts Archipelago Marine Park
- Pearson Isles SZ, Investigator Marine Park
- Salt Creek SZ, Sir Joseph Banks Group Marine Park
- North Neptune Island SZ, Neptune Islands Group (Ron Valerie Taylor) Marine Park
- Clinton Wetlands SZ, Upper Gulf St Vincent Marine Park
- Rapid Head, Bay of Shoals, Sponge Gardens and The Pages SZs, Encounter Marine Park
- Cape Borda and Cape du Couedic SZs, Western Kangaroo Island Marine Park.

Figure 4-1 Twelve focus sanctuary zones



Source: APPENDIX 9

4.1 Nuyts Reef Sanctuary Zone

Table 4-1 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.	*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 $82,000, 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 2016/17)), 1 fte job (less than 0.1% of the regional total (25,915 fte jobs in 2016/17)) and $0.05m in household income (less than 0.1% of the regional total ($1.8b in 2016/17)). *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 $82,000. *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	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	
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. *Observations since SZ implementation:* There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	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 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.1

Table 4-2 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	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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, 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. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as 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, changing the zoning to HPZ would allow such activities to potentially occur in the future. The SZ contains the largest limestone reef in the Murat bioregion and the westernmost example of this habitat in the marine park network. It is also the largest area of reef captured inside a SZ. Changing/downgrading the zoning would compromise the marine park system by reducing protection for these reef habitats. Loss of the sixth largest SZ would significantly compromise the adequacy of the network.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $82,000, would become available again for harvesting. This would be principally in the NZRL and the Western Zone Abalone Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. The effect of changing the status 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. For Southern Rock Lobster, catch in MFA 7 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 fisheries catch/effort. As noted above, the reduction in restricted areas may see a small increase in CPUE but total catch is very close to the total allowable commercial catch (TACC) so is unlikely to increase much. Abalone catch in this (spatial assessment unit) SAU has been low historically and very low in recent years and may increase slightly if opening up the SZ. The MSF is a minor contributor. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $82,000, would become available again for harvesting. This would be principally in the NZRL and the Western Zone Abalone Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* 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.	*Allowing Fishing* The SZ already has a SPA for shore-based recreational line fishing so there would be no change to this social value. As the area was rarely if ever 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. The Rock Lobster, Abalone and Charter Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible in the short-term, because it is unlikely that activities such as aquaculture or other coastal developments would occur in the location of the SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

Source: Appendix A.2.1

4.2 Isles of St Francis Sanctuary Zone

Table 4-3 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	*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 $668,000, 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; $0.94m in total GRP (less than 0.1% of the regional total ($3.4b in 2016/17), 6 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2016/17) and $0.56m in household income (less than 0.1% of the regional total ($1.8b in 2016/17)). *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 $175,000.	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	
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, 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.	*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 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.2

Table 4-4 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**	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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, 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. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* 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. Loss of the third largest SZ would significantly compromise the adequacy of the network.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $668,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster and Abalone Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. The effect of changing the status 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. As noted above, the reduction in restricted areas may see a small increase in CPUE but total catch is very close to the TACC so is unlikely to increase much. Abalone catch has not been recorded for 2015 and 2016 and the MSF is a minor contributor. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $668,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster and Abalone Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* It is unlikely that any relevant developments would occur in the area so changing the zoning would have no impact on tourism activities.	*Allowing Fishing* As the 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. *Changing to HPZ* 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. It is unknown what impact this might have on social values.

Source: Appendix A.2.2

4.3 Pearson Isles Sanctuary Zone

Table 4-5 Summary table for Pearson Isles sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	**Tourism industry**	
Regional characteristics: • Second largest SZ in the marine parks network • Adjoins the Investigator Group Wilderness Area, establishing a protected land and sea corridor. • Biodiversity hotspot influenced by the warm Leeuwin Current, which supports species more common in tropical waters. • Pearson, Veteran and Dorothee Isles within the SZ are geologically unique, being giant granite inselbergs (uncommon island mountains). • Numerous habitat types including (subtidal) soft-bottom habitat, seagrasses, reef (granite and limestone), (terrestrial/intertidal), sheltered beaches, tall cliffs. Unusually deep seagrass beds occur at depths of 25-30m. Also deep water travertine limestone reefs at 50m depths off Pearson island. Granite boulder reefs form large caverns, harbouring prolific fish and invertebrate species. • High species diversity including mature fish and invertebrates such as hard and soft corals, sponges, macroalgae, ascidians and echinoderms. *State/National priorities:* • Adjoins a Commonwealth marine park zone. • Provides two haul-out and breeding sites for the nationally vulnerable Australian sea lion. • Provides habitat for rare/conservation concern species/communities, e.g. white shark, Southern right whale, uncommon rhodolith communities (popcorn coral or coralline red algae), endangered white-bellied sea eagle. *Habitats and biodiversity:* The islands within the SZ provide significant breeding area for short-tailed shearwaters, little penguins, white-faced storm petrels, and fairy tern. The SZ has the highest diversity of fish species recorded in comparison to other SZs surveyed. Likewise, the SZ has the highest numbers of large fish (individuals greater than 200mm in size) of all other SZs surveyed. The SZ has relatively low numbers of sharks and rays recorded. It has the highest number of fished species of all the SZs surveyed.	*Background and context:* The NZRL Fishery was the principal fishery that previously used the SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $597,000, principally from the NZRL (1.42% of fishery catch, GVP $562,000) and from Abalone (0.09% of fishery catch) and Marine Scalefish (0.16% 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). The nearshore habitat of the SZ contains some reef suitable for Rock Lobster and Abalone but most of the area is unmapped. *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; $0.69m in total GRP (less than 0.1% of the regional total ($3.4b in 2016/17)), 5 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2016/17)) and $0.41m in household income (less than 0.1% of the regional total ($1.8b in 2016/17)). *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. *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 Abalone, Marine Scalefish and Charter Boat Fisheries since the introduction of the SZ because	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 on the mainland and is inaccessible to most recreational boats Shore-based recreational 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; much of the effort shown on the SAMPIT map is likely a result of people that had fished from commercial charter boats. 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:* A majority of respondents supported increasing conservation outcomes, being highly regarded for ecotourism and scientific study as one of the jewels of the west coast. Zoning was supported for being balanced enough to serve the needs of the fishing industry while meeting expectations for protection of representativeness, thus maintaining the integrity of the region's biodiversity, particularly with minimal impact on the Australian sea lion colony. 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'. SZ aligns with and overlays an existing Investigator Group 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	
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:* No observed changes have been recorded yet as only one year of data have been collected since the SZ becoming operational in 2014.	these fisheries are minor contributors. 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. 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.3

Table 4-6 Summary table for Pearson Isles sanctuary zone – impacts on values of changing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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 the 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 the SZ over the next 20 years. The SZ is a priority monitoring site. Opening the SZ to fishing would the reduce the effectiveness of this site for monitoring purposes *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as seagrass and reef habitats 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, changing the zoning to HPZ would allow such activities to potentially occur in the future. The SZ is an exceptional example of marine biodiversity and habitats, including deep seagrass meadows. Changing/downgrading the zoning would compromise the marine park system by reducing protection for these habitats. Loss of the second largest SZ would significantly compromise the adequacy of the State and National marine parks network.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $597,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster Fishery and to a lesser extent in the the Abalone, Marine Scalefish and Charter Boat Fisheries. The effect of changing the status 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 15 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, Marine Scalefish and Charter Boat Fisheries are relatively minor contributors. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $597,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster Fishery and to a lesser extent in the the Abalone, Marine Scalefish and Charter Boat Fisheries. Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.	*Allowing Fishing* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ status* It is unlikely that any relevant developments would occur in the area so changing the zoning would have no impact on tourism activities.	*Allowing Fishing* 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. The Rock Lobster, Abalone and Charter Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry, but not the conservation sector. There may be possible loss of 'wilderness value'. *Changing to HPZ status* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible in the short-term, because it is unlikely that activities such as aquaculture or other coastal developments would occur in the location of the SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

Source: Appendix A.2.3

4.4 Salt Creek Sanctuary Zone

Table 4-7 Summary table for Salt Creek sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	**Tourism industry**	
Regional characteristics: • Seventh largest SZ in the marine parks network. • Borders both Eyre and SG bioregions protecting a mix of the ecological characteristics of both bioregions. • Protects the ecosystem from the Salt Creek estuary mouth, across sandflats and out to the seagrass beds, providing a protective corridor and important breeding and nursery ground for many fish and invertebrate species. • Habitat for various life stages of blue swimmer crab, razorfish, king scallop, queen scallop, yellowfin whiting, snook, southern calamari, southern sea garfish, yellow eye mullet, baitworm, western king prawn, school whiting, western Australian salmon, tommy ruff, flathead, flounder, King George whiting, sand crab, snapper and red mullet. *State/National priorities:* • At least 5 migratory coastal shorebird species listed under international migratory treaties and other resident coastal waders use the Tumby Bay area (including Salt Creek) for roosting and feeding (e.g. Pacific golden plover, grey plover, eastern curlew, sharp-tailed sandpiper and ruddy turnstone). • Part of the Tumby Bay Wetland of National Importance. *Habitats and biodiversity* Provides habitat for rare/conservation concern species, e.g. white shark, sculptured sea moth and the Eastern stargazer. 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 Sardine and Marine Scalefish fisheries: removal of fished species biomass (low risk); bycatch of short-nosed common dolphins (medium risk for Sardine Fishery); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds.	*Background and context:* The principal fishery that previously used the SZ was the Sardine Fishery. Small amounts of activity occurred in the Marine Scalefish, Prawns, Abalone, Blue Crab and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $13,000, from the Marine Scalefish Fisheries (0.02% of fishery effort). Displaced catch from the Abalone Fishery was estimate to be minimal (less than 0.01% of fishery catch) while displaced catch and effort in the Charter Boat and Blue Crab Fisheries were confidential but would be minimal (less than $1,000 for Blue crab and $12,000 for Charter Boats for the entire marine park). Historical catch/effort from the Sardine Fishery (1.11% of fishery catch) and SG Prawn Fishery (less than 0.01% of fishery effort) was deemed, under the previous SA Government policy, to be redistributable (meaning displaced from the SZ but taken elsewhere in the fishery) and therefore does not represent lost income to these fisheries. *Predictions due to SZ implementation:* The displaced effort in the Marine Scalefish ($12,000) and Western Zone Abalone (less than $1,000) fisheries was minimal and, hence, the economic impact for this displaced catch and effort has not been estimated. *Commercial Fisheries Voluntary Catch/Effort Reduction Program:* For the Marine Scalefish, Abalone and Charter Boat Fisheries more than the estimated displaced catch/effort 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 $13,000. *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 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:* Boating and recreational shore-based activities occur in the SZ. Recreational boat and shore-based fishing occur adjacent to the SZ in Tumby Bay. *Recreational fishing*: Prior to SZ implementation, recreational fishing at the SZ was minimal, with only some area lost due to the SZ. The zoning was designed to minimise impact on nearshore recreational fishing. Shore-based line fishing is now prohibited in a relatively small area of coastline in the SZ. *Social values:* Non-market values of the SZ were not identified. *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	
Predictions due to SZ implementation: King George whiting, snapper, yellowfin whiting and western king prawn are predicted to temporarily increase in size and abundance whilst inside the SZ. *Observations since SZ implementation:* There is insufficient data to note observed changes in species diversity/population characteristics due to the SZ.	No negative change in the Marine Scalefish, Prawns, Abalone, Blue Crab and Charter Boat Fisheries since the introduction of the SZ because these fisheries are minor contributors. Catch of Sardines has been maintained in the presence of the SZ. The main issue with this fishery is the proximity to the SZ of traditional fishing grounds and the potential for sardine boats to drift into the SZ while pulling in the nets. 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.4

Table 4-8 Summary table for Salt Creek sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing (Sardine and Marine Scalefish fisheries) will be re-introduced if 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, particularly dolphins). King George whiting, snapper, yellowfin whiting and western king prawn, targeted by commercial/recreational fisheries in this SZ, are unlikely to temporarily increase in size and abundance whilst in this SZ over the next 20 years. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as seagrass and associated fauna communities. It is possible that activities such as aquaculture and coastal developments could occur in the future in the location of the SZ, as these activities already occur nearby. These activities would potentially impact on the environmental values of this SZ via damage to habitat (i.e. seagrass), disturbance to animals and pollution. The SZ contains the only example of a tidal estuary and mudflat transition to sandy bottom and extensive seagrass meadows. This SZ also exists in a transition area between the Spencer and Eyre bioregions creating a unique combination of biogeographic features not found elsewhere in SG. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these habitats. Loss of the seventh largest SZ would significantly compromise the adequacy of the network.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally in the Sardine Fishery and to a lesser extent in the Marine Scalefish, Prawn, Abalone, Blue Crab and Charter Boat Fisheries. The effect of changing the status 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. Opening the SZ to fishing is unlikely to see dramatic increases in fisheries catch. The reduction in restricted areas may see a small increase in CPUE. However, the Sardine Fishery is limited by the TACC. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally in the Sardine Fishery and to a lesser extent in the Marine Scalefish, Prawn, Abalone, Blue Crab and Charter Boat Fisheries. It is possible that there would be future activities such as aquaculture or coastal developments in this SZ. Changing the zoning to HPZ would allow such activities to potentially occur in the future.	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* 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.	*Allowing Fishing* 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. The Sardine Fishery would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector. *Changing to HPZ* It is possible that activities such as aquaculture and coastal developments (jetties, wharves, etc.) could occur in the future in the location of the SZ, as these activities already occur nearby. It is unknown what impact this might have on social values.

Source: Appendix A.2.4

4.5 North Neptune Islands Sanctuary Zone

Table 4-9 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.	*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 $468,000, 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; $0.56m in total GRP (less than 0.1% of the regional total ($3.4b in 2016/17), 4 fte jobs (less than 0.1% of the regional total (25,915 fte jobs in 2016/17) and $0.33m in household income (less than 0.1% of the regional total ($1.8b in 2016/17)). *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 $51,000. *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	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

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.	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 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 opportunites and therefore they were not measured.		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).

Source: Appendix A.2.5

Table 4-10 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	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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. *Changing to HPZ:* 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, changing the zoning 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.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $468,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster (NZRL) Fishery and to a lesser extent the Abalone, Marine Scalefish Fishery and Charter Boat Fisheries. The effect of changing the status 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, particularly as the TACC for the Northern Zone Fishery is being reached. As noted above the reduction in restricted areas may see a small increase in CPUE. Abalone and Marine Scalefish Fisheries are relatively minor contributors. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $468,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster (NZRL) Fishery and to a lesser extent the Abalone, Marine Scalefish Fishery and Charter Boat Fisheries. Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.	*Allowing Fishing:* Opening 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. 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. *Changing to HPZ:* While relevant activities such as aquaculture and jetties would affect the wildlife experience for tourism activities, they are unlikely to occur in the SZ.	*Allowing Fishing:* 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 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 not the conservation sector, shark cage diving industry nor recreational fishers. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible in the short-term, because it is unlikely that activities such as aquaculture or other coastal developments would occur in the location of the SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

Source: Appendix A.2.5

4.6 Clinton Wetlands Sanctuary Zone

Table 4-11 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).	*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 $485,000, 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; $0.73m in total GRP (less than 0.1% of the regional total ($3.1b in 2016/17)), 16 fte jobs (0.1% of the regional total (28,709 fte jobs in 2016/17)) and $0.36m in household income (less than 0.1% of the regional total ($1.6b in 2016/17)). *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	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

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

Source: Appendix A.2.6

Table 4-12 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	
Allowing fishing: Threats removed from the cessation of commercial fishing (MSF) will be re-introduced if 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 the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* 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.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $485,000, would become available again for harvesting. This would be principally in the Marine Scalefish Fishery and to a lesser extent in the Blue Crab and Charter Boat Fisheries. The effect of changing the status 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 Blue Crab, 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 opening of the SZ to fishing 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. 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. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $485,000, would become available again for harvesting. This would be principally in the Marine Scalefish Fishery and to a lesser extent in the Blue Crab and Charter Boat Fisheries. 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	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* 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.	*Allowing fishing:* Opening the SZ to commercial fishing would be supported by the commercial fishing industry. There would be increased opportunity for recreational fishing, particularly for boat based fishing, and opening the whole SZ to recreational fishing is likely to be supported by recreational fishers. However, based on community consultation leading up to the zoning, it is expected that recreational fishing and conservation sectors will oppose the return of commercial netting and crabbing to the SZ. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible in the short-term, because it is unlikely that activities such as aquaculture or other coastal developments would occur in the location of the SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
	allow such activities to potentially occur in the future and if so would potentially reduce access for commercial fishing.		

Source: Appendix A.2.6

4.7 Rapid Head Sanctuary Zone

Table 4-13 Summary table for Rapid Head sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	**Tourism industry**	
Regional characteristics: • Provides an important ecological stepping stone linking species of the lower gulf with those of the open Southern Ocean coastline. • Contains inshore reefs, significant deep water seagrass meadows and sandy plains. The area has rotating currents which supports a high diversity of invertebrates. • Provides protection for all life cycle stages of southern calamari (adult breeding and eggs inshore, juveniles offshore). *State/National priorities:* • contains habitat for the protected and iconic leafy sea dragon. • Haulout site for nationally vulnerable Australian sea lion *Habitats and biodiversity* The SZ conserves a wide variety of important habitats representative of the gulf-facing southern Fleurieu Peninsula coast. The SZ provides important habitat for fish species of conservation concern including harlequin fish and Western blue devils. The area is used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leatherjacket species, Snook, Western Blue Groper, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks. Fish species recorded are typical of nearshore reef habitats found along the Fleurieu coastline. Fish species richness is comparable to other SZs abutting the mainland with reefs (57 species recorded in surveys). Commercially and recreationally targeted fish species abundance is moderate to low in comparison 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 within the SZ from the activities of the Charter Boat, Marine Scalefish and GSV Prawn fisheries: removal of fished species biomass (low risk); bycatch (low risk); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. *Predictions due to SZ implementation:*	*Background and context:* The Charter Boat, Marine Scalefish and GSV Prawn Fisheries were the principal fisheries that previously used the SZ. There was some minor use by the Central Zone Abalone and Blue Crab Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $71,000, principally from the Charter Boat (0.79% of fishery effort), Marine Scalefish (0.08% of fishery effort) and GSV Prawn (0.45% of fishery effort) Fisheries. Displaced catch and effort from the Blue Crab and Central Zone Abalone Fisheries were confidential but would be minimal (less than $1,000 for the Blue Crab Fishery and less than $19,000 for the Central Zone Abalone Fishery covering the entire marine park). Most of the SZ is comprised of fringing reef, sand and some patchy seagrass habitats which are suitable habitats for the variety of fish that live in the SZ. Inshore areas (approximately 25%) are seagrass and reef areas suitable for squid 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; $0.07m in total GRP (less than 0.1% of the regional total ($1.6b in 2016/17)), 1 fte job (less than 0.1% of the regional total (15,596 fte jobs in 2016/17)) and $0.03m in household income (less than 0.1% of the regional total ($0.8b in 2016/17)). *Commercial Fisheries Voluntary Catch/Effort Reduction Program:* No displaced catch or effort for the GSV Prawn and Blue Crab Fisheries was deemed necessary for removal and negligible impact on these fisheries or individuals within the fisheries is expected. For Abalone, Marine Scalefish and Charter Boat fisheries more than the estimated displaced catch has been removed from the fisheries 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	Some commercial diving tours operate in the SZ and utilise the ex-HMAS Hobart ship wreck. The number of tours and participants is unknown. Since the scale of tourism activities in the SZ in unknown, the economic contribution cannot be estimated. Since the ex-HMAS Hobart was similarly protected under the *Historic Shipwrecks Act 1981* before the SZ was established, it is unlikely that any change in activities occurred directly surrounding the wreck.	*Recreational uses:* Boating, kayaking and diving occur within the SZ. The ex-HMAS Hobart ship wreck which lies in the SZ is a recognised dive site with several hundred permitted divers using the site each year. Some of these divers would have been on organised dive tours (see section on Economic – Tourism). Shore-based recreation activities adjacent to the SZ are limited due to the restricted access by road to the shoreline and high cliffs. *Recreational fishing*: Prior to SZ implementation, recreational fishing occurred throughout the southern Fleurieu Peninsula region, particularly from Cape Jervis to Sellicks Beach. With regard to recreational boat fishing inshore areas were lost due to the SZ. Shore-based line fishing is now prohibited in the SZ, but this area is difficult to access from the shore and previous recreational fishing effort was negligible. *Social values:* At a local level, the community values recreational (boat) and commercial fishing. For example, the community indicated that the SZ should accommodate the needs of the Prawn Fishery in submissions to the proposed zoning, which was accommodated in the final zoning. Likewise, in submissions to the zoning the inshore area adjacent to Rapid Heads in the SZ was identified as important to boat-based recreational fishing. At the broader community level, values focus on conservation of environmental values. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. The SZ is significant as a site that can be accessed by the public for recreational diving to observe a system that has full protection from fishing. *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 Central and

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper were predicted to increase in size and abundance over the next 20 years inside the SZ. Southern calamari were predicted to temporarily increase in size and abundance while spawning inside the SZ. *Observations since SZ implementation:* There is insufficient data yet to note observed changes in species diversity/population characteristics due to the SZ.	buyout of quota/licences and foregone annual income of approximately $71,000. *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 Blue Crab, Central Zone Abalone and GSV Prawn Fisheries since the introduction of the SZ. Catches of Southern Calamari and Snapper 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. King George Whiting and Garfish catch in the SZ is minimal and have been maintained 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 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 opportunites and therefore they were not measured.		Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70% (initially 75% in 2013, dropping to 60% in 2016, before increasing to 80% in 2017). A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them. The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs.

Source: Appendix A.2.7

Table 4-14 Summary table for Rapid Head sanctuary zone – impacts on values of changing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing (will be re-introduced if the SZ is opened to fishing (Charter Boat, Marine Scalefish and GSV Prawn fisheries) 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). Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper are unlikely to increase in size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site and has the longest running data set of any SZ. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. The SZ is a sheltered environment and it is possible that aquaculture and coastal developments may occur in the future. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass, reef), disturbance to animals and pollution. The SZ captures the complete transition from near shore reef and seagrass habitats to deep water sand habitats characteristic of southern GSV. Rapid head SZ also contains examples of some of the deepest seagrass meadows in the Encounter Marine Park. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these GSV habitats.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally in the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a lesser extent the Central Zone Abalone and Blue Crab Fisheries. The effect of changing the status 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 Snapper and Calamari have been maintained in the presence of the SZ. King George Whiting and Garfish catch is small in this MFA and has been maintained 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 and a temporary increase in overall catch. Charter Boat fishers would utilise this zone if opened to fishing. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally in the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a lesser extent the Central Zone Abalone and Blue Crab Fisheries. It is possible that activities such as aquaculture and coastal development could occur in the future in the Rapid Head SZ as it is a sheltered environment. It is unknown what impact this might have on fisheries values.	*Allowing Fishing:* While the SZ area is also protected by the *Historic Shipwrecks Act 1981*, compliance activities by DEW would reduce if the SZ zoning is changed. This could lead to an increase in illegal fishing which negatively affects the dive experience through damage to the wreck and the presence of waste. Divers have reported signs of illegal fishing activities at the site, including tangled lines and anchor strikes on the wreck. *Changing to HPZ:* The SZ is in a sheltered environment so it is possible that aquaculture activities or other coastal developments could occur there. However, it is unknown what effect these might have on the dive experience.	*Allowing Fishing:* As the area was previously used by recreational boat fishers, it is likely that changing the zoning arrangements to allow recreational fishing would result in an increase in recreational boat fishing activity in the SZ through a redistribution of existing activity from outside the zone. The Charter and MSF Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not recreational fishers nor the conservation sector. If zoning changes were made to the SZ, the ex-HMAS Hobart would still be protected by an exclusion zone under the *Historic Shipwrecks Act 1981*. However, without SZ status, there would likely be a decrease in compliance activities by DEW in the area and an increase in illegal activity at the site. *Changing to HPZ:* It is possible that activities such as aquaculture and coastal development could occur in the future in the SZ as it is a sheltered environment. It is unknown what impact this might have on social values.

Source: Appendix A.2.7

4.8 Bay of Shoals Sanctuary Zone

Table 4-15 Summary table for Bay of Shoals sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: • Regionally significant sheltered embayment dominated by seagrass meadows to 5m deep. Large shallow bay has natural channels protected by a tidally exposed sandbar including Busby and Beatrice Islets. Includes sheltered coarse sand beaches, and mud and sand flats. • Nursery area for King George whiting, and Western king prawn, Southern garfish and snook. Dense seagrass meadows support a range of fish and invertebrates including cryptic species like pipefish and leafy sea dragons. *State/National priorities:* • green macroalgae *Cladophora aegagropilioidea* - a limited range and listed as potentially threatened. • Busby and Beatrice Islets are Wetlands of National Importance and provide 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. • Busby Islet provides nesting area for seabirds including nationally rare osprey and vulnerable white-bellied sea eagle (although the latest survey found that the sea-eagle nest had been abandoned).. *Habitats and biodiversity* The seagrass meadows in the SZ are an important fish nursery and also support a variety of species including cryptic species like pipefish and iconic leafy sea dragons. Busby and Beatrice Islets provide nesting areas for seabirds, including state endangered osprey, pied cormorant and Pacific gull. The SZ provides important feeding and breeding habitat for shorebirds. Fish species are typical of seagrass habitats, e.g. hardyheads, little weedy whiting and striped trumpeter. Fish species richness is comparable to other SZs dominated by seagrass habitats. Commercially and recreationally targeted fish species abundance is comparable to other SZs dominated by seagrass habitats. Fish assemblages and abundance are similar to the adjacent HPZ.	*Background and context:* The MSF was the principal fishery that previously used the Bay of Shoals SZ. Historically, the total gross value of displaced catch in this SZ is estimated to be $13,000, principally from the MSF (0.05% of fishery effort). Most of the SZ is comprised of soft sediment and seagrass habitats which are suitable habitats for King George Whiting. *Predictions due to SZ implementation:* The displaced effort in the Marine Scalefish ($12,000) and Central Zone Abalone ($1,000) Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated. *Commercial Fisheries Voluntary Catch/Effort Reduction Program:* For Abalone and Marine Scalefish fisheries more than the estimated displaced catch has been removed from the fisheries 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 $13,000. *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 Central Zone Abalone Fishery since the introduction of the SZ. Catches of Southern Calamari and King George Whiting have been maintained in the presence of the SZ and there is no evidence of a negative impact since the introduction of the SZ. Garfish catch in the SZ is minimal and has been maintained 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 fisheries could potentially be higher and the development of	One tour operator directly utilises the SZ for full-day tours including snorkelling and wildlife experiences with dolphins, seals, birds and whales. No data are available on the number of visitors or expenditure occurring in the region due to the tour operation so the economic contribution of the activity cannot be directly estimated. It is unknown whether any change to activities has occurred due to the presence of the SZ.	*Recreational uses:* Boating, kayaking and snorkelling occur within the Bay of Shoals SZ. Boat fishing is popular in many areas adjacent to the SZ, with a boat ramp directly adjacent to the SZ. *Recreational fishing*: Prior to SZ implementation, recreational fishing occurred mainly in the entrance to Bay of Shoals or in Nepean Bay which lies outside the SZ but some area has been lost. Shore-based line fishing is now prohibited in the SZ, but the shoreline around the SZ is intertidal and mostly unsuitable for shore-based fishing. *Social values:* At the broader community level, social values focus on conservation of the environment. 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70% (initially 75% in 2013, dropping to 60% in 2016, before increasing to 80% in 2017). A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them. The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs.

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
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 (low risk); bycatch (low risk); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds. *Predictions due to SZ implementation:* Razorfish (intertidal seagrass resident) and mud cockle (intertidal sand resident) in the SZ are predicted to increase in size and abundance over the next 20 years. King George whiting, southern calamari and southern garfish are predicted to temporarily increase in size and 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.	new industries, such as aquaculture, is possible. However, there is no way to measure these foregone opportunites and therefore they were not measured.		

Source: Appendix A.2.8

Table 4-16 Summary table for Bay of Shoals sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing (MSF) will be re-introduced if 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 (intertidal seagrass resident) and mud cockle (intertidal sand resident) are unlikely to increase in size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as seagrass and associated fauna communities. The SZ is a sheltered environment and it is possible that aquaculture and coastal developments may occur in the future. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass, saltmarsh), disturbance to animals and pollution.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally in the Marine Scalefish Fishery. The effect of changing the status 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 King George Whiting and Southern Calamari have 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 and a temporary increase in overall catch. 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. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally in the Marine Scalefish Fishery. It is possible that activities such as aquaculture and coastal development could occur in the future in the SZ as it is a sheltered environment. Changing the zoning to HPZ would allow such activities to potentially occur in the future.	*Allowing fishing:* Since the tour operator offers wildlife and sightseeing experiences, fishing activities could affect the experience for visitors but the likely effect is unknown. *Changing to HPZ:* Since the tour operator offers wildlife and sightseeing experiences, other (non-fishing) activities could also affect the experience for visitors but the likely effect is unknown.	*Allowing Fishing:* 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 SZ through a redistribution of existing activity from outside the SZ. The MSF Fishery would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector. *Changing to HPZ:* It is possible that activities such as aquaculture and coastal development could occur in the future in the SZ as it is a sheltered environment. It is unknown what impact this might have on social values.

Source: Appendix A.2.8

4.9 Sponge Gardens Sanctuary Zone

Table 4-17 Summary table for Sponge Gardens sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: • Includes one of two deep water trenches in State waters. • The steep topography and high current velocities combine to create exceptional examples of invertebrate reef communities including sponge communities with unusually large specimens. These sponge-dominated community types are uncommon at the bioregional scale. • Provides a refuge for several species of conservation concern (harlequin, blue devils and blue groper). *State/National priorities:* • Supports a number of red macro algal species (seaweeds) with very limited range of distribution. • Nesting area for the state endangered white bellied sea eagle. *Habitats and biodiversity* The SZ extends offshore from the cliffs west of Antechamber Bay on Kangaroo Island and is characterized steep rocky shorelines, high currents and deep trenches. The SZ is dominated by habitat forming invertebrate communities (sponges and other filter feeders), with some areas of reef, sand and seagrass. Fish species are typical of nearshore reef habitats found along the Kangaroo Island coastline, with bluethroat wrasse, sea sweep, barber perch, horseshoe leatherjackets, zebrafish and blue groper common. Fish species richness is high in comparison to other surveyed SZs. The SZ also has comparatively high numbers of large fish. The SZ has the highest abundances of several reef species of conservation concern (harlequin fish, blue devils) in comparison to other surveyed SZs. Commercially and recreationally targeted fish species abundance is relatively high in comparison to other surveyed SZs. *Threats addressed by the SZ* The SZ addresses the following threats to conservation values within the SZ from the activities of the Charter Boat, Marine Scalefish and Rock Lobster fisheries: removal of fished species biomass (medium risk); bycatch (low risk); introduced marine pests/aquatic diseases (low risk); disturbance to breeding colonies of marine mammals and birds.	*Background and context:* The Charter Boat Fishery was the principal fishery that previously used the SZ. There was some use by the Marine Scalefish, NZRL and Central Zone Abalone Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $152,000, principally from the Charter Boat (1.70% of fishery effort), Marine Scalefish (0.19% of fishery effort) and NZRL (0.08% of fishery catch) Fisheries. Displaced catch and effort from the Central Zone Abalone Fishery was confidential but would be minimal (less than $19,000 for the entire marine park). Most of the SZ is comprised of habitat forming invertebrate communities. The SZ contains sand, reef and some seagrass which are suitable habitats for the variety of fish that live in the SZ. The SZ contains deep trenches and high currents. Very little of the SZ is comprised of reef 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; $0.34m in total GRP (less than 0.1% of the regional total ($1.6b in 2016/17)), 6 fte jobs (less than 0.1% of the regional total (15,596 fte jobs in 2016/17)) and $0.18m in household income (less than 0.1% of the regional total ($0.8b in 2016/17)). *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 effort from this SZ from the Charter Boat Fishery was the equivalent of the gross income of one Charter Boat Licence and resulted in the removal of one fishing business across the fishery. The displaced effort from this SZ from the MSF Fishery was the equivalent of half the gross income of an average licence. The displaced catch from the NZRL and Abalone fisheries in this SZ equated to foregone annual income of approximately $33,000.	One tour operator based at Penneshaw (Kangaroo Island Ocean Safari) directly utilises the SZ for snorkelling and sightseeing focused on seals, dolphins and whales. No data are available on the number of visitors or expenditure occurring in the region due to the tour operation so the economic contribution of the activity cannot be directly estimated. The nature of tours has changed since the SZ was established to include interactions with seals. It is unclear whether this would have occurred were the SZ not established. The tour operator has used the existence of the SZ for marketing purposes.	*Recreational uses:* Boating and diving occur within the Sponge Gardens SZ. Boat fishing is popular at many locations within the Encounter Marine Park including Nepean Bay and Antechamber Bay, which are adjacent to the SZ. There are several boat ramps near the SZ, including one at Penneshaw on Kangaroo Island and one at Cape Jervis on the mainland. Shore-based recreation activities adjacent to the SZ are limited due to the restricted access by road to the shoreline and high cliffs. *Recreational fishing*: Prior to SZ implementation, recreational fishing occurred along the NE coastline of Dudley Peninsula. With regard to recreational boat fishing some areas were lost due to the SZ. Shore-based line fishing is now prohibited in the SZ, but this area is difficult to access from the shore and previous recreational fishing effort was probably negligible. *Social values:* At the broader community level, social values focus on conservation of environmental values. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. The SZ is significant as a site that can be accessed by the public for recreational diving to observe a system that has full protection from fishing. The SZ has ‘wilderness 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70% (initially 75% in 2013, dropping to 60% in 2016, before increasing to 80% in 2017). A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Predictions due to SZ implementation: Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and/or western blue groper are predicted to increase in size and abundance over the next 20 years inside the SZ Southern calamari are predicted to temporarily increase in size and abundance while spawning inside the SZ. *Observations since SZ implementation:* There is insufficient data to record observed changes in species diversity/population characteristics due to the SZ.	*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 NZRL Fishery as there is relatively little reef habitat suitable for rock lobster and displaced catch was minimal. Catches of Southern Calamari and Snapper 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. King George Whiting and Garfish catch in the SZ is minimal and have been maintained 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 opportunites and therefore they were not measured.		SZs, with a small minority (less than 10 per cent) strongly opposed to them. The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs.

Source: Appendix A.2.9

Table 4-18 Summary table for Sponge Gardens sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing (will be re-introduced if the SZ is opened to fishing (Charter Boat, Marine Scalefish and Rock Lobster fisheries): 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). Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and/or western blue groper are unlikely to increase in size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as seagrass, reef, deep water sponges and associated fauna communities. It is unknown whether activities such as aquaculture and coastal developments 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 a deep water trench supporting giant sponges that is unique in the state. The steep topography and high current velocities combine to create exceptional examples of invertebrate reef communities. The SZ is also the largest SZ in the Encounter Marine Park. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these unique habitats.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $152,000, would become available again for harvesting. This would be principally in the Charter Boat Fishery and to a lesser extent in the Marine Scalefish, Northern Zone Rock Lobster and Central Zone Abalone Fisheries. The effect of changing the status 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 Snapper and Southern Calamari have been maintained in the presence of the SZ. King George Whiting and Garfish catch is small in this area and has been maintained 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 and a temporary increase in overall catch. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $152,000, would become available again for harvesting. This would be principally in the Charter Boat Fishery and to a lesser extent in the Marine Scalefish, Northern Zone Rock Lobster and Central Zone Abalone Fisheries. It is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.	*Allowing Fishing:* Commercial fishing vessel traffic and rock lobster pots are likely to be present in the area if fishing activities are allowed. These will likely impact the wilderness experience offered by the tour operator but the scale of the impact is unknown. *Changing to HPZ:* It is unlikely that activities such as aquaculture and coastal developments would ever occur in the SZ so rezoning to allow them is unlikely to impact tourism activities.	*Allowing Fishing:* The area was previously used by recreational boat fishers. It is likely that changing the zoning arrangements to allow fishing would result in an increase in recreational boat fishing activity in the SZ through a redistribution of existing activity outside the SZ. The Charter and MSF fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not by recreational fishers. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible, because it is unlikely that that activities such as aquaculture or other coastal developments would occur in the location of the SZ.

Source: Appendix A.2.9

4.10 The Pages Sanctuary Zone

Table 4-19 Summary table for The Pages sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: • Only offshore islands in Encounter Marine Park. • Overlays part of the Pages Conservation Park establishing a protected corridor from the land to the sea. *State/National priorities:* • Supports approximately one quarter of the world population of the vulnerable Australian sea lion, part of South Australia's third-largest breeding colony. • Recognised aggregation site for the vulnerable white shark. *Habitats and biodiversity* Beyond the island and its fringing reefs the SZ contains a mix of deep water (30 – 50m) soft sediment and reef habitat. The SZ has haul-out sites for the long-nosed fur seal and the Australian fur seal. Most fish species recorded are typical of reef habitats. A high abundance of surf sardines recorded, which are typically associated with the surf zone. Fish assemblages and abundance are similar to the adjacent HPZ and the SZ captures the biodiversity on offer. Fish species richness is relatively high in comparison to other surveyed SZ. The number of large fish is typical of reef sites. Commercially and recreationally targeted fish species abundance is relatively low in comparison to other surveyed sites. Sharks and rays are in relatively high abundances in SZ relative to other surveyed SZ. *Threats addressed by the SZ* The SZ addresses the following threats to conservation values within the SZ from the activities of the Charter and Marine Scalefish fisheries: removal of fished species biomass (low risk); bycatch (low risk); 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, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper are predicted to increase in size and abundance over the next 20 years inside the SZ.	*Background and context:* The MSF was the principal fishery that previously used the SZ. There was some use by the Charter Boat and Central Zone Abalone Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $31,000, principally from the Marine Scalefish (0.09% of fishery effort) and Charter Boat (0.20% of fishery effort) Fisheries. Displaced catch and effort from the Central Zone Abalone Fishery was confidential but would be minimal (less than $19,000 for the entire marine park). The SZ is comprised of mainly sand with some reef habitats suitable for the variety of fish, Rock Lobster and Abalone that live in the SZ. *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; $0.03m in total GRP (less than 0.1% of the regional total ($1.6b in 2016/17)), 1 fte job (less than 0.1% of the regional total (15,596 fte jobs in 2016/17)) and $0.02m in household income (less than 0.1% of the regional total ($0.8b in 2016/17)). *Commercial Fisheries Voluntary Catch/Effort Reduction Program:* For each of the fisheries (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 and effort from these fisheries in this SZ led to buyout of quota/licences and foregone annual income of approximately $31,000. *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 Abalone Fishery as the State-wide catch is stable and only small contributions from the applicable SAU. Catches of Snapper have been maintained in the presence	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:* Recreational activity is minimal at The Pages SZ, due to the remote nature of the SZ. There are two boat ramps near the SZ at Penneshaw on Kangaroo Island and at Cape Jervis on the mainland. *Recreational fishing*: Prior to SZ implementation, recreational fishing at the SZ was minimal due to its distance from the shore, with only some area lost due to the SZ *Social values:* At the broader community level, social values focus on conservation of environmental values. A number of scientific monitoring sites are located within the SZ as part of the Marine Parks Monitoring, Evaluation and Reporting Program. The Pages are part of the Ngurunderi Dreaming Story of the Ngarrindjeri people and are very culturally important to the Ngarrindjeri people. The SZ has 'wilderness 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70% (initially 75% in 2013, dropping to 60% in 2016, before increasing to 80% in 2017). A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them. The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs.

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.	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. King George Whiting and Garfish catch in the SZ is minimal and has been maintained 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 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.10

Table 4-20 Summary table for The Pages sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing (Charter and Marine Scalefish fisheries) will be re-introduced if 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, particularly the vulnerable Australian sea lion). Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper are unlikely to increase in size and abundance in the SZ over the next 20 years. The SZ is a priority monitoring site. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such 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, changing the zoning to HPZ would allow such activities to potentially occur in the future. The SZ represents the only remote offshore island ecosystem in the GSV bioregion. This SZ captures extensive highly exposed deep water reef not captured elsewhere in other SZs. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these unique reefs characteristic of remote offshore islands.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $31,000, would become available again for harvesting. This would be principally in the Marine Scalesfish Fishery, with some minor use by the Charter Boat and Central Zone Abalone Fisheries. The effect of changing the status 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 snapper have been maintained in the presence of the SZ. King George Whiting and Garfish catch is small in this MFA and has been maintained 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 and a temporary increase in overall catch for Marine Scalefish and Abalone. Charter fishers would utilise this SZ if opened to fishing. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $31,000, would become available again for harvesting. This would be principally in the Marine Scalesfish Fishery, with some minor use by the Charter Boat and Central Zone Abalone Fisheries. It is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* 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.	*Allowing fishing:* As the area was only lightly used by recreational boat fishers, it is possible that changing the zoning arrangements to allow fishing would result in only a slight increase in recreational boat fishing activity in the SZ through a redistribution of existing activity from outside of the SZ. The charter and MSF fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry, but possibly not supported by recreational fishers. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible, because it is unlikely that that activities such as aquaculture or other coastal developments would occur in the location of the SZ.

Source: Appendix A.2.10

4.11 Cape Borda Sanctuary Zone

Table 4-21 Summary table for Cape Borda sanctuary zone – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Regional characteristics: • Eighth largest SZ in the marine parks network. • Adjacent to Ravine des Casoars and Cape Torrens Wilderness Areas and Flinders Chase National Park establishing a protected corridor from land to sea. *State/National priorities:* • Supports a haul-out site for the vulnerable Australian sea lion. • Nesting area for the state endangered white-bellied sea eagle. • Near shore reef system is important habitat for long lived site-attached fish including western blue groper, harlequin fish, and western blue devils. *Habitats and biodiversity* The SZ contains a narrow band of fringing coastal reef that transitions to sandy seafloors sloping steeply into deep waters habitats (deeper than 50m) within 1 kilometre of shore. The SZ contains a 700m boulder beach and has exposed bedrock platform reef backed by cliffs up to 200m high. 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 are predicted to increase in size and abundance over the next 20 years inside the 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 SZ.	*Background and context:* The NZRL Fishery was the principal fishery that previously used the SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries. Historically, the total gross value of displaced catch in this SZ is estimated to be at least $58,000, from the NZRL ($42,000, 0.11% of fishery catch), Charter Boat ($14,000, 0.33% of fishery effort), Marine Scalefish ($1,000, 0.02% of fishery effort) and Abalone ($1,000, 0.01% of fishery catch) Fisheries. Displaced catch from the Sardine Fishery was confidential but would be minimal. The nearshore habitat of Cape Borda SZ is comprised of reef suitable for Rock Lobster and Abalone. Most of the SZ is sand and not suitable for Rock Lobsters or 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; $0.04m in total GRP (less than 0.1% of the regional total ($1.6b in 2016/17)), less than 1 fte job (less than 0.1% of the regional total (15,596 fte jobs in 2016/17)) and $0.02m in household income (less than 0.1% of the regional total ($0.8b in 2016/17)). *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 $58,000. *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 Rock Lobster, Abalone, Marine Scalefish and Charter Boat Fisheries as catch has been maintained in the presence of the SZ. The number of	No recognised tourism activities take place in 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 in the Cape Borda SZ is minimal 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 limited due to the restricted access by road to the shoreline and high cliffs. *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. The SZ is difficult to access from the land; fishing has been negligible. *Social values:* At the broader community level, social values focus on conservation of environmental values. The SZ has 'wilderness 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70% (initially 75% in 2013, dropping to 60% in 2016, before increasing to 80% 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.	Rock Lobster operators has declined since 2014 and the buyout of catch is consistent with this although not definitively the cause. No negative change has been observed in the Sardine fishery due to the SZ because displaced catch was minimal. However, this is an area where Sardines have been harvested so there may be issues with vessels inadvertently drifting into the SZ while hauling nets. 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 opportunites and therefore they were not measured.		

Source: Appendix A.2.11

Table 4-22 Summary table for Cape Borda sanctuary zone – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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 the vulnerable Australian sea lion (Rock Lobster Fishery)). Rock lobster, greenlip abalone and blacklip abalone 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 are unlikely to maintain size and abundance in the SZ over the next 20 years. *Changing to HPZ:* The SZ has several habitat types that are sensitive to disturbance such as 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, changing the zoning to HPZ would allow such activities to potentially occur in the future. The SZ captures the full transition from nearshore coastal reef to deep water sand characteristic of Investigator Strait. Changing/downgrading the zoning would compromise the marine park system by reducing the protection for these representative habitats. Loss of the eighth largest SZ would significantly compromise the adequacy of the network.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $58,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster (NZRL) Fishery. Some minor catch may be made by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries. The effect of changing the status 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. Rock Lobster, Abalone and MSF catch in MFA 39 and SAU 32A have 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 and a temporary increase in overall catch. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $58,000, would become available again for harvesting. This would be principally in the Northern Zone Rock Lobster (NZRL) Fishery. Some minor catch may be made by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries. Future activities such as aquaculture which could impact commercial fishing would be possible in this zone, but the likelihood is unknown.	*Allowing fishing:* Since there are no tourism activities, there would be no impact on tourism from opening the SZ to fishing activities. *Changing to HPZ:* Since there are no tourism activities and relevant developments are unlikely to occur, there would be no impact on tourism from opening the SZ to (non-fishing) activities allowed in a HPZ but not an SZ.	*Allowing Fishing:* As the area was rarely if ever used by recreational shore-based and boat fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in an increase in recreational fishing activity. The Rock Lobster and Charter Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible in the short-term, because it is unlikely that activities such as aquaculture or other coastal developments would occur in the location of the SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

Source: Appendix A.2.11

4.12 Cape du Couedic Sanctuary Zone

Table 4-23 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.	*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 $659,000, distributed between the Abalone ($217,000, 2.47% of fishery catch), Rock Lobster ($441,000, 1.12% of fishery catch), Marine Scalefish ($2,000, 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; $0.83m in total GRP (0.1% of the regional total ($1.6b in 2016/17)), 6 fte jobs (less than 0.1% of the regional total (15,596 fte jobs in 2016/17)) and $0.52m in household income (0.1% of the regional total ($834.6m in 2016/17)). *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.	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

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
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. *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.	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 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 opportunites and therefore they were not measured.		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).

Source: Appendix A.2.12

Table 4-24 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	
Allowing fishing: Threats removed from the cessation of commercial fishing will be re-introduced if 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 the SZ over the next 20 years. The SZ is a priority monitoring site. Opening the SZ to fishing would reduce the effectiveness of this site for monitoring purposes. *Changing to HPZ:* 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.	*Allowing fishing:* The total gross value of displaced catch in this SZ, estimated to be at least $659,000, would become available again for harvesting. This would be principally in the Central Zone Abalone and Northern Zone Rock Lobster (NZRL) Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. The effect of changing the status 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. Opening the SZ to fishing, specifically 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. Over time the catch rates would likely decline and stabilise to levels seen outside the SZ and across the western end of Kangaroo Island. *Changing to HPZ:* The total gross value of displaced catch in this SZ, estimated to be at least $659,000, would become available again for harvesting. This would be principally in the Central Zone Abalone and Northern Zone Rock Lobster (NZRL) Fisheries and to a lesser extent the Marine Scalefish and Charter Boat Fisheries. Due to the isolated and exposed location of the SZ 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.	*Allowing fishing:* 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). *Changing to HPZ:* 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 the SZ to (non-fishing) activities allowed in an HPZ.	*Allowing fishing:* 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. If the study were continued it would improve knowledge and support decision-making with regard to the marine parks monitoring program. 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. The Rock Lobster and Abalone Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry, but possibly not the conservation sector. There may be possible loss of 'wilderness value'. *Changing to HPZ:* The impact on social values from opening the SZ to non-fishing activities allowed in an HPZ is expected to be negligible, because it is unlikely that that activities such as aquaculture or other coastal developments would occur in the location of the SZ.

Source: Appendix A.2.12

4.13 Discussion

Our analysis shows that the environmental values of the 12 focus SZs are significant. For example:

- Five of the 12 focus SZs are in the top eight SZs in terms of size (see Table 6 1). 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.
- Seven of the 12 focus SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea. Pearson Isles SZ is adjacent to a Commonwealth marine park zone.
- 10 of the 12 focus SZs are known breeding locations for rare and threatened marine birds and mammals (see Table 6 1).
- 8 of the 12 focus SZ's were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.

Several of the focus 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[87] commercial fishing areas. These SZs are the Isles of St Francis, Pearson Isles, 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, Salt Creek, Rapid Head, Bay of Shoals, The Pages and Cape Borda were of minor importance to commercial fishing with displaced catch or effort estimated at below $100,000 for each of these SZs. A very small amount of charter boat activity took place prior to zoning in 10 focus SZs. The Sponge Gardens SZ was historically moderately important[88] to the Charter Boat Fishery (1.7 per cent of fishery effort).

The voluntary buybacks achieved through the SA Marine Parks Commercial Fisheries Voluntary Catch/Effort Reduction Program (described in Section 2.3.8) 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) 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.

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

[88] Historic average annual catch between $100,000 and $400,000 GVP.

For example, of the fisheries that sustained more than 1 per cent of displaced catch/effort from the implementation of SZs (i.e. Rock Lobster, Abalone, Marine Scalefish, Charter Boat and Sardine fisheries) all experienced reductions in their catch/effort over the 10 years prior to zoning in 2014[89]. Abalone and Charter fisheries experienced minor changes and Northern Zone Rock Lobster, Sardine and Marine Scalefish experienced significant declines of approximately 26 per cent, 42 per cent and 9 per cent respectively. These declines are due to a range of factors including changes in environmental conditions, market conditions, interannual fluctations in stock biomass and fisheries management changes (e.g. quota reductions, reductions in licence numbers, new spatial closures for netting). It should be noted that Abalone, Sardine and Marine Scalefish have experienced increased catch/effort in the period since 2014, further underlining the relative unimportance of marine park zoning in the trends in 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).

Eight of the 12 Focus SZs are sites for the government scientific monitoring program, which if 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.2.12.4). Data comparing various metrics from inside SZs relative to outside can be found in the 2017 Marine Parks Status Report (DEWNR 2017a).

The Pages and Cape du Couedic SZs are 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.

Four of the 12 focus SZs (North Neptune Islands, Rapid Head, Bay of Shoals and Sponge Gardens) are used for non-fishing based tourism. The 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. The existence of the SZ is known to be promoted by operators in two (North Neptune Islands and Sponge Gardens SZs) of the four SZs.

Comparative analysis of socio-economic trends (population, labour force, unemployment property prices and school enrolments, see APPENDIX 4) 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

[89] See Appendix Table 3-1 (Abalone fisheries), Appendix Table 3-3 (Northern Zone Rock Lobster Fishery), Appendix Table 3-6 (Sardine Fishery), Appendix Table 3-7 (Marine Scalefish Fishery) and Appendix Table 3-8 (Charter Boat Fishery).

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). 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 the activities or zoning arrangements in the focus SZs to allow fishing or other extractive activities inside a SZ (by changing to HPZ status) will significantly 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. 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.

With change in 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 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[90] (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

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

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 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 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 zoning status from SZ to allowing fishing or HPZ is likely to benefit recreational fishers in Clinton Wetlands, Rapid Heads and Sponge Gardens SZs through a redistribution of existing recreational fishing activity from areas adjacent to the zone. However, in Clinton Wetlands and Rapid Head it is likely that the return of commercial fishing will not be supported by recreational fishers.

With regard to non-fishing tourism activites, opening 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. Within the Rapid Heads SZ, the ex-HMAS Hobart would still be protected from fishing by an exclusion zone under the *Historic Shipwrecks Act 1981* if the zoning changed. However, without SZ status, there would likely be a decrease in compliance activities by DEW in the area and a return in illegal activity at the site. It is unknown if 'wildlife' tourism activities in Bay of Shoals and Sponge Gardens would be negatively impacted by a change in status of these SZs.

5. OPPORTUNITIES

DEW used the following criteria to identify areas for EconSearch to investigate for potential opportunities for marine parks or marine protection:

- Consider the metropolitan area (as per election commitment)
- Consider areas previously suggested through public submissions
- Consider areas that do not result in the displacement of commercial or recreational fishing or other recreational activities.

Two areas met these criteria: The Port Stanvac area as a SZ within an extension of the Encounter Marine Park, and the Adelaide metro coast within an extension of the Adelaide Dolphin Sanctuary. This section considers the values under existing arrangements and the values under changing arrangements in each of these cases. The following assessments are based on information provided by DEW and other sources (as referenced).

5.1 Metropolitan Coast – southerly extension of Adelaide Dolphin Sanctuary

The metropolitan coast is described as including the sandy beaches between Seacliff and North Haven and the adjacent marine waters. To the north of North Haven lies the Adelaide Dolphin Sanctuary, extending from Port Adelaide to Port Gawler, including the waters of the Port Adelaide River and Barker Inlet. The Adelaide Dolphin Sanctuary (ADS) is not a sanctuary as proclaimed under the *Marine Parks Act 2007*, although using the same terminology. It is not a high conservation no-take area, but rather, a marine mammal protected area, proclaimed under the *Adelaide Dolphin Sanctuary Act 2005*. The objects of the *Adelaide Dolphin Sanctuary Act 2005* are spatially focussed on the Port Adelaide River estuary and Barker Inlet, and the protection of the dolphin population and its habitats within that area. The *Adelaide Dolphin Sanctuary Act 2005* and its object and objectives do not currently provide for the protection of waters off the metropolitan coast and would require significant amendments. The *Adelaide Dolphin Sanctuary Act 2005* does not provide a mechanism to apply zoning such as that found in marine parks. If this is desired for the metropolitan coast, then the metropolitan coastal waters, along with the current Adelaide Dolphin Sanctuary, would need to be proclaimed under the *Marine Parks Act 2007,* and a management plan with zoning developed. Alternatively, the Encounter Marine Park could be extended north and a management plan with zoning developed.

Extending the Adelaide Dolphin Sanctuary to include the metropolitan coast has been proposed to the previous and current government by community stakeholders. The principal regulatory mechanism for protecting dolphins in the Adelaide Dolphin Sanctuary is the *National Parks and Wildlife (Protected Animals – Marine Mammals) Regulations 2010*. These regulations apply throughout the states' waters, therefore, dolphins are as protected outside the Adelaide Dolphin Sanctuary as within it.

The regulations also establish several key prescribed areas with additional protections, one of which is the Adelaide Metropolitan Beaches Restricted Area (Outer Harbor to Christies Beach). This Restricted Area governs the viewing of marine mammals, thus ensuring commercial and recreational marine mammal tourism and vessel use operates in a conservative and ecologically sustainable way.

This section considers the values under existing arrangements and the values under changing arrangements whereby the area is proclaimed as an extension of the Adelaide Dolphin Sanctuary.

5.2 Port Stanvac

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 is being 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 the marine area is proclaimed as a marine park SZ.

Table 5-1 Summary table for Metropolitan Coast – impacts on values of existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
The coast is dominated by sand and seagrass habitats with some patches of reef. Nearshore marine habitats of the metropolitan coast are in a degraded state due to historical water quality issues. Biodiversity is impacted by ongoing recreational and commercial harvesting of fish and invertebrates.	Commercial line fishing, blue crab, charter fishing and the GSV prawn fishery occurs off the metropolitan coast. Charter fishing in metropolitan waters is based out of each of the boat ramps and marinas. An exclusion area for commercial marine scale net fishing applies along the whole metropolitan coast.	Sailing tours operate, such as Temptation Sailing, based at Glenelg. Sailing cruises by tall ship One and All are based at Port Adelaide. Charter diving operates in the area with several key destinations, mostly off Glenelg, to dive on wrecks and reefs. Dolphin-viewing cruises around Port River and Barker Inlet.	The metropolitan waters experience the highest concentration of recreational fishing in South Australia, served by three boat ramps, two marinas and six jetties. The metropolitan coast includes the most highly used recreational beaches in South Australia. Reliable dolphin viewing in Port River.

Table 5-2 Summary table for Metropolitan Coast – impacts on values of changing existing arrangements

Environmental value	Economic Value		Social value
	Commercial fishing industry	Tourism industry	
Making the area an extension of the Adelaide Dolphin Sanctuary No additional protection for habitats or biodiversity. No change or improvement would be expected in ecological values. *Marine Mammal Regulations* already apply throughout SA waters, so no improvement in protection for dolphins or other marine mammals would be achieved.	*Making the area an extension of the Adelaide Dolphin Sanctuary* The *Adelaide Dolphin Sanctuary Act 2005* has no provisions to prevent fishing, therefore no impact on commercial fishing would be expected.	*Making the area an extension of the Adelaide Dolphin Sanctuary* No change expected for the existing tourism industry. No potential benefits expected for prospective new tourism businesses due to the unreliability of dolphin viewing opportunities along the metropolitan coast.	*Making the area an extension of the Adelaide Dolphin Sanctuary* Reliable dolphin viewing in Port River, but dolphin viewing opportunities for the public off the metropolitan coast would remain very unreliable. The *Adelaide Dolphin Sanctuary Act 2005* has no provisions to prevent fishing, therefore no impact on recreational fishing would be expected.

Table 5-3 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 1.6km^2 in area and encompasses 1.7km 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 5-4 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 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 area a Marine Park Sanctuary Zone* No displacement of commercial fishing as none currently occurs.	*Making the 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 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.

5.3 Discussion

Two areas have been identified as potential opportunities for protection that are within metropolitan waters, have been suggested through public submission and do not result in displacement of commercial or recreational fishing or other recreational activities. These are (i) the southerly extension of the Adelaide Dolphin Sanctuary and (ii) Port Stanvac restricted access area.

Extending the Adelaide Dolphin Sanctuary to include the metropolitan coast has been proposed to the previous and current government by community stakeholders. Significant legislative amendment would be required to extend the Adelaide Dolphin Sanctuary and to provide equivalent zoning arrangements as the *Marine Parks Act 2007*. The environmental values of the proposed extension are currently quite degraded from historical water quality issues. No change to these environmental values is expected through implementing this proposal, because current extractive and other threatening processes will not be changed by the governing legislation. Commercial and recreational fishing occur within this area and will continue if this proposal is implemented, therefore no impact on these activities is expected. Dolphin viewing by the public will remain highly reliable within the Port River and Barker Inlet and remain unreliable along the metropolitan coast.

The 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.

6. 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[91] and 7 community principles[92] (APPENDIX 7) and over 100 marine park policy commitments (Section 2.2.3). 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[93]. 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).

As described in Section 3.1, 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.

As noteded earlier (section 3.1), 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'. 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).

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91 The precautionary approach, comprehensiveness, adequacy, representativeness, connectivity and linkages, resilience and vulnerability and ecological importance

92 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

93 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).

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.8.2).

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 (Section 3.21), 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 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 4 and Appendix 3) 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.

For example, of the fisheries that sustained more than 1 per cent of displaced catch/effort from the implementation of SZs (i.e. Rock Lobster, Abalone, Marine Scalefish, Charter Boat and Sardine fisheries) all experienced reductions in their catch/effort over the 10 years prior to zoning in 2014[94]. Abalone and Charter fisheries experienced minor changes and Northern Zone Rock Lobster, Sardine and Marine Scalefish experienced significant declines of approximately 26 per cent, 42 per cent and 9 per cent respectively. These declines are due to a range of factors including changes in environmental conditions, market conditions, interannual fluctations in stock biomass and fisheries management changes (e.g. quota reductions, reductions in licence numbers, new spatial closures for netting). It should be noted that Abalone, Sardine and Marine Scalefish have experienced increased catch/effort in the period since 2014, further underlining the relative unimportance of marine park zoning in the trends in these fisheries.

Comparative analysis of socio-economic trends (population, labour force, unemployment property prices and school enrolments, see APPENDIX 4) in large, 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 4.13), indicating that the Marine Park zoning has not been a contributing factor affecting the socio-economic performance of these towns.

[94] See Appendix Table 3-1 (Abalone fisheries), Appendix Table 3-3 (Northern Zone Rock Lobster Fishery), Appendix Table 3-6 (Sardine Fishery), Appendix Table 3-7 (Marine Scalefish Fishery) and Appendix Table 3-8 (Charter Boat Fishery).

With regards to the focus SZs, our analysis shows that the environmental values of these 12 focus SZs are significant. For example:

- Five of the 12 focus SZs are in the top eight SZs in terms of size (see Table 6-1). 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.
- Seven of the 12 focus SZs are adjacent to land-based protected areas, providing protected corridors between the land and sea. Pearson Isles SZ is adjacent to a Commonwealth marine park zone.
- 10 of the 12 focus SZs are known breeding locations for rare and threatened marine birds and mammals (see Table 6-1).
- 8 of the 12 focus SZ's were selected for the Government's long term ecological monitoring program based on their outstanding biodiversity values.

Several of the focus 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[95] commercial fishing areas. These SZs are the Isles of St Francis, Pearson Isles, 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, Salt Creek, Rapid Head, Bay of Shoals, The Pages and Cape Borda were of minor importance to commercial fishing with displaced catch or effort estimated at below $100,000 for each of these SZs. A very small amount of charter boat activity took place prior to zoning in 10 focus SZs. The Sponge Gardens SZ was historically moderately important[96] to the Charter Boat Fishery (1.7 per cent of fishery effort).

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).

Eight of the 12 Focus SZs are sites for the government scientific monitoring program, which if 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 (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.2.12.4). The Pages and Cape du Couedic SZs are 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. Four of the 12 focus

95 Historic average annual catch greater than $400,000 GVP.

96 Historic average annual catch between $100,000 and $400,000 GVP.

SZs are used for non-fishing based tourism. The existence of the SZ is known to be promoted by operators in two of the four SZs.

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) will significantly 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.

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 the SZ. 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 zoning status from SZ to allowing fishing or HPZ is likely to benefit recreational fishers in Clinton Wetlands, Rapid Heads and Sponge Gardens SZs through a redistribution of existing recreational fishing activity from areas adjacent to these zones. However, in Clinton Wetlands and Rapid Head it is likely that the return of commercial fishing will not be supported by recreational fishers. The reintroduction of commercial fishing in North Neptune Island SZ would likely not be supported by the shark cage diving industry.

Two areas have been identified as potential opportunities for protection, that are within metropolitan waters, have been suggested through public submission and do not result in displacement of commercial or recreational fishing or other recreational activities. These are (i)

the southerly extension of the Adelaide Dolphin Sanctuary and (ii) Port Stanvac restricted access area. Extending the Adelaide Dolphin Sanctuary would appear to be of little conservation or social benefit and alternative approaches to afford more effective protection of the Port River dolphin population may be worth considering. Extenson of the Encounter Marine Park outer boundaries to incorporate the Port Stanvac restricted access area, on the available information would appear worthy of further investigation with 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.

Table 6-1 Summary table for 12 focus sanctuary zones – impacts on values of existing arrangements

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
Nuyts Reef (Nuyts Archipelago Marine Park)	***Area***: 105 km^2 (53 km^2 mapped, 50%) ***Mapped benthic (subtidal) habitats***: Reef (100%), sand (<1%) ***Features***: • Sixth largest SZ in the state marine park network • Largest and most westerly limestone reef in the Murat bioregion • Last shoreline inflection (or settling place) before the Head of the Bight.	Important breeding ground for nationally vulnerable Australian sea lion and state endangered osprey.	Prior to zoning, total gross value of displaced catch estimated at $82,000, principally from the NZRL (0.11% of fishery catch) and Abalone (0.13% of fishery catch) Fisheries. Also Marine Scalefish (0.02% of fishery effort). Ongoing impact: $0.09m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, boat-based recreational fishing was minimal (difficult access due to remoteness). Shore-based recreational fishing accommodated through SPA. Significant wilderness value maintained since zoning.
Isles of St Francis (Nuyts Archipelago Marine Park)	***Area***: 123 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Sand (60%), reef (32%), seagrass (8%) ***Features***: • Third largest SZ in the state marine park network • Biodiversity hotspot influenced by the Leeuwin Current and containing species common to Western and South Australia • Diverse habitats in comparatively 'pristine' condition.	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle, osprey).	Prior to zoning, total gross value of displaced catch estimated at $668,000, principally from the Abalone (1.78% of fishery catch), NZRL (0.44% of fishery catch) and Marine Scalefish (0.19% of fishery effort) Fisheries. Ongoing impact: $0.94m in total GRP (<0.1% regional total), 6 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific and wilderness values enhanced since zoning.
Pearson Isles (Investigator Marine Park)	***Area***: 165 km^2 (5 km^2 mapped, 3%) ***Mapped benthic (subtidal) habitats***: Reef (38%), sand (34%), seagrass (28%) ***Features***: • Second largest SZ in the state marine park network • Adjacent to Commonwealth Marine Park Zone • Exceptional example of marine biodiversity and habitats, including deep seagrass meadows • Isolated and unique geological feature (inselberg).	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish. Large populations of blue groper. Largest breeding colony of little penguins in the state Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle)	Prior to zoning, total gross value of displaced catch estimated at $597,000. Principally from the NZRL Fishery (1.42% of fishery catch). Also Abalone (0.09% of fishery catch) and Marine Scalefish (0.16% of fishery effort) Fisheries. Ongoing impact: $0.69m in total GRP (<0.1% regional total), 5 fte jobs (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific, educational and wilderness values enhanced since zoning.
Salt Creek (Sir Joseph Banks Group Marine Park)	***Area***: 105 km^2 (16 km^2 mapped, 15%) ***Mapped benthic (subtidal) habitats***: Seagrass (95%), reef (4%), sand (2%) ***Features***: • Seventh largest SZ in the state marine park network • Borders both Eyre and SG bioregions protecting a mix of the ecological characteristics of both bioregions • Protects the ecosystem from estuary mouth, across sandflats and out to seagrass beds, providing protective corridor and important breeding and nursery ground for many fish and invertebrate species.	At least 5 migratory coastal shorebird species listed under international migratory treaties and other resident coastal waders use SZ for roosting and feeding Provides habitat for rare/conservation concern species, e.g. white shark, sculptured sea moth and the Eastern stargazer.	Prior to zoning, the total gross value of displaced catch in this SZ is estimated to be at least $13,000, from the Marine Scalefish (0.02% of fishery effort) Fishery. Ongoing impact: $0.27m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minor (most of effort was inshore where SZ boundary inflection accommodates this).

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
North Neptune Islands (Neptune Isles Group Marine Park)	***Area***: 34 km^2 (3 km^2 mapped, 10%) ***Mapped benthic (subtidal) habitats***: Reef (100%) ***Features***: • 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.	World renowned hot spot for the vulnerable white shark Nationally significant breeding colony for long-nosed fur seals (50% of total SA breeding population) Important breeding ground for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle) Habitat for the endangered coastal stingaree, SA endemic.	Prior to zoning, total gross value of displaced catch estimated at $468,000, principally from the NZRL Fishery (1.06% of fishery catch). Also Abalone Fishery (0.17% of fishery catch). Ongoing impact: $0.56m in total GRP (<0.1% regional total), 4 fte jobs (< 0.1% regional total).	White shark cage diving tours are run in the SZ by 3 operators. There were 9,807 tour participants in 2016/17, generating around $7.4m total GRP and 67 fte jobs in Eyre Peninsula. The existence of the SZ influences the decision of some participants to take part in the activity. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific, educational and wilderness values enhanced since zoning.
Clinton Wetlands (Upper Gulf St Vincent Marine Park)	***Area***: 59 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Seagrass (76%), saltmarsh (9%), mangrove (8%), sand (4%), other (2%) ***Features***: • Contains entire top of gulf ecosystem from land to sea including saltmarsh, mangroves, intertidal seagrass and dense shallow seagrass meadows • Only example within State waters of hypersaline water due to the interaction between tidal extremes and inverse estuarine flow • Partially overlays Clinton Conservation Park, establishing a protected corridor between the land and sea.	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, and feeding grounds for migratory shorebirds protected under international treaties.	Prior to zoning, total gross value of displaced catch estimated at $485,000, principally from the MSF (1.04% of fishery catch). Ongoing impact: $0.73m in total GRP (<0.1% regional total), 16 fte jobs (0.1% regional total).	No recognised tourism industry activities took place in the area prior to the SZ and none have begun since.	Prior to zoning, recreational fishing was moderate. Shore-based fishing accommodated through SPA. Scientific and wilderness values maintained since zoning.
Rapid Head (Encounter Marine Park)	***Area***: 50 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Sand (89%), seagrass (9%), reef (2%) ***Features***: • Captures complete transition from near shore reef and seagrass habitats to deep water sand habitats characteristic of southern GSV coastal ecosystem	Protection for all life cycle stages of southern calamari (adult breeding and eggs inshore, juveniles offshore). Key habitat for protected leafy sea dragon. Contains a haul-out site for the vulnerable Australian sea lion. SZ with longest ecological timeseries dataset.	Prior to zoning, total gross value of displaced catch estimated at $71,000, principally from the Charter Boat (0.79% of fishery effort), Marine Scalefish (0.08% of fishery effort) and GSV Prawn (0.45% of fishery effort) Fisheries. Ongoing impact: $0.07m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	Some commercial diving tours operate in the SZ and utilise the ex-HMAS Hobart ship wreck. The number of tours and participants before and since the establishment of the SZ is unknown. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Prior to zoning, recreational fishing was moderate. Relatively easy access for recreational (diving, kayaking and boating), scientific and educational values enhanced.
Bay of Shoals (Encounter Marine Park)	***Area***: 25 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Seagrass (79%), sand (15%), other (6%) ***Features***: • Regionally significant sheltered embayment dominated by seagrass meadows to 5m deep. Large shallow bay has natural channels protected by a tidally exposed sandbar including Busby and Beatrice Islets • Nursery area for King George whiting, and Western king prawn, Southern garfish and snook. Dense seagrass meadows support a range	Busby and Beatrice Islets recognised as Wetlands of National Importance Provides important nesting and feeding grounds for resident shorebirds, and feeding grounds for migratory shorebirds protected under international treaties	Prior to zoning, total gross value of displaced catch estimated at $13,000, principally from the MSF (0.05% of fishery effort). Ongoing economic impact is minimal.	One tour operator directly utilises the SZ for full-day tours. It is unknown whether any change to activities has occurred due to the presence of the SZ.	Prior to zoning, boat-based recreational fishing was minimal (most of effort was in entrance to the Bay). Boat-based fishing accommodated through zoning. Boating, kayaking and recreational diving activities maintained. Scientific and wilderness values maintained since zoning.

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
	of fish and invertebrates including cryptic species like pipefish and leafy sea dragons	Nesting area for state endangered osprey.			
Sponge Gardens (Encounter Marine Park)	***Area***: 60 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Deep sea sponges (50%), reef (18%), sand (23%), seagrass (2%) ***Features:*** • Includes one of two deep water trenches in State waters • Supports sponge communities with unusually large specimens. These sponge-dominated community types are uncommon at the bioregional scale.	Biodiversity hotspot, highly diverse fish assemblages and high abundance of mature/large fish. Important refuge for fish species of conservation concern (blue devils, harlequin fish). Supports a haul-out site for the vulnerable Australian sea lion and nesting site for state endangered species (sea eagle and osprey). Supports a number of red macro algal species (seaweeds) with very limited range of distribution.	Prior to zoning, total gross value of displaced catch estimated at $152,000, mainly from the Charter Boat (1.70% of fishery effort), Marine Scalefish (0.19% of fishery effort and NZRL (0.08% of fishery catch) Fisheries. Ongoing impact: $0.34m in total GRP (<0.1% regional total), 6 fte jobs (< 0.1% regional total).	One tour operator directly utilises the SZ for tours. The operator uses the existence of the SZ for marketing and has since gained permits for seal and dolphin interactions as part of their tours. It is unknown whether activities have changed significantly due to the existence of the SZ.	Prior to zoning, boat-based recreational fishing was moderate. Scientific, educational and wilderness values enhanced since zoning.
The Pages (Encounter Marine Park)	***Area***: 42 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Reef (51%), sand (49%) ***Features:*** • Only offshore islands in Encounter Marine Park. • Overlays part of the Pages Conservation Park establishing a protected corridor from the land to the sea.	Internationally significant breeding population of vulnerable Australian sea lion (Supports approximately one quarter of the world population). Recognised aggregation site for the vulnerable white shark.	Prior to zoning, total gross value of displaced catch estimated at $31,000, principally from the Marine Scalefish (0.09% of fishery effort) and Charter Boat (0.20% of fishery effort) Fisheries. Ongoing impact: $0.03m in total GRP (<0.1% regional total), 1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). The Pages are very culturally important to the Ngarrindjeri people. Scientific and wilderness values enhanced since zoning.
Cape Borda (Western Kangaroo Island Marine Park)	***Area***: 82 km^2 (11 km^2 mapped, 14%) ***Mapped benthic (subtidal) habitats***: Sand (81%), reef (19%) ***Features:*** • Eighth largest SZ in the state marine park network • Adjacent to Ravine des Casoars and Cape Torrens Wilderness Areas and Flinders Chase National Park establishing a protected corridor from land to sea.	Supports a haul-out site for the vulnerable Australian sea lion. Nesting area for the state endangered white-bellied sea eagle.	Prior to zoning, the total gross value of displaced catch estimated at $58,000, principally from the NZRL Fishery (0.11% of fishery catch). Also Charter Boat Fishery (0.33% of fishery effort). Ongoing impact: $0.04m in total GRP (<0.1% regional total), <1 fte job (< 0.1% regional total).	A very small amount of charter boat activity took place prior to the SZ and has since ceased. No other recognised tourism industry activities take place in the area.	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). Scientific and wilderness values enhanced since zoning.
Cape du Couedic (Western Kangaroo Island Marine Park)	***Area***: 28 km^2 (100% mapped) ***Mapped benthic (subtidal) habitats***: Reef (76%), sand (24%) ***Features:*** • Adjacent to Flinders Chase National Park establishing a protected corridor from land to sea. • Located in an area with a seasonal upwelling that provides nutrients to support productive and complex ecosystems, including seabirds, fur	Important breeding site for nationally vulnerable Australian sea lion and state endangered species (white bellied sea eagle) One of two known South Australian breeding sites for Australian fur seals. Breeding area for long-nosed fur seals.	Prior to zoning, the total gross value of displaced catch estimated at $659,000, principally from the NZRL (2.47% of fishery catch) and Central Zone Abalone (1.12% of fishery catch) Fisheries. Ongoing impact: $0.83m in total GRP (0.1% regional total), 6 fte jobs (< 0.1% regional total).	The Cape du Couedic precinct attracts around 171,000 annual visitors who contribute around $22.2m in total GRP and 308 fte jobs to Kangaroo Island. Interpretive signage added since the SZ was established adds educative value for visitors but no additional	Prior to zoning, recreational fishing was minimal (difficult access due to remoteness). The Casuarina Islets are very culturally important to the Ngarrindjeri people.

Focus Sanctuary Zone	Zone description	Environmental value	Economic value		Social value
			Commercial fishing industry	Tourism industry	
	seals/sea lions, whales, abalone, rock lobster and a large diversity of fish species.	Observed changes: rock lobster increase in size and abundance in SZ since zoning implemented.		activities are expected from the existence of the SZ. A very small amount of charter boat activity took place prior to the SZ and has since ceased.	Scientific, educational and wilderness values enhanced since zoning.

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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 12 focus SZs was based around answering the following key questions:

Economic (commercial fishing) values:

1. Which fisheries sectors previously utilised the SZ?
2. For those fisheries that utilised the SZ, what was the historical importance of the SZ to the whole fishery?
3. What proportion of the SZ has habitat suitable for different fishing activities?
4. What was the estimated economic value and impact to fishing of the SZ?
5. What was the estimated impact on individual fishers versus the whole fishery?
6. Is there any evidence of a negative impact on fisheries since the introduction of the SZ?
7. Any compensation claims related to the SZ?
8. What impact would there be to the fisheries values of opening the SZ to different fishing activities?
9. What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a 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 the SZ to different fishing activities?
5. What impact would there be to the tourism values of opening the SZ to (non-fishing) activities allowed in a HPZ but not an 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 the SZ to different fishing activities?
7. What impact would there be to the social values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a 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 the SZ to different activities?
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?

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 12 focus SZs, based on the Questions listed in APPENDIX 1. As described in Section 1, assessment of the 12 focus SZs was based around answering these key questions.

A.2.1 Nuyts Reef Sanctuary Zone

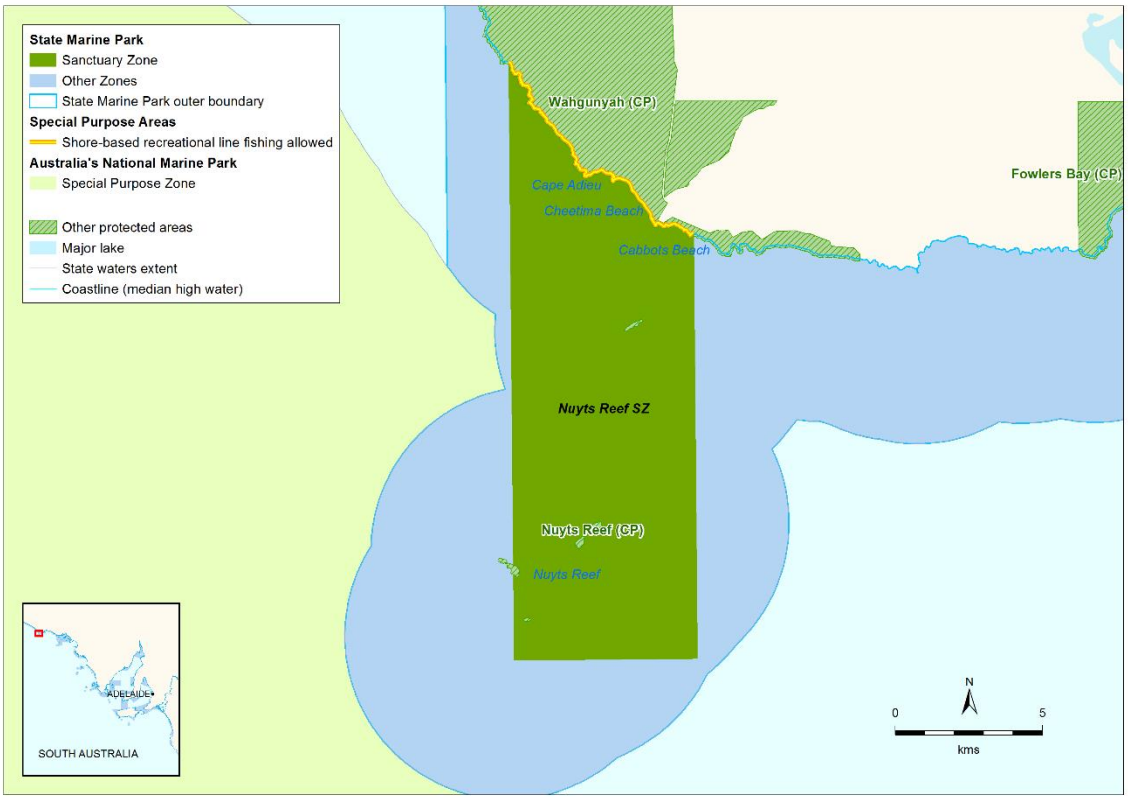
A.2.1.1 Zone description

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 9

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 Economic values and impacts

A.2.1.2.1 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.

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 $82,000, principally from the NZRL ($44,000), Western Zone Abalone ($34,000) and Marine Scalefish ($5,000) 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) 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)
Sardines	-	-	-
Abalone	750	0.13%	34
Rock Lobster	730	0.11%	44
Marine Scalefish	14	0.02%	5
Charter Boat	Confidential	-	-

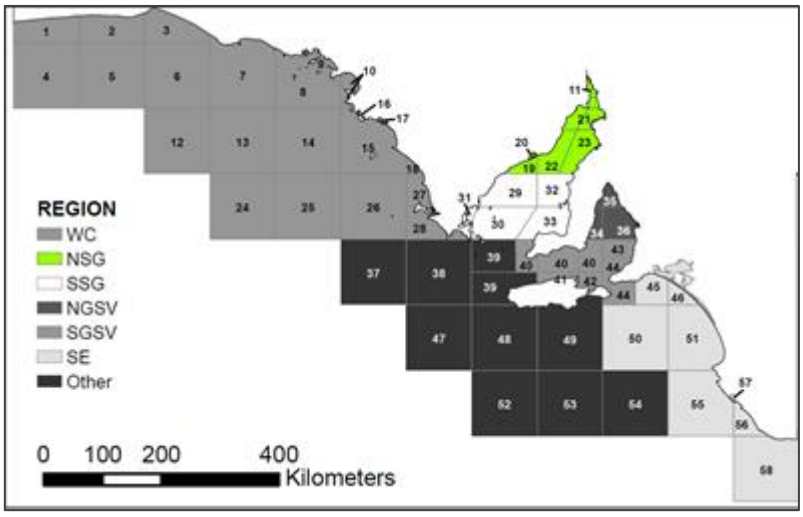
[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

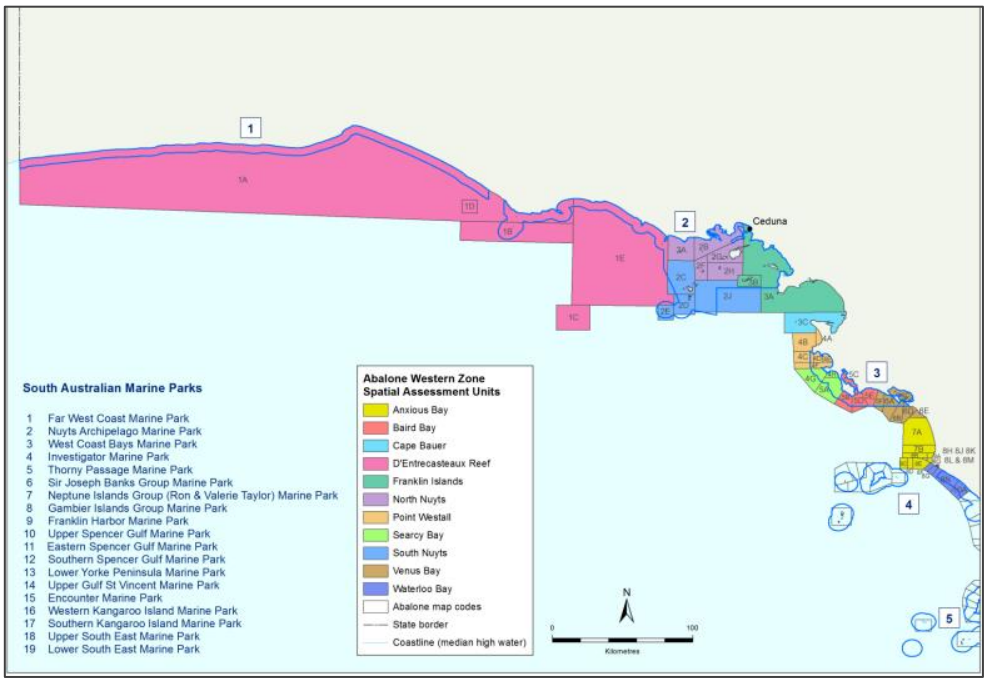
The Nuyts Reef SZ is located on the west coast of South Australia between Ceduna and the Head of the Bight. This SZ occupies 1 per cent of Marine Fishing Area 7 (MFA – Marine Scalefish and NZRL Fisheries) (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily Southern Rock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

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



Source: Steer et al. 2018

Appendix Figure 2-3 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).

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.

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 $0.09m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2016/17).
- Approximately 1 fte job which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2016/17).
- Approximately $0.05m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2016/17).

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	16%	-0.02	16%
Rock Lobster	-0.04	24%	0	30%	-0.01	27%	-0.02	26%
Downstream [b]	-0.02	14%	0	10%	0.00	5%	-0.01	8%
Total Direct [c]	*-0.10*	*56%*	*0*	*40%*	*-0.03*	*48%*	*-0.05*	*50%*
Total Flow-on [c]	*-0.08*	44%	*0*	60%	*-0.03*	52%	*-0.05*	50%
Total [c]	**-0.18**	**100%**	**-1**	**100%**	**-0.05**	**100%**	**-0.09**	**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? (e.g. effects of fishery buyback scheme)

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? (e.g. has the catch dropped?)

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 opportunites 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). 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). 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 Fishing Permitted

What impact would there be to the fisheries values of opening the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $82,000, would become available again for harvesting. 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.

The effect of changing the status 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.

For 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 fisheries value. As noted above the reduction in restricted areas may see a small increase in CPUE but total catch is very close to the TACC so is unlikely to increase much. Abalone catch in this SAU has been low historically and very low in recent years and may increase slightly if opening up the SZ. The MSF is a minor contributor.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $82,000, would become available again for harvesting. 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.

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

A.2.1.2.2 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.2.1.2.1). 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 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 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.2.1.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in the Nuyts Reef 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 (Bryars et al. 2016).

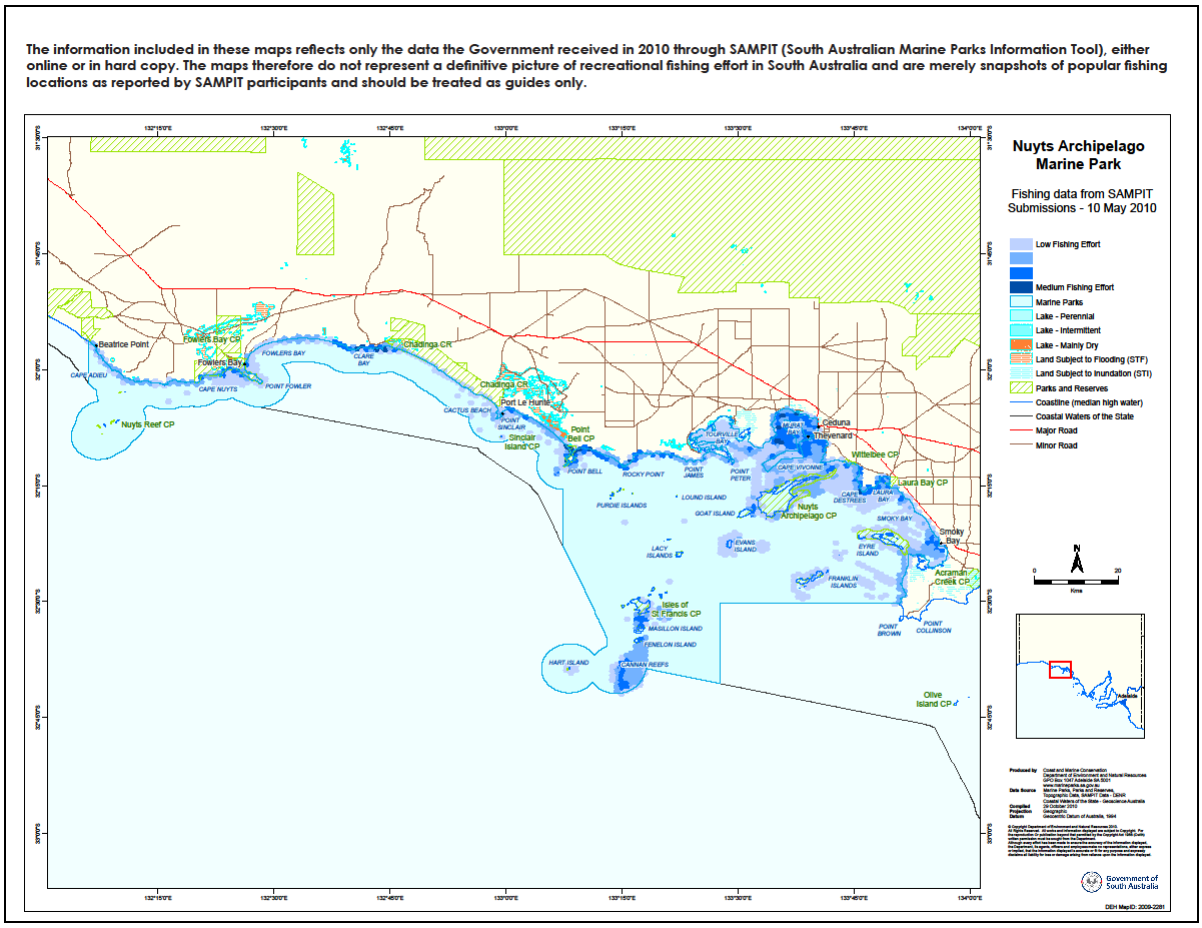
Shore-based recreation activities adjacent to the SZ are generally limited due to the restricted access by road to the shoreline and cliffs. However, some shore-based recreational line fishing does occur there as a SPA was provided to allow for this activity to continue in the SZ. The area is too exposed 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 2-4).

Appendix Figure 2-4 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?

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 enterely, 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.

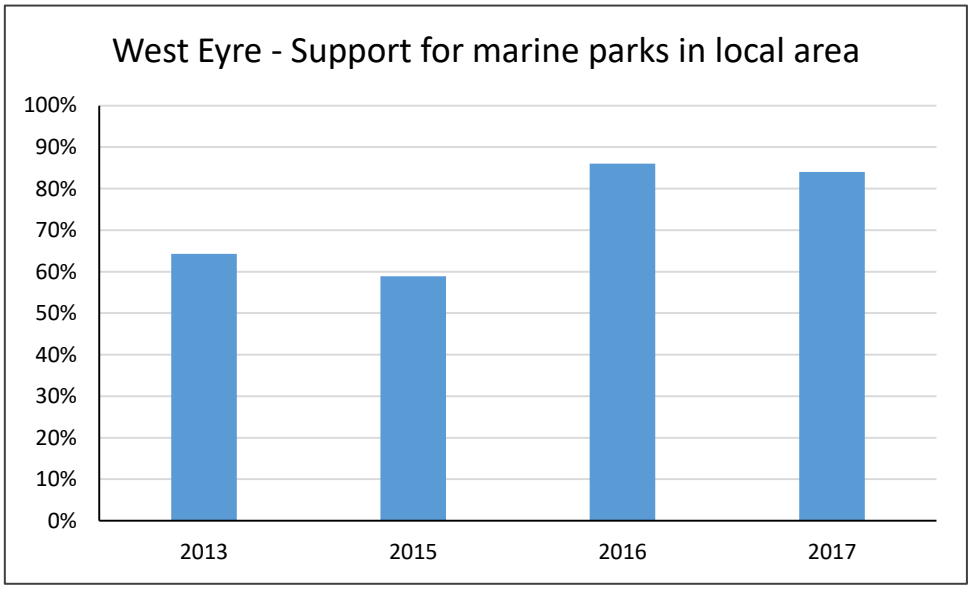
What are the non-market values of the SZ?

The SZ 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[97]).

Appendix Figure 2-5 West Eyre support for marine parks in local area



Source: DEWNR 2017a.

[97] 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.

Existing Arrangement with Fishing Permitted

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

The Nuyts Reef SZ already has a SPA for shore-based recreational line fishing so there would be no change to this social value.

As the area was rarely, if ever, 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.

The Rock Lobster, Abalone and Charter Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry, but may not supported by the conservation sector.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

What impact would there be to the social values of opening 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 (jetties, wharves, etc.) would occur in the location of the Nuyts Reef SZ due to its remoteness. Therefore, the impact on social values from opening the SZ to (non-fishing) activities allowed in an HPZ is expected to be negligible.

A.2.1.4 Environmental values

Baseline

What habitats and biodiversity are found in the 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.
Source: APPENDIX 9

Figure 3-6 (in Section 3.3.1) 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), 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: Source: DEWNR (2015c), Edyvane (1999a, b)

The habitats located within the Nuyts Reef SZ 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 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[98] and one of only 5 sites nationally which produces more than 100 pups annually (Goldsworthy et al 2015)

[98] 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

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.

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).

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.8.1.

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.8.2.

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 Fishing Permitted

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

Refer to Introduction Section A.8.3 for an overview of the impacts to environmental values of opening the SZ to different fishing activities.

<u>Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats</u>

Selective removal of target species

Opening the SZ would have negative impact on those species commonly targeted particularly lobster and abalone by removing biomass (relatively low impact based on relatively low levels of historical fishing) and selectively removing biomass from particular sizes. Fishing of these species could affect the trophic structure within the reef ecosystem of the SZ, which could have flow on effects to ecosystem function.

Removal of other species caught as bycatch

A number of species are captured as bycatch from lobster pots. Opening the SZ to fishing will increase the mortality of those 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

Whales and dolphins commonly use the SZ and there is a breeding colony of Australian sea lions. There is one active osprey nest located on the cliffs adjacent to this 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/ecosystem function/marine pest/disease

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. 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.8.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

Nuyts Reef 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.

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.8.4 for an overview of the impact to environmental values of opening the SZ to (non-fishing) activities allowed in a HPZ. Nuyts Reef SZ has habitat types that are sensitive to disturbance such as 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 affect environmental values as outlined in Section A.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, Nuyts Reef SZ contains the largest limestone reef in the Murat bioregion and the most westernmost example of this habitat in the marine park network. It is also the largest reef system captured inside a SZ. Changing/downgrading the zoning would compromise the CAR system by reducing protection for these reef habitats.

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 2-6) 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.

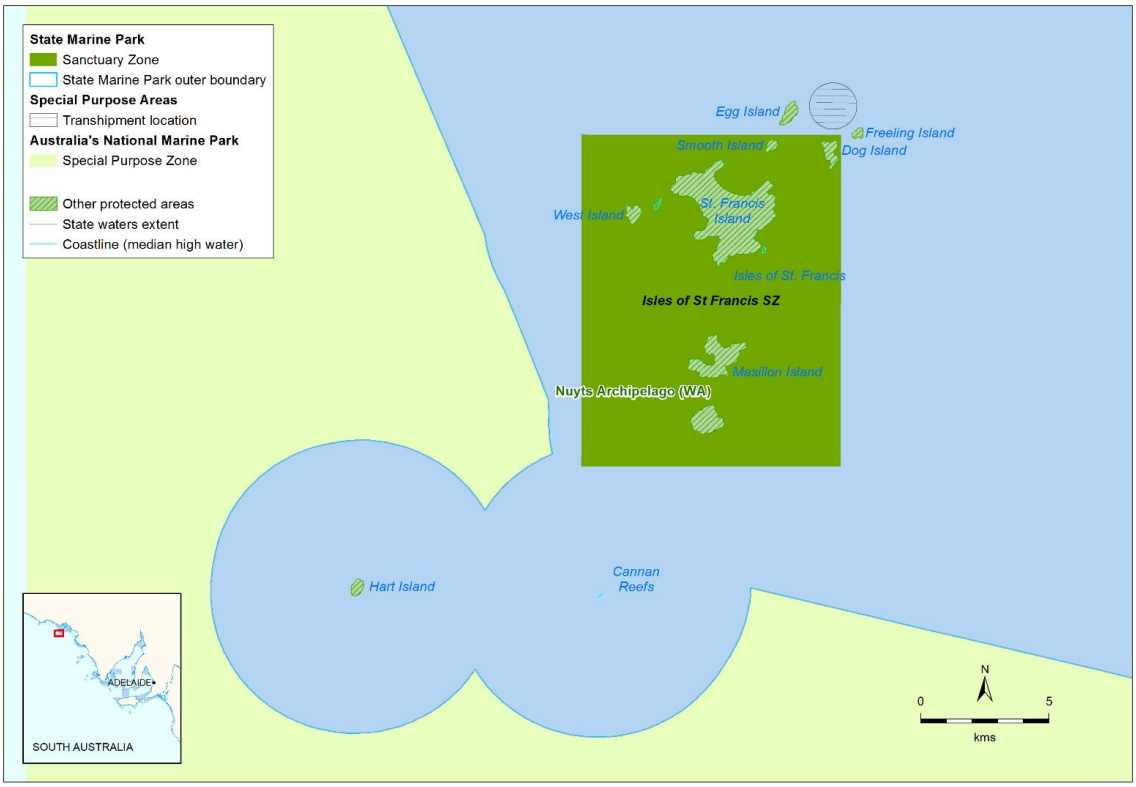
The variety of habitats within this SZ provide spawning locations for Southern rock lobster, Maori octopus, greenlip abalone, blacklip abalone, purple sea urchin, sea sweep, Western blue groper, baitworm, king scallop, queen scallop and yellow-eye mullet.

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 Stakekeholder Forum as the SZ was considered an essential part of a CAR system.

Appendix Figure 2-6 Isles of St Francis sanctuary zone



Source: APPENDIX 9

A.2.2.2 Economic values and impacts

A.2.2.2.1 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.

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 $668,000, principally from the Abalone ($451,000), NZRL ($175,000) and Marine Scalefish ($41,000) 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) 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)
Sardines	-	-	-
Abalone	10,100	1.78%	451
Rock Lobster	2,900	0.44%	175
Marine Scalefish	120	0.19%	41
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 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 2-2). 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 2-3). 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). 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). 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).

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.

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 (Appendix Table 2-1). 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	-0.45	27%	0	0%	-0.21	37%	-0.29	32%
Rock Lobster	-0.18	10%	-1	12%	-0.06	10%	-0.09	10%
Marine Scalefish	-0.04	2%	-1	16%	-0.01	1%	-0.03	3%
Downstream [b]	-0.27	16%	-1	13%	-0.03	6%	-0.09	9%
Total Direct [c]	*-0.94*	*56%*	*-2*	*41%*	*-0.30*	*55%*	*-0.50*	*54%*
Total Flow-on [c]	*-0.75*	44%	*-3*	59%	*-0.25*	45%	*-0.43*	46%
Total [c]	**-1.69**	**100%**	**-6**	**100%**	**-0.56**	**100%**	**-0.94**	**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 will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.94m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2016/17).

- Approximately 6 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2016/17).
- Approximately $0.56m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

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? (e.g. has the catch dropped?)

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 opportunites 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

What impact would there be to the fisheries values of opening the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $668,000, 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.

The effect of changing the status 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.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $668,000, 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.

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

A.2.2.2.2 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.2.2.2.1). 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 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 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.2.2.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in the Isles of St Francis 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 (Bryars et al. 2016).

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 2-4) 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?

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?

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 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[99]) (Appendix Figure 2-5).

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening the 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.

[99] 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 the 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.2.2.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The Isles of St Francis SZ contains rocky cliffs, sandy beaches, reefs, seagrass meadows and unmapped deep water habitats.

Figure 3-6 (in Section 3.3.1) provides a map of the main benthic (subtidal) habitats of the Nuyts Archipelago Marine Park. Appendix Table 2-7 and Appendix Table 2-8 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Isles of St Francis SZ.

Appendix Table 2-7 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
Seagrass	9.8	8.0

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-8 Shoreline (intertidal) habitats of the Isles of St Francis SZ

Habitat	Length of shoreline (km)	% SZ
Unmapped	40	100

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

The habitats located within the Isles of St Francis SZ 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 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). 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 Isle St Francis SZ in 2014/15.

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 2-9). 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 2-9).

Appendix Table 2-9 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 2-10). 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 2-10). 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 2-11).

Appendix Table 2-10 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
Parapriacanthus 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 2-11 Macro-invertebrate species list, dive surveys, Isles of St Francis SZ

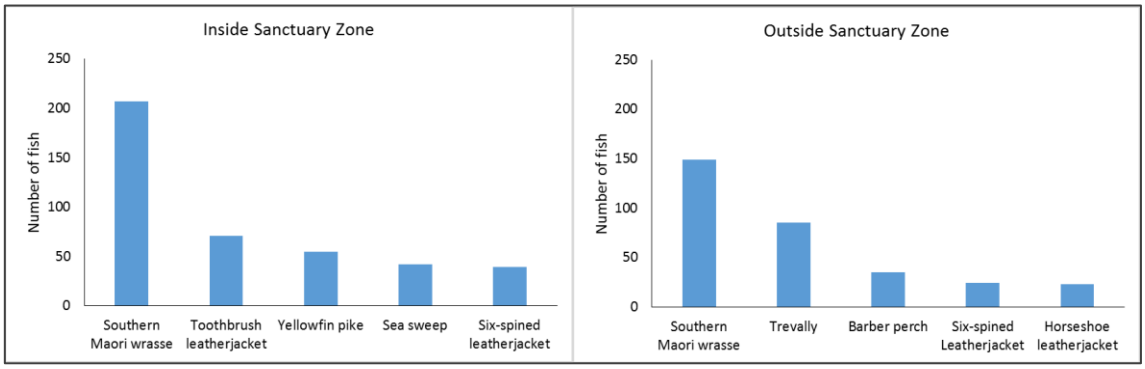
Species	Common name	Total no.
Heliocidaris erythrogramma	Purple Urchin	3810
Pinna bicolor	Razorfish	1933
Haliotis scalaris	Ridged ear abalone	367
Sepia apama	Giant cuttlefish	122
Portunus pelagicus	Blue swimmer crab	34
Anthaster valvulatus	Mottled seastar	22
Australostichopus mollis	Brown sea cucumber	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 2-7). 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 2-7). 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 2-7).

Appendix Figure 2-7 Abundance of the most common species inside and outside the Isles of St Francis SZ, BRUVS surveys



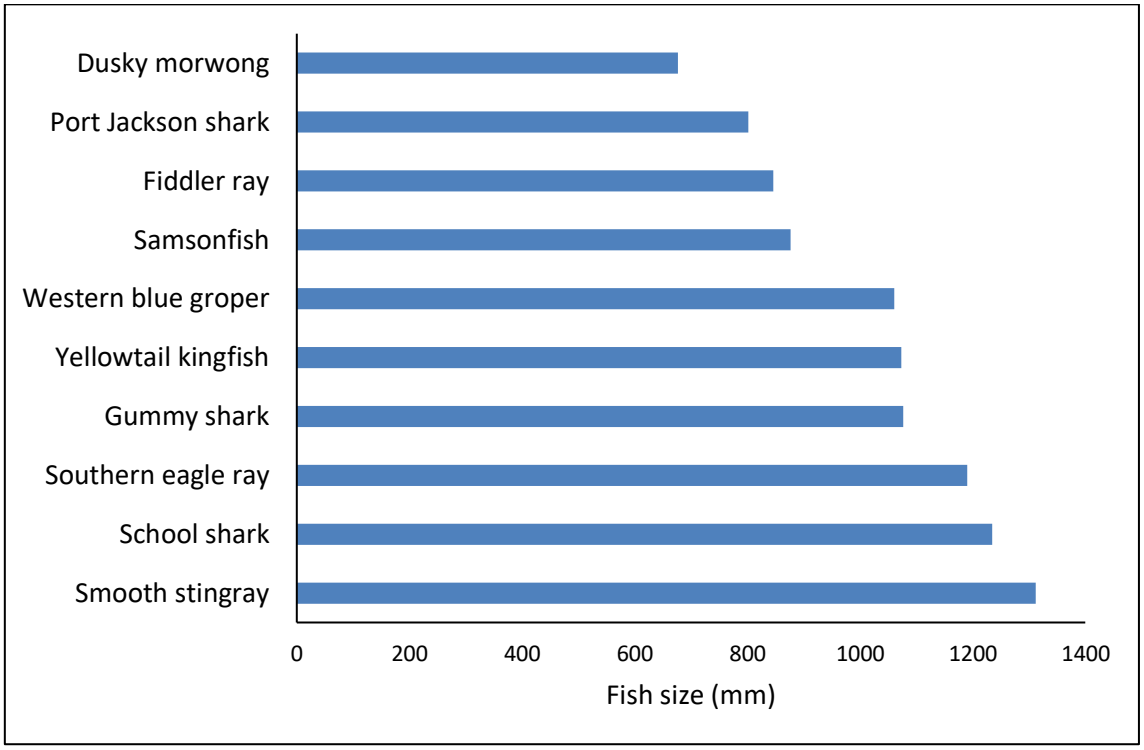
Source: DEW, unpublished data.

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 2-8). 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 2-8).

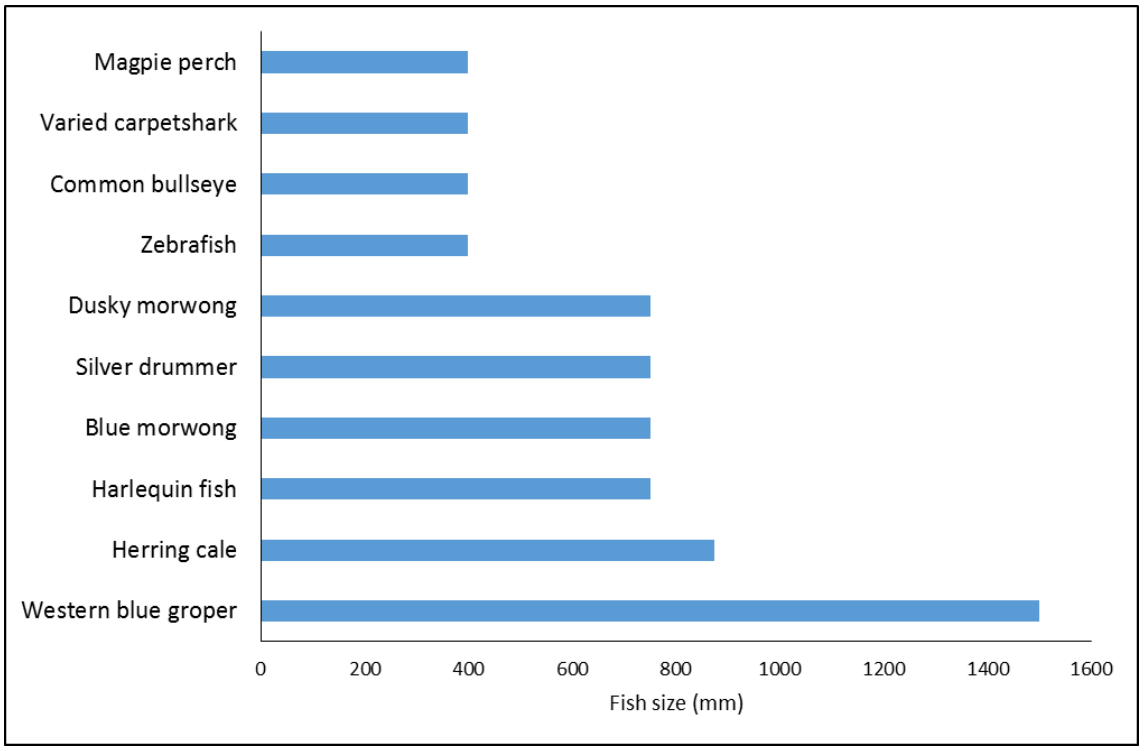
The largest fish recorded on dive surveys at Isle St Francis SZ was a 1,500mm Western blue groper (*Achoerodus gouldii*, Appendix Figure 2-9). Other large fish recorded included herring cale (*Olisthops cyanomelas*) at 875mm, a harlequin fish (*Othos dentex*) at 750mm and a blue morwong (*Nemadactylus valenciennesi*) at 750mm (Appendix Figure 2-9).

Appendix Figure 2-8 Largest fish recorded, BRUVS surveys, Isles of St Francis SZ



Source: DEW, unpublished data.

Appendix Figure 2-9 Largest fish recorded, dive surveys, Isles of St Francis SZ



Source: DEW, unpublished data.

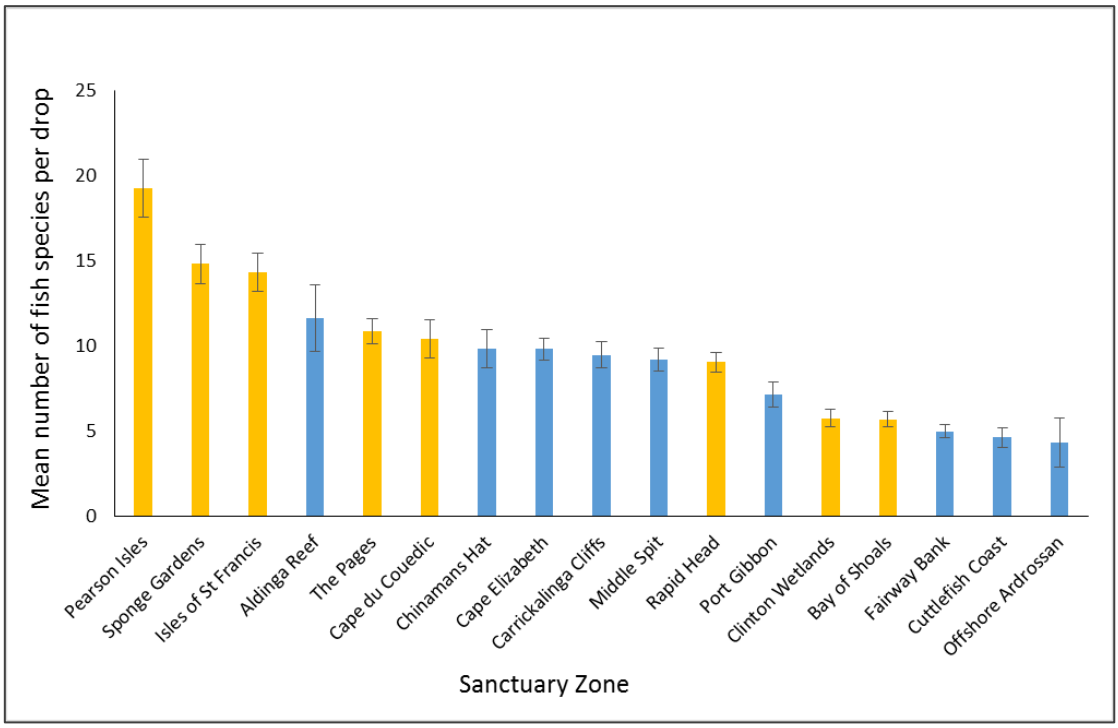
How does the biodiversity compare to other areas?

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 2-10). 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 2-11). 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 2-12).

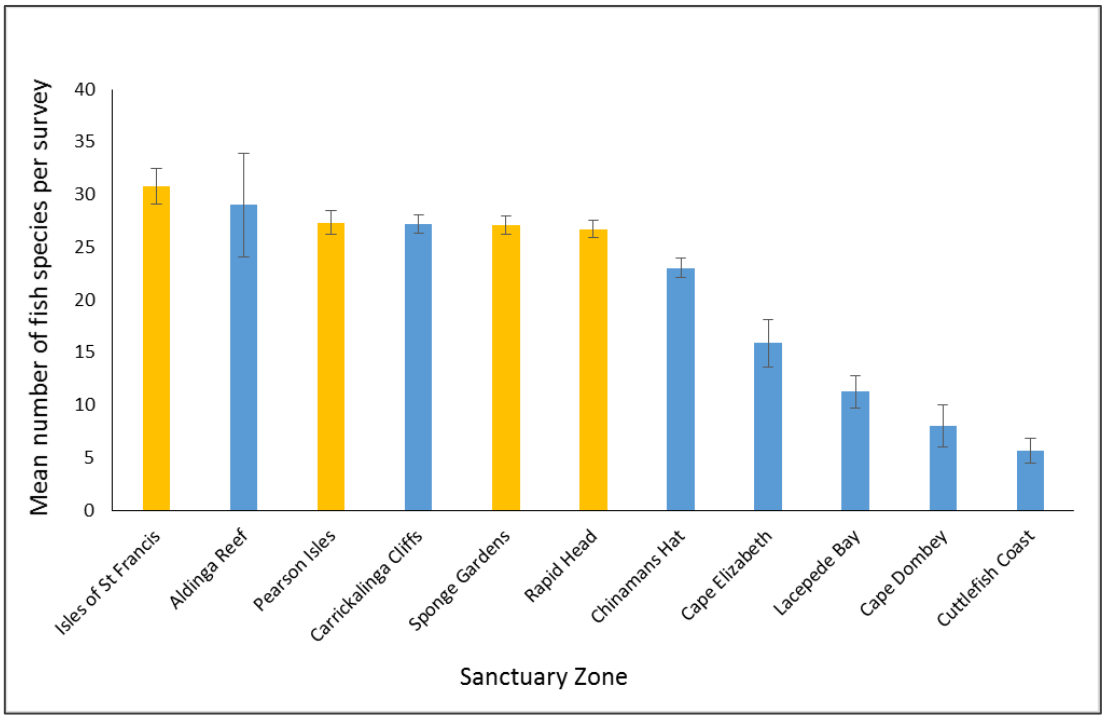
Appendix Figure 2-10 Mean (±SE) number of fish species by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

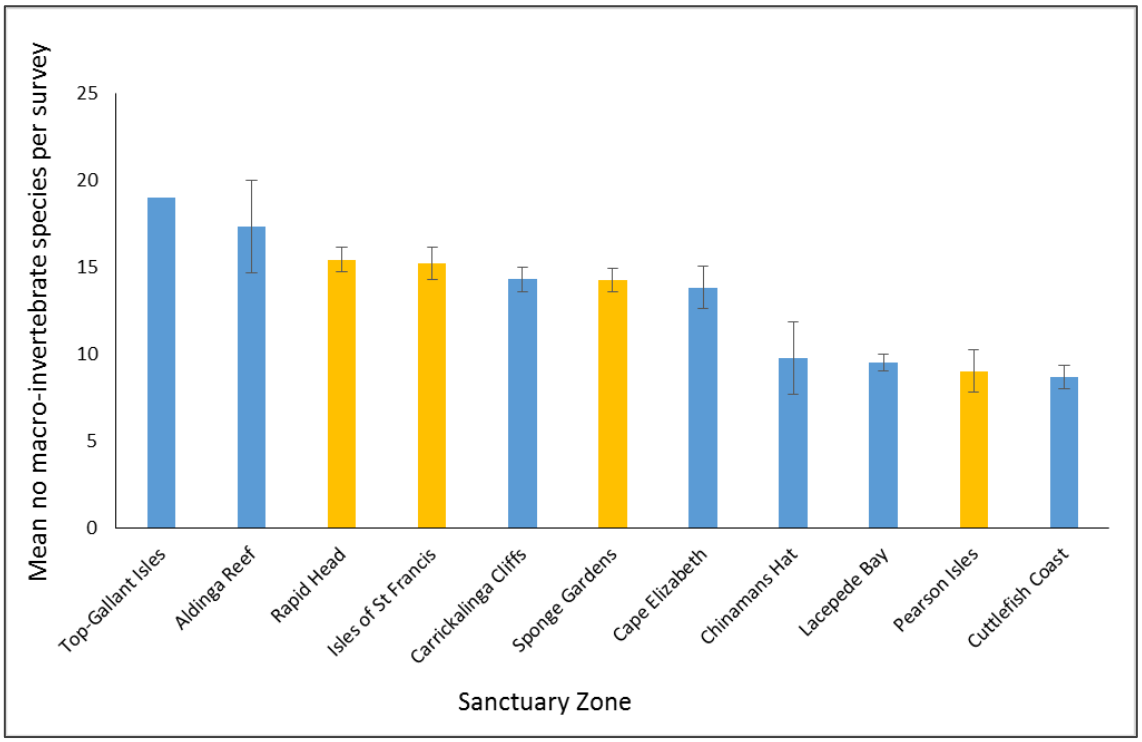
Appendix Figure 2-11 Mean (±SE) number of fish species by SZ, dive surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

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



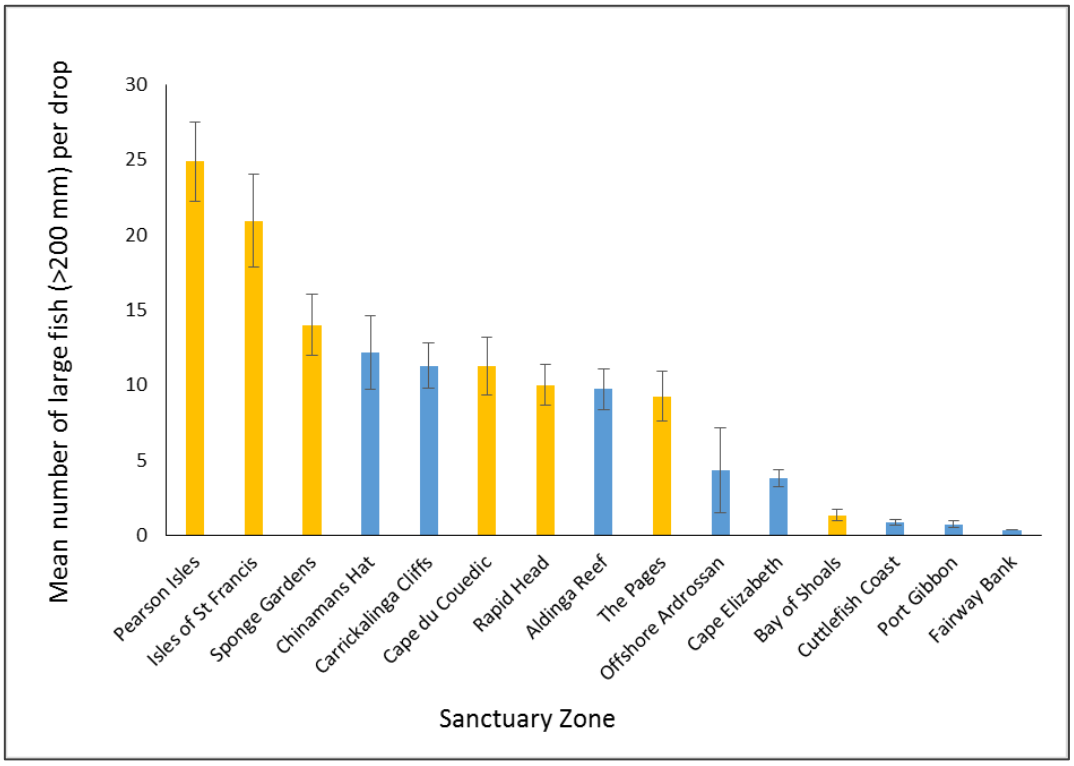
[a] Surveyed Focus SZs highlighted in yellow.

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 2-13). The SZ has the third highest abundance of large fish (>200mm) recorded by dive surveys (Appendix Figure 2-14).

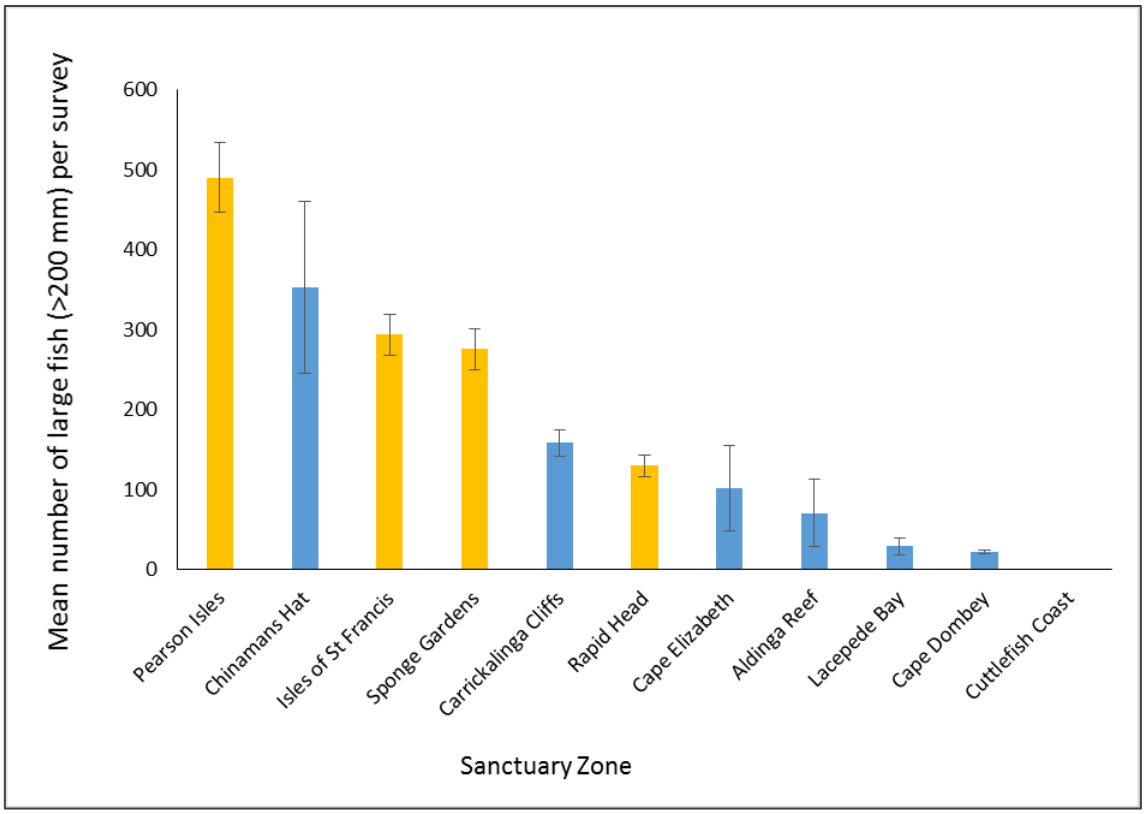
Appendix Figure 2-13 Mean (±SE) number of large fish (>200mm) by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

Appendix Figure 2-14 Mean (±SE) number of large fish (>200mm) by SZ, dive surveys[a]



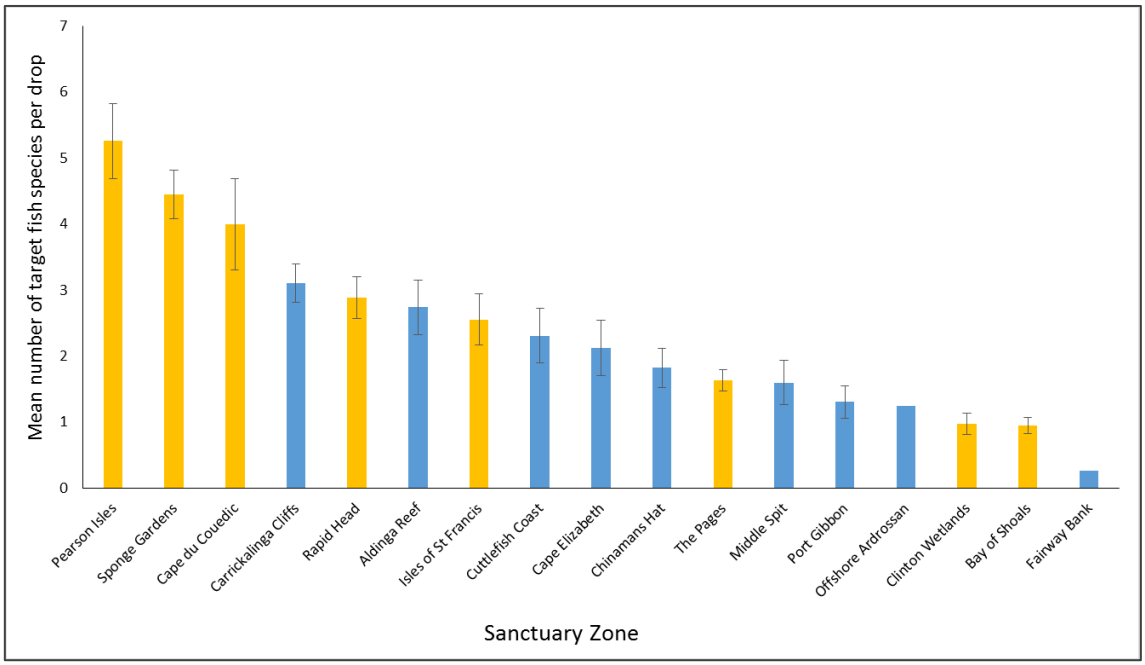
[a] Surveyed Focus SZs highlighted in yellow.

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 2-15). Dive surveys recorded slightly more target species on survey with a mean of greater than 150 individuals per survey (Appendix Figure 2-16). Trevally (*Pseudocaranx sp*), King George Whiting (*Sillaginodes punctatus*) and sea sweep (Scorpis aequipinnis) are common targeted species found at Isle St Francis SZ.

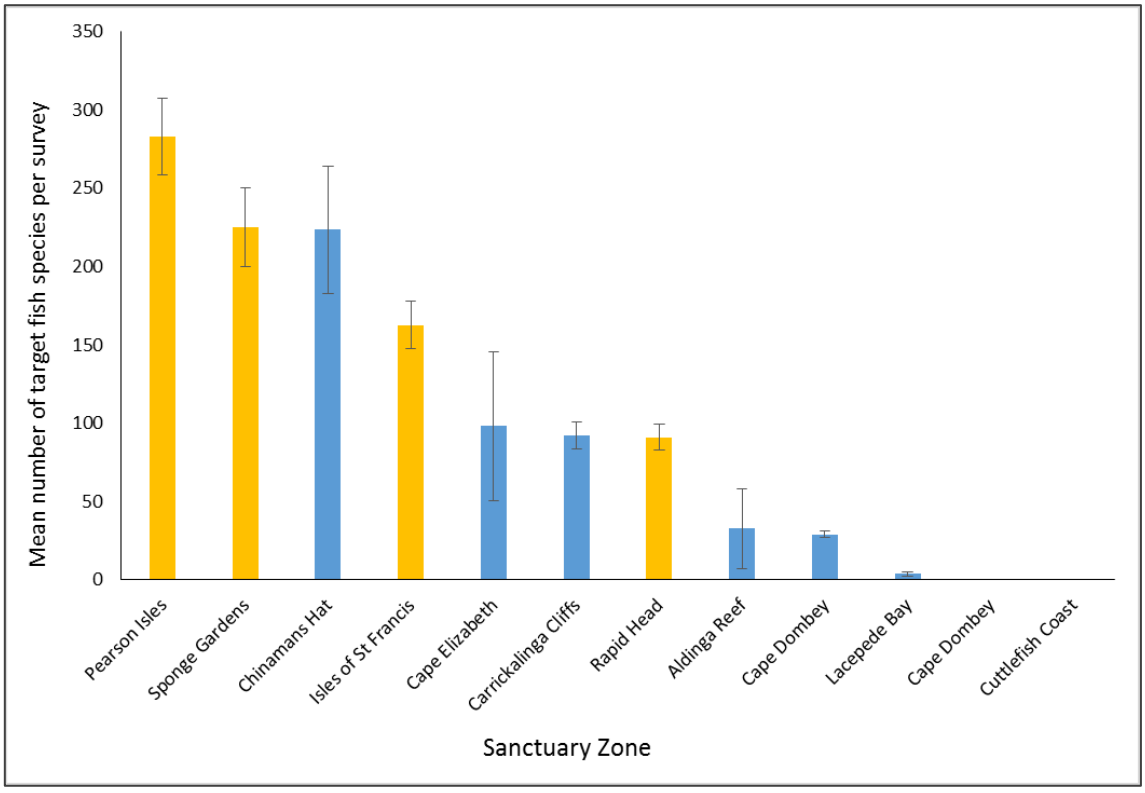
Appendix Figure 2-15 Mean (±SE) number of fished species by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

Appendix Figure 2-16 Mean (±SE) number of individuals of fished species by SZ, dive surveys[a]



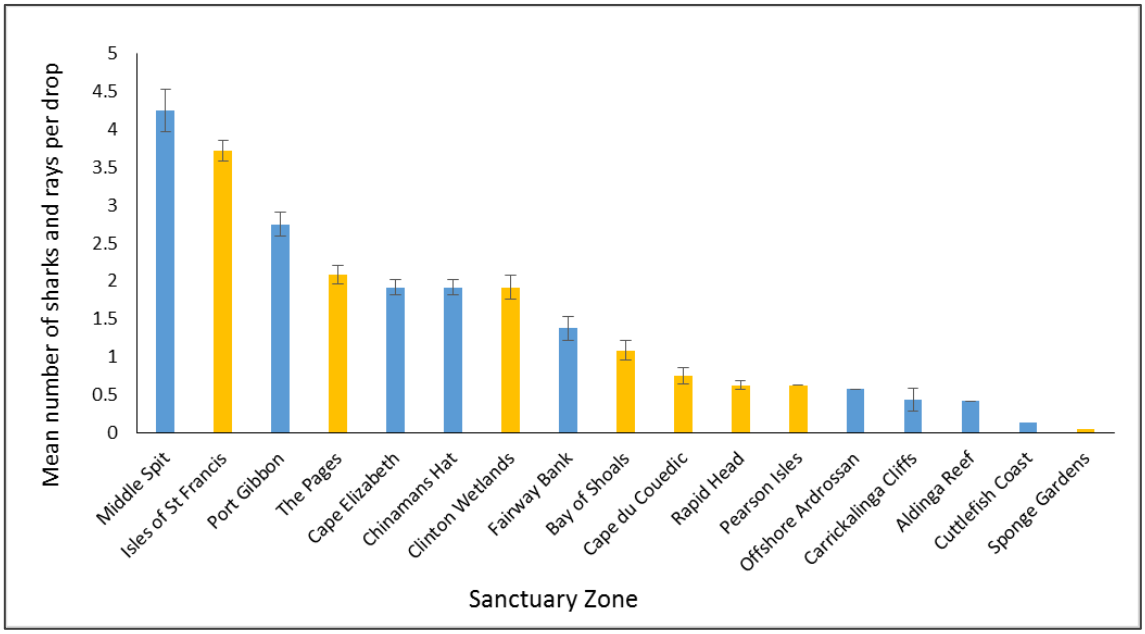
[a] Surveyed Focus SZs highlighted in yellow.

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 2-17). Common shark and ray species include Port Jackson shark (*Heterodontus portusjacksoni*), southern eagle ray (*Myliobatis tenuicaudatus*) and fiddler ray (*Trygonorrhina dumerilii*).

Appendix Figure 2-17 Mean (±SE) number of sharks and rays by SZ, BRUVS surveya



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

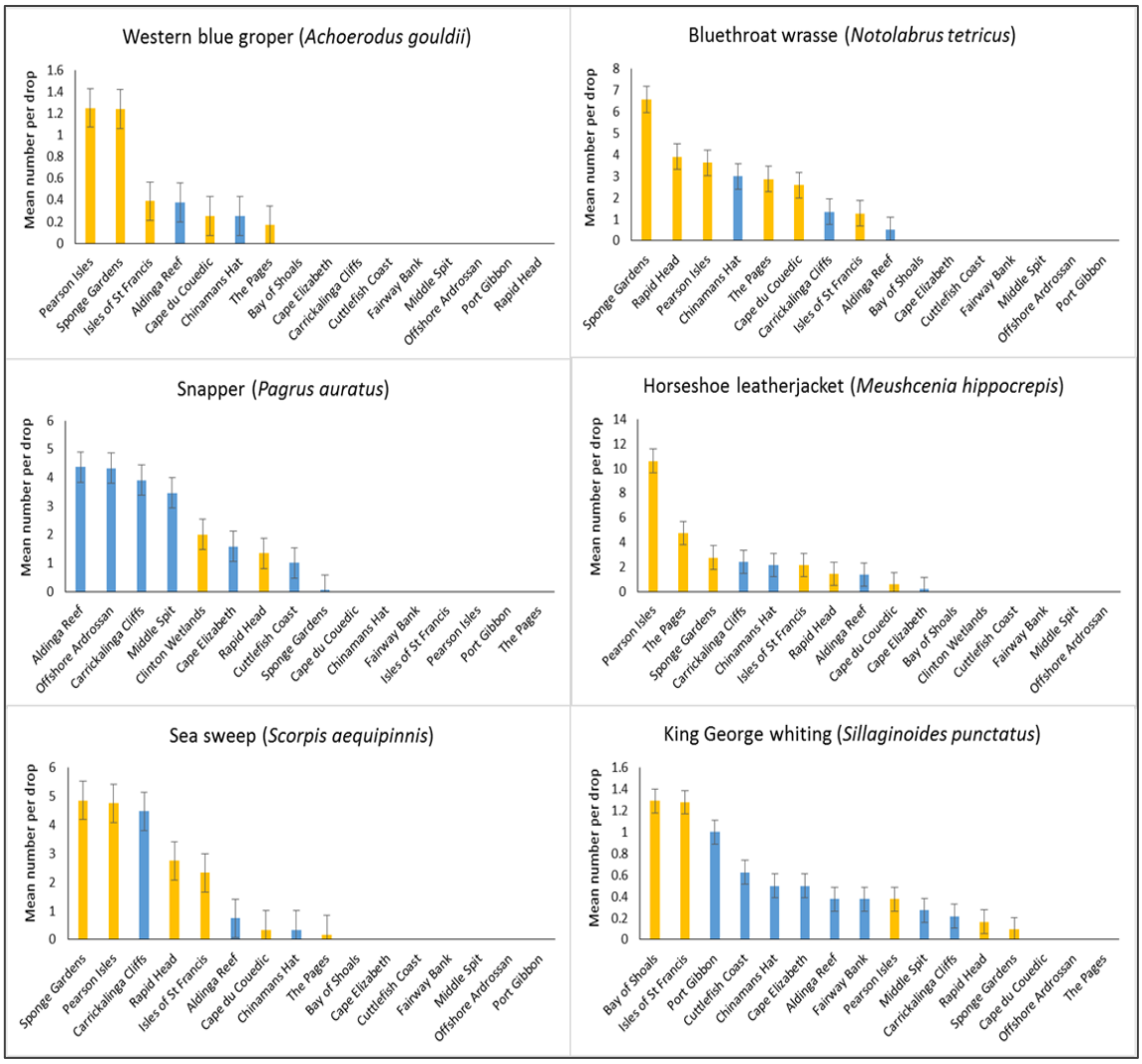
Indicator Species

Five of the six fish indicator species for reefs were recorded in the Isles St Francis SZ on BRUVS surveys (Appendix Figure 2-18). There were relatively high abundances of King George whiting (*Sillaginoides punctatus*), Western blue groper (*Achoerodus gouldii*) 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 2-19). 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 2-20). There were relatively high numbers of abalone recorded at Isles of St Francis SZ and no southern rock lobster recorded during dive surveys.

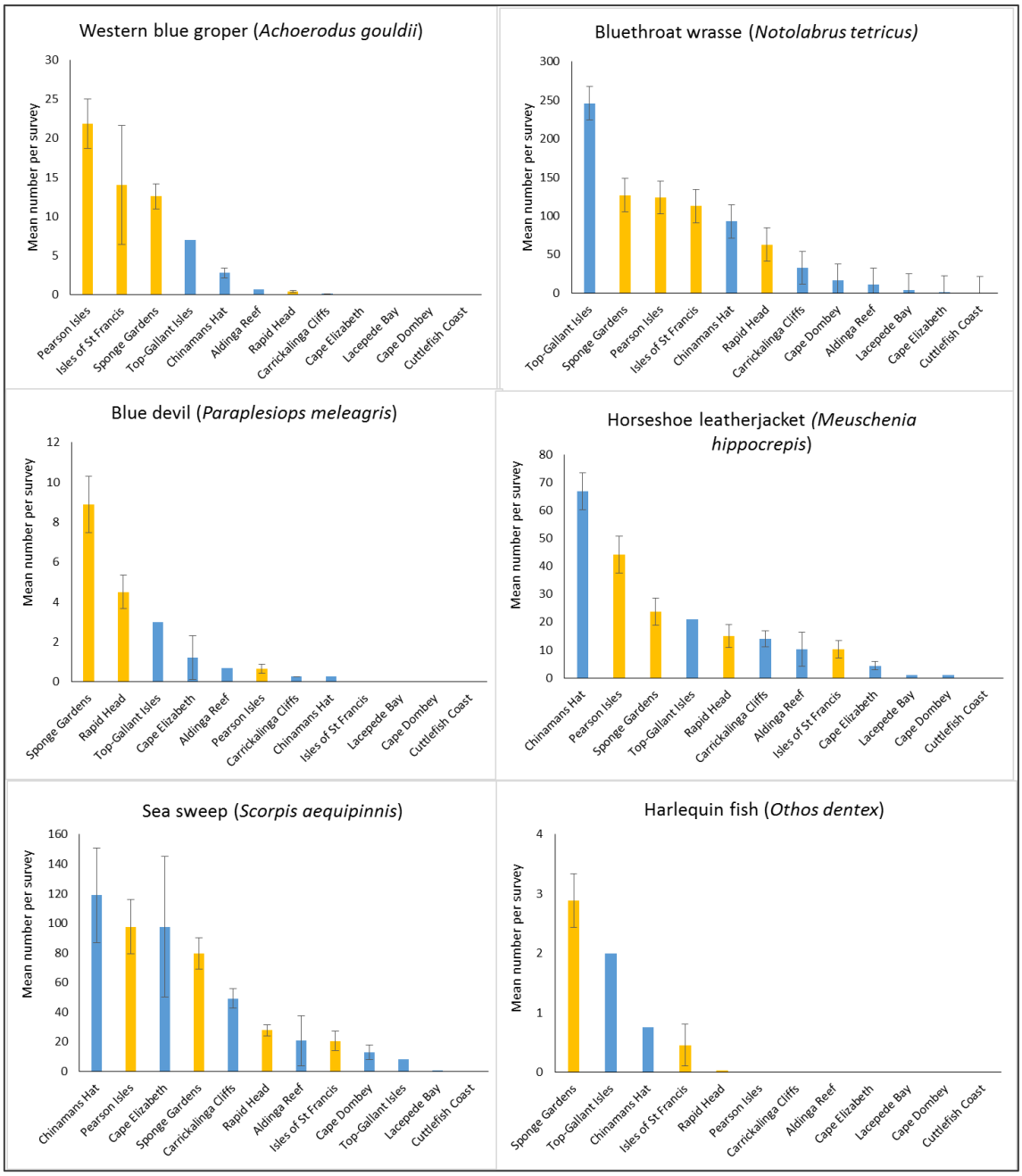
Appendix Figure 2-18 Mean number of reef fish indicator species by SZ, BRUVS surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

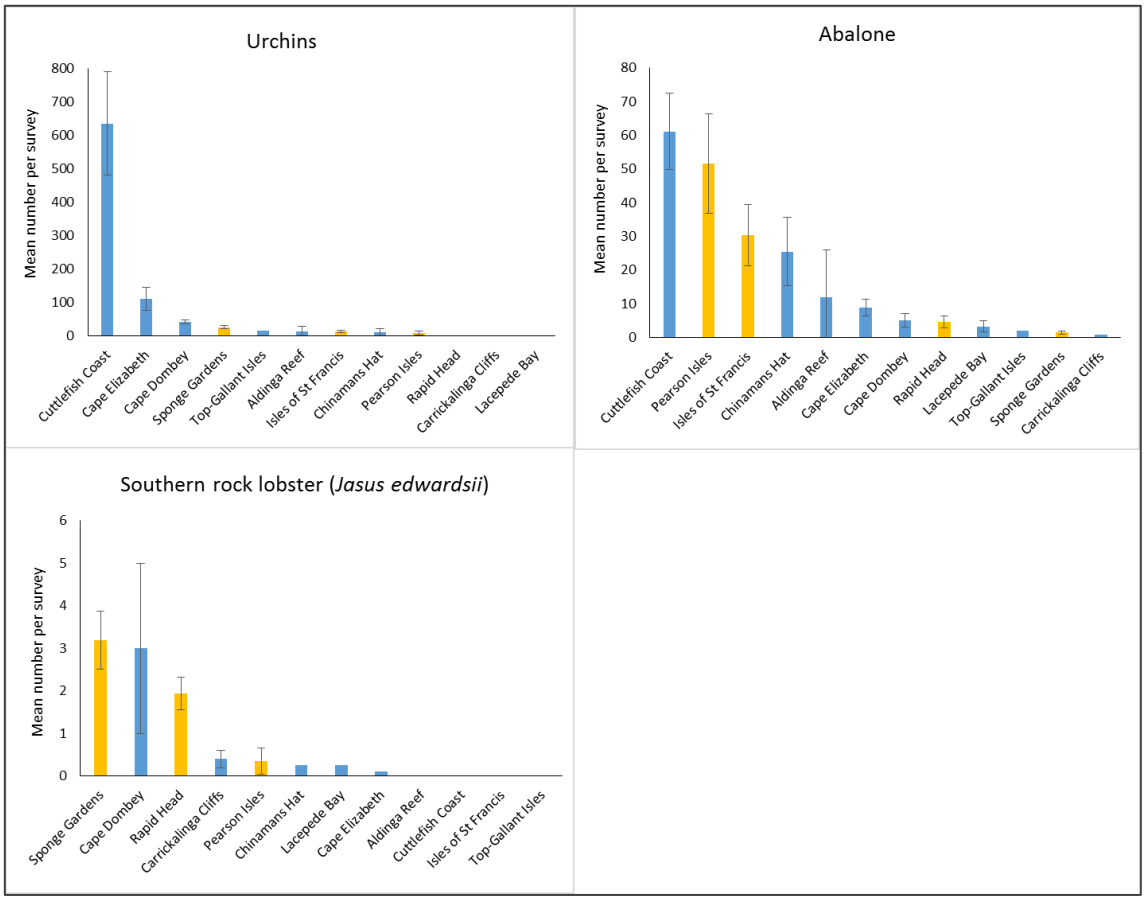
Appendix Figure 2-19 Mean number of reef fish indicator species by SZ, dive surveys[a]



[a] Surveyed Focus SZs highlighted in yellow.

Source: DEW, unpublished data.

Appendix Figure 2-20 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.8.1. 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.8.2.

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

What impact would there be to the environmental values of opening 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.8.3.

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.8.3 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.

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.8.4 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.8.4.

Refer to Section A.8.4 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 Pearson Isles Sanctuary Zone

A.2.3.1 Zone description

The Pearson Islands Group SZ (165km^2) located in the Investigator Marine Park is an place of outstanding conservation significance (Appendix Figure 2-21) and is part of the Eyre Bioregion. The zone adjoins the Investigator Group Wilderness Area, establishing a protected land and sea corridor. Pearson, Veteran and Dorothee Isles within the SZ are geologically unique, being giant granite inselbergs (uncommon island mountains). The mountain of Pearson Island rises steeply out of the water to 200 metres above sea level. While surrounding waters are exceptionally clear, with significant light penetration and strong, deep water swells. The area is strongly

influenced by the warm Leeuwin Current, which supports some species more common in tropical waters.

The zone protects numerous habitat types including:

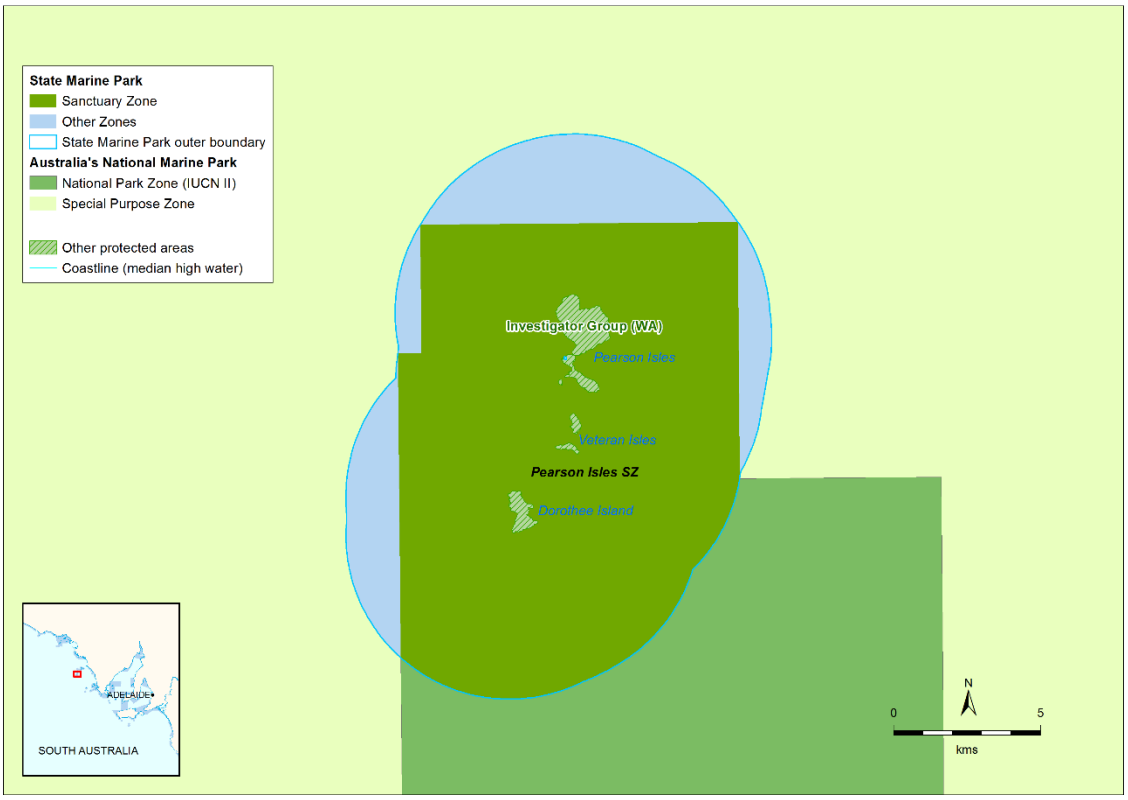
- Soft-bottom habitat, seagrasses and reef including granite and limestone.
- Extremely uncommon deep seagrass beds at depths of 25-30m due to the exceptionally clear water.
- Transition of habitats down steep slopes from shore to more than 50m deep.
- Sheltered beaches and tall cliffs.
- Relatively warm, clear water and large swell with strong currents between the islands.
- Higher sea surface temperatures in winter than summer due to the influence of the Leeuwin Current.
- Deep water travertine limestone reefs at 50m depths off of Pearson Island.

The SZ contains very high biodiversity and an abundance of large fishes due to its isolated location. The site protects:

- High species diversity including mature fish and invertebrates such as hard and soft corals, sponges, macroalgae, ascidians and echinoderms.
- Bird breeding colonies including white-faced storm petrels, little penguins and short-tailed shearwaters.
- Nesting sites for Fairy Tern and the state endangered white-bellied sea eagle.
- Sites for migratory birds whose habitats are required to be protected under international treaties.
- New Zealand fur seals and the vulnerable Australian sea lion breeding and haul out sites on all Islands within the group.
- Uncommon rhodolith communities (popcorn coral or coralline red algae).
- large blue groper, weedy seadragon, western blue devil, rock lobster, large sponges, gorgonian corals and soft corals.
- Granite boulder reefs which form large caverns, harbouring prolific fish and invertebrate species.

The sanctuary zoning was amended from both minority and majority MPLAG advice. Historically, the area was of importance to the NZRL Fishery with some fishing effort from the Abalone, Marine Scalefish and Charter Boat fisheries.

Appendix Figure 2-21 Pearson Isles sanctuary zone



Source: APPENDIX 9

A.2.3.2 Economic values and impacts

A.2.3.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The NZRL Fishery was the principal fishery that previously used the Pearson Isles SZ. There was some use, albeit minor, of the SZ by the Abalone, 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 by the SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-12. The total gross value of displaced catch in this SZ is estimated to be at least $597,000, principally from the NZRL ($562,000), Abalone ($22,000) and Marine Scalefish ($13,000) Fisheries.

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

Displaced catch in the Rock Lobster fishery is higher than the preliminary estimate (5,900kg) read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-12 Estimated catch or effort and GVP displaced by fishery, Pearson Isles SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	-	-	-
Abalone	490	0.09%	22
Rock Lobster	9,300	1.42%	562
Marine Scalefish	100	0.16%	13
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Pearson Island Group SZ is located offshore on the western side of Eyre Peninsula. This SZ overlaps Marine Fishing Area 15 and 26 (MFA - Marine Scalefish and NZRL Fisheries) (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily Southern Rock Lobster. The Pearson Island SZ overlaps 94 per cent of the Pearson Island Abalone SAU 10C (Appendix Figure 2-3). These species is also able to be targeted outside of the SZ.

Marine Scalefish Fishery

This area is not a large MSF with historic catches from MFA 15 and 26 recorded as confidential, less than 5t, 1t to 10t, zero and confidential for King George Whiting, Snapper, Garfish and Southern Calamari respectively.

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). 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). Historic catches from MFA 15 (no catch info for MFA 26) over the last 10 years have been declining. Catch ranges between 20t to 60t, out of a total fishery catch of 300t to 500t throughout this time frame (Linnane et al. 2017).

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 Pearson Island is less than 0.5t out of a total of around 75t for the Western Zone Abalone Fishery. The historic Blacklip Abalone catch for Pearson Island is less than 0.5t out of a total of around 100t for the Western Zone Abalone Fishery (Stobart et al. 2017).

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

The nearshore habitat of Pearson Isles SZ contains some reef suitable for Rock Lobster and Abalone but most of the area is unmapped.

Existing Arrangement

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

Appendix Table 2-13 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 2-12). 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.

Appendix Table 2-13 Regional economic impact of zoning, Pearson Isles SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Abalone	-0.02	2%	0	0%	-0.01	2%	-0.01	2%
Rock Lobster	-0.56	44%	-2	43%	-0.18	44%	-0.30	43%
Downstream [b]	-0.12	10%	0	6%	-0.02	5%	-0.04	6%
Total Direct [c]	*-0.71*	*55%*	*-3*	*49%*	*-0.21*	*51%*	*-0.36*	*52%*
Total Flow-on [c]	*-0.58*	45%	*-3*	51%	*-0.20*	49%	*-0.34*	48%
Total [c]	**-1.28**	**100%**	**-5**	**100%**	**-0.41**	**100%**	**-0.69**	**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 Pearson Isles SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.69m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2016/17).
- Approximately 5 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2016/17).
- Approximately $0.41m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Marine Scalefish Fishery

Change in the fishery due to the Investigator 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.
- Marine Scalefish fishers are highly mobile and should be able to adapt to the spatial restrictions.
- The estimated displaced effort was 0.20 per cent of the total average annual effort in the fishery (EconSearch 2014)

Northern Zone Rock Lobster Fishery

Change in the fishery due to the Investigator 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 MFA 15, which includes the SZs that are most likely to respond (Pearson and Topgallant Isles).
- Recent catches landed in the region are minor relative to the entire NZRL Fishery (Kosturjak et al. 2015 and Linnane et al. 2017).
- Estimated displaced catch was 1.76 per cent of the total average annual catch in the fishery (EconSearch 2014).

Abalone Fishery

Change in the fishery due to the Investigator 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 most important fishing locations within the Investigator Marine Park (e.g. Ward and Flinders Islands) remain open to fishing. Pearson Island is a relatively unimportant fishing location for the Abalone Fishery (see Stobart et al. 2015a).
- Estimated displaced catch was 0.53 per cent of the total average annual catch in the fishery (EconSearch 2014).

Charter Boat Fishery

Change in the fishery due to the Investigator 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.

- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- Charter fishers have lost access to some traditional fishing grounds in the Investigator Marine Park such as the Pearson Isles which was a recognised destination for long-range charters from other regions. However, there are numerous locations that remain available for fishing both in and out of the Investigator Marine Park.
- There are few operators within the Investigator Marine Park and therefore minimal competition for fishing grounds.
- 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? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

Marine Scalefish Fishery

The MSF does not harvest significant quantities from this SZ recording less than 5t, confidential, zero, 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 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 Table 3-3). 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). Catches from MFA 15 in 2015 were not significantly different from the previous 6 years (Linnane et al. 2017).

Abalone Fishery

Blacklip and Greenlip Abalone catch fluctuates annually for Pearson Island (Stobart et al. 2017). Catch in this area is small making it difficult to assess SZ impact. Data was 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

What impact would there be to the fisheries values of opening the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $597,000, would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster Fishery and to a minor extent the Abalone, Marine Scalefish and Charter Boat Fisheries.

The effect of changing the status 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 15 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, Marine Scalefish and Charter Boat Fisheries are relatively minor contributors.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $597,000, would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster Fishery and to a minor extent the Abalone, Marine Scalefish and Charter Boat Fisheries.

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

A.2.3.2.2 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.2.3.2.1). 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 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 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.2.3.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in the Pearson Isles 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).

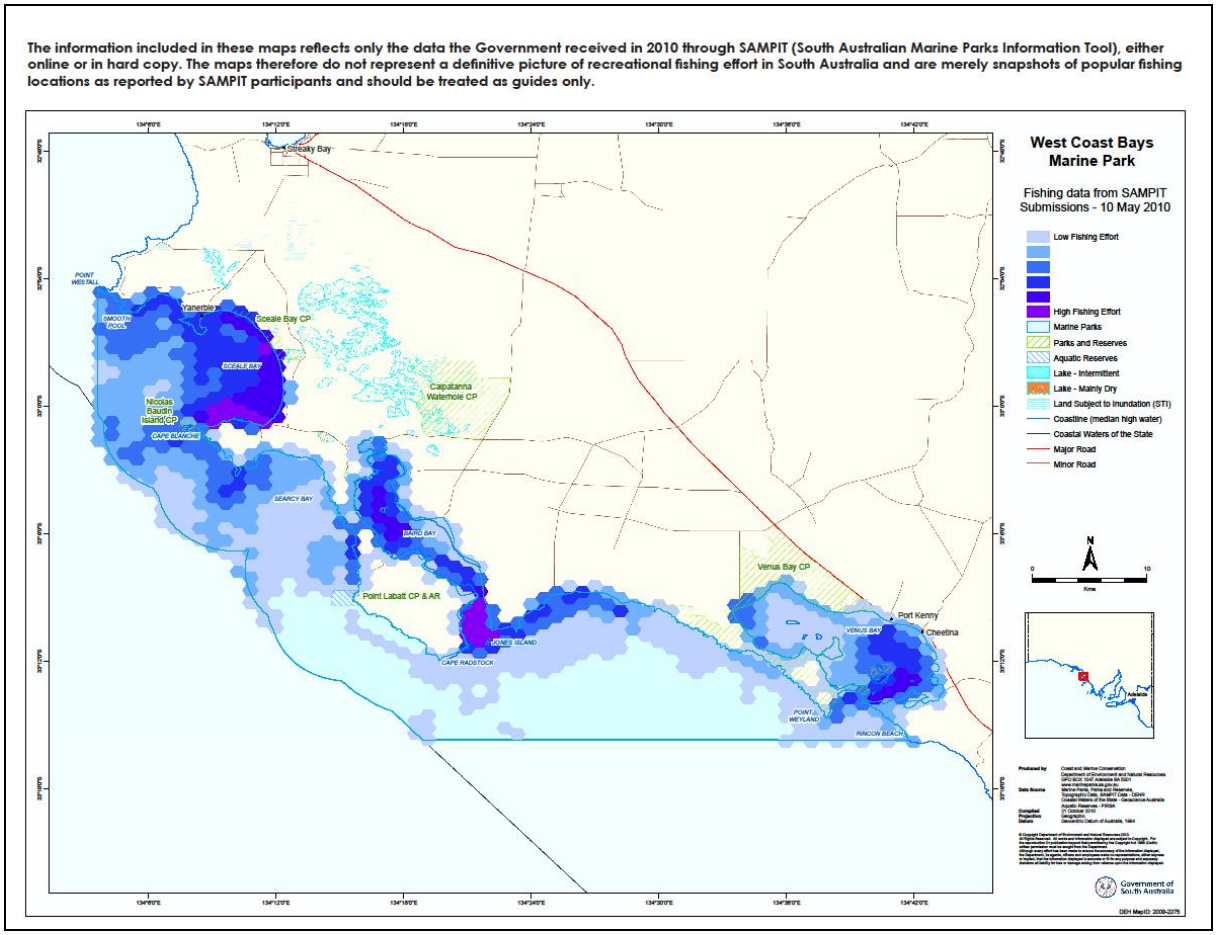
Shore-based recreational activities on the islands within the SZ would be minimal due to the remote location.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing at the Pearson Isles SZ was minimal, with only some area lost due to the SZ; much of the effort shown on the SAMPIT map is likely a result of people that had fished from commercial charter boats (Appendix Figure 2-22). 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 2-22 SAMPIT map showing intensity of fishing prior to SZ implementation



Source: DENR 2010b (SAMPIT)

What does the community value about the SZ?

A total of 7,332 (85 per cent) of the 8,649 respondents commented specifically on the Investigator Marine Park during submissions to the draft zoning. 4 (0.05 per cent) agreed with the proposed zoning as is, 7,177 (83 per cent) suggested changes to zoning to increase the conservation outcome, 151 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,317 (15 per cent) expressed no comment on the proposed zoning (DEWNR 2012c).

Majority supported increasing conservation outcomes, the SZ being highly regarded for ecotourism and scientific study as one of the jewels of the west coast. Zoning was supported for being balanced enough to serve the needs of the fishing industry while meeting expectations for protection of representativeness, thus maintaining the integrity of the region's biodiversity, particularly with minimal impact on the Australian sea lion colony.

What are the non-market values of the SZ?

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

The Pearson Isles SZ 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[100]) (Appendix Figure 2-5).

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening the 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.

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

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

What impact would there be to the social values of opening 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 (jetties, wharves, etc.) would occur in the location of the SZ.

A.2.3.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The zone protects numerous habitat types including:

- Soft-bottom habitat, seagrasses and reef including granite and limestone.
- Extremely uncommon seagrass beds at depths of 25-30m due to the exceptionally clear water.

[100] 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.

- Transition of habitats down steep slopes from shore to more than 50m deep.
- Sheltered beaches and tall cliffs.
- Relatively warm, clear water and large swell with strong currents between the islands.
- Higher sea surface temperatures in winter than summer due to the influence of the Leeuwin Current.
- Deep water travertine limestone reefs at 50m depths off of Pearson Island.

Figure 3-12 (in Section 3.5.1) provides a map of the main benthic (subtidal) habitats of the Investigator Marine Park. Appendix Table 2-14 and Appendix Table 2-15 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Pearson Isles SZ.

Appendix Table 2-14 Benthic (subtidal) habitats of the Pearson Isles SZ

Habitat	Area (km^2)	% SZ
Bare sand	0.640	1.0
Seagrass	0.547	0.8
Heavy limestone reef	0.721	1.1
Unmapped	160.468	97.0

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-15 Shoreline (intertidal) habitats of the Pearson Isles SZ

Habitat	Length of shoreline (km)	% SZ
Unmapped	22	100

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Investigator Marine Park is used by a number of shark species, including bronze whaler, dusky whaler, blue shark, smooth hammerhead, school shark, white shark, shortfin mako and porbeagle (DENR 2010b).

Mammals

The Investigator 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 2010b). 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 towards calving and resting areas further west (Mackay and Goldsworthy 2015).

Australian sea lion

There are 4 Australian sea lion breeding site in the Investigator Marine Park, including Dorothee and Pearson Islands within the SZ, with an estimated annual pup production of about 119 across the 4 sites (Goldsworthy and Page 2009, Goldsworthy et al. 2014). Pearson Island recorded 30 pups in 2015 (Goldsworthy et al. 2015).

Long-nosed fur seal

There are breeding sites for the long-nosed fur seal at Dorothee Island (1 site), Veteran Island (1 site) and Pearson Island (2 sites) within the SZ (Shaughnessy et al. 2014).

Seabirds

The Investigator Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, state endangered osprey, fairy tern, little penguin, Pacific gull, short-tailed shearwater and white-faced storm-petrel. (DENR 2010b). Some of these species are resident while others are more transient, visiting the Investigator Marine Park to rest, breed and/or feed. Most of the islands in the Investigator 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 Investigator Marine Park (Marchant and Higgins 1990).

Offshore islands are particularly important nesting sites for vulnerable white-bellied sea eagles and Western Eyre Peninsula has the highest concentration of sea eagle territories (Dennis et al. 2011a), so the Pearson Isles SZ is very likely to support territories of the state endangered white-bellied sea eagle. White-face storm-petrels breed on 4 Islands within the Investigator Martine Park, including estimated populations of about 5,200 pairs at Dorothee Island (Robinson et al. 1996, Copley 1996). Short-tailed shearwater breed on 4 islands, including estimated populations of about 1,896 pairs on Dorothee Island (Robinson et al. 1996).

Shorebirds

The Investigator 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 2010b).

Fish and macro-invertebrate communities

The information on fish and macro-invertebrate communities in this SZ is derived from the Marine Parks BRUVS and UVC monitoring programs (Miller et al. 2017, Brook et al. 2017). BRUVS surveys were conducted in 2015 and UVC surveys were conducted in 2018.

A total of 58 species were recorded during the BRUVS surveys comprising 50 species of species of fish, 6 species of sharks and rays, one crustacean species and one mollusc (Appendix Table 2-16). Horseshoe leatherjacket (*Meuschenia hippocrepis*) was the most the most common fish observed from BRUVS surveys, accounting for over 20 per cent of the total fish numbers recorded. Other common species were barber perch (*Caesioperca rasor*), yellowtail kingfish

(*Seriola lalandi*) and trevally (*Pseudocaranx* sp), which are typical species of reef habitats (Appendix Table 2-16).

A total of 91 species were recorded during dive surveys at Pearson Isles SZ comprising 63 species of fish and 28 species of macro-invertebrates (Appendix Table 2-17, Appendix Table 2-18). Noarlunga hulafish (*Trachinops noarlungae*) accounted for approximately 44 per cent of all fish species recorded during dive surveys at Pearson Isles SZ. Other common fish species recorded include bluethroat wrasse (*Notolabrus tetricus*), barber perch (*Caesioperca razor*) and sea sweep (*Scorpis aequipinnis*) (Appendix Table 2-17).

Blacklip abalone (Haliotis rubra) accounted for about 45 per cent of all macro-invertebrates recorded during dive surveys at Pearson Isles SZ (Appendix Table 2-18). Other common macro-invertebrates recorded during dive surveys include turbo shells (*Turbo torquatus*) and greenlip abalone (*Haliotis laevigata*).

Appendix Table 2-16 Species list, BRUVS surveys, Pearson Isles SZ[a]

Species	Common name	Total no.
Meuschenia hippocrepis	Horseshoe leatherjacket	85
Caesioperca rasor	Barber perch	69
Seriola lalandi	Yellowtail kingfish	60
Pseudocaranx sp	Trevally	52
Scorpis aequipinnis	Sea sweep	38
Neatypus obliquus	Footballer sweep	36
Notolabrus tetricus	Bluethroat wrasse	29
Tilodon sexfasciatus	Moonlighter	12
Achoerodus gouldii	Western blue groper	10
Cheilodactylus nigripes	Magpie perch	10
Olisthops cyanomelas	Herring cale	9
Meuschenia flavolineata	Yellowstriped leatherjacket	8
Pictilabrus laticlavius	Senator wrasse	8
Upeneichthys vlamingii	Red mullet	8
Meuschenia galii	Bluelined leatherjacket	7
Nemadactylus valenciennesi	Blue morwong	7
Ophthalmolepis lineolatus	Southern Maori wrasse	7
Enoplosus armatus	Old wife	6
Notolabrus parilus	Brownspotted wrasse	6
Austrolabrus maculatus	Black-Spotted wrasse	5

[a] 20 most abundant species shown out of a total of 54 species.

Source: DEW, unpublished data.

Appendix Table 2-17 Fish species list, dive surveys, Pearson Isles SZ[a]

Species	Common name	Total no.
Trachinops noarlungae	Noarlunga hulafish	6764
Notolabrus tetricus	Bluethroat wrasse	1566
Caesioperca rasor	Barber perch	1448
Scorpis aequipinnis	Sea sweep	1312
Meuschenia hippocrepis	Horseshoe leatherjacket	579
Pempheris multiradiata	Common bullseye	475
Cheilodactylus nigripes	Magpie perch	461
Girella zebra	Zebrafish	457
Meuschenia flavolineata	Yellowstriped leatherjacket	423
Achoerodus gouldii	Western blue groper	306
Olisthops cyanomelas	Herring cale	292
Centroberyx lineatus	Swallowtail	226
Pictilabrus laticlavius	Senator wrasse	198
Pseudocaranx spp.	Trevally	160
Parma victoriae	Victorian scalyfin	129
Upeneichthys vlamingii	Red mullet	128
Arripis georgianus	Australian herring	97
Tilodon sexfasciatus	Moonlighter	81
Heteroscarus acroptilus	Rainbow cale	69
Meuschenia venusta	Stars and stripes leatherjacket	62

[a] 20 most abundant species shown out of a total of 54 species.

Source: DEW, unpublished data.

Appendix Table 2-18 Fish species list, dive surveys, Pearson Isles SZ[a]

Species	Common name	Total no.
Haliotis rubra	Blacklip abalone	586
Turbo torquatus	Turbo	296
Haliotis laevigata	Greenlip abalone	136
Heliocidaris erythrogramma	Purple urchin	123
Turbo jourdani	Jourdans turban	29
Dicathais orbita	Cartrut shell	20
Fromia polypora	Many-spotted seastar	17
Comanthus trichoptera	Ornage Feather star	17
Pentagonaster dubeni	Fire-brick seastar	17
Plagusia chabrus	Red Bait crab	17
Echinaster arcystatus	Pale mosaic seastar	11
Pseudonepanthia troughtoni	Troughtons seastar	7
Petricia vernicina	Velvet seastar	7
Jasus edwardsii	Southern rock lobster	5
Phyllacanthus irregularis	Western slate-pencil urchin	5
Nectria multispina	Multi-spined seastar	5
Nectria macrobrachia	Large-plated seastar	3
Nectria ocellata	Ocellate seastar	3
Scutus antipodes	Elephant snail	3
Ceratosoma brevicaudatum	Short-tailed nudibranch	2

[a] 20 most abundant species shown out of a total of 54 species.

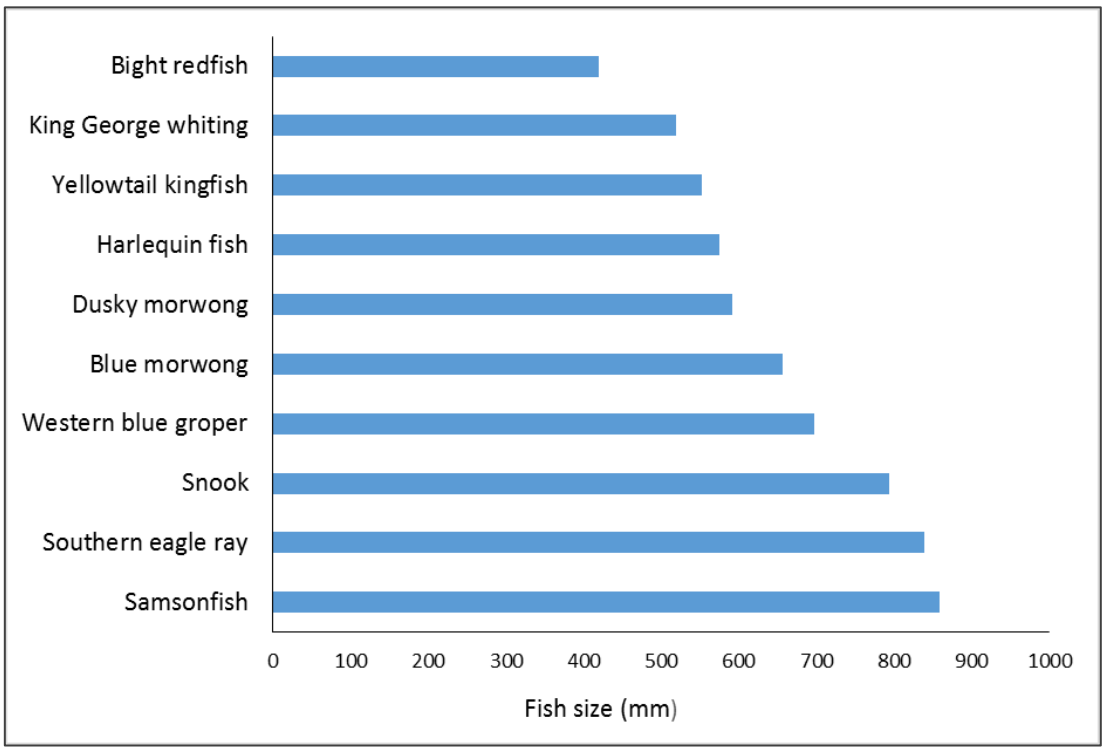
Source: DEW, unpublished data.

Largest fish

The largest fish (including sharks and rays) recorded at Pearson Isles SZ on BRUVS surveys was a 859mm Samsonfish (*Seriola hippos*), followed by a 838mm Southern eagle ray (*Myliobatis tenuicaudatus*) (Appendix Figure 2-23). Other large fish recorded on BRUVS included Snook (*Sphyraena novaehollandiae*) at 793mm and Western blue groper (*Achoerodus gouldii*) at 697mm.

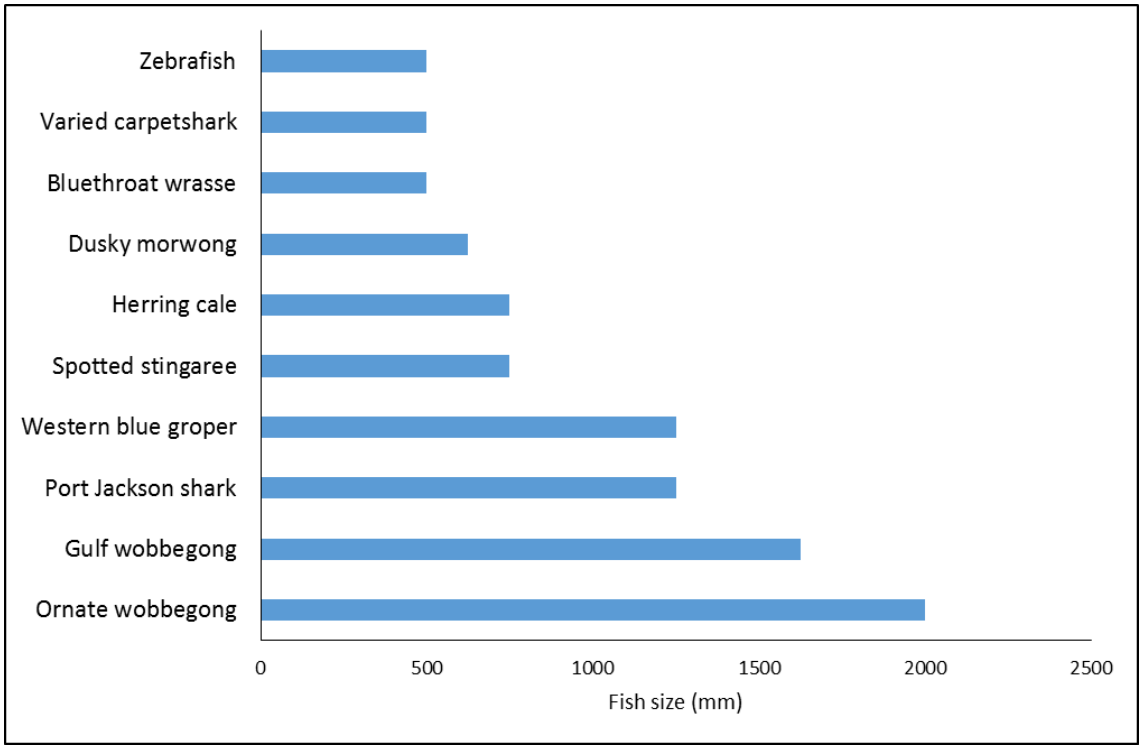
The largest fish recorded at Pearson Isles SZ on dive surveys was a 2,000mm ornate wobbegong (*Orectolobus ornatus*) followed by a gulf wobbegong at 1,625mm (Appendix Figure 2-24). Other large fish recorded during dive surveys included Port Jackson shark (*Heterodontus portusjacksoni*) at 1,250mm, western blue groper (*Achoerodus gouldii*) at 1,250mm and spotted stingaree (*Urolophus gigas*) at 750mm (Appendix Figure 2-24).

Appendix Figure 2-23 Largest fish recorded, BRUVS surveys, Pearson Isles SZ



Source: DEW, unpublished data.

Appendix Figure 2-24 Largest fish recorded, diver surveys, Pearson Isles 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

Pearson Isles SZ has the highest diversity of fish species recorded in comparison to other SZs surveyed on BRUVS with an average of almost 20 fish species per drop recorded (Appendix Figure 2-10). The dive survey data shows a similar trend where Pearson Isles SZ has 3rd highest number of species recorded compared to other SZs (Appendix Figure 2-11). There was a moderate to low species richness of macro-invertebrates recorded during dive surveys at Pearson Isles SZ (Appendix Figure 2-12).

Large fish

Pearson Isles SZ has the highest numbers of large fish (individuals greater than 200mm in size) of all other SZs surveyed, with an average of 25 individuals recorded per BRUVS drop (Appendix Figure 2-13) and approximately 500 individuals per dive survey (Appendix Figure 2-14).

Fished species

Pearson Isles SZ has the highest number of targeted fish species of all the SZs surveyed (Appendix Figure 2-15, Appendix Figure 2-16). Common targeted fish species which occur in the Pearson Isles SZ include horseshoe leatherjacket (*Meuschenia hippocrepis*), yellowtail kingfish (*Seriola lalandi*) and trevally (*Pseudocaranx sp*).

Sharks and rays

Pearson Isles SZ has relatively low numbers of sharks and rays recorded on BRUVS compared to other SZs surveyed (Appendix Figure 2-17).

Indicator Species

Five of the six reef indicator fish species were recorded at Pearson Isles SZ on BRUVS surveys (Appendix Figure 2-18). Horseshoe leatherjacket (*Meuschenia hippocrepis*) and Western blue groper (*Achoerodus gouldii*) abundances were highest at the Pearson Isles SZ compared to all other SZs (Appendix Figure 2-18). All six reef fish indicator species were recorded on dive surveys at Pearson Isles SZ with horseshoe leatherjacket (*Meuschenia hippocrepis*), sea sweep (*Scorpis aequipinnis*) and Western blue groper (*Achoerodus gouldii*) all displaying high abundances at Pearson Isles SZ compared to other SZs surveyed (Appendix Figure 2-19). All three of the macro-invertebrate indicator species for reef were found during dive surveys at Pearson Isles SZ with a high abundance of abalones recorded compared to other SZs surveyed (Appendix Figure 2-20).

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Pearson Isles SZ include:

- Soft-bottom habitat, seagrasses and reef including granite and limestone.
- Extremely uncommon seagrass beds at depths of 25-30m due to the exceptionally clear water.
- Transition of habitats down steep slopes from shore to more than 50m deep.
- Sheltered beaches and tall cliffs.
- Relatively warm, clear water and large swell with strong currents between the islands.
- Higher sea surface temperatures in winter than summer due to the influence of the Leeuwin Current.
- Deep water travertine limestone reefs at 50m depths off of Pearson Island.

Important features of the SZ include:

- Pearson, Veteran and Dorothee Isles are geologically unique, being giant granite inselbergs (uncommon island mountains), The mountain of Pearson Island rises steeply out of the water to 200 metres above sea level.
- Exceptionally clear waters, with significant light penetration and strong, deep water swells.
- Abundance of large fishes, now less common in places more accessible to fishing.
- High species diversity including mature fish and invertebrates such as hard and soft corals, sponges, macroalgae, ascidians and echinoderms.
- Bird breeding colonies including white-faced storm petrels, little penguins and short-tailed shearwaters.
- Nesting sites for little penguin, white-faced storm petrel, Fairy Tern and the endangered white-bellied sea eagle.
- Site for migratory birds whose habitats are required to be protected under international treaties.
- New Zealand fur seals and the vulnerable Australian sea lion breeding and haul out sites on all Islands.
- Strongly influenced by the warm Leeuwin Current, which supports some species more common in tropical waters.
- High degree of ‘naturalness’ due to its isolation.
- Uncommon rhodolith communities (popcorn coral or coralline red algae).
- Presence of large blue groper, weedy seadragon, western blue devil, rock lobster, large sponges, gorgonian corals and soft corals.
- Granite boulder reefs form large caverns, harbouring prolific fish and invertebrate species.
- Home to Australian sea lions, Dolphins, Weedy Seadragons, and sponge and soft coral gardens, gorgonian corals.

- The granite reef ecosystem surrounding these islands are very different to the different biodiversity of limestone reefs surrounding Topgallant Island.

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 Pearson Isles 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.8.1. Predicted changes to indicator species relevant to the Pearson Isles SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone and blacklip abalone, when each is considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Pearson Isles SZ (Bailey et al. 2012a). Bight redfish, bluethroat wrasse, harlequin fish, swallowtail, sea sweep and Western blue groper, when each is considered in isolation, are predicted to maintain size and/or abundance inside the Pearson Isles 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.8.2.

The NZRL Fishery was the principal fishery that previously used the Pearson Isles SZ. There was some use, albeit minor, of the SZ by the Abalone, 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 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.8.3.

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

Selective removal of target species

Opening the Pearson Isles 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.2.12.4). 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. Opening 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

Pearson Isles SZ has breeding colonies of Australian sea lions and long-nosed fur seals and dolphins commonly use the SZ. There is one active white-bellied sea eagle nest located in 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 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.8.3 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 Pearson Isles 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.

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

The Pearson Isles SZ has several habitat types that are sensitive to disturbance such as seagrass, reef and rodolith habitats 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.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system.

A.2.4 Salt Creek Sanctuary Zone

A.2.4.1 Zone description

The Salt Creek SZ (105 km^2) located in the Sir Joseph Banks Group Marine Park protects the ecosystem from the Salt Creek estuary mouth, across the sandflats and then out to the seagrass beds, providing a protective corridor and important breeding and nursery ground for many fish and invertebrate species (Appendix Figure 2-25). The SZ is representative of waters in the northern part of the Sir Joseph Banks Group that are sheltered from southerly winds, but exposed to northerly breezes. The SZ is also unique in that it borders both Eyre and Spencer Gulf bioregions and protects a mix of the ecological characteristics that make up these bioregions.

The range of habitats in this SZ support different parts of the lifecycle for species such as yellowfin whiting. The SZ provides nursery and spawning grounds for recreational important species such as; blue swimmer crab, razorfish, king scallop, queen scallop, yellowfin whiting, snook, southern calamari, southern sea garfish, yellow eye mullet, Australian salmon, tommy ruff, flathead, flounder, King George whiting, sand crab, snapper, red mullet and baitworm.

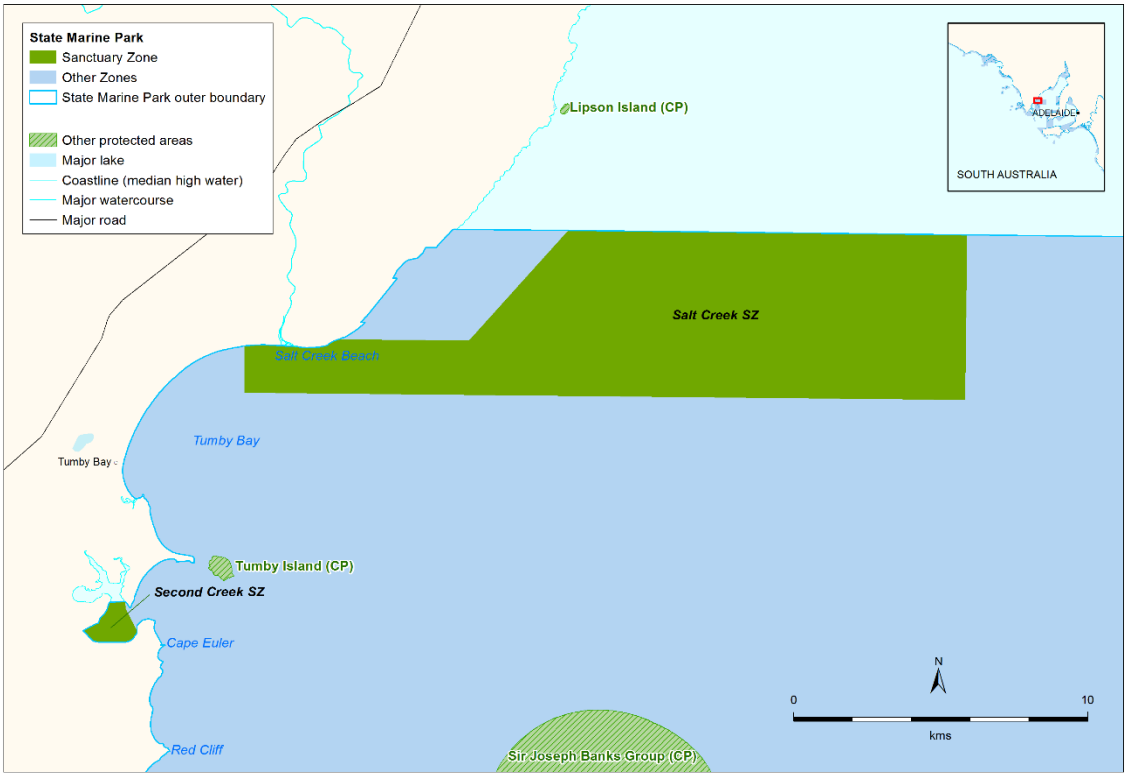
Common and bottlenose dolphins forage throughout this SZ.

At least 5 migratory coastal bird species listed under international migratory treaties and other resident coastal waders use the Tumby Bay area (including Salt Creek) for roosting and feeding (e.g. Pacific golden plover, grey plover, eastern curlew, sharp-tailed sandpiper and ruddy turnstone). Migratory shorebird habitat is required to be protected under international treaties.

MPLAG advice for this sanctuary was unanimous. Part of the SZ is complemented by an existing managed netting closure. This SZ avoids areas of medium to high recreational fishing effort closer to the township of Tumby Bay.

It is recognised that this Zone is in an area used by the scale fish and sardine industry. Based on publicly available information the zoning was aimed at minimising the impact on these fisheries.

Appendix Figure 2-25 Salt Creek sanctuary zone



Source: APPENDIX 9

A.2.4.2 Economic values and impacts

A.2.4.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The principal fishery that previously used the Salt Creek SZ was the Sardine Fishery. Small amounts of activity occurred in the Marine Scalefish, Prawns, Abalone, 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 2-19.

The total gross value of displaced catch in this SZ is estimated to be at least $12,000, from the Marine Scalefish ($12,000) and Abalone (less than $1,000) Fisheries.

Displaced catch and effort from the Blue Crab and Charter Boat Fisheries were confidential but would be minimal. In fact, for the entire Sir Joseph Banks Group Marine Park the value of displaced catch and effort would be less than $12,000 for the Charter Boat Fishery and less than $1,000 for the Blue Crab Fishery.

Historical average annual catch for the Sardine Fishery was estimated to be 257 tonnes (1.11 per cent of Fishery catch) prior to zoning. Because the fishery is highly mobile and targets a pelagic species that can be captured elsewhere the historical catch is not deemed displaced. There was a very small historical catch from the SG Prawn Fishery of 56kg. Like the Sardine Fishery, this catch from the Parawn Fishery was not deemed displaced.

Catch identified here as primarily Sardines concurs with that identified in preliminary estimates read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-19 Estimated catch or effort and GVP displaced by fishery, Salt Creek SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Abalone	2	0.00%	0
Rock Lobster	-	-	-
Blue Crab	Confidential	-	-
Marine Scalefish	11	0.02%	12
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Salt Creek SZ is located on the East coast of the Eyre Peninsula within SG. This SZ occupies 2.7 per cent of Marine Fishing Area 29 (MFA) (Appendix Figure 2-3). This MFA is utilised by commercial fishers targeting primarily Sardines and Marine Scalefish species. Some minor fisheries also occur in the region. These species are also able to be targeted outside of the SZ.

Australian Sardine Fishery

The Gulf Zone fishery makes up the majority of the South Australian Sardine Fishery catch averaging between 25,000t to 30,000 annually since 2007. This fishery has been growing rapidly. The TACC for 2016 (38,000t) was 38 times higher than in 1992 (1,000t) and more than 10 times the TACC in 2000 (3,500t). In 2017 the TACC was set at 42,750t (Ward et al. 2017).

King George Whiting

Currently, SG is the largest King George Whiting fishery out of the three King George Whiting stocks. In 2016 total catch (recreational PLUS commercial) was recorded at around 150t in GSV/ Kangaroo Island, 310t in SG and 250t in West Coast. Salt Creek SZ occupies 2.7 per cent of MFA 29**.** Historically (1999-2012/13), MFA 29 has produced between 11t to 20t of King George Whiting out of about 100t for the region (commercial catch only). Catch has declined along with a significant reduction in licences to fish King George Whiting (325 to 136 licences).

King George Whiting in SG is currently *Sustainable* (Steer et al. 2018). It is estimated that the commercial and recreation catch represent a proportion of approximately 42 per cent to 58 per cent, respectively.

Snapper

Historically, SG provided the bulk of the Snapper catch in South Australia. Between 2007-2010 the catch from Northern GSV increased rapidly and now contributes the bulk of Snapper catch to South Australia (Fowler et al. 2016). The SG/West Coast Snapper stock is currently classified as *transitional depleting* (Steer et al. 2018).

In 2012/13, prior to SZs, MFA 29 which overlaps Salt Creek SZ produced between 11t to 25t out of around 500t state-wide (Fowler et al. 2013).

It was estimated that the commercial and recreation catch represent a proportion of approximately 62 per cent to 38 per cent, respectively.

Garfish

Garfish catch in Southern SG has only contributed 3 per cent of the state-wide catch for the last decade (Steer et al. 2018) with large areas closed to haul net fishing. Garfish catches in MFA 29 prior to SZs were confidential in 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 77 per cent to 23 per cent, respectively. The southern SG stock is classified Sustainable.

Southern Calamari

Historically, the catch of Southern Calamari in the Southern SG region has fluctuated between 60t and 120t since 1994 and represents about 30 per cent of total state catch (443t 2016) (Steer et al. 2018). Total catch for the state has remained stable since 2010 at a round 400t. Catch of Southern Calamari in MFA 29 which overlaps the Salt Creek SZ was between 1t and 5t 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 70 per cent to 30 per cent, respectively. The Southern Calamari stock is classified as sustainable (Steer et al. 2018).

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

The main fishery is the pelagic Australian Sardine Fishery. There is no assessment for the suitability of the pelagic zone to the sardine fishery.

Existing Arrangement

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

The displaced effort in the Marine Scalefish ($12,000) and Central Zone Abalone (less than $1,000) Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Sardine Fishery

While the estimated displaced catch was 1.49 per cent of the total average annual catch in the fishery (EconSearch 2014), change in the fishery due to the Sir Joseph Banks Group Marine Park is predicted to be minimal because:

- No displaced catch or effort was deemed necessary for removal through the Commercial Fisheries Voluntary Catch/Effort Reduction Program.
- The fishery is highly mobile and targets a pelagic species that can be captured elsewhere.

Marine Scalefish Fishery

Change in the fishery due to the Sir Joseph Banks 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.
- Marine scalefish fishers are highly mobile and should be able to adapt to the spatial restrictions.
- The estimated displaced effort was 0.15 per cent of the total average annual effort in the fishery (EconSearch 2014).

Charter Boat Fishery

Change in the fishery due to the Sir Joseph Banks 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.
- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- There are numerous locations that remain available for fishing both in and out of the Sir Joseph Banks Group Marine Park.
- Most of the islands within the Sir Joseph Banks Group remain open to fishing.
- There are few operators within the Sir Joseph Banks Group Marine Park and therefore minimal competition for fishing grounds.
- The estimated displaced effort was 0.28 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? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

Australian Sardine Fishery

Catch has been increasing for the Sardine Fishery as fisheries managers (PIRSA) increase the TACC. The 2017 season had the highest TACC set at 42,750t. This fact along with catch data suggests they are catching large amounts of Sardines in close proximity to the SZ indicating that the SZ is not having a negative impact on the fishery. The main issue with this fishery (as outlined in the Hansard) is the proximity to the SZ and the potential for boats to drift into the SZ while pulling in the nets. Technically if they drift into the SZ with a net full of sardines they would have to release the fish (as they are would be taking fish from the SZ despite initial capture being from outside the SZ). There is currently no policy to deal with this situation. A permit system has been proposed as a potential solution rather than rezoning (see Hansard excerpt below).

King George Whiting

Total catch of King George Whiting has decreased since the 1990's in SG. Since the introduction of SZs, total catch for the SG stock has continued to follow the 10-year trend of about 100t per year (Steer et al. 2018). Historically, MFA 29 which overlaps Salt Creek SZ produced less than 5t of King George Whiting (Fowler et al. 2013). In 2016 MFA 29 also recorded a catch of less than 5t (Steer et al. 2018).

Snapper

Since 2007, annual Snapper catch in SG has reduced from around 600t to between 70t to 100t (2012-2016, Prior to SZ's). In 2016, 66t of Snapper was caught in SG compared to the state wide catch of 382t (Steer et al. 2018). The catch has maintained this low level since 2012.

Catches in MFA 29 overlapping Salt Creek SZ, were between 0.1t to 6t in 2016. The reduction in catch is related to declining effort and the stock is classified transitional depleting (Steer et al. 2018 and Fowler et al. 2013).

Garfish

Large areas of Southern SG have been closed to commercial hauling net fishing since 2005. Catches in MFA 29 overlapping Salt creek SZ were confidential in 2012/13 and 2016 (Steer et al. 2018). Total catch in the Southern SG has increased since 2012 from below 10t to just over 10 t in 2016. Catch has not exceeded 15t since 2009 (Steer et al. 2018).

Southern Calamari

Total catch for Southern SG has remained around 100t since 2010 (Steer et al. 2018). Catch in 2016 was slightly lower at 93t but this is similar to catch in the late 1990's (but with less effort).

Catch of Southern Calamari in MFA 29 overlapping the Salt Creek SZ was less than 5t in 2012/13 Prior to SZ's, and also in 2016 (Fowler et al. 2013, Steer et al. 2018).

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally by the Sardine Fishery and to a minor extent the Marine Scalefish, Prawns, Abalone, Blue Crab and Charter Boat Fisheries.

The effect of changing the status 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.

Opening the SZ to fishing is unlikely to see dramatic increases in fisheries value, because the Sardine Fishery is limited by the TACC. As noted above, the reduction in restricted areas may see a small increase in CPUE.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally by the Sardine Fishery and to a minor extent the Marine Scalefish, Prawns, Abalone, Blue Crab and Charter Boat Fisheries.

It is possible that there would be future activities such as aquaculture or coastal developments in this SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.4.2.2 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.2.4.2.1). 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 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 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.2.4.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

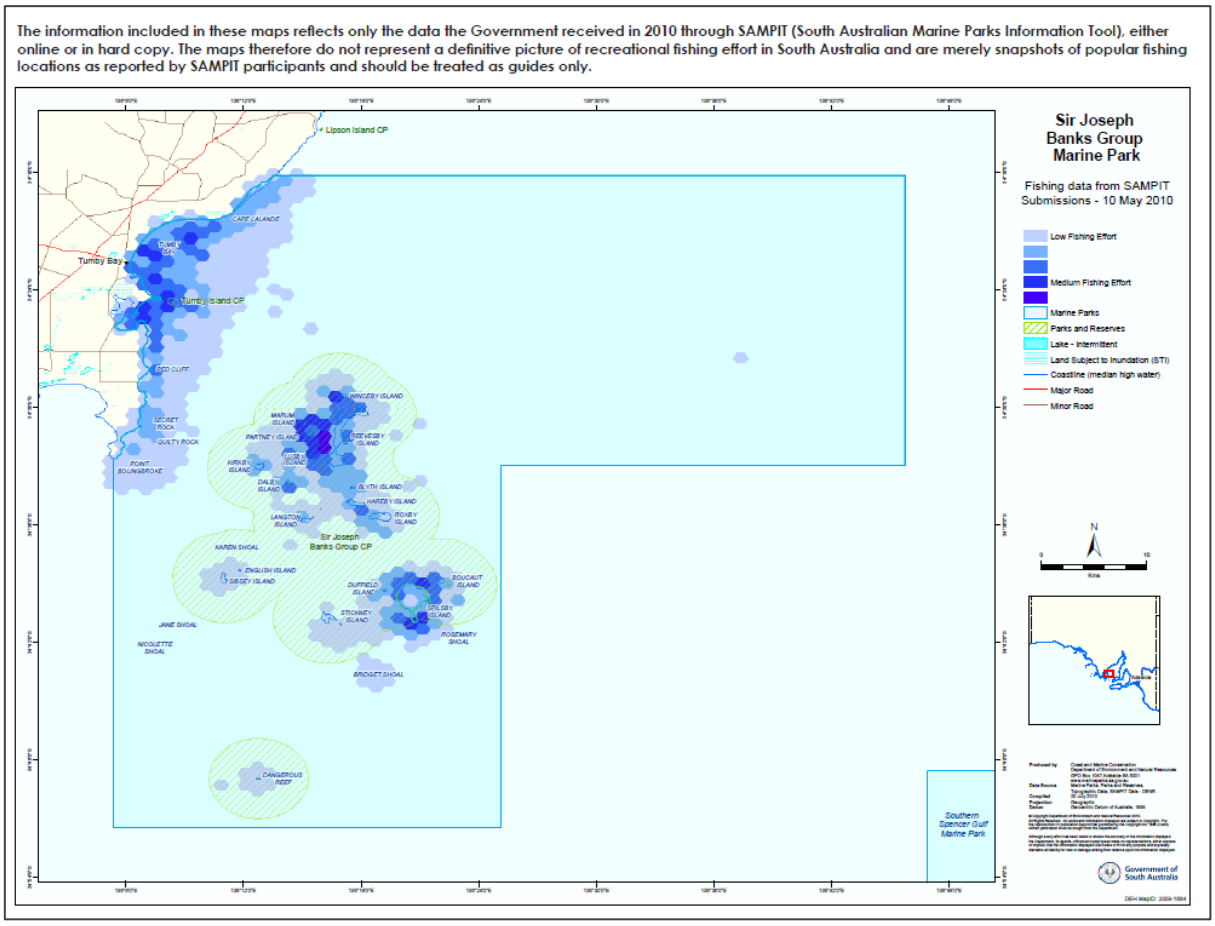
Boating and recreational shore-based activities occur in the Salt Creek SZ. Recreational boat and shore-based fishing occur adjacent to the SZ in Tumby Bay.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing at the Salt Creek SZ was minimal, with only some area lost due to the SZ. Zoning was designed to minimise impact on nearshore recreational fishing. Shore-based line fishing is now prohibited in a relatively small area of the coastline in the SZ (Appendix Figure 2-26).

Appendix Figure 2-26 SAMPIT map showing intensity of fishing prior to SZ implementation



Source: DENR 2010e (SAMPIT)

What does the community value about the SZ?

A total of 103 (1 per cent) of the 8,649 respondents commented specifically on the Sir Joseph Banks Group Marine Park during submissions to the draft zoning. 1 (0.01 per cent) agreed with the proposed zoning entirely, 3 (0.03 per cent) suggested changes to zoning to increase conservation outcomes, 99 (1 per cent) suggested changes to zoning to reduce impacts on current uses, while 8,546 (99 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

What are the non-market values of the SZ?

Nothing identified.

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[101]) (Appendix Figure 2-5).

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening the 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.

The Sardine Fishery would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector.

Habitat Protection Zone Status

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

It is possible that activities such as aquaculture and coastal developments (jetties, wharves, etc.) could occur in the future in the location of the SZ, as these activities already occur nearby.

A.2.4.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

Salt Creek SZ contains sandy beach, seagrass and deepwater habitats.

Appendix Figure 3-18 provides a map of the main benthic (subtidal) habitats of the Sir Joseph Banks Group Marine Park. Appendix Table 2-20 and Appendix Table 2-21 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Salt Creek SZ.

[101] 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 2-20 Benthic (subtidal) habitats of the Salt Creek SZ

Habitat	Area (km^2)	% SZ
Bare sand	0.255	0.2
Heavy limestone reef	0.555	0.5
Seagrass	14.837	14.2
Unmapped	89.142	85.1

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-21 Shoreline (intertidal) habitats of the Salt Creek SZ

Habitat	Length of shoreline (km)	% SZ
Coarse sandy beach	3	100

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Sir Joseph Banks Group Marine Park is used by a number of shark species, including bronze whaler, dusky whaler, smooth hammerhead, school shark and white shark (DENR 2010e). It is assumed that some of these species move through the Salt Creek SZ at times.

Mammals

The Sir Joseph Banks 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 2010e). It is assumed that some of these species move through the Salt Creek SZ at times.

Seabirds

The Sir Joseph Banks Group Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, state endangered osprey, black-faced cormorant, Caspian tern, crested tern, fairy tern, little penguin, Pacific gull, pied cormorant, silver gull and white-faced storm petrel (DENR 2010e). It is expected that some of these species use the Salt Creek SZ at times.

An osprey nesting site is located in the vicinity of Salt Creek SZ (Dennis et al. 2011a).

Shorebirds

The Sir Joseph Banks Group Marine Park is used by a number of shorebird species, including pied oystercatchers, red necked stint, grey plover, sharp tailed sandpiper and banded stilt (DENR 2010e, Watkins 1993). It is expected that some of these species use the Salt Creek SZ at times.

Fish Communities

Tumby Bay includes mangroves, algae and seagrass that are important feeding, spawning and nursery habitats for a wide variety of fish species such as King George whiting (DENR 2010e). These species move offshore to the deeper waters around the islands as adults. As well as King George whiting, Australian salmon, sweep, snook, snapper, Australian herring (tommy ruff) and mullet are found in the area, using the various habitat types for different stages of their lifecycles. For example, juvenile mullet are mainly found in inlets, bays and shallow sheltered marine waters. As juvenile mullet get older they tend to move to deeper gulf and offshore waters in which they will remain until they reach 12 to 13 years of age and then return to inshore waters for the remainder of their lives (DENR 2010e).

The leafy seadragon can be found in Tumby Bay, as well as the spotted snake-blenny which may be endemic to South Australia. The eastern stargazer fish is regularly observed in the Tumby Bay area, but is only recorded in South Australian gulfs and is considered uncommon at a national level (DENR 2010e).

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 Salt Creek 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 Salt Creek SZ include:

- Intertidal habitats within this zone include a tidal creek with tidal flats, with a wide sand delta at the mouth of the creek.
- Moving offshore, the benthic habitats include sandy bottom and seagrass ranging from dense to spare as the water increases in depth.

Important features of the SZ include:

- Salt Creek is the main estuary (extending 2km inland – although the SZ does not include the estuary above median high water) in the Tumby Bay area, and part of the Tumby Bay Wetland of National Importance.
- At least 5 migratory coastal bird species listed under international migratory treaties and other resident coastal waders use the Tumby Bay area (including Salt Creek) for roosting and feeding (e.g. Pacific golden plover, grey plover, eastern curlew, sharp-tailed sandpiper and ruddy turnstone). Migratory shorebird habitat is required to be protected under international treaties.
- The range of habitats within this SZ are important for different parts of the lifecycle of many fish and invertebrates of recreational and commercial importance. For example

yellowfin whiting spawn on the tidal flats and subtidal sandy bottom habitats of the zone, whilst the post larvae, juvenile and adult fish utilise the subtidal sandy bottom habitat of the zone, in effect, protecting the whole lifecycle of the yellowfin whiting.

- The Zone is located in a transition area between the Spencer and Eyre Bioregions meaning there is a mix of the 2 different types of, creating a different niche than occurs in these bioregions alone.
- The sea surface temperatures in this Zone are typically in the mid 20°Cs for summer and low 10°Cs in winter, representing a large fluctuation in sea surface temperature.
- It is representative of waters in the northern part of the Group that are sheltered from southerly winds, but exposed to northerly breezes.
- The SZ contains habitat for reef fish.
- Uncommon fish species such as the sculptured sea moth and the Eastern stargazer live in the sandy bottom habitat within this zone.
- Spawning habitat for blue swimmer crab, razorfish, king scallop, queen scallop, yellowfin whiting, snook, southern calamari, southern sea garfish, yellow eye mullet and baitworm.
- Nursery habitat for the above species as well as western king prawn, school whiting, western Australian salmon, tommy ruff, flathead, flounder, King George whiting, sand crab, snapper and red mullet.
- Common and bottlenose dolphins foraging habitat.

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 Salt Creek SZ became operational in 2014.

Predicted changes

Predicted changes that apply to all SZs are described in Section A.8.1. Predicted changes to indicator species relevant to the Salt Creek SZ are described below.

Subtidal seagrass

King George whiting are predicted to temporarily increase in abundance inside the Salt Creek SZ (Bailey et al. 2012a).

Subtidal sand

Snapper, when considered in isolation, is predicted to increase in size and abundance over the next 20 years inside the Salt Creek SZ. King George whiting and yellowfin whiting are predicted

to temporarily increase in abundance inside the Salt Creek SZ (Bailey et al. 2012a). Western king prawn are predicted to temporarily increase in size and abundance inside the Salt Creek SZ.

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.8.2.

The principal fishery that previously used the Salt Creek SZ was the Sardine Fishery (which is a part of the Marine Sclefish Fishery). Small amounts of activity occurred in the Marine Scalefish (other sectors), Prawns, Abalone, Blue Crab and Charter Boat Fisheries.

The MSF pose a threat to Southern garfish (relatively low impact based on relatively low levels of historical fishing); a threat (low) to all other target species and a threat (low) to other species of bycatch except the short-beaked common dolphin for which a Sardine Fishery code of Practice is in place (Mackay and Goldsworthy 2017). In addition to removal of targeted species and bycatch the MSF 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 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.8.3.

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

Selective removal of target species

Opening the Salt Creek SZ to fishing would have a negative impact on those species commonly targeted including sardines, King George whiting, snapper and a range of soft sediment species. Conservation of these species would be compromised by allowing fishing in the Salt Creek SZ with negative flow on effects for biodiversity conservation and ecosystem function.

Removal of other species caught as bycatch

A number of species are captured as bycatch including dolphins 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 dolphins and 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

Given the limited level of fishing in this zone there is expected to be little impact on non-target species.

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.8.3 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 Salt Creek 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.

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

The Salt Creek SZ has several habitat types that are sensitive to disturbance such as seagrass and associated fauna communities. It is possible that activities such as aquaculture and coastal developments (jetties, wharves, etc.) could occur in the future in the location of the SZ, as these activities already occur nearby. These activities would potentially impact on the environmental values of this SZ via damage to habitat (i.e. seagrass), disturbance to animals, and pollution as outlined in Section A.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Salt Creek SZ contains the only example of a tidal estuary and mudflat transition to sandy bottom and extensive seagrass meadows. This SZ also exists in a transition area between the Spencer and Eyre bioregions creating a unique combination of biogeographic features not found elsewhere in SG. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these habitats.

A.2.5 North Neptune Islands Sanctuary Zone

A.2.5.1 Zone description

The North Neptune Islands SZ (35km^2) is located in the Neptune Islands Group Marine Park (Appendix Figure 2-27) 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.

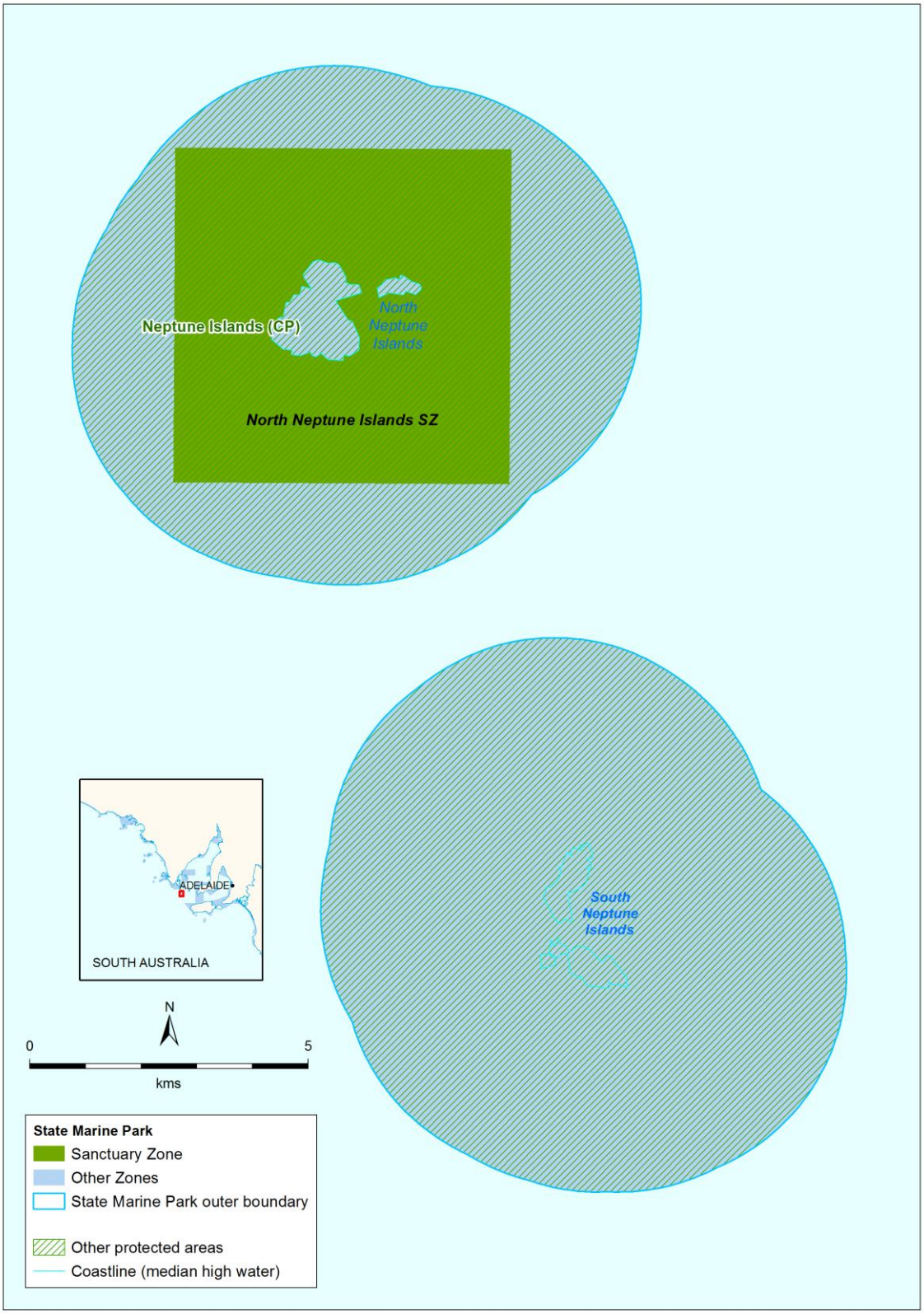
The North Neptune Islands contain half of the breeding population of long-nosed fur seals in South Australia. The area is also a breeding colony for the vulnerable Australian sea lion.

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 2-27 North Neptune Islands sanctuary zone



Source: APPENDIX 9

A.2.5.2 Economic values and impacts

A.2.5.2.1 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 2-22. The total gross value of displaced catch in this SZ is estimated to be at least $468,000, principally from the NZRL ($417,000), Abalone ($44,000), Marine Scalefish ($3,000) 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).

Appendix Table 2-22 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)
Sardines	-	-	-
Abalone	990	0.17%	44
Rock Lobster	6,900	1.06%	417
Marine Scalefish	35	0.06%	3
Charter Boat	22	0.10%	4

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 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 2-2). 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 2-3). 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 2-23 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 2-22). 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 $0.56m in total GRP, which represents less than 0.1 per cent of the regional total ($3.4b in 2016/17).
- Approximately 4 fte jobs which represent less than 0.1 per cent of the regional total (25,915 fte jobs in 2016/17).
- Approximately $0.33m in household income, which represents less than 0.1 per cent of the regional total ($1.8b in 2016/17).

Appendix Table 2-23 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	-0.42	41%	-2	41%	-0.13	41%	-0.22	40%
Abalone	-0.04	4%	0	0%	-0.02	6%	-0.03	5%
Downstream [b]	-0.10	10%	0	7%	-0.02	5%	-0.04	6%
Total Direct [c]	*-0.57*	*55%*	*-2*	*48%*	*-0.17*	*51%*	*-0.29*	*52%*
Total Flow-on [c]	*-0.46*	*45%*	*-2*	*52%*	*-0.16*	*49%*	*-0.27*	*48%*
Total [c]	**-1.02**	**100%**	**-4**	**100%**	**-0.33**	**100%**	**-0.56**	**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? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

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? (e.g. has the catch dropped?)

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 opportunites 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 Table 3-3). 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). 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

What impact would there be to the fisheries values of opening the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The effect of changing the status 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.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

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

A.2.5.2.2 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 2-24 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 2-24 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.2.5.2.1). 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 different fishing activities?

The total gross value of displaced catch in this SZ, estimated to be at least $468,000, 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.

Opening 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. 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 the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

The total gross value of displaced catch in this SZ, estimated to be at least $468,000, 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.

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.2.5.3 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).

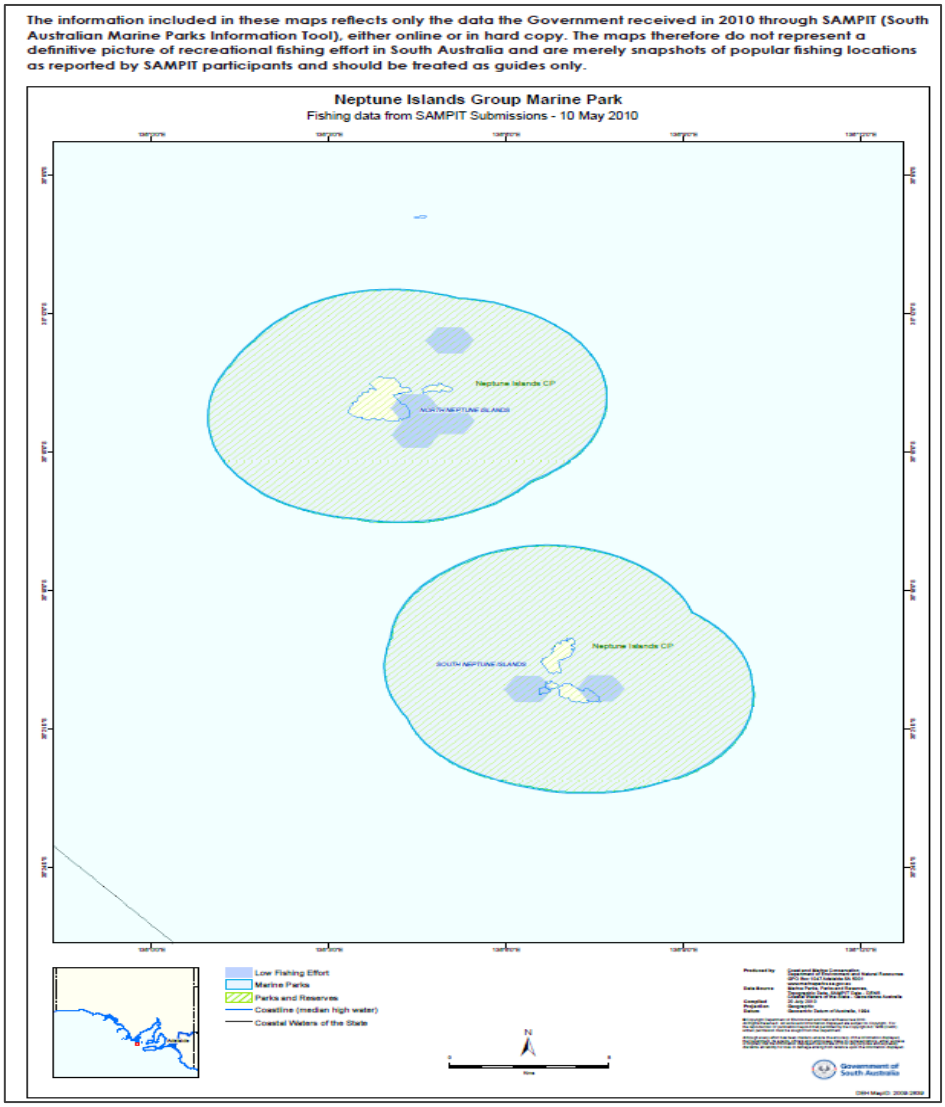
Shore-based recreational activities on the islands within the SZ would be minimal due to the remote location.

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 2-28).

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



Source: DENR 2010c (SAMPIT)

What does the community value about the SZ?

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?

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[102]) (Appendix Figure 2-5).

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening 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.

[102] 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.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

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

The impact of opening 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.2.5.4 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 3-20 (in Section 3.8.1) provides a map of the main benthic (subtidal) habitats of the Investigator Marine Park. Appendix Table 2-25 and Appendix Table 2-26 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the North Neptune Islands SZ.

Appendix Table 2-25 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), Edyvane (1999a, b)

Appendix Table 2-26 Shoreline (intertidal) habitats of the North Neptune Islands SZ

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

Source: Source: DEWNR (2015c), 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, 2013b, 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.8.1. 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.8.2.

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

What impact would there be to the environmental values of opening 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.8.3.

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

Selective removal of target species

Opening 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.2.12.4). 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 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 thorugh the SZ. There is one active state endangered white-bellied sea eagle nest located on the cliffs of North Neptune Island. 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 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.8.3 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 North Neptune Islands 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.

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.8.4 for an overview of the impact to environmental values of opening 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.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the North Neptunes 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.

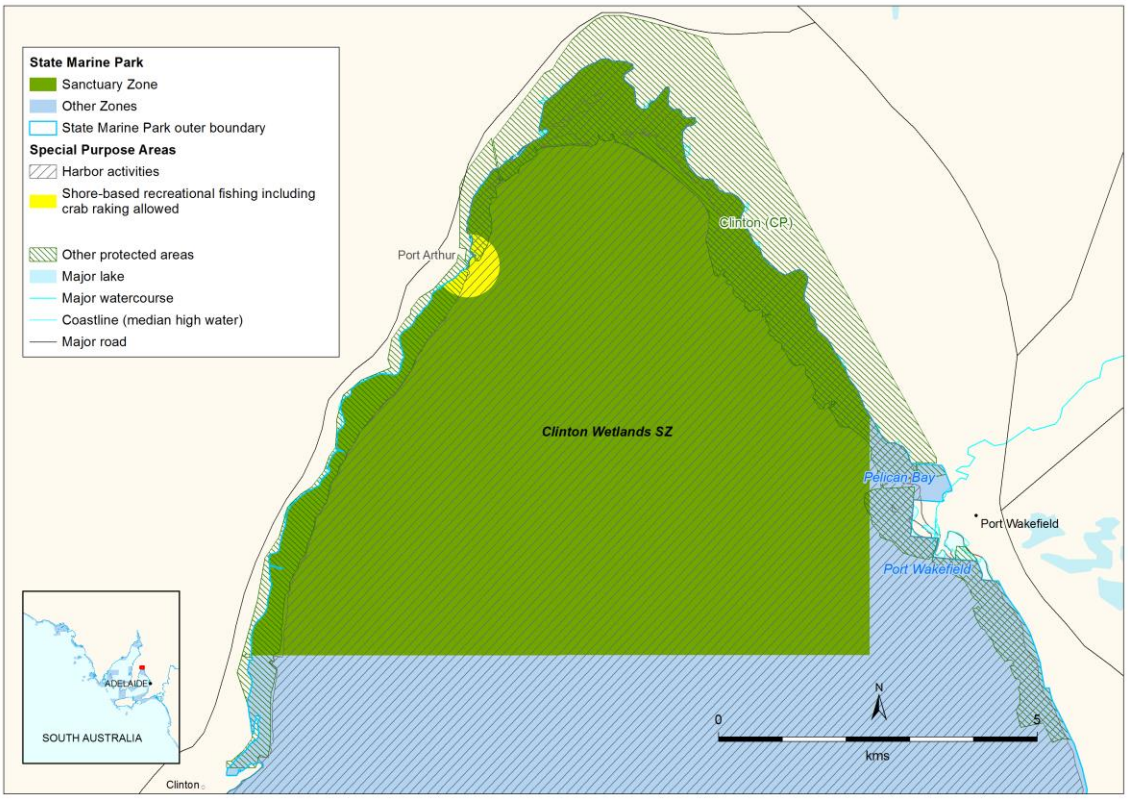
A.2.6 Clinton Wetlands Sanctuary Zone

A.2.6.1 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 2-29) 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 2-29 Clinton Wetlands sanctuary zone



Source: APPENDIX 9

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.2.6.2 Economic values and impacts

A.2.6.2.1 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 2-27. The total gross value of displaced catch in this SZ is estimated to be at least $485,000, 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 ($485,000) is lower than preliminary estimates ($1.8 million) read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-27 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)
Sardines	-	-	-
Abalone	-	-	-
Rock Lobster	-	-	-
Blue Crab	Confidential	-	-
Marine Scalefish	645	1.04%	485
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

Clinton Wetlands SZ comprises the northern section of Marine Fishing Area 35 (MFA) (Appendix Figure 2-2). 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 2-28 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 2-27). 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 2-28 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	36%	-11	68%	-0.09	26%	-0.32	43%
Downstream [b]	-0.32	23%	-2	13%	-0.09	26%	-0.12	16%
Total Direct [c]	*-0.80*	*59%*	*-13*	*81%*	*-0.19*	*52%*	*-0.44*	*60%*
Total Flow-on [c]	*-0.55*	41%	*-3*	19%	*-0.17*	48%	*-0.29*	40%
Total [c]	**-1.35**	**100%**	**-16**	**100%**	**-0.36**	**100%**	**-0.73**	**100%**
Regional Total [d]	5,806.48		28,709		1,648.60		3,116.66	
Impact on Region	0.0%		-0.1%		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 $0.73m in total GRP, which represents less than 0.1 per cent of the regional total ($3.1b in 2016/17).
- Approximately 16 fte jobs which represent 0.1 per cent of the regional total (28,709 fte jobs in 2016/17).
- Approximately $0.36m in household income, which represents less than 0.1 per cent of the regional total ($1.6b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

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? (e.g. has the catch dropped?)

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 opportunites 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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $485,000, 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.

The effect of changing the status 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.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $485,000, 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.

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.2.6.2.2 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.2.6.2.1). 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 different fishing activities?

The total gross value of displaced catch in this SZ, estimated to be at least $485,000, 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.

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 the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

The total gross value of displaced catch in this SZ, estimated to be at least $485,000, 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.

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.2.6.3 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[103]. The area (including the Clinton Wetlands SZ) is recognised as a wetland of international importance.

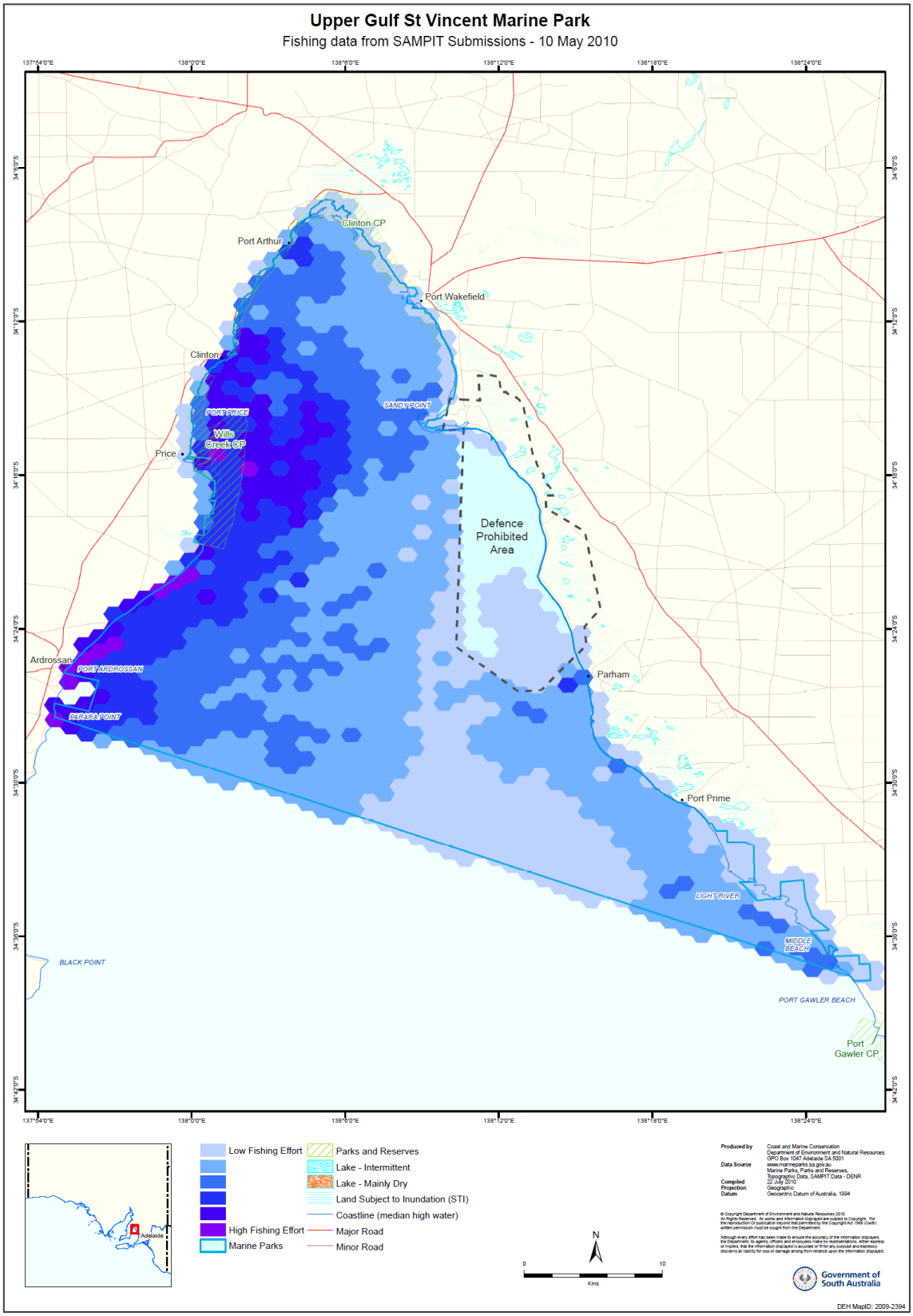
Existing Arrangement

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 2-30). 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.

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

Appendix Figure 2-30 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 km² 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 km² 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

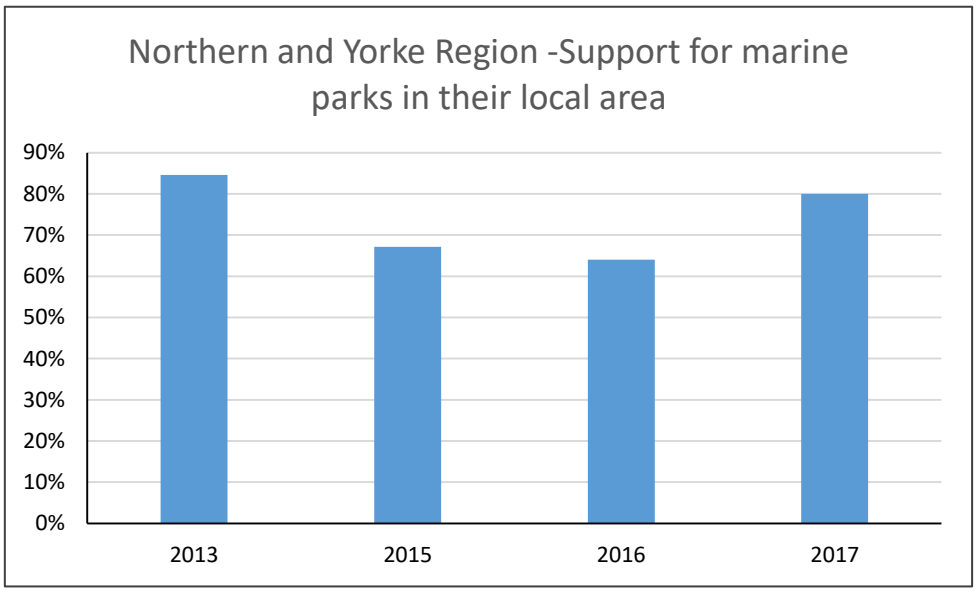
Birdlife Australia undertakes annual shorebird surveys of the SZ and adjacent Clinton Conservation Park, maintaining important time series of data (from 2009) on the distribution and abundance of shorebird species (see Purnell et al. 2018).

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)[104] (Appendix Figure 2-31).

Appendix Figure 2-31 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 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 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.

[104] 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.

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.2.6.4 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 Section 3.15) provides a map of the main benthic (subtidal) habitats of the Upper Gulf St Vincent Marine Park. Appendix Table 2-29 and Appendix Table 2-30 provide estimates of the benthic (subtidal) and shoreline (intertidal) habitats in the Clinton Wetlands SZ.

Appendix Table 2-29 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), Miller et al. (2009).

Appendix Table 2-30 Shoreline (intertidal) habitats, Clinton Wetlands SZ

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

Source: DEWNR (2015c, d), 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)[105].

[105] 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

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 2-31). 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 2-31).

Appendix Table 2-31 Species list, BRUVS survey, Clinton Wetlands SZ, 2015

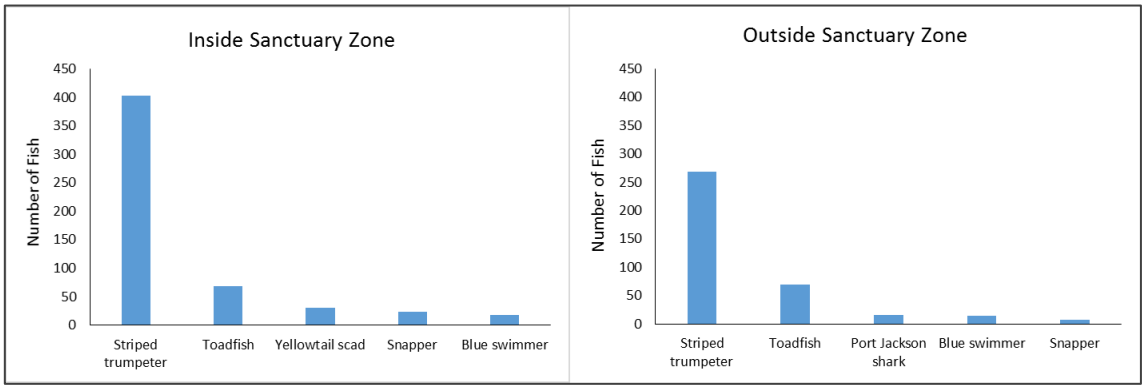
Species	Common name	Total no.
Pelates octolineatus	Striped trumpeter	403
Torquigener pleurogramma	Toadfish	68
Trachurus novaezelandiae	Yellowtail Scad	31
Pagrus auratus	Snapper	24
Portunus armatus	Blue Swimmer Crab	18
Heterodontus portusjacksoni	Port Jackson shark	7
Acanthaluteres spilomelanurus	Bridled 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 2-32). Four of the top five species were the same with similar levels of abundance indicating that the SZ captures the biodiversity on offer.

(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).

Appendix Figure 2-32 Abundance of most common species captured by BRUVS inside and outside the 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 2-10). The fish species richness was however comparable to other SZs dominated by seagrass habitats (e.g. Port Gibbon, Bay of Shoals).

Fished species

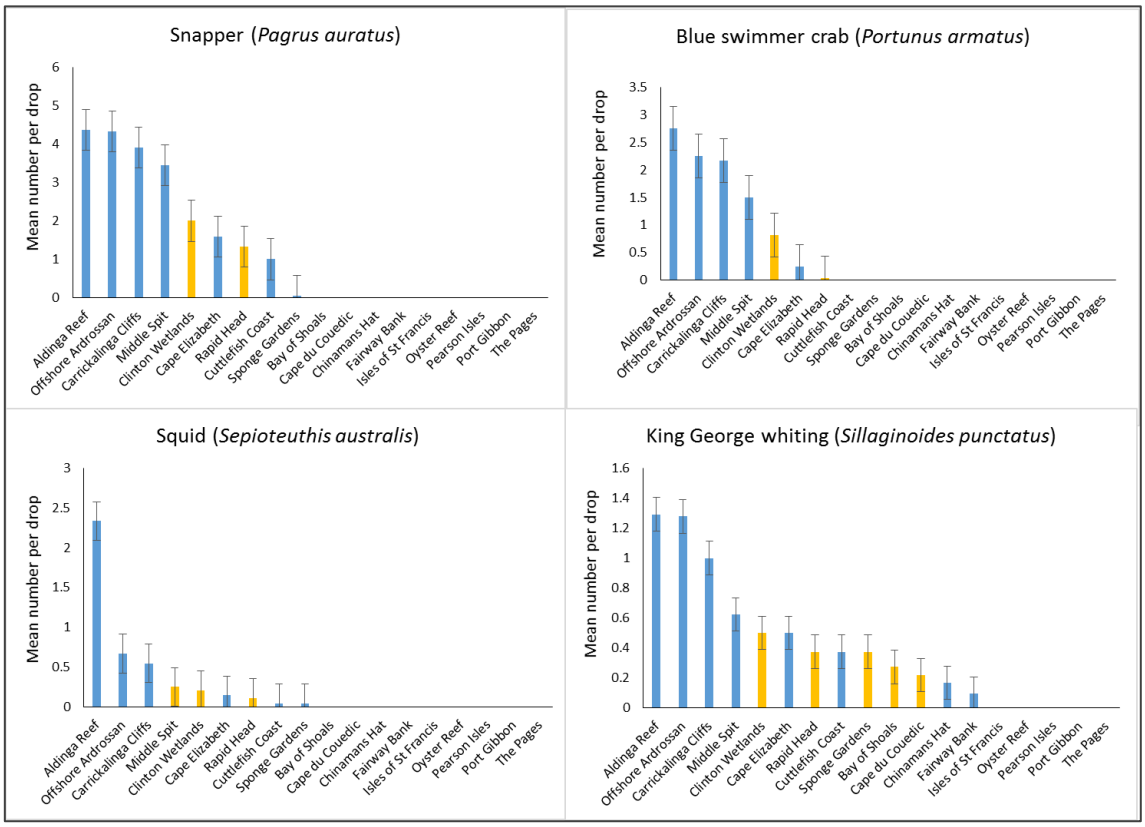
The abundance of commercially and recreational targeted fish species in the Clinton SZ was about average in comparison with other SZs assessed as part of the BRUV surveys (Appendix Figure 2-15). Snapper (*Pagrus auratus*) was the most significant commercially and recreational targeted fish species recorded 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 2-33). 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 2-33 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.8.1. 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.8.2.

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 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.8.3.

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.8.3 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 the SZ to (non-fishing) activities allowed in a HPZ but not a SZ?

Refer to Section A.8.4 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.8.4.

Refer to Section A.8.3 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.2.7 Rapid Head Sanctuary Zone

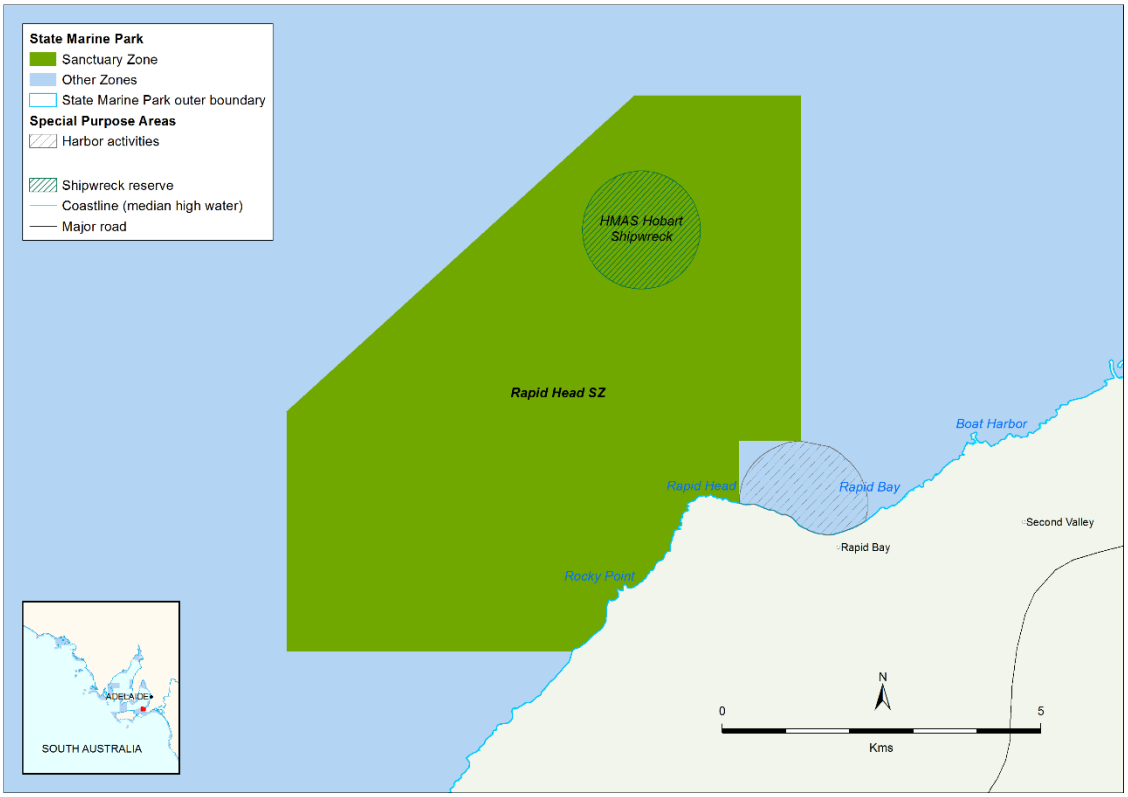
A.2.7.1 Zone description

The Rapid Head SZ (50km^2) in the Encounter Marine Park conserves a variety of habitats and species (Appendix Figure 2-34) in the Gulf St Vincent Bioregion. It provides a critical ecological stepping stone linking species of the lower gulf with those of the open Southern Ocean coastline.

The SZ contains inshore reefs, significant deep water seagrass meadows and sandy plains. The area has rotating currents which provides support a high diversity of invertebrates.

This SZ conserves a wide variety of important habitats representative of the gulf-facing southern Fleurieu Peninsula coast. The area is used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leatherjacket species, Snook, Western Blue Groper, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks.

Appendix Figure 2-34 Rapid Head sanctuary zone



Source: APPENDIX 9

The SZ contains habitat suitable for the protected and iconic leafy sea dragon. The area is also unique as it is a focus site for the marine park monitoring program, and one of a few sites with historical baseline information available. The HMAS Hobart Shipwreck Reserve is popular for recreational diving and also unique to this marine park.

This SZ is backed by the Rapid Head cliffs and most of the surrounding coastline has no vehicle access. Recreational fishing is popular around Rapid Bay Jetty from the shore and Yankalilla Bay by boat. The SZ has displaced some commercial (and recreational) squid fishing but squid are also readily found outside the sanctuary boundaries. The final zoning was derived from MPLAG advice (minority support), with refinements based on industry advice and tested by public consultation.

A.2.7.2 Economic values and impacts

A.2.7.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The Charter Boat, Marine Scalefish and GSV Prawn Fisheries were the principal fisheries that previously used the Rapid Head SZ. There was some minor use by the Central Zone Abalone and Blue Crab 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 Rapid Head SZ for affected fisheries and the estimated values of the displaced catch and effort are summarised in Appendix Table 2-32. The total gross value of displaced catch in this SZ is estimated to be at least $71,000, principally from the Charter Boat, Marine Scalefish and GSV Prawn Fisheries.

Displaced catch and effort from the Blue Crab and Central Zone Abalone Fisheries were confidential but would be minimal. In fact, for the entire Encounter Marine Park the value of displaced catch would be less than $1,000 for the Blue Crab Fishery and approximately $19,000 for the Central Zone Abalone Fishery.

Displaced catch presented here for the MSF ($19,000) is lower than preliminary estimates ($215,000) read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-32 Estimated catch or effort and GVP displaced by fishery, Rapid Head SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	-	-	-
Prawns	916	0.45%	18
Abalone	Confidential	-	-
Rock Lobster	-	-	-
Blue Crab	Confidential	-	-
Marine Scalefish	50	0.08%	19
Charter Boat	173	0.79%	35

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Rapid Head SZ is located on the south west of Fleurieu Peninsula and occupies 1.9 per cent of Marine Fishing Area 44 (MFA) (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily Snapper and Southern Calamari but also small amounts of King George

Whiting and Southern Garfish. Minor fisheries such as Snook and Western Australian Salmon are also recorded in this MFA. These species are all able to be targeted outside of the SZ.

King George Whiting

GSV/ Kangaroo Island 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/ Kangaroo Island, 310t in SG and 250t in West Coast. Historically (1999-2001), Rapid Head SZ (which occupies 1.9 per cent of MFA 44) produced between 0.1-5t of King George Whiting out of a total of approximately 100t for GSV/ Kangaroo Island. (Fowler et al. 2013).

King George Whiting in GSV/ Kangaroo Island 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 a proportion of approximately 42-58 per cent, respectively.

Snapper

Historically, SG provided the bulk of the snapper catch in South Australia. Between 2007-2010 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 44 which overlaps Rapid Head SZ produced between 11-25t out of around 500t state-wide (Fowler et al. 2013).

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

Garfish

Garfish catch in Sothern GSV has rarely exceeded 10 per cent of the state-wide catch and has remained less than 6t for the past 4 years (Steer et al. 2018).

Garfish catches in MFA 44 prior to SZs were confidential in 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 77-23 per cent, respectively.

The southern GSV stock is classified Sustainable.

Southern Calamari

Historically, the catch of Southern Calamari for the Southern GSV stock is typically between 50-80t and between 300-400t across the state stock (Steer et al. 2018).

Catch of Southern Calamari in MFA 44 which overlaps Rapid Head SZ has been between 26-50t since 2013/14.

It is estimated that the commercial and recreation catch represent a proportion of approximately 70-30 per cent, respectively. The Southern Calamari stock is classified as sustainable (Steer et al. 2018).

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

Rapid Head is comprised of fringing reef, sand and some patchy seagrass habitats which are suitable habitats for the variety of fish that live in the SZ. Inshore areas (approximately 25 per cent) are seagrass areas suitable for squid fishing.

Existing Arrangement

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

Appendix Table 2-33 shows the economic impact on the regional economy of sanctuary zoning on the Charter Boat Fishery. Impacts are based on the gross value of displaced catches (Appendix Table 2-32). Note the displaced effort in the Marine Scalefish, GSV Prawn Blue Crab and Central Zone Abalone Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

Appendix Table 2-33 Regional economic impact of zoning, Rapid Head SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Charter Boat	-0.03	34%	-1	65%	-0.01	24%	-0.03	47%
Downstream [b]	-0.02	17%	0	13%	-0.01	26%	-0.01	15%
Total Direct [c]	*-0.05*	*52%*	*-1*	*78%*	*-0.02*	*49%*	*-0.04*	*62%*
Total Flow-on [c]	*-0.05*	48%	*0*	22%	*-0.02*	51%	*-0.03*	38%
Total [c]	**-0.10**	**100%**	**-1**	**100%**	**-0.03**	**100%**	**-0.07**	**100%**
Regional Total [d]	2,498.81		15,596		834.61		1,586.16	
Impact on Region	0.00%		-0.01%		0.00%		0.00%	

[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 zoning in the Rapid Head SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.07m in total GRP, which represents less than 0.1 per cent of the regional total ($1.6b in 2016/17).

- Approximately 1 fte job which represents less than 0.1 per cent of the regional total (15,596 fte jobs in 2016/17).
- Approximately $0.03m in household income, which represents less than 0.1 per cent of the regional total ($0.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Marine Scalefish Fishery

While the estimated displaced effort for the Encounter Marine Park was 0.59 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.

Charter Boat Fishery

The estimated displaced effort was 2.71 per cent of the total average annual effort in the fishery (EconSearch 2014), but change in the fishery due to the Encounter Marine Park is predicted to be minimal because:

- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions. There are numerous other locations that remain available for fishing both in and out of the Encounter Marine Park
- Removal of effort was targeted at the Cape Jervis region 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? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

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, MFA 44 which overlaps Rapid Head SZ produced less than 5t of King George Whiting (Fowler et

al. 2013). In 2016 MFA 44 recorded a catch of less than 5t (Steer et al. 2018) indicating no negative impact.

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).

Catches in MFA 44 overlapping Rapid Head SZ, were between 14-25 tonne in 2016. 11-25 tonne was recorded in 2012/13 prior to SZ implementation (Steer et al. 2018 and Fowler et al. 2013) suggesting snapper catches in this MFA have not significantly changed.

Garfish

Southern Garfish catch in MFA 44 overlapping Rapid Head SZ were confidential in 2012/13 and 2016 (Steer et al. 2018). Total catch in the Southern GSV stock remained below 6t between 2012-2016.

Southern Calamari

Catch of Southern Calamari in MFA 44 overlapping Rapid Head SZ were between 26-50t in 2013/14 and 2016 (Fowler et al. 2013, Steer et al. 2018), suggesting fishers are still catching Southern Calamari in high numbers despite the Rapid Head SZ.

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally by the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a minor extent the Central Zone Abalone and Blue Crab Fisheries

The effect of changing the status 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 Snapper and Calamari have been maintained in the presence of SZ. King George Whiting and Garfish catch is small in this MFA and has been maintained 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 and a temporary increase in overall catch. Charter Boat and recreational fishers would utilise this zone if opened to fishing.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally by the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a minor extent the Central Zone Abalone and Blue Crab Fisheries.

It is possible that activities such as aquaculture and coastal development could occur in the future in the Rapid Head SZ as it is a sheltered environment. It is unknown what impact this might have on fisheries values.

A.2.7.2.2 Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

Some commercial diving tours operate in the SZ and utilise the ex-HMAS Hobart ship wreck. XX provides the number of dive permits issued per year to individual divers to access the site. The number of tours and participants is unknown and the profile of the divers is unknown[106].

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

Since the scale of tourism activities in the SZ in unknown, the economic contribution cannot be estimated.

[106] Permits are issued to individuals, who may be part of a tour or diving independently and it unknown how many are in each category. It is not known the origin of the divers, e.g. local residents and visitors from within SA, interstate or from overseas. It is therefore difficult to determine the likely expenditure profiles of the divers, which is necessary to estimate their economic contribution.

Existing Arrangement

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

Since the area around the ex-HMAS Hobart was similarly protected under the *Historic Shipwrecks Act 1981* before the SZ was established, it is unlikely that any change in activities occurred directly surrounding the wreck.

Charter boat activity took place in the area before the SZ was established (see Section A.2.7.2.1). 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 different fishing activities?

The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally by the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a minor extent the Central Zone Abalone and Blue Crab Fisheries.

While the area around the ex-HMAS Hobart is also protected by the *Historic Shipwrecks Act 1981*, compliance activities by DEW would reduce were the SZ zoning changed. This could lead to an increase in illegal fishing which negatively affects the dive experience through damage to the wreck and the presence of waste. Divers have reported signs of illegal fishing activities at the site, including tangled lines and anchor strikes on the wreck.

A 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 the SZ to (non-fishing) activities allowed in a HPZ but not an SZ?

The total gross value of displaced catch in this SZ, estimated to be at least $71,000, would become available again for harvesting. This would be principally by the Charter Boat, Marine Scalefish and Gulf St Vincent Prawn Fisheries and to a minor extent the Central Zone Abalone and Blue Crab Fisheries.

The SZ is in a sheltered environment so it is possible that aquaculture activities or other coastal developments could occur there. However, it is unknown what effect these might have on the dive experience.

A.2.7.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Boating, kayaking and diving occur within the Rapid Heads SZ. The ex-HMAS Hobart ship wreck which lies in the Rapid Head SZ is a recognised dive site that requires a permit to dive on it. In the past few years, several hundred permitted divers have utilised the ex-HMAS Hobart each year (xref table). Some of these divers would have been on organised dive tours (see section on Economic – Tourism).

Appendix Table 2-34

Year	No. permits	Notes
2012	Unknown	Not available as managed by SATC
2013	Unknown	As above
2014	48	For November and December 2014 after permit management transferred to DEWNR
2015	303	
2016	277	
2017	322	
2018	160	To 27 August 2018

Source: DEW.

Shore-based recreation activities adjacent to the SZ are limited due to the restricted access by road to the shoreline and high cliffs.

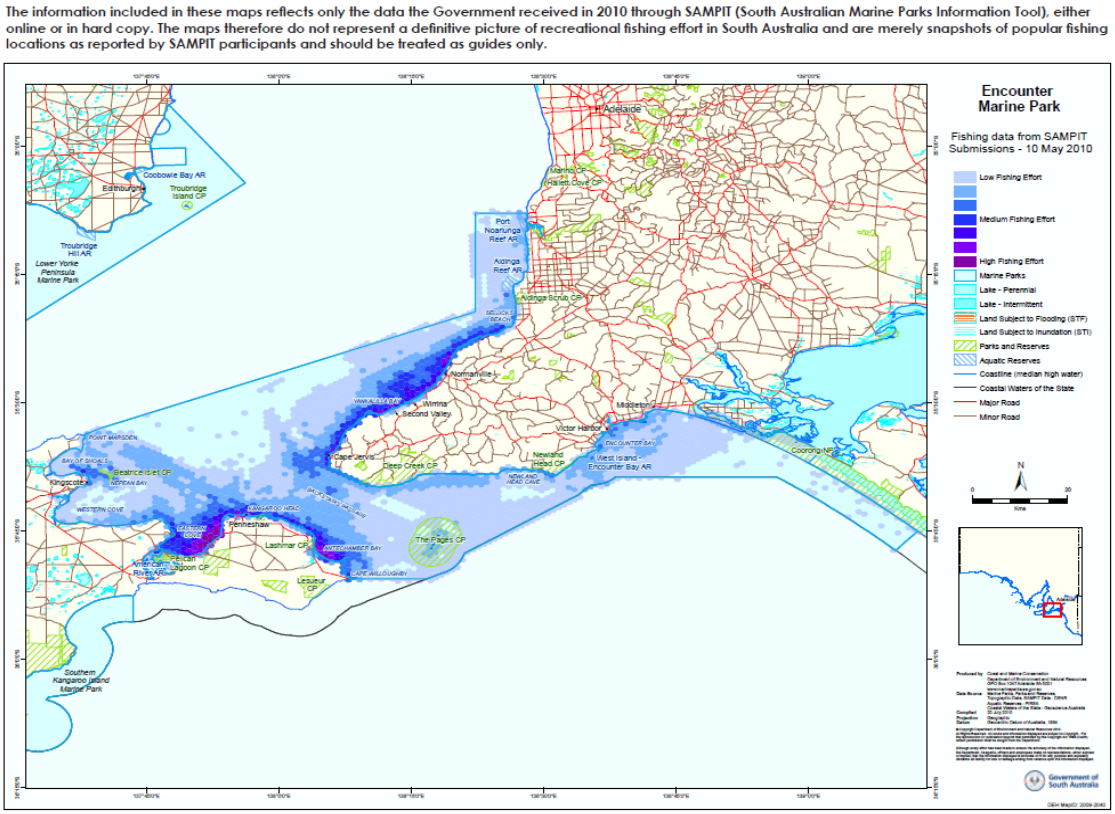
Boat fishing is popular at many locations within the Encounter Marine Park including Rapid Bay which is adjacent to the SZ (DENR 2010a). There are two boat ramps near to the SZ at Cape Jervis and Wirrina.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing occurred throughout the southern Fleurieu Peninsula region, particularly from Cape Jervis to Sellicks Beach (Appendix Figure 2-35). With regard to recreational boat fishing some areas would have been lost due to the SZ. Shore-based line fishing is now prohibited in the Rapid Head SZ, but this area is difficult to access from the shore and previous recreational fishing effort was probably negligible (Bryars et al. 2016).

Appendix Figure 2-35 SAMPIT map showing intensity of fishing prior to SZ implementation



Source: DENR 2010a (SAMPIT)

What does the community value about the SZ?

At a local level, the community values recreational (boat) and commercial fishing. For example, in submissions to the draft zoning the community indicated that the SZ should accommodate the needs of the Prawn Fishery. This was incorporated into the final design of the SZ by removing the Northwest corner of the proposed SZ. Likewise, in submissions to draft zoning the inshore area adjacent to Rapid Heads in the SZ was identified as important to boat-based recreational fishing (DEWNR 2012a).

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for Encounter Marine Park were significant in number. A total of 7,330 (85 per cent) of the 8,649 respondents commented specifically on the Encounter Marine Park. Eight agreed with the proposed zoning entirely, 7,180 (83 per cent) suggested changes to zoning to increase the conservation outcomes, 142 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,319 (25 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

What are the non-market values of the SZ?

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

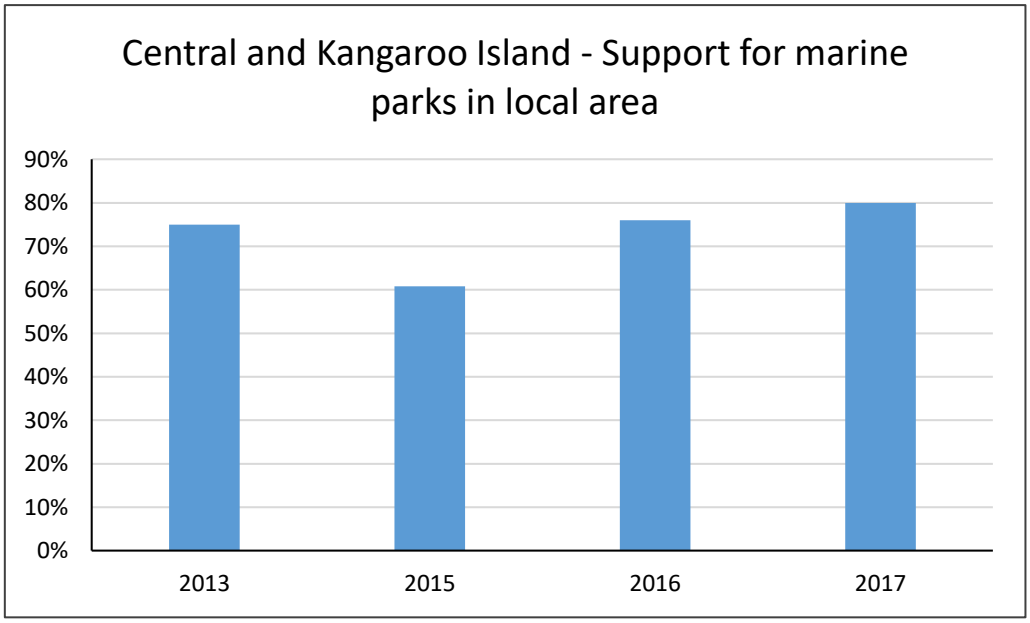
The SZ is significant as a site that can be accessed by the public for recreational diving to observe a system that has full protection from fishing.

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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a[107]) (Appendix Figure 2-36).

A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them (Navarro et al. 2018). The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs (Navarro et al. 2018).

Appendix Figure 2-36 Central and Kangaroo Island – support for marine parks in local area



Source: DEWNR 2017a

[107] 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.

Existing Arrangement with Fishing Permitted

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

As the area was previously used by recreational boat fishers, it is likely that changing the zoning arrangements to allow recreational fishing would result in an increase in recreational boat fishing activity in the SZ through a redistribution of existing activity from outside the zone.

The Charter 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 recreational fishers and the conservation sector.

If zoning changes were made to the Rapid Head SZ, the ex-HMAS Hobart would still be protected by an exclusion zone under the *Historic Shipwrecks Act 1981*. So in theory it would still have the same level of protection. However, without SZ status, there would likely be a decrease in compliance activities by DEW in the area and thus an increased chance of illegal activity at the ex-HMAS Hobart; this has been shown to be the case the wreck of the Zanoni in the Upper Gulf St Vincent Marine Park where increased compliance due to the Offshore Ardrossan SZ has resulted in a decrease in illegal fishing at the site (DEWNR 2017a).

Habitat Protection Zone Status

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

It is possible that activities such as aquaculture and coastal development could occur in the future in the SZ as it is a sheltered environment. It is unknown what impact this might have on social values.

A.2.7.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

Rapid Head SZ has a band of nearshore fringing reef but mainly comprises algal and patchy seagrass (*Amphibolis sp*) habitats (previously mapped, see DEH 2009b). The area is subject to high currents and, as a consequence, the soft sediment habitat that extends to the western margin of the SZ consists of coarse grain and shell rubble habitat. Figure 3-45 (in Section 3.16.1) provides a map of the main benthic (subtidal) habitats of the Encounter Marine Park. Appendix Table 2-35 and Appendix Table 2-36 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Rapid Head SZ.

Appendix Table 2-35 Benthic (subtidal) habitats of the Rapid Head SZ

Habitat	Area (km^2)	% SZ
Bare sand	44.5	89.0
Heavy limestone reef	1.1	2.2
Seagrass	4.4	8.8

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-36 Shoreline (intertidal) habitats of the Rapid Head SZ

Habitat	Length of shoreline (km)	% SZ
Cliff	2	50
Boulder beach	2	50

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Encounter Marine Park is used by a number of shark species, including dusky whaler, smooth hammerhead, school shark, hammerhead shark, white shark and shortfin mako (DENR 2010a). It is assumed that some of these species move through the Rapid Head SZ at times.

Mammals

The Encounter Marine Park is used by a number of marine mammal species, including southern right whale, pigmy right whale, humpback whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), short-nosed fur seal (formerly the Australian fur seal), common dolphin and bottlenose dolphin (DENR 2010a). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. Australian sea lions and long-nosed fur seals haul out in the Rapid Head SZ. Dolphins are common in the Rapid Head SZ.

Seabirds

The Encounter Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, rare osprey, black-faced cormorant, Caspian tern, crested tern, fairy tern, little penguin, Pacific gull, pied cormorant and silver gull (DENR 2010a). Some of these species are resident while others are more transient, visiting the Encounter Marine Park to rest, breed and/or feed.

Shorebirds

The Encounter Marine Park is used by a number of shorebird species for breeding and feeding, including pied oystercatchers, greater sand plover, grey plover, terek sandpiper and masked

lapwing (DENR 2010a). Some of these species are resident and others migrate to the Encounter Marine Park from interstate or overseas.

Fish Communities

The information on fish and macro-invertebrate communities in this section is derived from the Marine Parks BRUVS and UVC monitoring programs (Miller et al. 2017, Brook et al. 2017). BRUVS surveys have been undertaken in Rapid Bay SZ in 2015/16 and 16/17 and UVC surveys have been undertaken in 2005/06/07/13/16/17 and 2018.

A total of 57 species were recorded during the BRUVS surveys of the Rapid Head SZ comprising 50 species of fish, 5 species of sharks and rays, one crustacean species and one mollusc species (Appendix Table 2-37). Trevally (*Pseudocaranx sp*) were the most common fish recorded accounting for around 30 per cent of the total number of fish recorded. Other common species were bluethroat wrasse (*Notolabrus tetricus*), sea sweep (*Scorpis aequipinnis*) and horseshoe leatherjackets (*Meuschenia hippocrepis*). All common species were typical of nearshore reef habitats found along the Fleurieu coastline.

Appendix Table 2-37 Species list, BRUVS survey, Rapid Head SZ[a]

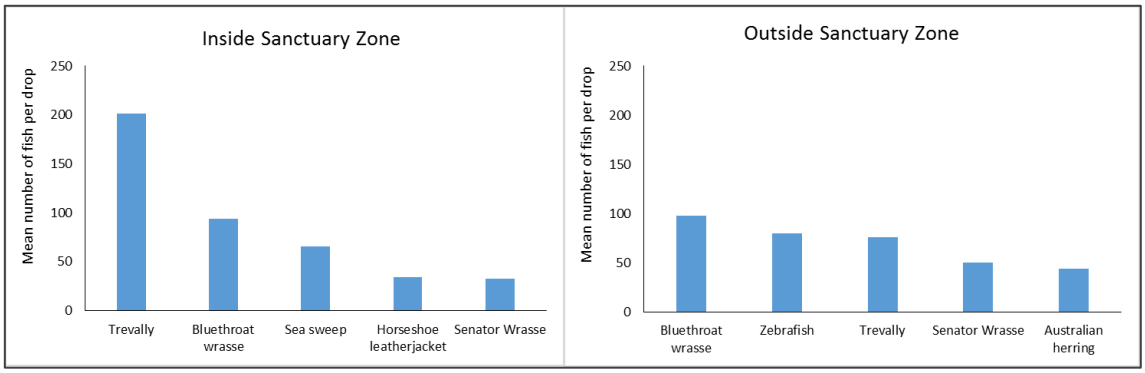
Species	Common name	Total no.
Pseudocaranx sp	Trevally	201
Notolabrus tetricus	Bluethroat wrasse	94
Scorpis aequipinnis	Sea sweep	66
Meuschenia hippocrepis	Horseshoe leatherjacket	34
Notolabrus parilus	Brownspotted wrasse	33
Pictilabrus laticlavius	Senator wrasse	33
Pagrus auratus	Snapper	32
Upeneichthys vlamingii	Red mullet	23
Austrolabrus maculatus	Black-Spotted wrasse	13
Cheilodactylus nigripes	Magpie perch	12
Arripis georgianus	Australian herring	12
Meuschenia galii	Bluelined leatherjacket	9
Trachurus novaezelandiae	Yellowtail scad	9
Parma victoriae	Victorian scalyfin	7
Dactylophora nigricans	Dusky morwong	6
Dotalabrus aurantiacus	Castelnau's wrasse	6
Acanthaluteres brownii	Spinytail leatherjacket	6
Parequula melbournensis	Southern silverbelly	6
Sepioteuthis australis	Southern calamari	5

[a] 20 most abundant species shown out of a total of 54 species.

Source: DEW, unpublished data.

Fish assemblages were fairly similar inside the Rapid Head SZ compared to the adjacent HPZ (Appendix Figure 2-37). Three out of the top five species were the same and similar levels of abundance for bluethroat wrasse and senator wrasse indicating that the SZ captures the biodiversity on offer (Appendix Figure 2-37).

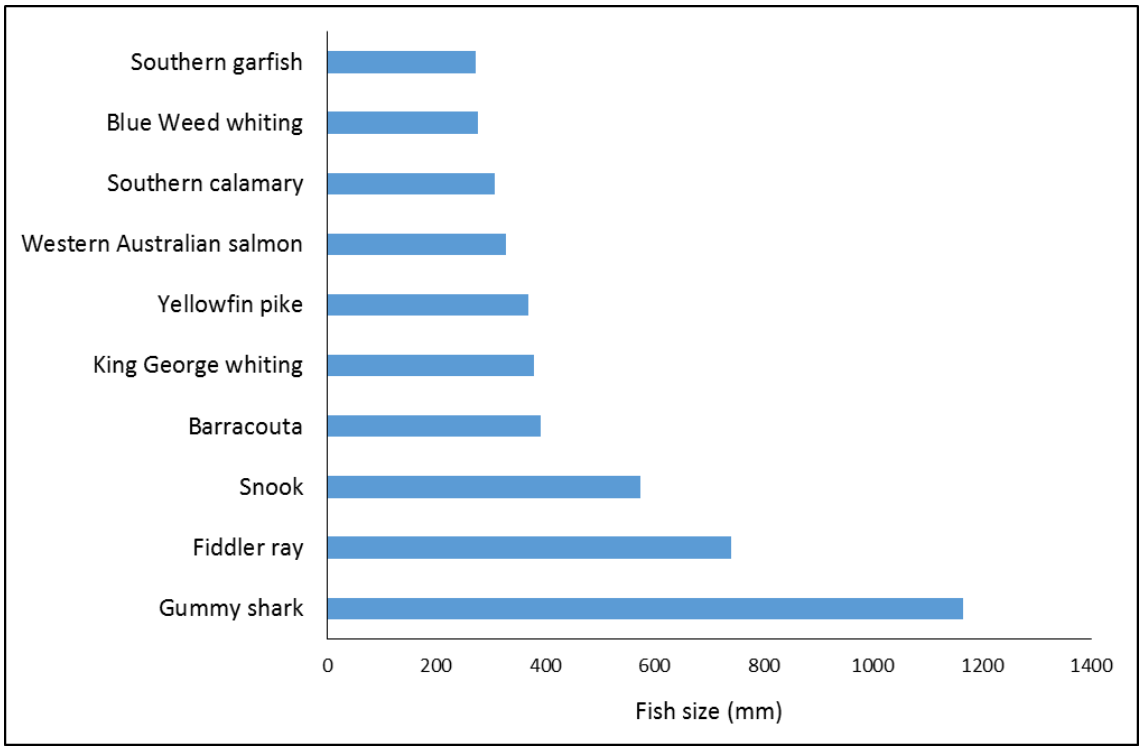
Appendix Figure 2-37 Abundance of the most common species captured inside and outside the Rapid Head SZ



Source: DEW, unpublished data.

The largest fish (including sharks and rays) recorded at Rapid Head SZ was a 917mm gummy shark (*Mustelus antarcticus*). Other large fish recorded included dusky morwong (Dactylophora nigricans) at 843mm; snook (Sphyraena novaehollandiae) at 629mm and southern eagle ray (*Myliobatis tenuicaudatus*) at 625mm (Appendix Figure 2-38).

Appendix Figure 2-38 Largest fish recorded in the Rapid Head 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

Rapid Head SZ has the 11th highest number of fish species recorded from BRUVS surveys with a mean of 9.04 fish species recorded per BRUVS drop (Appendix Figure 2-10). The dive surveys showed a higher number of fish species recorded at Rapid Head SZ with the 6th highest species richness compared to other SZs surveyed (Appendix Figure 2-10). Compared to other reef sites the fish species richness is comparable to other mainland reef sites such as Carrickalinga Cliffs and Chinaman's Hat.

Large fish

Rapid Head SZ has the 7th highest mean number of large fish (>200 m) recorded from BRUVS surveys with a mean of 10 large fish recorded per BRUVS drop (Appendix Figure 2-13). Compared to other reef sites the mean number of large fish recorded in Rapid Head SZ is comparable to other mainland reef sites such as Carrickalinga and Aldinga Reef SZs (Appendix Figure 2-13).

Fished species

The abundance of commercially and recreational targeted fish species recorded on BRUVS in the Rapid Head SZ was moderate to low compared to other SZs surveyed (Appendix Figure 2-15).

Sharks and rays

Rapid Head SZ had relatively low abundances of sharks and rays recorded on BRUVS when compared to other SZs (Appendix Figure 2-17). Southern eagle rays (*Myliobatis tenuicaudatus*) were the only species recorded on more than one drop during BRUVS surveys.

Indicator species

Four of the six fish indicator species for reefs were recorded on BRUVS at Rapid Head SZ (Appendix Figure 2-18). Of these there were relatively high abundances of blue throat wrasse (*Notolabrus tetricus*) and sea sweep (*Scorpis aequipinnis*). King George whiting (*Sillaginodes punctatus*) and snapper (*Pagrus auratus*) were also recorded at Rapid Head SZ but in relatively low numbers.

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Rapid Head SZ include:

- The coastline is moderately-exposed cliffs, rocky headlands and rocky shores.
- Inshore reefs give way to seagrass meadows and sandy plains.
- Significant deep water seagrass (up to 20 m deep).

Important features of the SZ include:

- Habitat for the protected leafy sea dragon.
- Backed by Rapid Head cliffs.
- Highly diverse in invertebrates from increased larval settlement due to rotating currents.
- Focus site for marine park monitoring program, with historical baseline information available.
- Reefs in the area have been reported to be used by one or more of the life stages of King George Whiting, Snapper, West Australian Salmon, Tommy Ruff, Southern Sea Garfish, Yellow-eye Mullet, Trevally, Leatherjacket species, Snook, Western Blue Groper, Sea Sweep, Silver Drummer, Gummy Shark and Whaler Sharks.

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 three years of data have been collected since the Rapid Head SZ becoming 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.8.1. Predicted changes to indicator species relevant to the Rapid Head SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper, when each considered in isolation, were predicted to increase in size and/or abundance over the next 20 years inside the Rapid Head SZ (Bailey et al. 2012a). Southern calamari were predicted to temporarily increase in size and abundance while spawning inside the Rapid Head SZ (Bailey et al. 2012a).

Subtidal seagrass

King George whiting, when considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Rapid Head SZ (Bailey et al. 2012a). Southern calamari are predicted to temporarily increase in size and abundance while spawning inside the Rapid Head SZ (Bailey et al. 2012a).

Subtidal sand

King George whiting and snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Rapid Head 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.8.2.

The Charter Boat, Marine Scalefish and GSV Prawn Fisheries were the principal fisheries that previously used the Rapid Head SZ. There was some minor use by the Central Zone Abalone and Blue Crab Fisheries.

The Charter Boat, Marine Scalefish and GSV Prawn Fisheries pose a threat (low) to most target species and a threat (low) to other species of bycatch. The MSF pose a threat (high) to Southern garfish. 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 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.8.3.

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

Selective removal of target species

Opening the Rapid Head SZ to fishing would have negative impact on those species commonly targeted including, King George whiting, snapper, calamari 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 could be compromised by allowing fishing in the SZ with negative flow on effects for biodiversity conservation and 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. 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 commonly use the SZ and long nosed fur seals and Australian sea lions commonly haulout in this SZ. There is one active state endangered white-bellied sea eagle nest located on the cliffs at Rapid Head. 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.

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.

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

Refer to Section A.8.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

Rapid Head SZ has been selected as a priority SZ for monitoring due to the representative nearshore reef habitats it contains. 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. Rapid Head SZ has one of the longest running time series of data from dive surveys in the entire state dating back to 2005.

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

Rapid Head SZ has several habitat types that are sensitive to disturbance such as seagrass and reef and associated fauna communities. The SZ is a sheltered environment and it is possible that aquaculture and coastal developments may occur in the future. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass, reef), disturbance to animals and pollution as outlined in Section A.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, Rapid Head SZ captures the complete transition from near shore reef and seagrass habitats to deep water sand habitats characteristic of southern GSV. Rapid head SZ also contains examples of some of the deepest seagrass meadows in the Encounter Marine Park. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these GSV habitats.

A.2.8 Bay of Shoals Sanctuary Zone

A.2.8.1 Zone description

The Bay of Shoals SZ (25km^2) located in the Encounter Marine Park, conserves a regionally significant sheltered embayment dominated by seagrass meadows to 5 m deep (Appendix Figure 2-39) in the Gulf St Vincent Bioregion. The large shallow bay has natural channels protected by

a tidally exposed sandbar including Busby and Beatrice Islets. The zone also includes sheltered coarse sand beaches, and mud and sand flats.

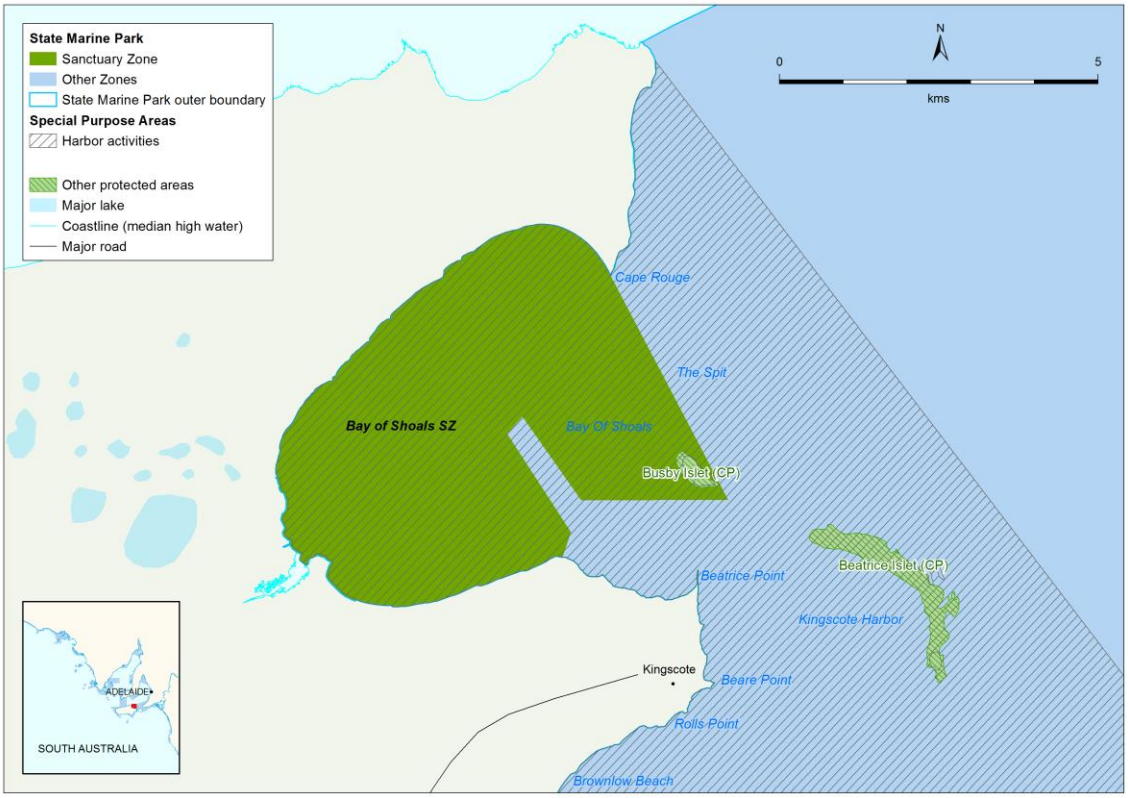
Bay of Shoals is a nursery area for King George whiting, and Western King Prawns, Southern garfish and Snook. Dense seagrass meadows support a range of fish and invertebrates including cryptic species like pipefish and Leafy sea dragons and is a feeding area for crabs and other crustacean species.

This zone has recorded to contain the green macroalgae *Cladophora aegagropilioidea* which reportedly has a limited range and has been listed as potentially threatened.

Busby Islet Conservation Park protects nesting seabirds and is a Wetland of National Importance. The state endangered osprey and the state endangered white-bellied sea eagles nest on the southern shoreline.

The final zone is derived from MPLAG advice (minority support) and tested through public consultation. The zone displaces commercial power-haul net fishing within the Bay of Shoals. Some commercial line fishers have indicated support for this measure, which they believe will benefit other fishing throughout Nepean Bay. Popular fishing spots around Kingscote are still accessible for recreational fishing.

Appendix Figure 2-39 Bay of Shoals sanctuary zone



Source: APPENDIX 9

A.2.8.2 Economic values and impacts

A.2.8.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The MSF was the principal fishery that previously used the Bay of Shoals SZ. There was some use, albeit minor, of the Central Zone Abalone Fishery.

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 2-38. The total gross value of displaced catch in this SZ is estimated to be $13,000, principally from the MSF. Displaced catch and effort from the Central Zone Abalone Fishery was estimated to be $1,000.

Displaced catch presented here for the MSF ($12,000) is lower than preliminary estimates ($195,000) read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-38 Estimated catch or effort and GVP displaced by fishery, Bay of Shoals SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	-	-	-
Abalone	20	0.01%	1
Rock Lobster	-	-	-
Marine Scalefish	32	0.05%	12
Charter Boat	-	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Bay of Shoals SZ is located off the north east of Kangaroo Island and occupies 2.5 per cent of Marine Fishing Area 42 (MFA) (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily King George Whiting and small amounts of Southern Calamari and Garfish. These species are all able to be targeted outside of the SZ.

King George Whiting

GSV/ Kangaroo Island 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/ Kangaroo Island, 310t in SG and 250t in West Coast. Bay of Shoals SZ occupies 2.5 per cent of MFA 42 which historically (2012/13), produces between 16-30t of King George Whiting out of a total of approximately 50-100 tonne for GSV/ Kangaroo Island (Fowler et al. 2013, Steer et al. 2018).

King George Whiting in GSV/ Kangaroo Island 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 a proportion of approximately 42-58 per cent, respectively.

Garfish

Garfish catch in Southern GSV has rarely exceeded 10 per cent of the state-wide catch and has remained less than 6t for the past 4 years (Steer et al. 2018).

Garfish catches in MFA 42 prior to SZs were confidential in 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 77-23 per cent, respectively. The southern GSV stock is classified Sustainable.

Southern Calamari

Historically, the catch of Southern Calamari for the Southern GSV stock is typically between 50-80t and between 300-400t across the state stock (Steer et al. 2018).

Catch of Southern Calamari in MFA 42 which overlaps Bay of Shoals SZ has been between 1-5t since 2013/14.

It is estimated that the commercial and recreation catch represent a proportion of approximately 70-30 per cent, respectively. The Southern Calamari stock is classified as sustainable (Steer et al. 2018).

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

Most of Bay of Shoals SZ is comprised of soft sediment and seagrass habitats which are suitable habitats for King George Whiting.

Existing Arrangement

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

The displaced effort in the Marine Scalefish ($12,000) and Central Zone Abalone ($1,000) Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Marine Scalefish Fishery

While the estimated displaced effort for the Encounter Marine Park was 0.59 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 Bay of Shoals SZ in the Kangaroo Island region (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 Bay of Shoals SZ has displaced some net fishing effort and it is currently unclear if this effort can be relocated to other locations within or outside of the Encounter Marine Park.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

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, MFA 42 which overlaps Bay of shoals SZ produced 16-30t of King George Whiting (Fowler et al. 2013). In 2016 MFA 42 also recorded a catch of 16-30t (Steer et al. 2018) indicating no negative impact.

Garfish

Southern garfish catch in MFA 42 overlapping Bay of Shoals SZ were confidential in 2012/13 and 2016 (Steer et al. 2018). Total catch in the Southern Gulf St. Vincent stock remained below 6t over between 2012-2016 (Steer et al. 2018).

Southern Calamari

Catch of Southern Calamari across the state has remained steady (>350t) over the last 6 years (Steer et al. 2018). In MFA 42 overlapping Bay of Shoals SZ catch was between 0-5t in 2013/14 and 2016 (Fowler et al. 2013, Steer et al. 2018), suggesting the SZ has not changed total catch.

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally by the Marine Scalefish Fishery.

The effect of changing the status 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 King George whiting and Southern Calamari have been maintained in the presence of 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 and a temporary increase in overall catch.

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.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $13,000, would become available again for harvesting. This would be principally by the Marine Scalefish Fishery.

It is unlikely that there would be any future activities such as aquaculture or coastal developments in this zone. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.8.2.2 Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

One tour operator directly utilises the SZ for full-day tours including snorkelling and wildlife experiences with dolphins, seals, birds and whales (Kangaroo Island Marine Adventures 2018).

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

No data are available on the number of visitors or expenditure occurring in the region due to the tour operation so the economic contribution of the activity cannot be directly estimated.

Existing Arrangement

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

It is unknown whether any change to activities has occurred.

The presence of the SZ would mean that there is less recreational and commercial fishing vessel traffic in the area which could potentially be beneficial for the tour operator. However, the existence of the SZ doesn't appear to be used for marketing by the tour operator as it was not mentioned on their website as of September 2018.

Existing Arrangement with Fishing Permitted

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

Since the tour operator offers wildlife and sightseeing experiences, fishing activities could affect the experience for visitors but the likely effect is unknown.

Habitat Protection Zone status

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

Since the tour operator offers wildlife and sightseeing experiences, other (non-fishing) activities could also affect the experience for visitors but the likely effect is unknown.

A.2.8.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Boating, kayaking and diving occur within the Bay of Shoals SZ. Boat fishing is popular in many areas adjacent to the SZ, with a boat ramp directly adjacent to the SZ.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing occurred mainly in the entrance to Bay of Shoals or in Nepean Bay which lies outside the SZ but some area has been lost. Shore-based line fishing is now prohibited in the SZ, but the shoreline around the SZ is intertidal and mostly unsuitable for shore-based fishing (Bryars et al. 2016).

What does the community value about the SZ?

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for Encounter Marine Park were significant in number. A total of 7,330 (85 per cent) of the 8,649 respondents commented specifically on the Encounter Marine Park. Eight agreed with the proposed zoning as is, 7,180 (83 per cent) suggested changes to zoning to increase the conservation outcomes, 142 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,319 (15 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

What are the non-market values of the SZ?

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

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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a[108]) (Appendix Figure 2-36).

A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them (Navarro et al. 2018). The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs (Navarro et al. 2018).

[108] 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.

Existing Arrangement with Fishing Permitted

What impact would there be to the social values of opening 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 SZ through a redistribution of existing activity outside the SZ.

The MSF fishery would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector.

Habitat Protection Zone Status

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

It is possible that activities such as aquaculture and coastal development could occur in the future in the SZ as it is a sheltered environment. It is unknown what impact this might have on social values.

A.2.8.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The Bay of Shoals SZ is a shallow and very sheltered soft sediment environment which is ideal for seagrass habitats. Seagrass is the dominant habitat type, with algal species (e.g. seaweeds) often mixed among the seagrass beds. Figure 3-45 (in Section 3.16.1) provides a map of the main benthic (subtidal) habitats of the Encounter Marine Park. Appendix Table 2-39 and Appendix Table 2-40 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Bay of Shoals SZ.

Appendix Table 2-39 Benthic (subtidal) habitats of the Bay of Shoals SZ

Habitat	Area (km^2)	% SZ
Bare sand	3.8	15.3
Seagrass	19.7	78.6
Other coastal features	1.4	5.7
Unmapped	0.1	0.5

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-40 Shoreline (intertidal) habitats of the Bay of Shoals SZ

Habitat	Length of shoreline (km)	% SZ
Coarse sandy beach	14	100

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Encounter Marine Park is used by a number of shark species, including dusky whaler, smooth hammerhead, school shark, hammerhead shark, white shark and shortfin mako (DENR 2010a). It is assumed that some of these species move through the Bay of Shoals SZ at times.

Mammals

The Encounter Marine Park is used by a number of marine mammal species, including southern right whale, pigmy right whale, humpback whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), short-nosed fur seal (formerly the Australian fur seal), common dolphin and bottlenose dolphin (DENR 2010a). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. The Cape Jervis and Encounter Bay regions form a migratory corridor for southern right whales (Carroll et al. 2011). Long-nosed fur seals and dolphins are common in the Bay of Shoals SZ.

Seabirds

The Encounter Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, rare osprey, black-faced cormorant, Caspian tern, crested tern, fairy tern, little penguin, Pacific gull, pied cormorant and silver gull (DENR 2010a). Some of these species are resident while others are more transient, visiting the Encounter Marine Park to rest, breed and/or feed. Many of the islands in the Encounter Marine Park, such as Busby and Beatrice Islets within the Bay of Shoals SZ, 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 Encounter Marine Park (Marchant and Higgins 1990).

The state endangered white-bellied sea eagle and the state endangered osprey are known to have territories in the vicinity of the Bay of Shoals SZ (Dennis et al. 2011a, Copley 1996). There are known breeding sites for pied cormorant and Pacific gull on Busby Islet within the Bay of Shoals SZ (Copley 1996).

Shorebirds

The Encounter Marine Park is used by a number of shorebird species for breeding and feeding, including pied oystercatchers, greater sand plover, grey plover, terek sandpiper and masked lapwing (DENR 2010a). Some of these species are resident and others migrate to the Encounter Marine Park from interstate or overseas. Shorebird habitat is provided by a number of Wetlands

of National Importance, including Busby and Beatrice Islet (Department of the Environment 2018).

Fish Communities

The main information on fish communities in this SZ comes from the Marine Parks BRUVS monitoring program (Miller et al. 2017). In 2016 and 2017, BRUVS surveys were conducted in the Bay of Shoals SZ. A total of 32 species were recorded during the surveys comprising; 28 species of species of fish, 3 crustacean species and one mollusc (squid) (Appendix Table 2-41). Hardyheads (*Atherinidae sp*) were the most abundant fish species recorded accounting for more than 50 per cent of the total fish abundance. Other fish species recorded, e.g. little weed whiting (*Neoodax balteatus*), striped trumpeter (*Pelates octolineatus*) and blue swimmer crabs (*Portunus armatus*) are typical of seagrass and soft sediment habitats (Appendix Table 2-41).

Appendix Table 2-41 Species list, BRUVS survey, Bay of Shoals SZ[a]

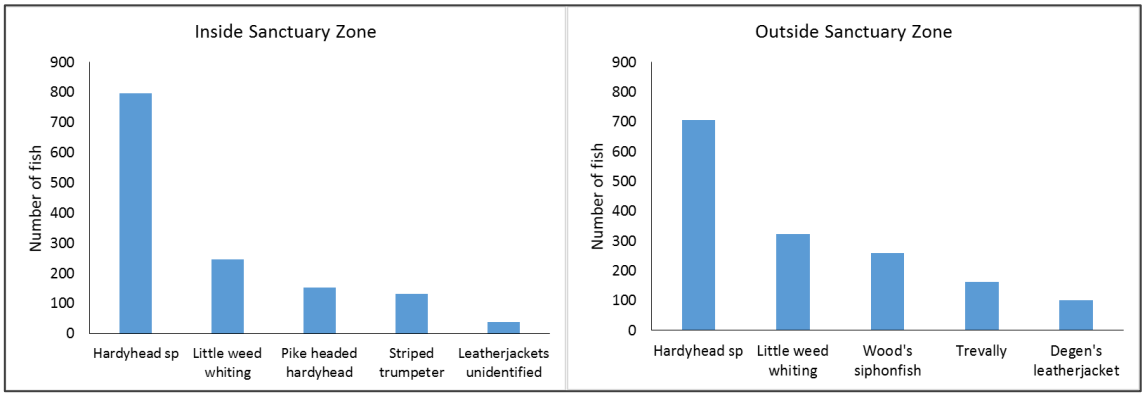
Species	Common name	Total no.
Atherinidae spp	Hardyhead sp	798
Neoodax balteatus	Little weed whiting	247
Kestratherina esox	Pike headed hardyhead	152
Pelates octolineatus	Striped trumpeter	133
Monacanthidae	Leatherjackets unidentified	39
Sillaginodes punctatus	King George whiting	31
Hyporhamphus melanochir	Southern garfish	29
Acanthaluteres spilomelanurus	Bridled leatherjacket	23
Siphamia cephalotes	Wood's siphonfish	18
Nectocarcinus integrifrons	Rough rock crab	14
Vincentia conspersa	Southern cardinalfish	10
Parequula melbournensis	Southern silverbelly	8
Haletta semifasciata	Blue weed whiting	7
Arripis truttaceus	Western Australian salmon	5
Trygonorrhina dumerilii	Southern fiddler ray	5
Sphyraena novaehollandiae	Snook	5
Arripis georgianus	Australian herring	3
Mustelus antarcticus	Gummy shark	3
Meuschenia freycineti	Six-spined leatherjacket	2
Chlorotocella spinicaudus	slender-beaked shrimp	1

[a] 20 most abundant species shown out of a total of 54 species.

Source: DEW, unpublished data.

Fish assemblages were similar inside the Bay of Shoals SZ compared to the adjacent HPZ (Appendix Figure 2-40). Two out of the top five species were the same with similar levels of abundance indicating that the SZ captures the biodiversity the biodiversity on offer (Appendix Figure 2-40).

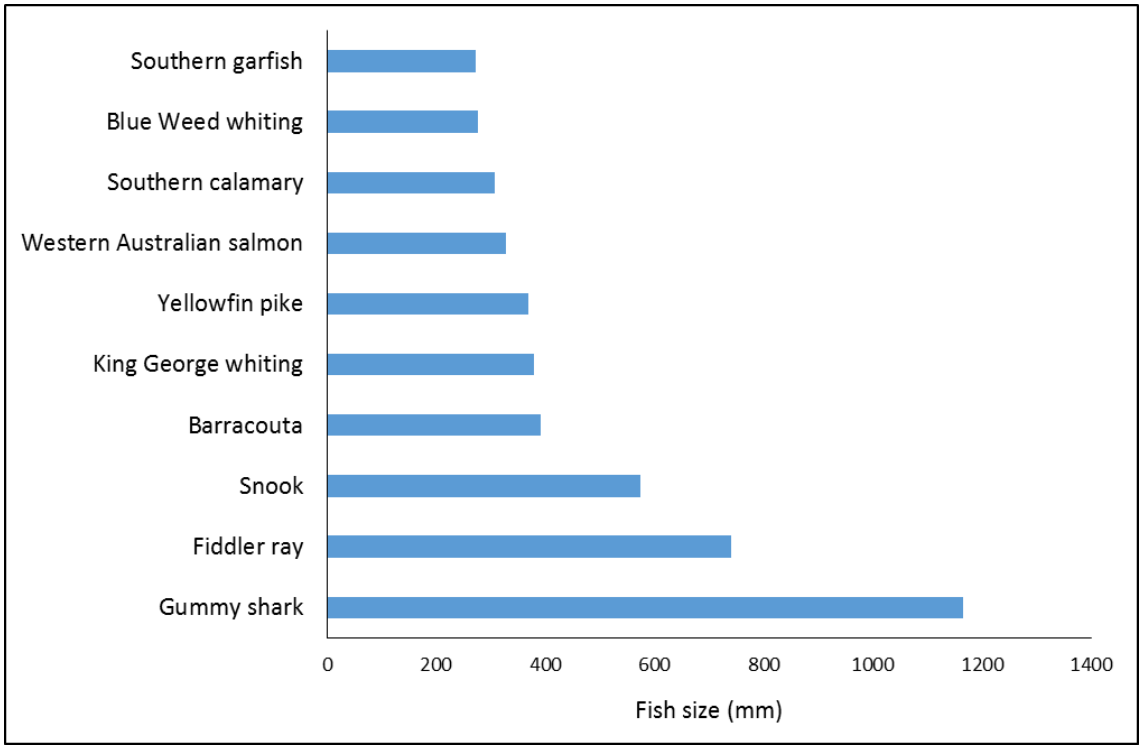
Appendix Figure 2-40 Abundance of the most common species captured inside and outside the Bay of Shoals SZ, 2016-17



Source: DEW, unpublished data.

The largest fish (including sharks and rays) recorded at Bay of Shoals SZ was a 1,166 mm gummy shark (*Mustelus antarcticus*) followed by a 740mm fiddler ray (*Trygonorrhina dumerilii*). Other large fish included snook (*Sphyraena novaehollandiae*) at 570mm and barracouta (*Thyrsites atun*) at 390mm. (Appendix Figure 2-41).

Appendix Figure 2-41 Largest fish recorded in the Bay of Shoals SZ, 2016-17



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

Bay of Shoals SZ has relatively low fish species richness compared to other SZs with a mean of 5.7 species recorded per BRUVS drop (Appendix Figure 2-10). The fish species richness was however comparable to other SZs dominated by seagrass habitats (e.g. Port Gibbon, Clinton SZs) (Appendix Figure 2-10).

Large fish

The Bay of Shoals SZ recorded low numbers of large fish (fish > 200 mm) compared to other SZs with a mean of 1.33 large fish recorded per BRUVS drop (Appendix Figure 2-13). This is due to the large number of small bodied fish present (e.g. hardy heads, weedy whiting) in the system. The low mean number of large fish was however comparable to other SZs dominated by seagrass habitats (e.g. Port Gibbon, Clinton SZs). (Appendix Figure 2-13).

Fished species

The abundance of commercially and recreational targeted fish species recorded on BRUVS in the Bay of Shoals SZ was low compared to other SZs surveyed (Appendix Figure 2-15). King George whiting (*Sillaginodes punctatus*) and garfish (*Hyporhamphus melanochir*) were the most common fished species recorded in this zone.

Sharks and rays

Bay of Shoals SZ had average abundances of sharks and rays recorded on BRUVS when compared to other SZs (Appendix Figure 2-17). The most common shark and ray species recorded on BRUVS were fiddler rays (*Trygonorrhina dumerilii*) and gummy sharks (*Mustelus antarcticus*).

Indicator species

In general, Bay of Shoals SZ had low abundances of the four indicator species for seagrass habitats recorded on BRUVS compared to other SZs with three of the indicator species not present (Appendix Figure 2-33). The exception was King George whiting (*Sillaginoides punctatus*) which was recorded on BRUVS but in relatively low numbers compared to other SZs (Appendix Figure 2-33).

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Bay of Shoals SZ include:

- Extensive seagrass meadows dominate the bay from the shoreline to 5m deep.

- Sand and mudflats support cockle and razorfish beds
- Sheltered coarse sand beach surrounds the bay.

Important features of the SZ include:

- Large shallow bay with natural channels protected by a tidally exposed sandbar including Busby and Beatrice Islets.
- Dense seagrass meadows support a range of fish and invertebrates including cryptic species like pipefish and Leafy sea dragons.
- Recognised nursery area for King George whiting
- Busby Islet Conservation Park protects nesting seabirds and is a Wetland of National Importance.
- The state endangered osprey nests on the southern shoreline.
- This zone has recorded to contain the green macroalgae Cladophora aegagropilioidea which reportedly has a limited range and has been listed as potentially threatened.
- The seagrass meadows in this zone are reported to provide habitat for spawning adult Southern Sea Garfish and Snook.
- Bay of Shoals is also reported to provide a nursery are for Western King Prawn and nursery and feeding areas for crabs and other crustacean species.

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 three years of data have been collected since the Bay of Shoal 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.8.1. Predicted changes to indicator species relevant to the Bay of Shoals SZ are described below.

Intertidal seagrass

Razorfish, when considered in isolation, is predicted to increase in size and abundance over the next 20 years inside the Bay of Shoals SZ (Bailey et al. 2012a, Appendix Table 5-1).

Subtidal seagrass

King George whiting and southern garfish are predicted to temporarily increase in abundance while inside the Bay of Shoals SZ (Bailey et al. 2012a, Appendix Table 5-1). Southern calamari are

predicted to temporarily increase in size and abundance while spawning inside the Bay of Shoals SZ (Bailey et al. 2012a, Appendix Table 5-1).

Intertidal sand

Razorfish and mud cockle, when considered in isolation, were predicted by Bailey et al. (2012a, Appendix Table 5-1) to increase in size and abundance over the next 20 years inside the Bay of Shoals SZ.

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.8.2.

The MSF was the principal fishery that previously used the Bay of Shoals SZ.

The MSF pose a threat (low) to most target species and a threat (low) to other species of bycatch. The MSF pose a threat (high) to Southern garfish. 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 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.8.3.

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

Selective removal of target species

Opening the Rapid Head SZ to fishing would have negative impact on those species commonly targeted including King George whiting, tommy ruff 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 Bay of Shoals SZ would result in significant 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 and long-nosed fur seals commonly use the area and these species can be at risk of entanglement with fishing nets. There is potential that there could be dolphin and seal mortality

associated with entanglement with fishing gear if the SZ is opened to fishing. Opening the SZ would increase vessel traffic and increase disturbance levels on marine mammals and coastal raptors that use this 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.8.3 for an overview of the how opening the SZ to fishing may reduce the ability to assess the effectiveness of the Marine Park Network.

Bay of Shoals SZ has been selected as a priority SZ for monitoring due to the representative seagrass habitats it contains. 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.

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

Bay of Shoals SZ has several habitat types that are sensitive to disturbance such as seagrass and saltmarsh and associated shorebird and migratory bird communities. The SZ is a sheltered environment and it is possible that aquaculture and coastal developments may occur in the future. These activities would potentially impact on the environmental values of this SZ via damage to physical structures (i.e. seagrass, saltmarsh), disturbance to animals and pollution as outlined in Section A.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Bay of Shoals SZ contains one of the few examples of sheltered seagrass embayment's with extensive dense Posidonia seagrass meadows. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for a habit type that is currently unique in the network.

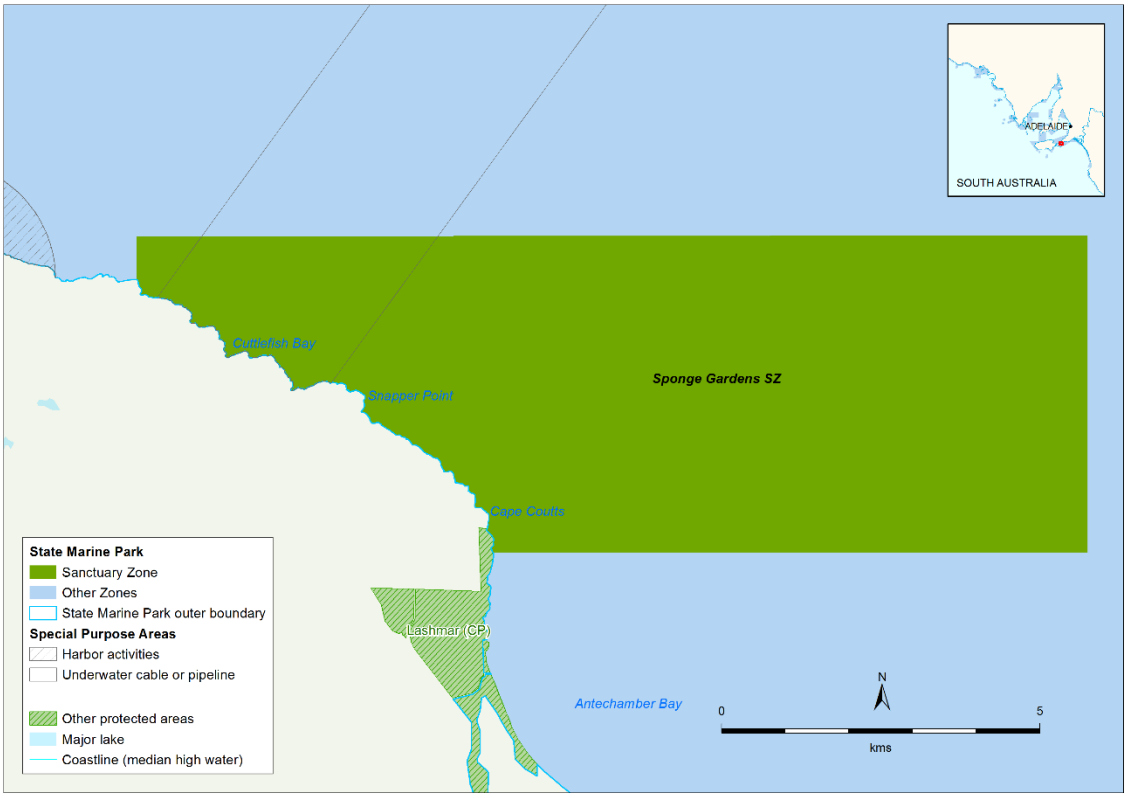
A.2.9 Sponge Gardens Sanctuary Zone

A.2.9.1 Zone description

Sponge Gardens SZ (60km^2) off Kangaroo Island in the Encounter Marine Park includes one of two deep water trenches in the state, has fringing reefs and steep drop offs (Appendix Figure 2-42) in the Gulf St Vincent Bioregion. The shoreline consists of moderately exposed steep cliffs (50m) which continue into deep water.

The fringing reefs are habitat for Western Blue groper, Harlequin fish and Western Blue devils. A number of red macro algal species have been recorded on the reefs in this zone which have a very limited range of distribution. The waters of this zone are nutrient rich with strong currents allowing the sponges in this zone to grow much larger than usual. Other filter feeding animals such as gorgonian corals, bryozoans and ascidians thrive in the fast currents adjacent to shore where they would otherwise be outcompeted by large algae such as kelp, for the light. The steep depths and strong currents close to shore provide ideal conditions for the growth of sessile invertebrate fauna and result in distinct invertebrate dominated community types that are uncommon at the bioregional scale.

Appendix Figure 2-42 Sponge Gardens sanctuary zone



Source: APPENDIX 9

Strong tides and currents through Backstairs Passage determine larval dispersal patterns and provide important ecological linkages in Encounter Marine Park. A diversity of mobile species

associated with the sponge gardens including snapper, blue devil fish, brittle stars, cowries, magpie perch and rock lobster.

Final zone derived from MPLAG advice (minority support) and tested through public consultation. There is limited vehicle access to most of the coast around the SZ and recreational use was relatively low due to the strength of the currents. Low levels of commercial long lining (snapper and shark) and lobster fishing were displaced while areas around Penneshaw and Antechamber bay that are popular for fishing are not included in the SZ boundary.

A.2.9.2 Economic values and impacts

A.2.9.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The Charter Boat Fishery was the principal fishery that previously used the Sponge Gardens SZ. There was some use of the SZ by the Marine Scalefish, NZRL and Central Zone Abalone 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 2-42. The total gross value of displaced catch in this SZ is estimated to be at least $152,000, principally from the Charter Boat ($74,000), Marine Scalefish ($45,000) and NZRL ($33,000) Fisheries.

Displaced catch and effort from the Central Zone Abalone Fishery were confidential but would be minimal. In fact, for the entire Encounter Marine Park the value of displaced catch would be $19,000 for the Central Zone Abalone Fishery.

Appendix Table 2-42 Estimated catch or effort and GVP displaced by fishery, Sponge Gardens SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	-	-	-
Abalone	Confidential	-	-
Rock Lobster	540	0.08%	33
Marine Scalefish	120	0.19%	45
Charter Boat	370	1.70%	74

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Sponge Gardens SZ comprises a northern eastern section of Kangaroo Island within the southern section of Marine Fishing Area (MFA) 44 (Appendix Figure 2-2). This MFA was utilised by commercial fishers targeting primarily Snapper and Southern Calamari but also small amounts of King George Whiting and Southern Garfish. Minor fisheries such as Snook are also recorded in this MFA. These species are all able to be targeted outside of the SZ.

King George Whiting

GSV/ Kangaroo Island 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/ Kangaroo Island, 310t in SG and 250t in the West Coast. Historically (1999-2001), this SZ occupies 2.2 per cent of MFA 44 which produced between 0.1-5t of King George Whiting out of a total of approximately 100t for GSV/ Kangaroo Island.

King George Whiting in GSV/ Kangaroo Island 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 a proportion of approximately 42-58 per cent, respectively.

Snapper

Historically, SG provided the bulk of the Snapper catch in South Australia. Between 2007-2010 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 44 which overlaps the Sponge Gardens SZ produced between 11-25t out of around 500t state-wide (Fowler et al. 2013).

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

Garfish

Garfish catch in Sothern GSV has rarely exceeded 10 per cent of the state-wide catch and has remained less than 6t for the past 4 years (Steer et al. 2018). Garfish catches in MFA 44 prior to SZs were confidential in 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 77-23 per cent, respectively. The southern GSV stock is classified Sustainable.

Southern Calamari

Historically, the catch of Southern Calamari in the Southern GSV region has fluctuated between 45t and 120t since 1984 and represents about 20 per cent of total state catch (443t in 2016) (Steer et al. 2018). Total catch for the state has remained stable since 2010 at a round 400t.

Catch of Southern Calamari in MFA 44 which overlaps the SGSZ was between 25-50t in 2016, a decline from 51-75t in 2012/13 due to decreased effort.

It is estimated that the commercial and recreation catch represent a proportion of approximately 70-30 per cent, respectively.

The Southern calamari 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 habitat forming invertebrate communities. The SZ contains sand, reef and some seagrass which are suitable habitats for the variety of fish that live in the SZ. The SZ contains deep trenches and high currents.

Existing Arrangement

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

Appendix Table 2-43 shows the economic impact on the regional economy of sanctuary zoning on the Charter Boat, Marine Scalefish and NZRL Fisheries. Impacts are based on the gross value of displaced catches (Appendix Table 2-42). Note the displaced effort in the Central Zone Abalone Fishery was confidential but minimal and, hence the economic impact for this displaced catch has not been estimated.

Appendix Table 2-43 Regional economic impact of zoning, Sponge Gardens SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Marine Scalefish	-0.04	8%	-1	17%	-0.01	5%	-0.03	9%
Charter Boat	-0.07	14%	-2	33%	-0.02	9%	-0.07	21%
Rock Lobster	-0.03	6%	0	2%	-0.01	6%	-0.02	5%
Downstream [b]	-0.07	13%	-1	10%	-0.03	15%	-0.03	10%
Total Direct [c]	*-0.22*	*41%*	*-4*	*62%*	*-0.06*	*34%*	*-0.15*	*46%*
Total Flow-on [c]	*-0.32*	*59%*	*-2*	*38%*	*-0.12*	*66%*	*-0.18*	54%
Total [c]	**-0.55**	**100%**	**-6**	**100%**	**-0.18**	**100%**	**-0.34**	**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] Fleurieu and Kangaroo Island 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 $0.34m in total GRP, which represents less than 0.1 per cent of the regional total ($1.6b in 2016/17).
- Approximately 6 fte jobs which represent less than 0.1 per cent of the regional total (15,596 fte jobs in 2016/17).
- Approximately $0.18m in household income, which represents less than 0.1 per cent of the regional total ($0.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Northern Zone Rock Lobster Fishery

The estimated displaced catch was 0.08 per cent of the total average annual catch in the NZRL Fishery (Appendix Table 2-42). Relatively little reef habitat suitable for Rock Lobster occurs in the Sponge Gardens SZ (see Figure 3-45).

Marine Scalefish Fishery

While the estimated displaced effort for the Encounter Marine Park was 0.59 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 SZ.

- The Sponge Gardens SZ has displaced some long-line fishing effort but there are numerous other locations within the Encounter Marine Park available for this form of fishing.

Charter Boat Fishery

The estimated displaced effort was 2.71 per cent of the total average annual effort in the fishery (EconSearch 2014), but change in the fishery due to the Encounter 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 SZ. No data have been published to confirm or reject this assumption.
- Removal of effort was targeted at the Cape Jervis region as part of the Commercial Fisheries Voluntary Catch/Effort Reduction Program.
- Charter fishers are generally highly mobile and should be able to adapt to the spatial restrictions.
- The Sponge Gardens was recognised as charter fishing grounds 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 Encounter Marine Park.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

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, MFA 44 which overlaps SGSZ produced less than 5t of King George Whiting (Fowler et al. 2013). In 2016 MFA 44 recorded a catch of less than 5t (Steer et al. 2018) indicating no change in catch.

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).

Catches in MFA 44 overlapping Sponge Gardens SZ, were between 14-25t in 2016. 11-25t was recorded in 2012/13 prior to SZ implementation (Steer et al. 2018 and Fowler et al. 2013) suggesting Snapper catches in this MFA have not significantly changed.

Garfish

Garfish catch in MFA 44 overlapping Sponge Gardens SZ were confidential in 2012/13 and 2016 (Steer et al 2018). Total catch in the Southern GSV stock remained below 6t over between 2012-2016.

Southern Calamari

Total catch for Southern GSV has declined from a peak in 2011 of 123t to 52t in 2016 as a result of a reduction in effort.

Catch of Southern Calamari in MFA 44 overlapping the Sponge Gardens SZ were between 26-50t in 2013/14 and 2016 (Fowler et al. 2013, Steer et al. 2018), suggesting fishers are still catching Southern Calamari in high numbers despite the SZ.

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $152,000, would become available again for harvesting. This would be principally by the Charter Boat Fishery and to a lessor extent the Marine Scalefish, Northern Zone Rock Lobster and Central Zone Abalone Fisheries.

The effect of changing the status 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 Snapper and Southern Calamari have been maintained in the presence of the SZ. King George Whiting and Garfish catch is small in this area and has been maintained 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 and a temporary increase in overall catch.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $152,000, would become available again for harvesting. This would be principally by the Charter Boat Fishery and to a lessor extent the Marine Scalefish, Northern Zone Rock Lobster and Central Zone Abalone Fisheries.

It is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.9.2.2 Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

One tour operator based at Penneshaw (Kangaroo Island Ocean Safari) directly utilises the SZ for snorkelling and sightseeing focused on seals, dolphins and whales (Kangaroo Island Ocean Safari 2015a).

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

No data are available on the number of visitors or expenditure occurring in the region due to the tour operation so the economic contribution of the activity cannot be directly estimated.

Existing Arrangement

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

The nature of tours has changed since the SZ was established. Specifically, a permit was granted under the *Marine Parks Act 2007* for the operator to include seal interactions in the SZ as part of one of their tours (Kangaroo Island Ocean Safari 2015b). It is unclear whether this would have occurred were the SZ not established. A text search on the operator's website identified one use of the existence of the SZ for marketing, the announcement relating to seal interactions mentioned above.

Charter boat activity took place in the area before the SZ was established (see Section A.2.9.2.1). 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 different fishing activities?

Commercial fishing vessel traffic and rock lobster pots are likely to be present in the area if fishing activities are allowed. These will likely impact the wilderness experience offered by the tour operator but the scale of the impact is unknown.

Habitat Protection Zone status

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

It is unlikely that activities such as aquaculture and coastal developments would ever occur in the SZ so rezoning to allow them is unlikely to impact tourism activities.

A.2.9.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Boating and diving occur within the Sponge Gardens SZ.

Boat fishing is popular at many locations within the Encounter Marine Park including Nepean Bay and Antechamber Bay which are adjacent to the SZ (DENR 2010a). There are several boat ramps near the SZ, including one at Penneshaw on Kangaroo Island and one at Cape Jervis on the mainland.

Shore-based recreation activities adjacent to the SZ are limited due to the restricted access by road to the shoreline and high cliffs.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing occurred right along the NE coastline of Dudley Peninsula (Appendix Figure 2-35). With regard to recreational boat fishing some areas would have been lost due to the SZ. Shore-based line fishing is now prohibited in the SZ, but this area is difficult to access from shore and previous recreational fishing effort was negligible (Bryars et al. 2016).

What does the community value about the SZ?

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for Encounter Marine Park were significant in number. A total of 7,330 (85 per cent) of the 8,649 respondents commented specifically on the Encounter Marine Park. Eight agreed with the proposed zoning as is, 7,180 (83 per cent) suggested changes to zoning to increase the conservation outcomes, 142 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,319 (15 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

What are the non-market values of the SZ?

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

The SZ is significant as a site that can be accessed by the public for recreational diving to observe a system that has full protection from fishing.

The SZ 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a) (Appendix Figure 2-36).

A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them (Navarro et al. 2018). The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs (Navarro et al. 2018).

Existing Arrangement with Fishing Permitted

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

As the area was previously used by recreational boat fishers (Appendix Figure 2-35), it is likely that changing the zoning arrangements to allow fishing would result in an increase in recreational boat fishing activity in the SZ through a redistribution of existing activity outside the SZ.

The Charter and MSF Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not recreational fishers or the conservation sector.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

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

Unknown

A.2.9.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The Sponge Gardens SZ extends offshore from the cliffs west of Antechamber Bay and is characterized by diverse physical and geographic influences, including steep rocky shorelines, high currents and deep trenches. Inventory mapping found that broadly the zone is dominated by habitat forming invertebrate communities (sponges and other filter feeders). Figure 3-45 (in Section 3.16.1) provides a map of the main benthic (subtidal) habitats of the Encounter Marine Park. Appendix Table 2-44 and Appendix Table 2-45 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Bay of Shoals SZ.

Appendix Table 2-44 Benthic (subtidal) habitats of the Sponge Gardens SZ

Habitat	Area (km^2)	% SZ
Deep sea sponges	34.1	57.0
Bare sand	13.8	23.0
Heavy limestone reef	10.8	18.0
Seagrass	1.2	2.0

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-45 Shoreline (intertidal) habitats of the Sponge Gardens SZ

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

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Encounter Marine Park is used by a number of shark species, including dusky whaler, smooth hammerhead, school shark, hammerhead shark, white shark and shortfin mako (DENR 2010a). It is assumed that some of these species move through the Sponge Gardens SZ at times.

Mammals

The Encounter Marine Park is used by a number of marine mammal species, including southern right whale, pigmy right whale, humpback whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), short-nosed fur seal (formerly the Australian fur seal), common dolphin and bottlenose dolphin (DENR 2010a). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. It is likely that all of those species utilise the Sponge Gardens SZ at some stage. The Cape Jervis and Encounter Bay regions form a migratory corridor for southern right whales (Carroll et al. 2011).

Seabirds

The Encounter Marine Park is used by a number of seabird species, including vulnerable white-bellied sea eagle, rare osprey, black-faced cormorant, Caspian tern, crested tern, fairy tern, little penguin, Pacific gull, pied cormorant and silver gull (DENR 2010a). Some of these species are resident while others are more transient, visiting the Encounter Marine Park to rest, breed and/or feed.

The state endangered white-bellied sea eagle and the state endangered osprey are known to have territories in the vicinity of the Sponge Gardens SZ (Dennis et al. 2011a).

Shorebirds

The Encounter Marine Park is used by a number of shorebird species for breeding and feeding, including pied oystercatchers, greater sand plover, grey plover, terek sandpiper and masked lapwing (DENR 2010a). Some of these species are resident and others migrate to the Encounter Marine Park from interstate or overseas. It is likely some of these species utilise the Sponge Gardens SZ.

Fish Communities

The information on fish and macro-invertebrate communities in this section is derived from the marine parks BRUVS and UVC monitoring programs (Miller et al. 2017, Brook et al. 2017). BRUVS surveys have been undertaken in the Sponge Gardens SZ in 2015/16 and 16/17 and UVC surveys have been undertaken in 2005/06/07/12/16/17 and 2018.

A total of 57 species were recorded during the BRUVS surveys of the Sponge Gardens SZ comprising 54 species of fish, one crustacean species and two mollusc species (Appendix Table 2-46). Bluethroat wrasse (*Notolabrus tetricus*), sea sweep (*Scorpis aequipinnis*) and barber perch (*Caesioperca rasor*) were the most common fish recorded accounting for around 40 per cent of the total number of fish recorded. Other common species included horseshoe leatherjackets (*Meuschenia hippocrepis*), zebrafish (*Girella zebra*) and blue groper (*Achoerodus gouldii*) (Appendix Table 2-46). All common fish species recorded were typical of nearshore reef habitats found along the Kangaroo Island coastline.

Appendix Table 2-46 Species list, BRUVS surveys, Sponge Gardens SZ[a]

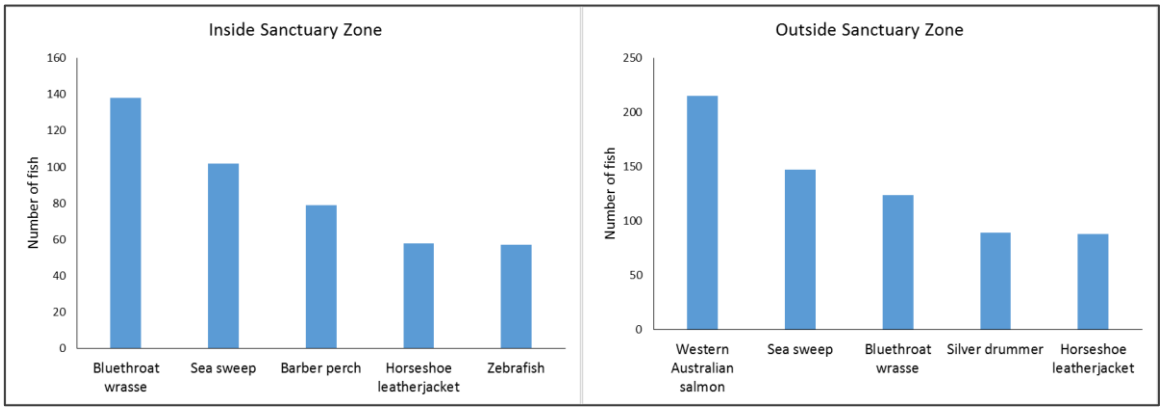
Species	Common name	Total no.
Notolabrus tetricus	Bluethroat wrasse	138
Scorpis aequipinnis	Sea sweep	102
Caesioperca razor	Barber perch	79
Meuschenia hippocrepis	Horseshoe leatherjacket	58
Girella zebra	Zebrafish	57
Atherinidae	Hardyhead	50
Achoerodus gouldii	Western blue groper	26
Austrolabrus maculatus	Black-Spotted wrasse	24
Tilodon sexfasciatus	Moonlighter	21
Kyphosus sydneyanus	Silver drummer	21
Pictilabrus laticlavius	Senator wrasse	20
Meuschenia flavolineata	Yellowstriped leatherjacket	16
Cheilodactylus nigripes	Magpie perch	15
Othos dentex	Harlequin fish	15
Chelmonops curiosus	Western talma	15
Parma victoriae	Victorian scalyfin	15
Olisthops cyanomelas	Herring cale	14
Notolabrus parilus	Brownspotted wrasse	11
Upeneichthys vlamingii	Red mullet	10
Enoplosus armatus	Old wife	10

[a] 20 most abundant species shown out of a total of 54 species.

Source: DEW, unpublished data.

Fish assemblages were similar inside the Sponge Gardens SZ compared to the adjacent area (Appendix Figure 2-43Bluethroat wrasse (*Notolabrus tetricus*), sea sweep (*Scorpis aequipinnis*) and horseshoe leatherjackets (*Meuschenia hippocrepis*) were common both inside and outside the Sponge Gardens SZ with the main difference being the large numbers of Australian salmon (*Arripis truttaceus*) recorded outside the SZ (Appendix Figure 2-43).

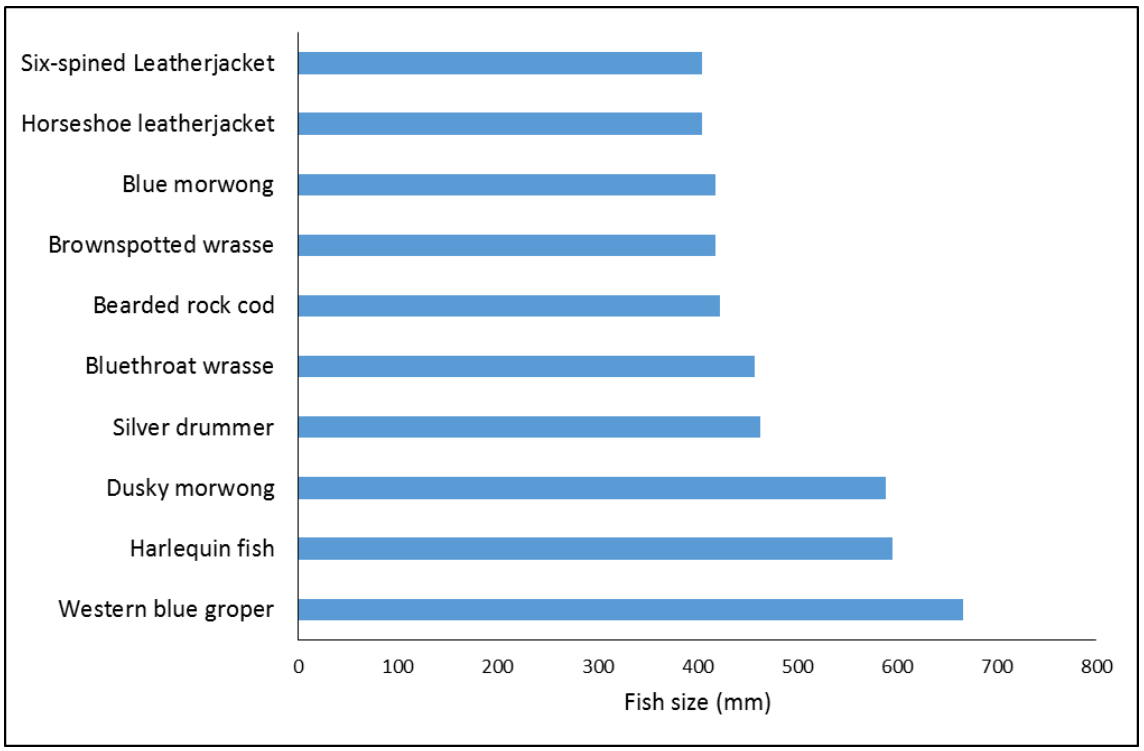
Appendix Figure 2-43 Abundance of the most common species inside and outside the Sponge Gardens SZ, BRUVS surveys



Source: DEW, unpublished data.

The largest fish (including sharks and rays) recorded at Sponge Gardens SZ was a 680mm Western blue groper (*Achoerodus gouldii*) followed by a 596mm harlequin fish (*Othos dentex*) Other large fish recorded included dusky morwong (*Dactylophora nigricans*) at 590mm and silver drummer (*Kyphosus sydneyanus*) at 463mm (Appendix Figure 2-44).

Appendix Figure 2-44 Largest fish recorded, BRUVS surveys, Sponge Gardens 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

Sponge Gardens SZ has high fish species richness compared to other SZs surveyed using BRUVS, with only Pearson Isles SZ having a higher number of fish species recorded (Appendix Figure 2-10). The dive survey data also indicates a high diversity of fish species with Sponge Gardens SZ recording a similar number of species to Pearson Isles, Carrickalinga Cliffs and Rapid Head SZs (Appendix Figure 2-11).

Large fish

The Sponge Gardens SZ has high numbers of large fish (>200 m) recorded from BRUVS surveys with a mean of 14 large fish recorded per BRUVS drop (Appendix Figure 2-13). Compared to other reef sites the mean number of large fish recorded in Sponge Gardens SZ is higher than all mainland reef sites (e.g. Rapid Head and Cape Elizabeth SZs) but lower or similar to remote offshore Island SZs (e.g. Pearson Isles, Isles of St Francis). The dive survey data follows a similar trend with Sponge Gardens SZ having the 4th highest number of large fish recorded per survey with similar values to Isle of St Francis SZ (Appendix Figure 2-14).

Fished species

Sponge Gardens SZ has high numbers of fish species which are targeted by recreational and commercial fishers recorded on BRUVS and dive surveys with only Pearson Isles SZ having higher abundances of these species (Appendix Figure 2-15 and Appendix Figure 2-16). Common targeted fish species which occur in the Sponge Gardens SZ include bluethroat wrasse (*Notolabrus tetricus*), sea sweep (*Scorpis aequipinnis*) and trevally (*Pseudocaranx sp*).

Sharks and rays

Sponge Gardens SZ has very low numbers of shark and rays species and recorded the lowest number of any SZ surveyed (Appendix Figure 2-17).

Indicator species

All six reef indicator fish species were recorded at Sponge Gardens SZ on the BRUVS surveys (Appendix Figure 2-18). Sea sweep (*Scorpis aequipinnis*) and blue throat wrasse (*Notolabrus tetricus*) abundances were highest in the Sponge Gardens SZ compared to all other SZs, while the numbers of blue gropers were second only to Pearson Isles SZ (Appendix Figure 2-18).

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within Bay of Shoals SZ include:

- Fringing reefs have been mapped along the shoreline to 10 m deep.
- The majority of the deeper waters of Backstairs Passage in this SZ are yet to be mapped for habitats.

- Shoreline consists of moderately exposed high cliffs (greater than 50m), many of which continue to drop steeply into deep water.

Important features of the SZ include:

- Only two deep water trenches (>50m) have been mapped in state waters. The zone contains a section of one trench.
- Sponges in these trenches grow much larger than usual, up to 1m in diameter due to the nutrient-rich fast currents moving past.
- A diversity of mobile species associated with the sponge gardens including snapper, blue devil fish, brittle stars, cowries, magpie perch and rock lobster.
- Other filter feeding animals such as gorgonian corals, bryozoans and ascidians thrive in the fast currents adjacent to shore where they would otherwise be outcompeted by large algae such as kelp, for the light.
- The fringing reefs are habitat for Western Blue groper, Harlequin fish and Western Blue devils.
- Strong tides and currents through Backstairs Passage determine larval dispersal patterns and provide important ecological linkages in Encounter Marine Park.
- The steep depths and strong currents close to shore provide ideal conditions for the growth of sessile invertebrate fauna and result in distinct invertebrate dominated community types that are uncommon at the bioregional scale.
- A number of red macroalgal species of nationally recognised limited range have been record on reefs in this zone.

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 three years of data have been collected since the Sponge Gardens 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.8.1. Predicted changes to indicator species relevant to the Sponge Gardens SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and/or western blue groper, when each considered in isolation, were predicted to increase in size and abundance over the next 20 years

inside the Sponge Gardens SZ (Bailey et al. 2012a, Appendix Table 5-1). Southern calamari were predicted to temporarily increase in size and abundance while spawning inside the Sponge Gardens SZ (Bailey et al. 2012a, Appendix Table 5-1).

Subtidal sand

King George whiting and snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Sponge Gardens SZ (Bailey et al. 2012a, Appendix Table 5-1).

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.8.2.

The Charter Boat Fishery was the principal fishery that previously used the Sponge Gardens SZ. There was some use of the SZ by the Marine Scalefish, NZRL and Central Zone Abalone Fisheries.

The SZ addresses the following threats to conservation values from the activities of these fisheries. The MSF pose a threat (high) to Southern garfish; a threat (low) to all other target species and a threat (low) to other species of bycatch. The Charter and Rock Lobster fisheries pose a threat (medium) to their respective 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 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.8.3.

<u>Reduced effectiveness of the zone to protect and conserve marine biological diversity and marine habitats</u>

Selective removal of target species

Opening the Sponge Gardens SZ to fishing would have negative impact on those species commonly targeted including King George whiting, snapper, calamari, rock lobster, abalone and a range of reef species. Many reef fish species (e.g. blue devils and blue groper) are site attached and slow growing and are therefore very vulnerable to overfishing (DEWNR 2017a). Conservation of these species could be compromised by allowing fishing in the SZ with negative flow on effects for biodiversity conservation and 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. 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 commonly use the SZ and long nosed fur seals and Australian sea lions commonly haulout in this SZ. There is one active white-bellied sea eagle nest located on the cliffs adjacent the SZ. Opening the SZ would increase vessel traffic and increase disturbance levels on marine mammals and coastal raptors that use this 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. However, this SZ does contain one of the only know examples of deep water sponge habitat in the state and these habitats are susceptible to damage from anchoring and lobster potting.

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

Refer to Section A.8.3 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 Sponge Gardens SZ has been selected as a priority SZ for monitoring due to the representative nearshore reef habitats it contains. The SZ has one of the longest running time series of data from dive surveys in the state dating back to 2005. 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.

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

Sponge Gardens SZ has several habitat types that are sensitive to disturbance such as seagrass, reef, deep water sponges and associated fauna communities. It is unknown whether activities such as aquaculture and coastal developments (bridges, 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.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Sponge Gardens SZ contains deep water trench supporting giant sponges that is unique in the state. The steep topography and high current velocities combine to create exceptional examples of invertebrate reef communities. The Sponge Gardens SZ is also the largest SZ in the Encounter Marine Park. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these unique habitats.

A.2.10 The Pages Sanctuary Zone

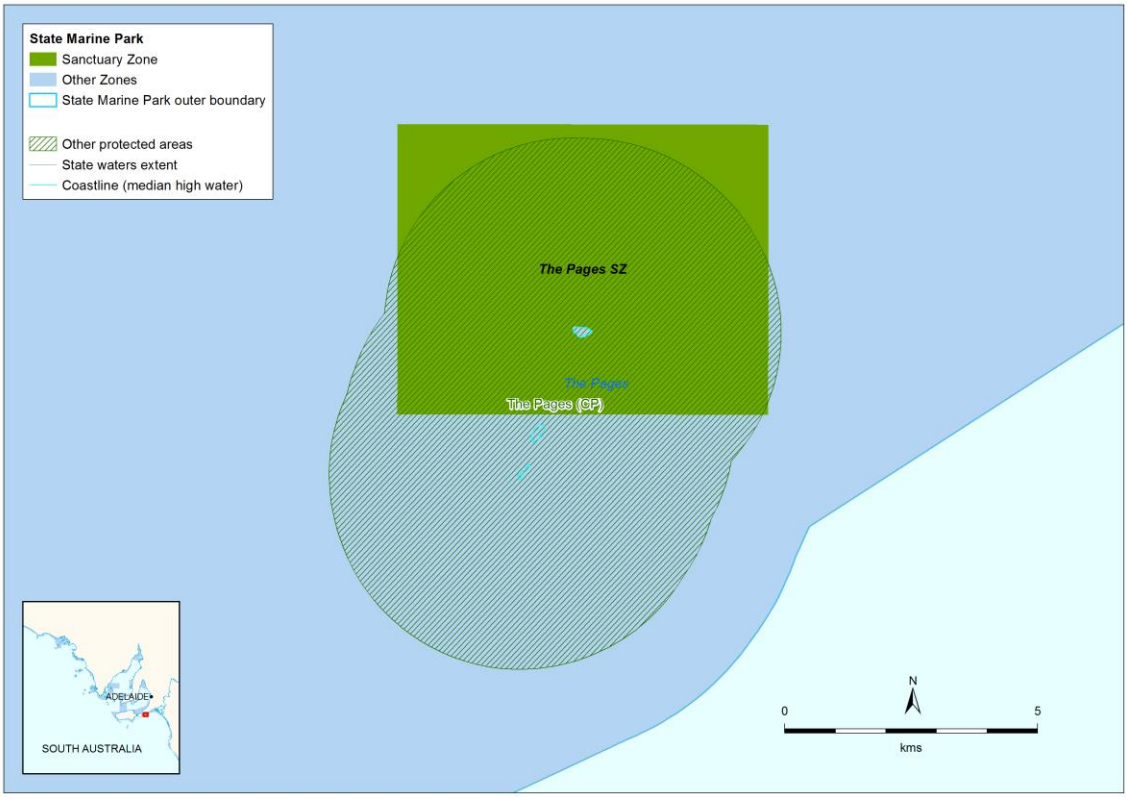
A.2.10.1 Zone description

The Pages SZ and RAZ protect North Pages Island (42km^2) within the Encounter Marine Park (Appendix Figure 2-45) and is located in the Coorong Bioregion. This SZ is located in Backstairs Passage, a strait separating Kangaroo Island and Fleurieu Peninsula. The Pages, which consist of two small islands and a reef, are discreet granite outcrops and are exposed offshore rocky reef systems subject to high wave energy. They are the only offshore islands in the Encounter Marine Park.

The reefs are important spawning and nursery areas for sea sweep and Western blue groper. The Pages Islands provide habitat for approximately one quarter of the world population of the endemic vulnerable Australian sea lion (*Neophoca cinerea*), part of Australia's third-largest breeding colony. The area is also a shark hotspot with regular sightings of gummy sharks (*Mustelus antarcticus*) and the vulnerable white shark (*Carcharodon carcharias*). The SZ overlays part of the Pages Conservation Park and provides a protected corridor from the land to the sea.

There was minimal anticipated impact of the zone on fishing industries. The zone was designed to accommodate commercial, recreational and charter fishing industries by excluding the South Pages Island in the SZ boundaries. Recreational fishing was historically low due to the remoteness of the islands and exposed offshore location while a minor amount of lobster fishing was displaced. Zoning was consistent with MPLAG advice (minority support), with boundaries modified for ease of navigation.

Appendix Figure 2-45 The Pages sanctuary zone



Source: APPENDIX 9

A.2.10.2 Economic values and impacts

A.2.10.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The MSF was the principal fishery that previously used The Pages SZ. There was some use, albeit minor, of the SZ by the Charter Boat and Central Zone Abalone 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 2-47. The total gross value of displaced catch in this SZ is estimated to be at least $31,000, principally from the Marine Scalefish ($22,000) and the Charter Boat ($9,000) Fisheries.

Displaced catch from the Central Zone Abalone Fishery was confidential but would be minimal. In fact, for the entire Encounter Marine Park the value of displaced catch would be $19,000.

Appendix Table 2-47 Estimated catch or effort and GVP displaced by fishery, The Pages SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	-	-	-
Abalone	Confidential	-	-
Rock Lobster	-	-	-
Marine Scalefish	58	0.09%	22
Charter Boat	43	0.20%	9

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

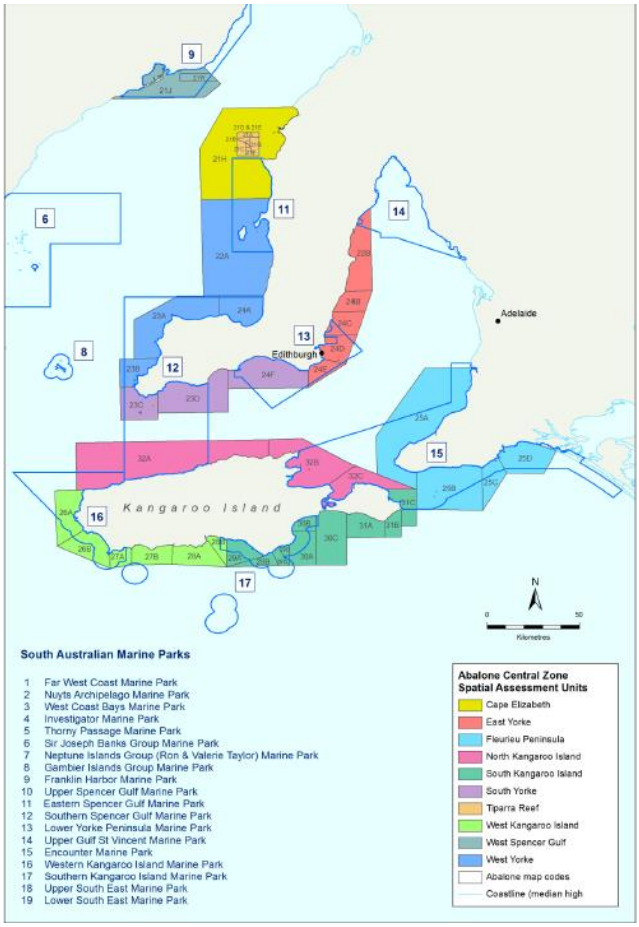
Source: SARDI (by special request).

The Pages SZ comprises of North Page Island in the Backstairs Passage between Cape Jervis and Kangaroo Island and occupies 1.6 per cent of Marine Fishing Area (MFA) 44 (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily Snapper and Southern Calamari but also small amounts of King George Whiting and Garfish. Minor fisheries such as Western Australian Salmon are also recorded in this MFA.

The Pages SZ occupies 6.3 per cent of the Abalone SAU 25B (Appendix Figure 2-46) where Blacklip and Greenlip Abalone are historically targeted.

The Marine Scalefish species and Abalone are all able to be targeted outside of the SZ.

Appendix Figure 2-46 Central Zone Abalone spatial assessment units



Source: Bryars et al. 2017b

King George Whiting

GSV/ Kangaroo Island 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/ Kangaroo Island, 310t in SG and 250t in the West Coast. Historically (1999-2001), The Pages SZ occupies 1.6 per cent of MFA 44 which produced between 0.1-5t of King George Whiting out of a total of approximately 100t for GSV/ Kangaroo Island (Steer et al. 2018).

King George Whiting in GSV/ Kangaroo Island 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 a proportion of approximately 42-58 per cent, respectively.

Snapper

Historically, SG provided the bulk of the Snapper catch in South Australia. Between 2007-2010 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 44 which overlaps a portion of The Pages SZ produced between 11-25t out of around 500t state-wide (Fowler et al. 2013).

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

Garfish

Garfish catch in Sothern GSV has rarely exceeded 10 per cent of the state-wide catch and has remained less than 6t for the past 4 years (Steer et al. 2018).

Garfish catches in MFA 44 prior to SZs were confidential in 2012/13.

It is estimated that the commercial and recreation catch represent a proportion of approximately 77-23 per cent, respectively. The southern GSV stock is classified Sustainable.

Southern Calamari

Historically, the catch of Southern Calamari has remained fairly stable (Steer et al. 2018).

Catch of Southern Calamari in MFA 44 which overlaps The Pages SZ has been between 25-50t since 2013/14.

It is estimated that the commercial and recreation catch represent a proportion of approximately 70-30 per cent, respectively. The Southern Calamari stock is classified as sustainable (Steer et al. 2018).

Abalone

Historically the Greenlip Abalone catch from the Fleurieu Peninsula SPA is recorded at less than 0.25t since 2000 out of a state catch of around 50t (Burnell and Mayfield 2017). Blacklip Abalone catch from the Fleurieu Peninsula SPA is recorded at less than 0.5t since 2005 out of a state catch of around 10t (Burnell and Mayfield 2017).

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

The Pages is comprised of mainly sand with some reef habitats suitable for the variety of fish, Rock Lobster and Abalone that live in the SZ. The area of mapped reef habitat suitable for Abalone inside pages SZs is relatively small compared to the area still available for fishing outside of SZs across the Encounter Marine Park. Relatively little reef habitat suitable for Rock Lobster and Abalone occurs in The Pages SZ.

Existing Arrangement

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

Appendix Table 2-48 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 2-47). Note the displaced effort in the Charter Boat and Abalone Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

Appendix Table 2-48 Regional economic impact of zoning, The Pages SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Marine Scalefish	-0.02	38%	0	67%	0.00	27%	-0.01	45%
Downstream [b]	-0.01	25%	0	13%	0.00	27%	-0.01	17%
Total Direct [c]	*-0.04*	*63%*	*-1*	*81%*	*-0.01*	*53%*	*-0.02*	*62%*
Total Flow-on [c]	*-0.02*	37%	*0*	19%	*-0.01*	47%	*-0.01*	38%
Total [c]	**-0.06**	**100%**	**-1**	**100%**	**-0.02**	**100%**	**-0.03**	**100%**
Regional Total [d]	2,498.81		15,596		834.61		1,586.16	
Impact on Region	0.00%		0.00%		0.00%		0.00%	

[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 zoning in The Pages SZ will generate the following loss of regional economic activity on an ongoing annual basis.

- Approximately $0.03m in total GRP, which represents less than 0.1 per cent of the regional total ($1.6b in 2016/17).
- Approximately 1 fte job which represent 0.1 per cent of the regional total (15,596 fte jobs in 2016/17).
- Approximately $0.02m in household income, which represents less than 0.1 per cent of the regional total ($0.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Marine Scalefish Fishery

While the estimated displaced effort for the Encounter Marine Park was 0.59 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.

Charter Boat Fishery

The estimated displaced effort was 2.71 per cent of the total average annual effort in the fishery (EconSearch 2014), but change in the fishery due to the Encounter Marine Park is predicted to be minimal because:

- The Pages SZs were recognised Charter fishing grounds 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 Encounter Marine Park.
- Removal of effort was targeted at the Cape Jervis region as part of the Commercial Fisheries Voluntary Catch/Effort Reduction Program.

Abalone Fishery

Change in the fishery due to the Encounter 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.
- Some traditional fishing grounds were lost due to the Sponge Gardens, The Pages, Rapid Head and Encounter Bay SZs. However, the area of mapped reef habitat suitable for Abalone inside these SZs is relatively small compared to the area still available for fishing outside of SZs across the Encounter Marine Park.
- The estimated displaced catch was 0.21 per cent of the total average annual catch in the fishery (EconSearch 2014).

Is there any evidence of a negative impact on fisheries since the introduction of the SZ? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

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 the 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, MFA 44 which overlaps The Pages SZ produced less than 5t of King George Whiting (Fowler et al. 2013). In 2016 MFA 44 recorded a catch of less than 5t (Steer et al. 2018) indicating no negative impact.

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).

Catches in MFA 44 overlapping The Pages SZ, were between 14-25t in 2016. Approximately 11-25t was recorded in 2012/13 prior to SZ implementation (Steer et al. 2018 and Fowler et al. 2013) suggesting snapper catches in this MFA have not changed significantly.

Garfish

Southern Garfish catch in MFA 44 overlapping The Pages SZ were confidential in 2012/13 and 2016 (Steer et al. 2018). Total catch in the Southern GSV stock remained below 6t over between 2012-2016.

Southern Calamari

Catch of Southern Calamari in MFA 44 overlapping The Pages SZ were between 26-50t in in 2013/14 and 2016 (Fowler et al. 2013, Steer et al. 2018), suggesting fishers are still catching Southern Calamari in high numbers despite the Pages SZ.

Abalone

No negative impact as State-wide catch is stable and only small contributions from the applicable special assessment unit.

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $31,000, would become available again for harvesting. This would be principally by the Marine Scalesfish Fishery, with some minor use by the Charter Boat and Central Zone Abalone Fisheries.

The effect of changing the status 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 snapper have been maintained in the presence of the SZ. King George Whiting and Garfish catch is small in this MFA and has been maintained 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 and a temporary increase in overall catch for Marine scalefish and Abalone. Charter fishers would utilise this SZ if opened to fishing.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $31,000, would become available again for harvesting. This would be principally by the Marine Scalesfish Fishery, with some minor use by the Charter Boat and Central Zone Abalone Fisheries.

It is unlikely that there would be any future activities such as aquaculture or coastal developments in this SZ. Nonetheless, changing the zoning to HPZ would allow such activities to potentially occur in the future.

A.2.10.2.2 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.2.10.2.1). 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 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 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.2.10.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in The Pages SZ due to the remote nature of the SZ.

There are two boat ramps nearby: at Penneshaw on Kangaroo Island and at Cape Jervis on the mainland.

Existing Arrangement

Was recreational fishing impacted by the SZ?

Prior to SZ implementation, recreational fishing at the SZ was minimal due to its distance from the shore, with only some area lost due to the SZ.

What does the community value about the SZ?

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for the Encounter Marine Park were significant in number. A total of 7,330 (85 per cent) of the 8,649 respondents commented specifically on the Encounter Marine Park. Eight agreed with the proposed zoning entirely, 7,180 (83 per cent) suggested changes to zoning to increase the conservation outcomes, 142 (2 per cent) suggested changes to zoning to reduce impacts on current uses, while 1,319 (15 per cent) expressed no comment on the proposed zoning (DEWNR 2012a).

What are the non-market values of the SZ?

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

The Pages are part of the Ngurunderi Dreaming Story of the Ngarrindjerri people and are very culturally important to the Ngarrindjerri people (Robinson 1990).

The SZ 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a) (Appendix Figure 2-36)

A survey of recreational fishers that utilise the Encounter Marine Park found that 2.5 years after SZ implementation, the majority (greater than 60 per cent) of respondents were supportive of SZs, with a small minority (less than 10 per cent) strongly opposed to them (Navarro et al. 2018). The majority (greater than 70 per cent) of respondents believed there was a high to very high environmental benefit of SZs, and the majority (greater than 70 per cent) also believed that there had been no impact on recreational fishing due to the SZs (Navarro et al. 2018).

Existing Arrangement with Fishing Permitted

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

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

The Charter and MSF fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

What impact would there be to the social values of opening 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 (jetties, wharves, etc.) would occur in the location of the SZ.

A.2.10.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The Pages SZ contains the only offshore island habitats in the Encounter Marine Park. Beyond the island and its fringing reefs the SZ contains a mix of deep water (30 – 50m) soft sediment and reef habitat Figure 3-45 (In Section 3.16.1).

Appendix Table 2-49 and Appendix Table 2-50 provide estimates of the benthic (subtidal) and shoreline (intertidal) habitats in The Pages SZ.

Appendix Table 2-49 Benthic (subtidal) habitats of The Pages SZ

Habitat	Area (km^2)	% SZ
Heavy limestone reef	21.4	51
Bare sand	20.6	49

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-50 Shoreline (intertidal) habitats of The Pages SZ

Habitat	Length of shoreline (km)	% SZ
Unmapped	1	100

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

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

Sharks

The Encounter Marine Park is used by a number of shark species, including dusky whaler, smooth hammerhead, school shark, gummy shark, hammerhead shark, white shark and shortfin mako (DENR 2010a). Vulnerable white shark is sighted regularly within The Pages SZ.

Mammals

The Encounter Marine Park is used by a number of marine mammal species, including southern right whale, pigmy right whale, humpback whale, Australian sea lion, long-nosed fur seal (formerly New Zealand fur seal), short-nosed fur seal (formerly the Australian fur seal), common dolphin and bottlenose dolphin (DENR 2010a). Some of these species are resident while others are more transient, visiting to rest, breed and/or feed. The Cape Jervis and Encounter Bay regions form a migratory corridor for southern right whales (Carroll et al. 2011).

Australian sea lion

There are 2 Australian sea lion breeding sites in the Encounter Marine Park, at North and South Pages Islands, with an estimated annual pup production of 589 (Goldsworthy and Page 2009). Of the 42 breeding sites in SA, the Pages Islands are one of only 5 sites that produced more than 100 pups in 2014 (estimated 2nd highest pup production in the state) (Goldsworthy et al. 2015).

Australian fur seal

A haul-out site for the Australian fur seal is located at North Pages Island (DEWNR 2015b).

Long-nosed fur seal

Haul-out sites for the long-nosed fur seal include North Pages Islands (Shaughnessy et al. 1994, Shaughnessy et al. 2014).

Seabirds

The Encounter Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, rare osprey, black-faced cormorant, Caspian tern, crested tern, fairy tern, little penguin, Pacific gull, pied cormorant and silver gull (DENR 2010a). Some of these species are resident while others are more transient, visiting the Encounter Marine Park to rest, breed and/or feed. Many of the islands in the Encounter 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 Encounter Marine Park (Marchant and Higgins 1990).

Fish Communities

The information on fish and macro-invertebrate communities in this section is derived from the Marine Parks BRUVS and UVC monitoring programs (Miller et al. 2017, Brook et al. 2017). BRUVS surveys have been undertaken in the Pages SZ in 2015/16 and 16/17.

A total of 63 species were recorded during the surveys comprising; 61 species of species of fish, 1 crustacean species and one mollusc (squid) (Appendix Table 2-51). Surf sardines (*Iso rhothophilus*) were the most abundant fish species recorded accounting for around 20 per cent of the total fish abundance. Other fish species recorded, e.g. horseshoe leatherjacket (*Meuschenia hippocrepis*), trevally (*Pseudocaranx sp*) and yellowfin pike (*Dinolestes lewini*) are typical of reef habitats (Appendix Table 2-51).

Appendix Table 2-51 Species list, BRUVS surveys, The Pages SZ[a]

Species	Common name	Total no.
Iso rhothophilus	Surf sardine	200
Meuschenia hippocrepis	Horseshoe leatherjacket	114
Pseudocaranx sp	Trevally	96
Dinolestes lewini	Yellowfin pike	71
Notolabrus tetricus	Bluethroat wrasse	69
Parequula melbournensis	Southern silverbelly	30
Thamnaconus degeni	Degen's leatherjacket	28
Pictilabrus laticlavius	Senator wrasse	28
Meuschenia galii	Bluelined leatherjacket	19
Meuschenia flavolineata	Yellowstriped leatherjacket	16
Austrolabrus maculatus	Black-Spotted wrasse	15
Upeneichthys vlamingii	Red mullet	15
Acanthaluteres vittiger	Toothbrush leatherjacket	13
Trachurus novaezelandiae	Yellowtail scad	12
Notolabrus parilus	Brownspotted wrasse	12
Olisthops cyanomelas	Herring cale	10
Mustelus antarcticus	Gummy shark	10
Eupetrichthys angustipes	Snakeskin wrasse	9
Enoplosus armatus	Old wife	7
Ophthalmolepis lineolatus	Southern Maori wrasse	7

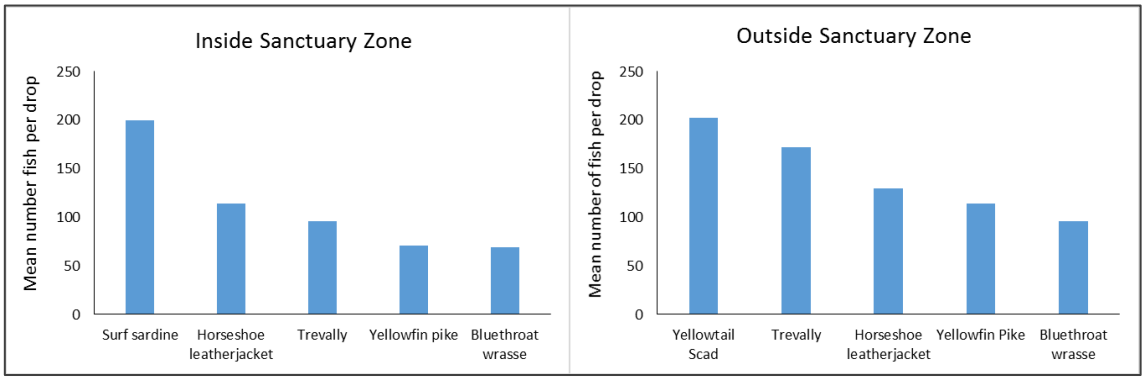
[a] 20 most abundant species shown out of a total of 63 species.

Source: DEW, unpublished data.

Species abundance

Based on the five most common fish species, assemblages were very similar inside the SZ compared to outside (Appendix Figure 2-47). Horseshoe leatherjackets (*Meuschenia hippocrepis*), trevally (*Pseudocarynx sp*), yellowfin pike (*Dinolestes lewini*) and bluethroat wrasse (*Notolabrus tetricus*) are all found commonly inside and outside of The Pages SZ. The main difference was higher numbers of surf sardines (*Iso rhothophilus*) were recorded inside the SZ compared to high numbers of yellowtail scad (*Trachurus novaezelandiae*) recorded outside of the SZ (Appendix Figure 2-47).

Appendix Figure 2-47 Abundance of the most common species inside and outside The Pages SZ, BRUVS surveys

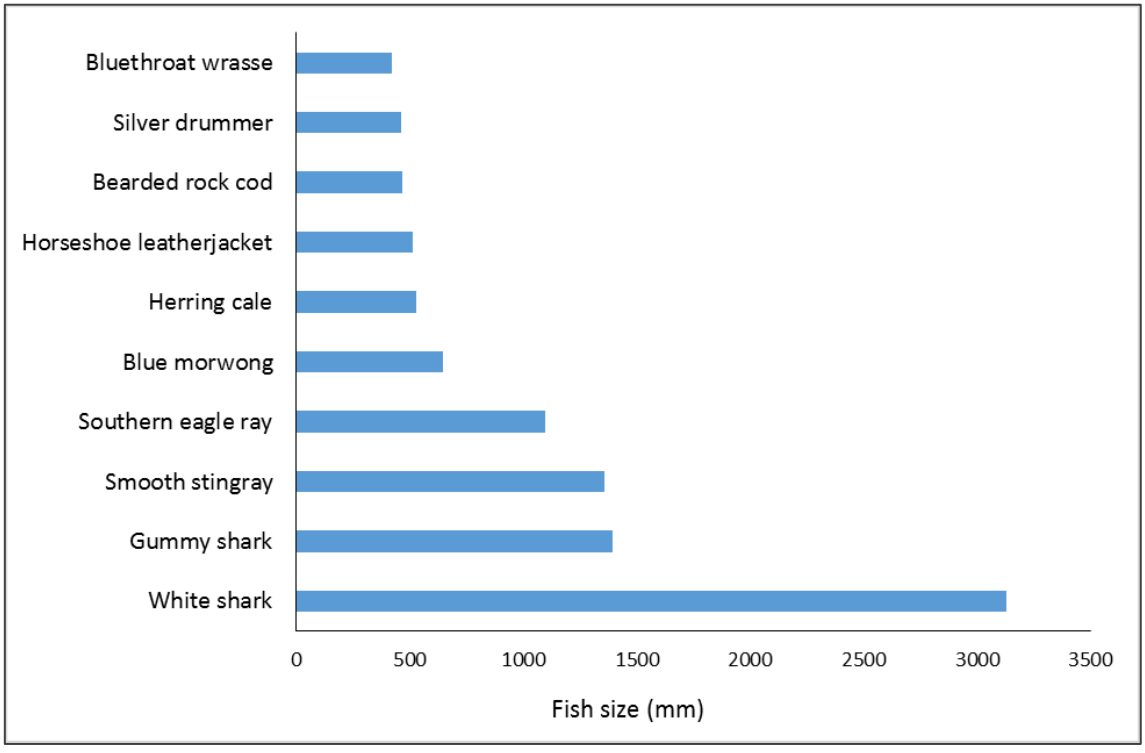


Source: DEW, unpublished data.

Largest fish

The largest fish (including sharks and rays) recorded at the Pages SZ was a 3,100mm white shark (*Carcharodon carcharias*) followed by a 1,390mm gummy shark (*Mustelus antarcticus*) (Appendix Figure 2-48). Other large fish recorded included smooth stingray (*Dasyatis brevicaudata*) at 1,358mm and southern eagle ray (*Myliobatis tenuicaudatus*) at 1,095mm.

Appendix Figure 2-48 Largest fish recorded, BRUVS surveys, The Pages 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 Pages SZ has a relatively high diversity of fish species with the 5th highest number of species recorded for SZs surveyed by BRUVS survey (Appendix Figure 2-10).

Large fish

The Pages SZ has average numbers of large fish (>200 m) recorded from BRUVS surveys with a mean of 9 large fish recorded per BRUVS drop (Appendix Figure 2-13). Compared to other reef sites the mean number of large fish recorded in the Pages SZ is similar to mainland reef sites (e.g. Rapid Head and Aldinga SZ's) but higher then seagrass and soft sediment sites (e.g. Bay of Shoals and Port Gibbon).

Fished species

The mean number of recreationally and commercially targeted fish species recorded on BRUVS in The Pages SZ was below average in comparison to other SZs surveyed (Appendix Figure 2-15). Common targeted fish species which occur in the Pages SZ include horseshoe leatherjacket (*Meuschenia hippocrepis*), trevally (*Pseudocarynx sp*) and bluethroat wrasse (*Notolabrus tetricus*).

Sharks and rays

Sharks and rays are in relatively high abundances in The Pages SZ with fourth highest numbers recorded by BRUVS survey (Appendix Figure 2-17).

Indicator Species

Four of the six reef indicator fish species were recorded at the Pages SZ (Appendix Figure 2-18). Horseshoe leatherjacket (*Meuschenia hippocrepis*) abundances were second highest at the Pages SZ compared to all SZ surveyed by BRUVS (Appendix Figure 2-18).

Existing Arrangement

How does the SZ contribute to the CAR network?

The CAR habitats represented within The Pages SZ include:

- Two discrete granite outcrops surrounded by fringing rocky reef.
- High coastal wave energies.
- High velocity tidal regulated currents via Backstairs Passage.
- Exposed offshore rocky reef systems.

Important features of the SZ include:

- Only offshore islands in Encounter Marine Park.
- Islands provide habitat for approximately one quarter of the world population of the vulnerable Australian sea lion, part of South Australia's third-largest breeding colony.
- Vulnerable white shark sighted regularly.
- Overlays part of the Pages Conservation Park establishing a protected corridor from the land to the sea.
- Reefs are reported to provide spawning and nursery areas for Sea Sweep and 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 only three years of data have been collected since The Pages SZ became operational in 2014. Changes are not expected to be measurable for 5 to10 years (DEWNR 2017a, Delean 2017).

Predicted changes

Predicted changes that apply to all SZs are described in Section A.8.1. Predicted changes to indicator species relevant to The Pages SZ are described below.

Subtidal reef

Rock lobster, greenlip abalone, blacklip abalone, Bight redfish, bluethroat wrasse, harlequin fish, King George whiting, snapper, swallowtail, sweep and western blue groper, when each considered in isolation, were predicted to increase in size and/or abundance over the next 20 years inside The Pages SZ (Bailey et al. 2012a).

Subtidal sand

King George whiting and snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside The Pages 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.8.2.

The MSF was the principal fishery that previously used The Pages SZ. There was some use, albeit minor, of the SZ by the Charter Boat and Central Zone Abalone Fisheries. However, the use by these fisheries was relatively minor.

The Charter and Marine Scalefish fisheries pose a threat (low) to most target species and a threat (low) to other species of bycatch. The MSF pose a threat (high) to Southern garfish. 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 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.8.3.

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

Selective removal of target species

Opening The Pages SZ to fishing would have negative impact on those species commonly targeted including King George whiting, snapper, calamari and a range of reef species. Many reef fish species (e.g. blue devils and blue groper) are site attached and slow growing are therefore very vulnerable to overfishing (DEWNR 2017a). Conservation of these species would be compromised by allowing fishing in The Pages SZ with negative flow on effects for biodiversity conservation and 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. 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 Pages SZ is home to one of the most significant breeding colonies of the Australian sea lion in Australia. 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 vulnerable Australian sea lions.

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.

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

Refer to Section A.8.3 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 Pages SZ has been selected as a priority SZ for monitoring due to the representative nearshore reef habitats it contains. 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 whether marine biodiversity was being conserved.

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

The Pages SZ has several habitat types that are sensitive to disturbance such as reef and associated fauna communities. It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would ever occur in the location of the 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.8.4.

Refer to Section A.8.4for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, The Pages SZ represents the only remote offshore island ecosystem in the GSV bioregion. This SZ captures extensive highly exposed deep water reef not captured elsewhere in other SZs. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these unique reefs characteristic of remote offshore islands.

A.2.11 Cape Borda Sanctuary Zone

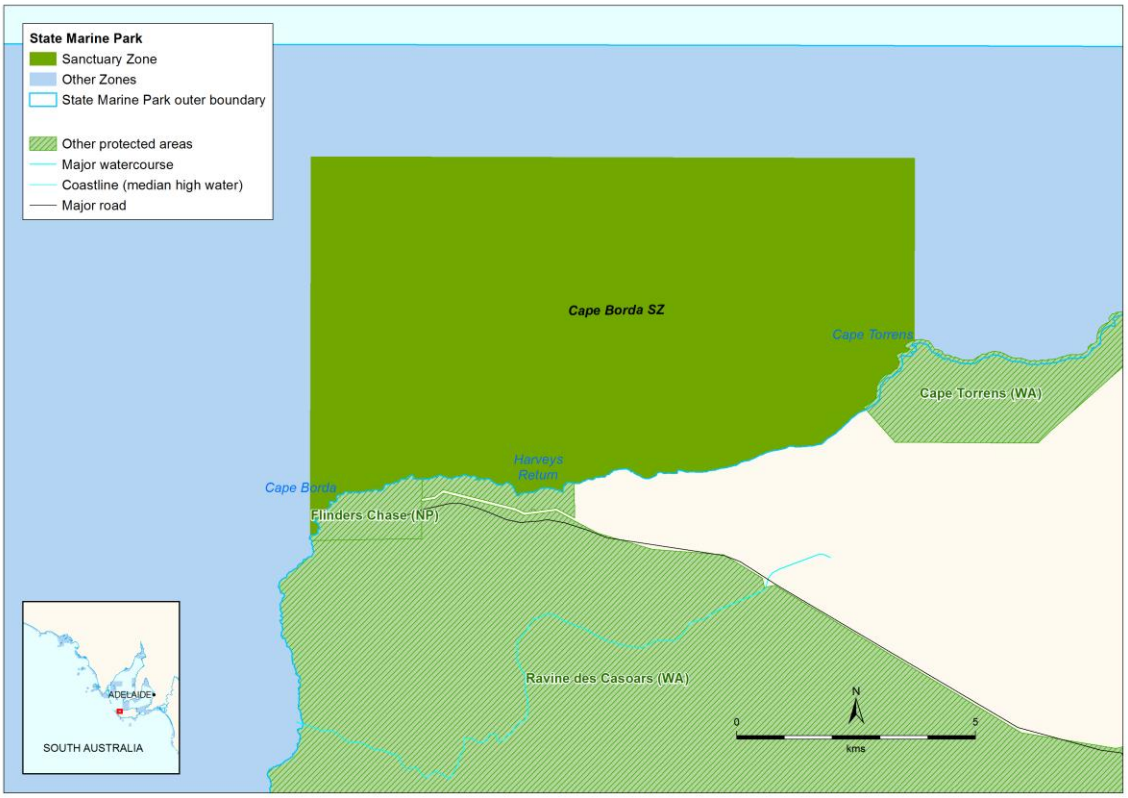
A.2.11.1 Zone description

The Cape Borda SZ (82km^2) within the Western Kangaroo Island Marine Park contains sandy seafloors sloping steeply into deep waters habitats (deeper than 50m) within 1 kilometre of shore (Appendix Figure 2-49) and is within the Eyre Bioregion. The SZ contains a 700m boulder beach and is predominantly exposed bedrock platform reef backed by cliffs up to 200m high. The area is known for its outstanding natural beauty and is backed by wilderness, national parks and some of the highest coastal cliffs in Australia. This SZ is adjacent to Ravine des Casoars and Cape Torrens Wilderness Areas and Flinders Chase National Park establishing a protected corridor from land to sea.

This SZ contains near shore reef habitats for site-attached fish including western blue groper, harlequin fish and western blue devils. The SZ is a haul out site for the vulnerable Australian sea lion and contains nesting sites for the state endangered white-bellied sea eagle. The SZ has two reef monitoring sites which contribute to long term monitoring.

This SZ was modified from MPLAG advice (minority support) and tested through public consultation. There was low impact to recreational fishing and accommodations made for commercial sardine fishing along the north coast of Kangaroo Island. Some lobster and abalone fishing were displaced by the SZ.

Appendix Figure 2-49 Cape Borda sanctuary zone



Source: APPENDIX 9

A.2.11.2 Economic values and impacts

A.2.11.2.1 Commercial Fishing

Baseline

Which fisheries sectors previously utilised the SZ?

The NZRL Fishery was the principal fishery that previously used the Cape Borda SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish, Sardine 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 2-52. The total gross value of displaced catch in this SZ is estimated to be at least $58,000, from the NZRL ($42,000), Charter Boat ($14,000), Marine Scalefish ($1,000) and Abalone ($1,000) Fisheries. Displaced catch from the Sardine Fishery was confidential but would be minimal.

Displaced catch of Rock Lobster presented here (690kg) is lower than the preliminary estimate (13,228kg) read in the Legislative Council in May 2014 (APPENDIX 6).

Appendix Table 2-52 Estimated catch or effort and GVP displaced by fishery, Cape Borda SZ

	SARDI Estimated Displaced Catch/Effort [a]	% Fishery Catch/Effort	Value of Catch/Effort [b] ($'000)
Sardines	Confidential	-	-
Abalone	20	0.01%	1
Rock Lobster	690	0.11%	42
Marine Scalefish	11	0.02%	1
Charter Boat	72	0.33%	14

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[b] 2018 dollars.

Source: SARDI (by special request).

The Cape Borda SZ is located on North West of Kangaroo Island and occupies 1.14 per cent of Marine Fishing Area 39 (MFA - Marine Scalefish and Northern Rock Lobster Fisheries) (Appendix Figure 2-2). This MFA is utilised by commercial fishers targeting primarily Rock Lobster. Additionally, the Cape Borda SZ occupies 5.8 per cent of the North Kangaroo Island Abalone SAU 32A (Appendix Figure 2-46). 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, 1-10t and 1-5t for Southern Calamari, Garfish, Snapper and King George Whiting, respectively.

Northern Zone Rock Lobster Fishery

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

Central Zone Abalone Fishery

The Central Zone Blacklip and Greenlip Abalone Fisheries are classified as transitional depleting (Burnell and Mayfield 2017). The historic Greenlip Abalone catch for north Kangaroo Island is less than 1 t out of a total of around 45t for the Central Zone Fishery. The historic Blacklip

Abalone catch for north Kangaroo Island is less than 0.2t out of a total of around 8t for the Central Zone Fishery (Burnell and Mayfield 2017).

Sardine Fishery

Catch of sardines was minimal and only occurred sporadically around Cape Borda (Ward et al. 2017).

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

The nearshore habitat of Cape Borda SZ is comprised of reef suitable for Rock Lobster and Abalone. Most of the SZ is sand and not suitable for Rock Lobsters or Abalone (see Figure 3-48).

Existing Arrangement

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

Appendix Table 2-53 shows the economic impact on the regional economy of sanctuary zoning on the NZRL Fishery. Impacts are based on the gross value of displaced catches (Appendix Table 2-52). Note the displaced effort in the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries was minimal and, hence the economic impact for this displaced catch and effort has not been estimated.

Appendix Table 2-53 Regional economic impact of zoning, Cape Borda SZ

Sector	Output		Employment [a]		Household Income		Contribution to GRP	
	($m)	%	(fte jobs)	%	($m)	%	($m)	%
Direct effects								
Rock Lobster	-0.04	55%	0	48%	-0.01	56%	-0.02	58%
Downstream [b]	-0.01	11%	0	4%	0.00	4%	0.00	3%
Total Direct [c]	*-0.05*	*66%*	*0*	*51%*	*-0.01*	*60%*	*-0.02*	*61%*
Total Flow-on [c]	*-0.03*	34%	*0*	49%	*-0.01*	40%	*-0.01*	39%
Total [c]	**-0.08**	**100%**	**0**	**100%**	**-0.02**	**100%**	**-0.04**	**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] Fleurieu and Kangaroo Island State Government region.

Source: EconSearch analysis.

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

- Approximately $0.04m in total GRP, which represents less than 0.1 per cent of the regional total ($1.6b in 2016/17).

- Less than 1 fte job which represent less than 0.1 per cent of the regional total (15,596 fte jobs in 2016/17).
- Approximately $0.02m in household income, which represents less than 0.1 per cent of the regional total ($0.8b in 2016/17).

What was the estimated impact on individual fishers versus the whole fishery? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

Marine Scalefish Fishery

While the estimated displaced effort for the Western Kangaroo Island Marine Park was 0.05 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 Cape Borda SZ in the Kangaroo Island region (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 Cape Borda SZ has displaced some net fishing effort and it is currently unclear if this effort can be relocated to other locations within or outside of the Western Kangaroo Island Marine Park.

Northern Zone Rock Lobster Fishery

The estimated displaced catch in this marine park was 1.36 per cent of the total average annual catch in the Northern Rock Lobster Fishery (EconSearch 2014), but change in the fishery due to the Western Kangaroo Island 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).
- Apart from the inshore band of reef, most of the habitat inside the Cape Borda SZ is sand habitat unsuitable for rock lobster.

Abalone Fishery

The estimated displaced catch was 2.46 per cent of the total average annual catch in the fishery (EconSearch 2014), but change in the fishery due to the Western Kangaroo Island 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 Cape Borda and Cape du Couedic SZs were traditional fishing grounds but there are numerous other fishing grounds still available both in and out of the Western Kangaroo Island Marine Park.
- Apart from the inshore band of reef, most of the habitat inside the Cape Borda SZ is sand habitat unsuitable for Abalone.

Is there any evidence of a negative impact on fisheries since the introduction of the SZ? (e.g. has the catch dropped?)

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 opportunites and therefore they were not measured.

Marine Scalefish Fishery

The MSF does not harvest significant quantities from this SZ recording zero, confidential, confidential and 0-5t for Southern Calamari, Garfish, Snapper and King George Whiting, respectively, in 2016. This is comparable to historic catches (Steer et al. 2018). In addition, 1-3t of Wrasse and 1-5 t of Gummy Shark were caught in 2016 which is comparable to 2013/14 (Steer et al. 2018 and Fowler et al. 2014c).

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). 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). Catches from MFA 39 are not significantly different from the previous 6 years.

Central Zone Abalone Fishery

Blacklip and Greenlip Abalone catch fluctuates annually for North Kangaroo Island (Burnell and Mayfeild 2017). There is no evidence that the Cape Borda SZ has influenced catch in this region although data is not available for 2016 or 2017.

Sardine Fishery

While the estimated displaced effort for the Western Kangaroo Island Marine Park was 0.25 per cent of the total average annual catch in the fishery (EconSearch 2014), change in the fishery due to the Marine Park was predicted to be minimal because no displaced catch of effort was deemed necessary for removal through the Commercial Fisheries Voluntary Catch/Effort Reduction Program. However, this is an area where Sardines have been harvested so there may be issues with vessels inadvertently drifting into the SZ.

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 the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $58,000, would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster (NZRL) Fishery. Some minor catch may be made by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries.

The effect of changing the status 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.

Rock Lobster, Abalone and MSF catch in MFA 39 and SAU 32A have 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 and a temporary increase in overall catch.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $58,000, would become available again for harvesting. This would be principally by the Northern Zone Rock Lobster (NZRL) Fishery. Some minor catch may be made by the Abalone, Marine Scalefish, Sardine and Charter Boat Fisheries.

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

A.2.11.2.2 Tourism

Baseline

What tourism activities occur in or adjacent to the SZ?

No recognised tourism activities take place in the SZ. The historic Cape Borda Lighthouse, adjacent to the SZ, is a popular accommodation site.

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.2.11.2.1). 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 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 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.2.11.3 Social values and impacts

Baseline

What recreation activities occur in or adjacent to the SZ?

Recreational activity is minimal in the Cape Borda 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 (Bryars et al. 2016).

Recreational activity is minimal in the SZ due to the remote nature of the SZ. Shore-based recreation activities adjacent to the SZ are limited due to the restricted access by road to the shoreline and high cliffs.

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. This SZ is difficult to access from the land, so recreational fishing has been negligible (Bryars et al. 2016).

What does the community value about the SZ?

At the broader community level, values focus on conservation of environmental values. Submissions to the proposed zoning for Western Kangaroo Island Marine Park were significant in number. A total of 6,501 (75 per cent) of the 8,649 respondents commented specifically on the Encounter 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).

What are the non-market values of the SZ?

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

The SZ 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 Central and Kangaroo Island region over the period 2013 to 2017 has fluctuated around 70 per cent (initially 75 per cent in 2013, dropping to 60 per cent in 2016, before increasing to 80 per cent in 2017 (DEWNR 2017a) (Appendix Figure 2-36).

Existing Arrangement with Fishing Permitted

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

As the area was rarely if ever used by recreational shore-based and boat fishers, it is unlikely that changing the zoning arrangements to allow fishing would result in an increase in recreational fishing activity.

The Rock Lobster and Charter Fisheries would likely resume fishing the area. Opening the SZ to commercial fishing would be supported by the commercial fishing industry but not the conservation sector.

There may be possible loss of 'wilderness value'.

Habitat Protection Zone Status

What impact would there be to the social values of opening 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 (jetties, wharves, etc.) would occur in the location of the Cape Borda SZ.

A.2.11.4 Environmental values

Baseline

What habitats and biodiversity are found in the SZ?

The Cape Borda SZ contains sandy seafloors sloping steeply into deep waters habitats (deeper than 50m) within 1 kilometre of shore. The SZ contains a 700m boulder beach and is predominantly exposed bedrock platform reef backed by cliffs up to 200m high. Figure 3-48 (in Section 3.17.1).

Appendix Table 2-54 and Appendix Table 2-55 provide estimates of the benthic (subtidal) and shoreline (intertidal) habitats in Cape Borda SZ.

Appendix Table 2-54 Benthic (subtidal) habitats of the Cape Borda SZ

Habitat	Area (km^2)	% SZ
Bare sand	8.9	10.9
Heavy limestone reef	2.1	2.6
Unmapped	70.5	86.5

Source: DEWNR (2015c), Edyvane (1999a, b)

Appendix Table 2-55 Shoreline (intertidal) habitats of the Cape Borda SZ

Habitat	Length of shoreline (km)	% SZ
Boulder beach	1	7.0
Bedrock platform	14	93.0

Source: Source: DEWNR (2015c), Edyvane (1999a, b)

The habitats located within the Cape Borda 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 Borda 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 New Zealand fur seal), Australian fur seal, common dolphin and bottlenose dolphin (DENR 2010g). It is assumed that some of these species move through the Cape Borda SZ at times.

The SZ is a haul out site for the vulnerable Australian sea lion.

Seabirds

The Western Kangaroo Island Marine Park is used by a number of seabird species, including state endangered white-bellied sea eagle, state endangered osprey, crested tern, fairy tern and Pacific gull (DENR 2010g). Some of these species are resident while others are more transient, visiting the Western Kangaroo Island Marine Park to rest, breed and/or feed. Seabirds that breed in New Zealand or Antarctica, such as albatrosses, petrels and prions also occur in the Western Kangaroo Island Marine Park (Marchant and Higgins 1990).

White-bellied sea eagles have territories in the areas around Cape Borda SZ and are particularly vulnerable to human disturbance (Dennis et al. 2011a). Osprey territories have also been recorded around the Cape Borda SZ (Dennis et al. 2011a).

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 Borda SZ.

Fish Communities

Much of the knowledge concerning fish and marine macro-invertebrate communities has been developed through the Marine Parks 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 Cape Borda 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 Cape Borda 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 Cape Borda SZ include:

- This majority of this zone is characterised by deep water habitats (deeper than 50m) within 1 kilometre of shore.
- The habitat comprises of predominantly exposed bedrock platform reef backed by cliffs up to 200m high and a 700m boulder beach.
- Other habitats include sandy seafloors sloping steeply into deep waters.

Important features of the SZ include:

- The near shore reef system is important habitat for long lived site-attached fish including western blue groper, harlequin fish, and western blue devils.
- This site is also an important haul out area for Australian sea lion.
- This zone is a nesting area for the state endangered white-bellied sea eagle.
- Two reef monitoring sites contribute to long term monitoring.
- The reefs in this zone contain a high diversity of benthic macro algae, a key species in reef ecosystems.

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 Cape Borda SZ became operational in 2014.

Predicted changes

Predicted changes that apply to all SZs are described in Section A.8.1. Predicted changes to indicator species relevant to the Cape Borda 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 Cape Borda SZ (Bailey et al. 2012a). 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 Borda 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.8.2.

The NZRL Fishery was the principal fishery that previously used the Cape Borda SZ. There was some use, albeit minor, of the SZ by the Abalone, Marine Scalefish, Sardine 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 the SZ to different activities?

Refer to Introduction Section A.8.3 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 Cape Borda SZ to fishing would have negative impact on those species commonly targeted including Kings George whiting, snapper, rock lobster, abalone, sardines 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 could be compromised by allowing fishing in the SZ with negative flow on effects for biodiversity conservation and 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. 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

Whales and dolphins commonly use or pass through this SZ and there is a long nosed fur seal haulout in this SZ. There is one active white-bellied sea eagle nest located on the cliffs adjacent to this 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.8.3 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 Borda 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.

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

The Cape Borda SZ has several habitat types that are sensitive to disturbance such as reef and seagrass including the associated fauna. It is unlikely that activities such as aquaculture and coastal developments (jetties, wharves, etc.) would ever occur in the location of the Cape Borda SZ. However, if these activities were to occur then it is possible that they would impact on environmental values as outlined in Section A.8.4.

Refer to Section A.8.4 for an overview on what changing/downgrading the zoning would mean to the CAR system. Specifically, the Cape Borda SZ captures the full transition from nearshore coastal reef to deep water sand characteristic of Investigator Strait. Changing/downgrading the zoning would compromise the CAR system by reducing the protection for these representative habitats.

A.2.12 Cape du Couedic Sanctuary Zone

A.2.12.1 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 2-50) 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.

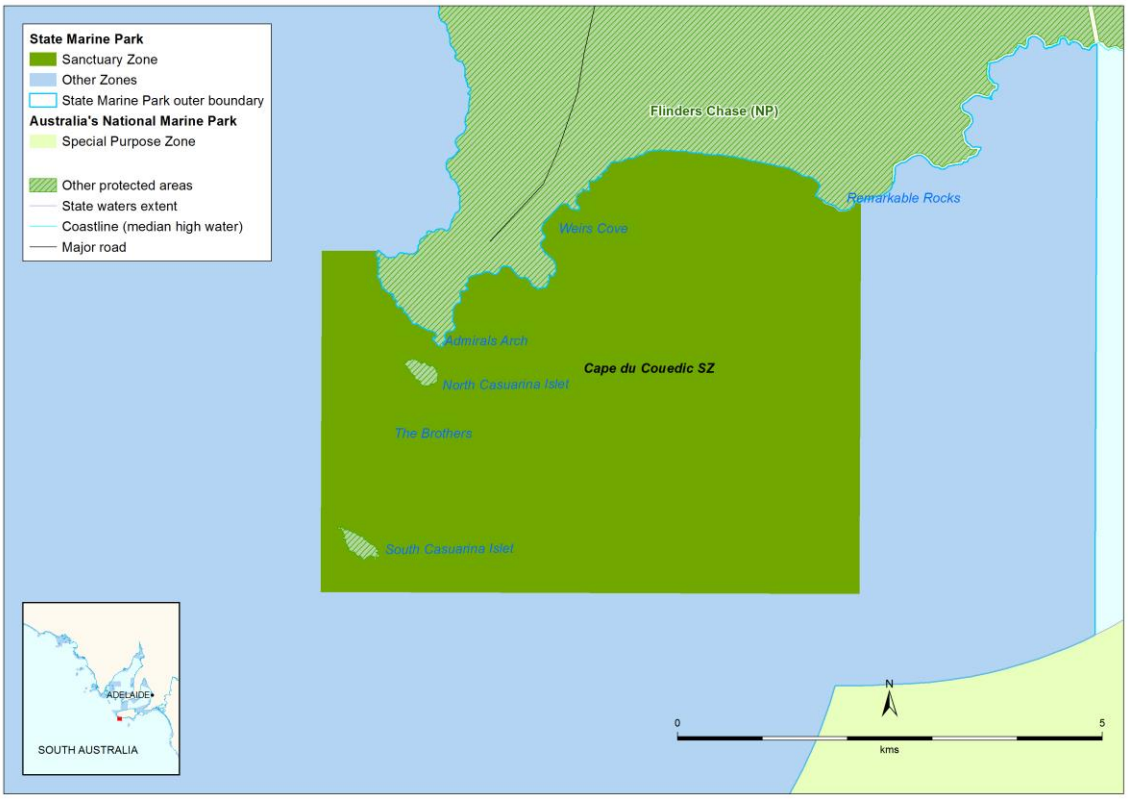
The SZ is located in an area with a seasonal upwelling that provide nutrients to support complex food webs. The SZ protects complex reefs extending at least 50 m deep as well as exposed bedrock, sand and soft bottom habitats. This productive area supports marine mammals, crustaceans, molluscs and a number 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 2-50 Cape du Couedic sanctuary zone



Source: APPENDIX 9

A.2.12.2 Economic values and impacts

A.2.12.2.1 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 2-56. The total gross value of displaced catch in this SZ is estimated to be at least $659,000, distributed between the Abalone ($217,000), Rock Lobster ($441,000), Marine Scalefish ($2,000) 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).

Appendix Table 2-56 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)
Sardines	-	-	-
Abalone	4,600	2.47%	217
Rock Lobster	7,300	1.12%	441
Marine Scalefish	17	0.03%	2
Charter Boat	Confidential	-	-

[a] Fisher days (MSF), person days (Charter Boat Fishery) and kg (other fisheries).

[e] 2018 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.2.12.4) 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 2-57 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 2-56). 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 2-57 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	15%	0	0%	-0.16	31%	-0.21	25%
Rock Lobster	-0.44	31%	-2	32%	-0.14	27%	-0.24	29%
Downstream [b]	-0.09	6%	0	2%	-0.01	2%	-0.01	2%
Total Direct [c]	*-0.75*	*53%*	*-2*	*34%*	*-0.31*	*60%*	*-0.46*	*55%*
Total Flow-on [c]	*-0.67*	47%	*-4*	66%	*-0.21*	40%	*-0.37*	45%
Total [c]	**-1.42**	**100%**	**-6**	**100%**	**-0.52**	**100%**	**-0.83**	**100%**
Regional Total [d]	2,498.81		15,596		834.61		1,586.16	
Impact on Region	-0.1%		0.0%		-0.1%		-0.1%	

[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 $0.83m in total GRP, which represents 0.1 per cent of the regional total ($1.6b in 2016/17).
- Approximately 6 fte jobs which represent less than 0.1 per cent of the regional total (15,596 fte jobs in 2016/17).
- Approximately $0.52m in household income, which represents 0.1 per cent of the regional total ($834.6m in 2016/17).

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? (e.g. effects of fishery buyback scheme, any individual compensation claims received)

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? (e.g. has the catch dropped?)

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 opportunites 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).

Existing Arrangement with Fishing Permitted

What impact would there be to the fisheries values of opening the SZ to different fishing activities? (e.g. would the CPUE and fishing efficiency increase)

The total gross value of displaced catch in this SZ, estimated to be at least $659,000, 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.

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.

Habitat Protection Zone status

What impact would there be to the fisheries values of opening the SZ to (non-fishing) activities allowed in a HPZ but not a SZ? (e.g. potential impacts from dredging, coastal development, aquaculture)

The total gross value of displaced catch in this SZ, estimated to be at least $659,000, 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.

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.2.12.2.2 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 2-58 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 2-58 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.2.12.2.1). 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 different fishing activities?

The effect of changing the status 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.

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 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 the SZ to (non-fishing) activities allowed in an HPZ.

A.2.12.3 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[109] (Robinson 1990).

[109] '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.

What are the non-market values of the SZ?

Nature-based experience and education value

Tourism is important to Kangaroo Island's economy[110]. 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.2.12.4, 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 2-10).

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.

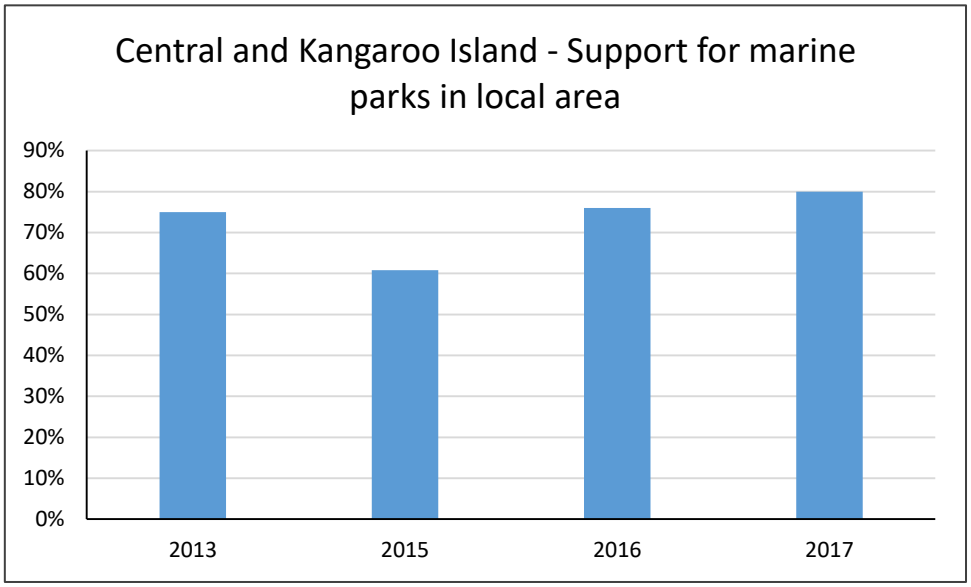
Have social values changed due to the SZ?

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[111]) (Appendix Figure 2-1).

[110] 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).

[111] 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 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.2.12.4 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 Section 3.17.1) provides a map of the main benthic (subtidal) habitats of the Western Kangaroo Island Marine Park. Appendix Table 2-59 and Appendix Table 2-60 provide estimates of the areas of benthic (subtidal) and shoreline (intertidal) habitats of the Cape du Couedic SZ.

Appendix Table 2-59 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), Edyvane (1999a, b)

Appendix Table 2-60 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: Source: DEWNR (2015c), 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 2-61). 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 2-61). 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 2-61 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

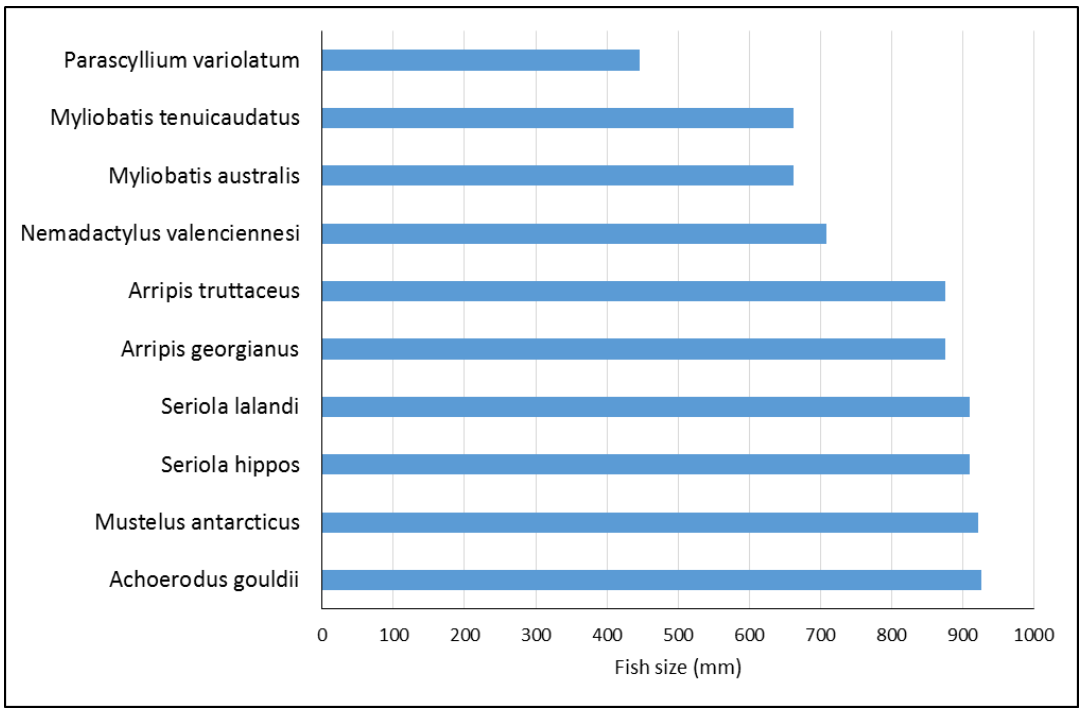
[a] 20 most abundant species shown out of a total of 34 species.

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 antar*cticus) and yellowtail kingfish (*Seriola lalandii*) recorded between 850 and 1000mm (Appendix Figure 2-51).

Appendix Figure 2-51 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 2-10).

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 2-13).

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 2-15).

Sharks and rays

In terms of sharks and rays, Cape du Couedic SZ had low numbers recorded on BRUVS (Appendix Figure 2-17).

Indicator species

Overall Cape du Couedic SZ has relatively low abundances of the reef associated indicator species identified for BRUVS monitoring (Appendix Figure 2-18). 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 2-18).

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.8.2.

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 the SZ to different activities?

Refer to Introduction Section A.8.3 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 proximinity 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.8.3 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.8.4 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.8.4.

Refer to Section A.8.4 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.

APPENDIX 3 FISHERY TRENDS

The following section of the report provides estimates of catch, TACC, CPUE, average licence values, rate of return to total capital, economic rent and other factors for each of the SA commercial Fisheries discussed in this report.

Catch, **TACC** and **CPUE** are sourced from the various stock status and fishery assessment reports published by SARDI.

GVP and **Price** sourced from EconSearch reports are based on beach prices and are reported in real 2016/17 terms.

The **value of licences** sourced from EconSearch reports can represent a significant proportion of the capital used by each licence holder in the fisheries. The reported licence values represent the licence holders' estimates of the value of their licence based on the latest survey responses.

The **rate of return to total capital** sourced from EconSearch reports is calculated to be profit at full equity as a percentage of total capital employed. Capital includes boats, licence/quota, fishing gear, sheds, vehicles and other capital items used as part of the fishing enterprise.

Economic rent sourced from EconSearch reports is defined as the difference between the price of a good produced using a natural resource and the unit cost of turning that natural resource into the good. It is worth noting that zero economic rent is the usual situation for firms in a market without limited or restricted entry and that this rent is the income received by ownership of a licence.

There are a number of **other factors,** sourced from EconSearch reports, that impact on the economic performance of the fisheries. Some factors common across all fisheries include:

- fuel prices
- interest rates
- wage rates
- prices for other inputs

Other factors specific to individual fisheries are detailed under each fishery below.

Abalone

Data presented in Appendix Table 3-1 indicate that total catch of Abalone in the Western Zone declined by 23 per cent over the past 15 years. As a result of this decline in catch and a real price fall of 31 per cent, real GVP has almost halved between 2002/03 and 2016/17. The Central Zone Fishery has also seen a similar real price decline (36 per cent) but with a 5 per cent increase in catch, real GVP has only declined by 32 per cent over the same period.

Appendix Table 3-1 Catch, GVP, price and TACC of the Western and Central Abalone Fisheries, 2002/03 to 2016/17 [a]

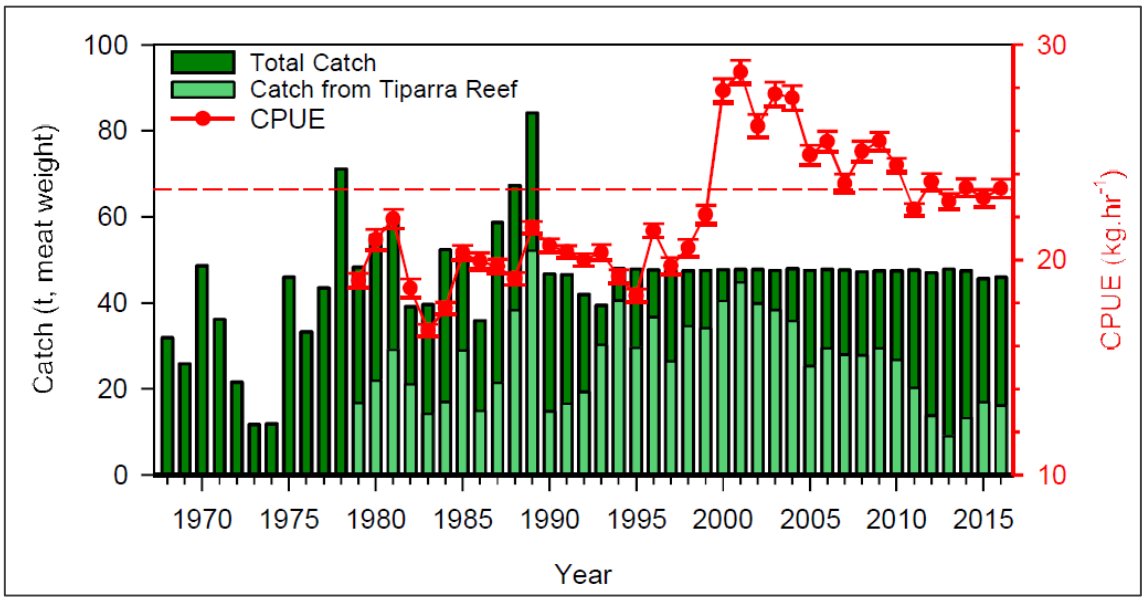
	Western Zone				Central Zone			
	Catch (t)	GVP ($m)	Price ($/kg)	TACC (t)[b]	Catch (t)	GVP ($m)	Price ($/kg)	TACC (t)[b]
2002/03	573	31.2	54.52	583	171	11.2	65.37	185
2003/04	559	27.9	49.83	583	177	8.9	50.47	185
2004/05	565	27.1	47.92	583	180	9.8	54.30	173
2005/06	579	27.3	47.20	604	181	9.2	50.92	167
2006/07	551	24.0	43.54	604	168	7.7	45.89	167
2007/08	550	23.5	42.70	604	193	8.3	43.11	167
2008/09	535	26.0	48.59	604	151	6.7	44.15	167
2009/10	544	21.9	40.20	566	164	6.3	38.34	167
2010/11	508	19.7	38.79	538	155	6.3	40.91	167
2011/12	503	19.4	38.51	524	166	6.9	41.59	167
2012/13	541	20.2	37.26	490	174	6.1	34.78	167
2013/14	374	13.5	36.18	471	168	5.8	34.61	167
2014/15	446	16.3	36.51	471	163	5.8	35.50	157
2015/16	353	13.3	37.73	443	139	5.6	40.10	157
2016/17	439	16.5	37.50	443	180	7.6	41.99	157

[a] GVP and prices are in real 2016/17 terms.

Source: Burnell et al. 2016, Stobart et al. 2017 and EconSearch 2018a

Central Zone Greenlip Abalone CPUE (Appendix Figure 3-1) was relatively stable from 1985 to 1999 but increased significantly in 2000 and 2001. After 2001, a decreasing trend in CPUE for was evident before stabilising between 2011 and 2016 (Burnell and Mayfield 2017).

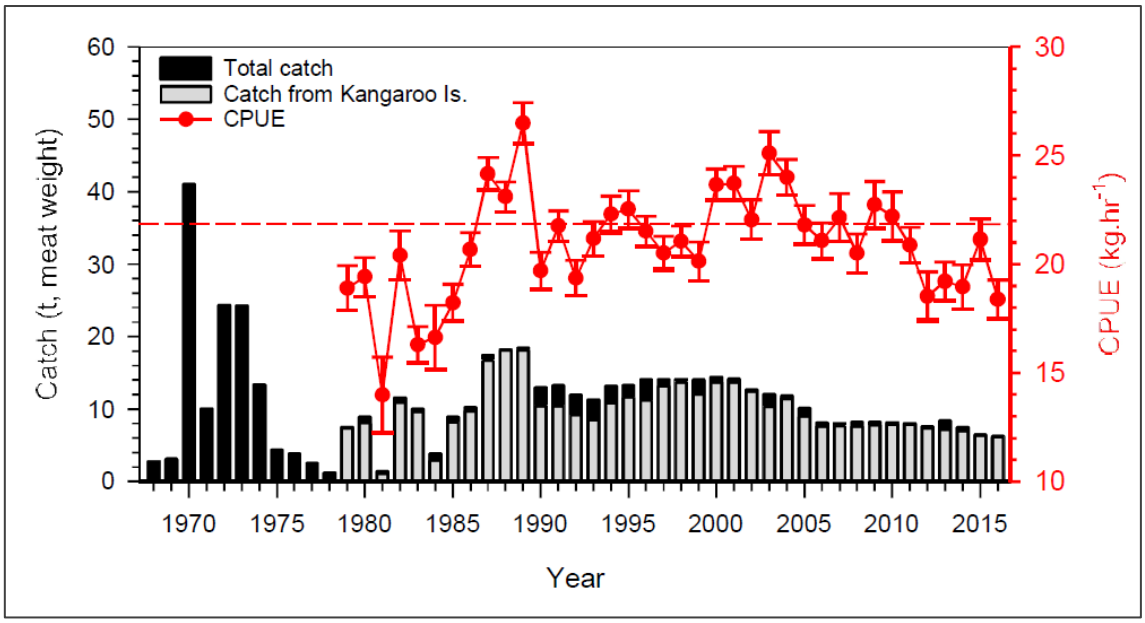
Appendix Figure 3-1 Total catch (t ,meat weight), catch from Tiparra Reef (t, meat weight, 1979 to 2016) and CPUE (kg/hr) of Greenlip Abalone from the Central Zone, 1968 to 2016



Source: Burnell and Mayfield 2017

Since 1989 Central Zone Blacklip Abalone CPUE (Appendix Figure 3-2) has followed a declining trend with mean CPUE in 2016 the lowest level since 1985 (Burnell and Mayfield 2017).

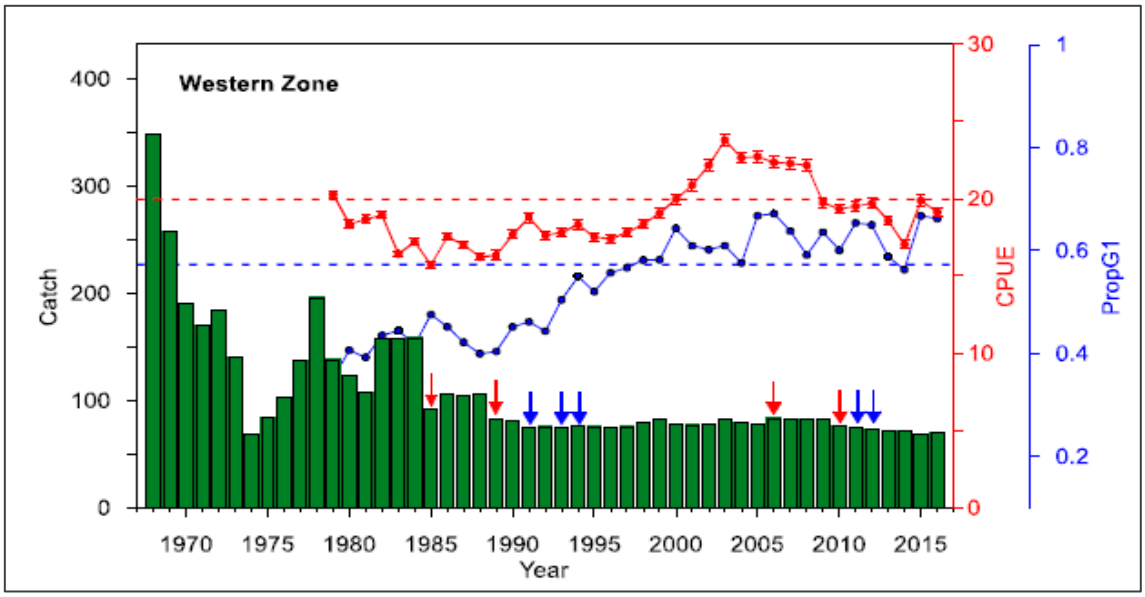
Appendix Figure 3-2 Total catch (t ,meat weight), catch from Kangaroo Island (t, meat weight, 1979 to 2016) and CPUE (kg/hr) of Blacklip Abalone from the Central Zone, 1968 to 2016



Source: Burnell and Mayfield 2017

Western Zone Greenlip Abalone CPUE (Appendix Figure 3-3) declined between 2003 and 2013 but increased in 2014 before a slight decline in 2015.

Appendix Figure 3-3 Catch (t, meat weight), CPUE (kg/hr) and the proportion of Grade 1 (PropG1) of Greenlip Abalone from the Western Zone, 1968 to 2016 [a]

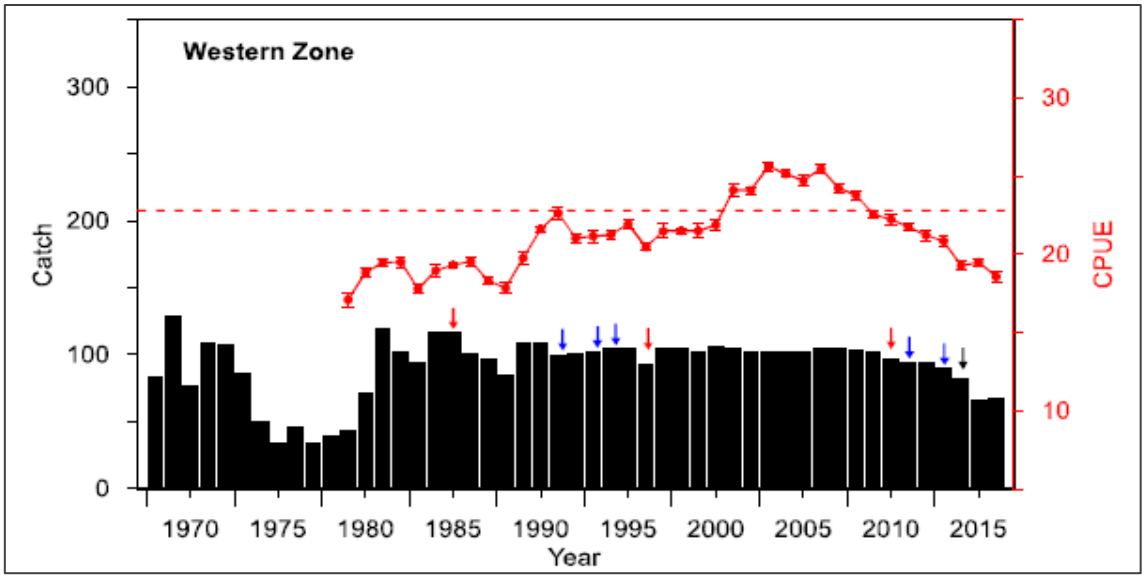


[a] Red arrows indicate implementation (1985) and amendment (1989, 2006 and 2010) of the Greenlip TACC in Region A. Blue arrows indicate implementation (1991) and amendment (1993, 1994, 2011 and 2013) of the TACC in Region B.

Source: Stobart et al. 2017

Western Zone Blacklip Abalone CPUE (Appendix Figure 3-4) followed an increasing trend between 1979 to 2006 before declining over the next ten years to 2016 (Stobart et al. 2017).

Appendix Figure 3-4 Catch (t ,meat weight) and CPUE (kg/hr) of Blacklip Abalone from the Western Zone, 1968 to 2016 [a]

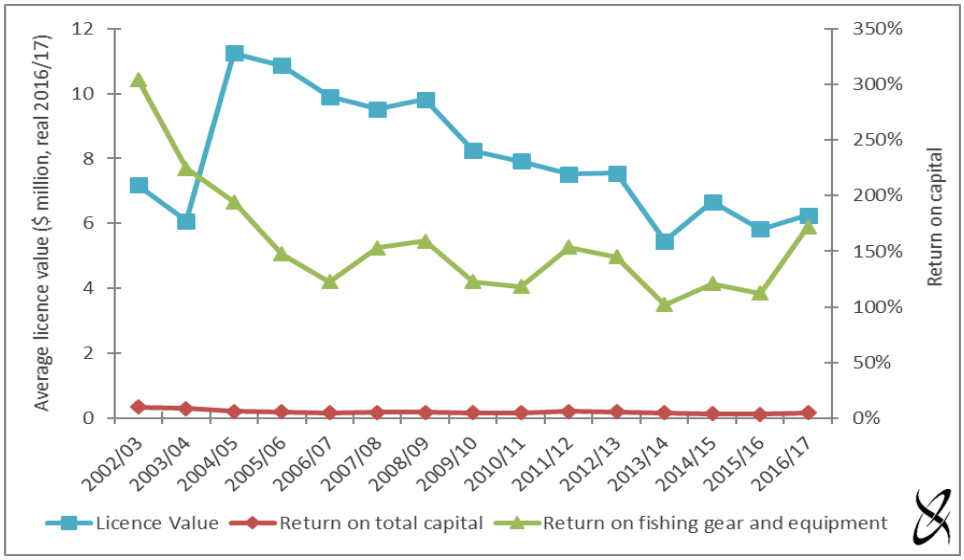


[a] Red arrows indicate implementation (1985) and amendment (1996 and 2010) of the Blacklip TACC in Region A. Blue arrows indicate implementation (1991) and amendment (1993, 1994, 2011 and 2013) of the TACC in Region B. Black arrow indicates amendment to the WZ TACC (2014).

Source: Stobart et al. 2017

The estimated licence value and rate of return to total capital for the Abalone Fishery (all zones) declined over the 15 years to 2016/17. The decline was a result of a decrease in profitability in the fishery. While this measure of return on investment has declined, it should be noted that the fishery is still highly profitable (Appendix Figure 3-5 and EconSearch 2018a).

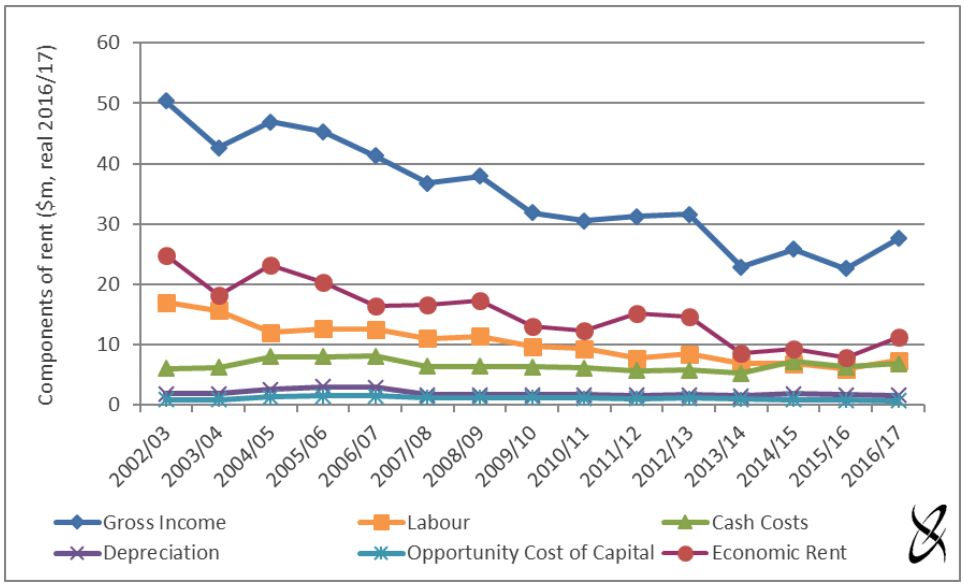
Appendix Figure 3-5 Licence values and return on capital in the SA Abalone Fishery, 2002/03 to 2016/17



Source: EconSearch 2018a

The economic rent generated in the SA Abalone Fishery (Appendix Figure 3-6) followed a downward trend, with some fluctuations, over the 15-year period between 2002/03 and 2016/17. Rent more than halved over the period to $11.2 million in 2016/17.

Appendix Figure 3-6 Economic rent in the SA Abalone Fishery, 2002/03 to 2016/17 [a]



[a] All indicators are expressed in real 2016/17 terms.

Source: EconSearch 2018a

Some factors influencing the economic performance of the Abalone Fishery were sourced from EconSearch (2018a) and are described below.

Illegal, unregulated and unreported abalone fishing activity is an ongoing problem that has the potential to cost the industry millions of dollars in lost income per year. This practice also undercuts the economic benefits received by legitimate Abalone fishers.

A proportion of the SA Abalone catch is exported overseas each year. The *value of the Australian dollar* can have a significant impact on the economic performance of the fishery since the Australian dollar influences the price of Australian exports overseas. Significant changes in the value of the Australian dollar, therefore, have the potential to influence the demand for Australian Abalone exports. The coefficient of correlation between the exchange rate (USD) and the price for SA Abalone for the period 2002/03 to 2016/17 is –0.76. This indicates that there was a strong inverse relationship between the two variables over this period. Thus, when the Australian dollar depreciates, the average price received by SA Abalone fishers tends to increase, as it did between 2013/14 and 2015/16. While this relationship is not expected to hold in each individual year, it does hold over the longer periods.

The total quantity of *Abalone products exported* in 2016/17 represented approximately 24 per cent of total SA Abalone catch, compared to 18 per cent in the previous year. While the majority of Abalone harvested in SA does get exported not all of it leaves directly from SA. In some instances, it is further processed in other states and then exported, and in other instances, it is flown to another state before it is transferred to an international flight.

Blue Crab Fishery

The total catch of Blue Crabs in the gulfs in SA increased from 515 tonnes in 2002/03 to a peak of 625 tonnes in 2007/08 before decreasing to 511 tonnes in 2012/13. Catch has followed an increasing trend between 2012/13 and 2016/17, reaching 627t in 2016/17. Comparison of the two end-years in Appendix Table 3-2 (2002/03 and 2016/17) illustrates how the value of the fishery has changed over the 15 years. The total catch in 2016/17 (627t) was 22 per cent above that in 2002/03 while the GVP was 86 per cent higher than that in 2002/03, a result of the increase in catch (22 per cent) and a rise in the real price (52 per cent). The TACC was set at 627t between 2002/03 and 2012/13, was reduced to 578 in 2013/14 and 2014/15 due to stock sustainability concerns and increased once again for 2015/16 and 2016/17 (Appendix Table 3-2 and EconSearch 2018b).

Appendix Table 3-2 Catch, GVP, price and TACC of the Blue Crab Fishery, 2002/03 to 2016/17[a]

	Catch (t)	GVP ($m)	Price ($/kg)	TACC (t)
2002/03	515	4.4	8.52	627
2003/04	559	4.6	8.17	627
2004/05	584	4.4	7.51	627
2005/06	600	6.3	10.53	627
2006/07	617	6.7	10.82	627
2007/08	625	6.5	10.47	627
2008/09	604	6.1	10.06	627
2009/10	539	4.7	8.77	627
2010/11	591	5.2	8.78	627
2011/12	611	5.8	9.44	627
2012/13	511	5.2	10.24	627
2013/14	571	6.1	10.67	578
2014/15	576	6.1	10.64	578
2015/16	625	7.2	11.53	627
2016/17	627	8.1	12.99	627

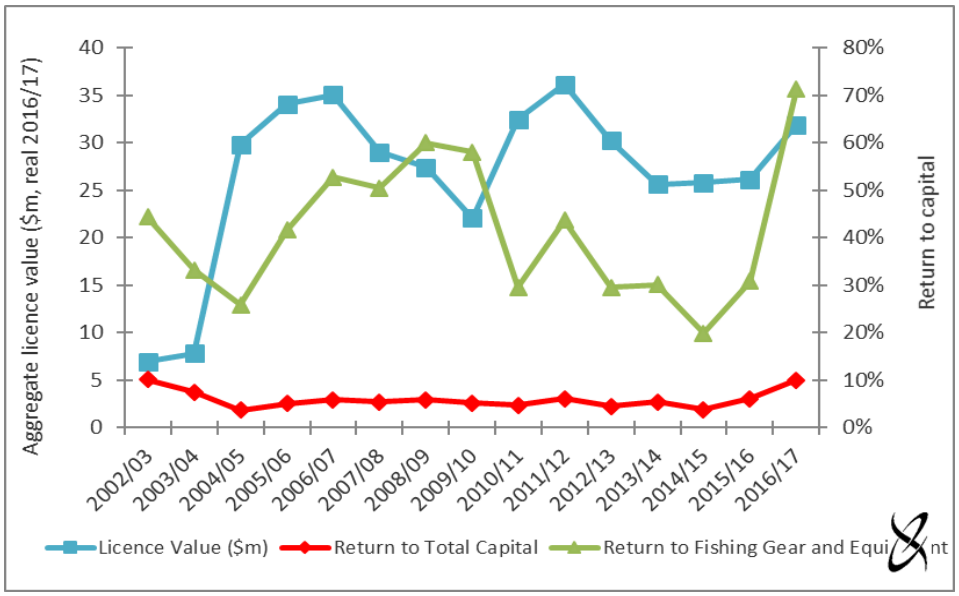
[a] GVP and prices are in real 2016/17 terms.

Source: EconSearch 2018b

Commercial CPUE in SG remained stable and in 2016/17 was the fifth highest annual estimate recorded since 1996/97. Commercial CPUE in GSV in 2016/17 was the highest on record (Beckman and Hooper 2018).

Despite fluctuations, the estimated rate of return to total capital for the Blue Crab Fishery has decreased slightly overall between 2002/03 (10.1 per cent) and 2016/17 (9.9 per cent). This was caused by total boat capital (including licence value) within the fishery increasing at a faster rate than profitability (which also increased). The rate of return to fishing gear and equipment (excluding licence value) followed an increasing trend, from 44.4 per cent in 2002/03 to 71.2 per cent in 2016/17 (Appendix Figure 3-7). This reflects the slower rate of increase in the value of fishing gear and equipment within the fishery relative to profitability (EconSearch 2018b).

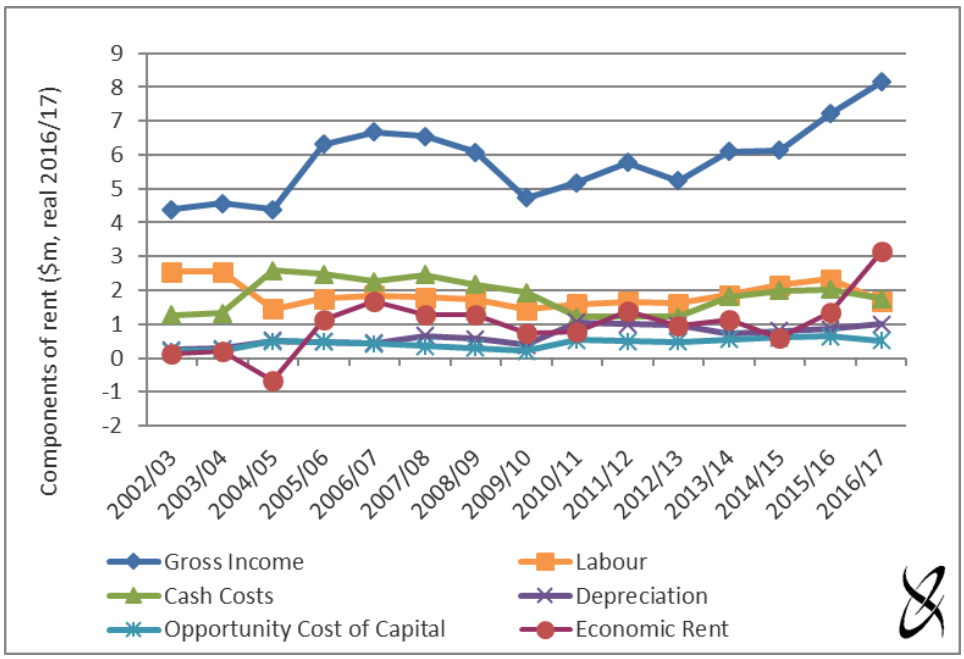
Appendix Figure 3-7 Licence values and return on capital in the SA Blue Crab Fishery, 2002/03 to 2016/17



Source: EconSearch 2018b

The economic rent in the Blue Crab Fishery (Appendix Figure 3-8) increased from $0.1 million in 2002/03 to a peak of $3.2 million in 2016/17, mainly due to the increase in income but also partly attributable to a fall in the cost of labour (Appendix Figure 3-8). Fluctuations in economic rent during this period can be attributed to fluctuating income, fluctuating cash costs, higher depreciation and a higher opportunity cost of capital (due to increased investment in fishing gear and equipment).

Appendix Figure 3-8 Economic rent in the SA Blue Crab Fishery, 2002/03 to 2016/17 ($'000) [a]



[a] All indicators are expressed in real 2016/17 terms.

Source: EconSearch 2018b

Some factors influencing the economic performance of the SA Blue Crab Fishery were sourced from EconSearch (2018b) and are described below.

The *seasonality and strategic marketing* of SA Blue Crabs influence the economic performance of the fishery. Within each financial year, beach prices in SA tend to peak in December and trough in January to March, corresponding with a period of peak supply. However, these prices are likely to underestimate the average price received by fishers as higher prices are realised in interstate markets.

As well as *spatial closur*es, the Blue Crab Fishery is also subject to *temporal closures*. SG is closed from 21 December until 19 February each year. Licence holders are able to take advantage of higher prices in the lead up to Christmas. GSV is closed from 1 November until 15 January. Given a number of strict conditions, the GSV closure was modified for 2015/16 to 2017/18 to allow a temporary fishing trial during the closure period. This enabled GSV fishers to also take advantage of the higher prices in the lead up to Christmas (Beckmann and Hooper 2018).

Northern Zone Rock Lobster Fishery

Total catch in the SA NZRL Fishery was 320t in 2016/17, below the TACC of 360t (Appendix Table 3-3). This was a similar level of catch to the previous seven years but notably lower than the decade prior (i.e. 595t in 2002/03 and 403t in 2008/09).

Real value of catch in the SA NZRL Fishery was $20.3 million in 2016/17, a 20 per cent decline from that of 2015/16 (Appendix Table 3-3). The decrease in value was due to 8 per cent fall in catch and a 13 per cent decrease in the real price for rock lobster. Between 2002/03 and 2016/17 real value of catch has fluctuated but decreased overall from $26.2 million in 2002/03 to $20.3 million in 2016/17.

Appendix Table 3-3 Catch, GVP, price and TACC of the SA NZRL Fishery, 2002/03 to 2016/17[a]

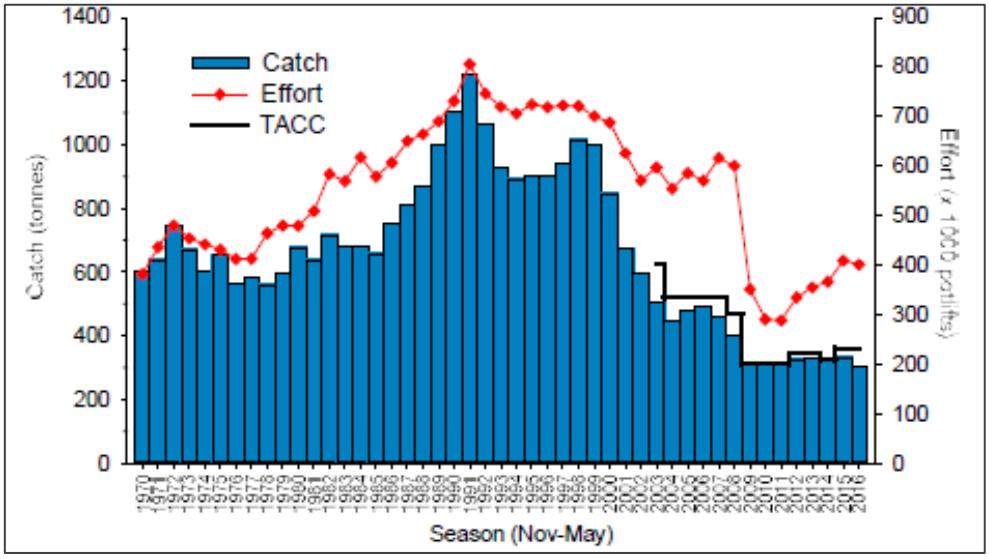
Year	Catch (tonnes)	GVP ($m)	Price ($/kg)	TACC (T)
2002/03	595	26.2	43.96	-
2003/04	504	16.3	32.26	625
2004/05	446	15.4	34.47	520
2005/06	476	19.6	41.26	520
2006/07	492	22.5	45.70	520
2007/08	459	19.1	41.52	520
2008/09	403	22.8	56.53	470
2009/10	310	17.3	55.88	310
2010/11	313	15.8	50.42	310
2011/12	307	18.5	60.16	310
2012/13	325	16.6	51.18	345
2013/14	331	20.3	61.23	345
2014/15	321	23.0	71.85	323
2015/16	347	25.3	72.89	360
2016/17	320	20.3	63.30	360

[a] GVP and prices are in real 2016/17 terms.

Source: EconSearch 2018c

SA NZRL CPUE followed an increasing trend between 1970 and 1991, then declined through to 2011. Since 2011, CPUE has followed a decreasing trend (Linnane et al. 2017).

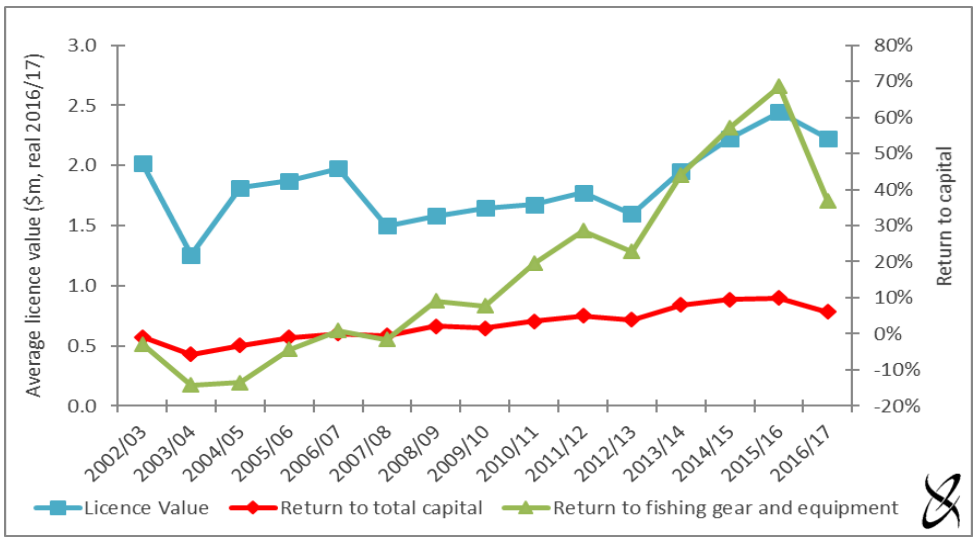
Appendix Figure 3-9 Catch, CPUE and TACC in the SA NZRL Fishery, 1970 to 2016



Source: Linnane et al. 2017

There was a decline in the average rate of return to capital for the SA NZRL Fishery between 2002/03 and 2003/04. Since that time, and coinciding with the introduction of quota, it has improved significantly, rising from -5.7 per cent in 2003/04 to 6.1 per cent in 2016/17. Licence values have steadily increased over the same period (Appendix Figure 3-10 and EconSearch 2018g).

Appendix Figure 3-10 Licence values and return on capital in the SA NZRL Fishery, 2002/03 to 2016/17

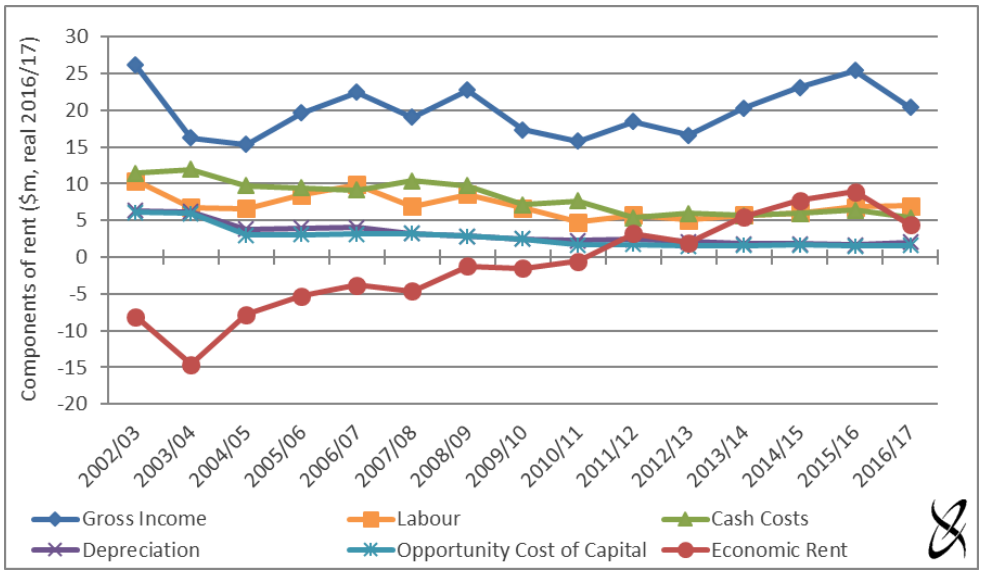


Source: EconSearch 2018c

Economic rent in the SA NZRL Fishery (Appendix Figure 3-11) fluctuated between years but increased overall. In 2002/03, estimated economic rent in the fishery was -$8.1 million and

declined through to 2003/04 when it was estimated to be -$14.6 million. Since then it has followed an increasing trend and in 2011/12 it was estimated to be approximately $3.2 million. This was the first time that economic rent had been estimated to be positive in this fishery for more than a decade. In 2016/17, economic rent increased to $4.4 million. Notwithstanding the 2012/13 and 2016/17 declines, the increase in economic rent since 2003/04 is attributable to a combination of a reduction in labour, capital and operating costs. In other words, the rising trend in economic rent is largely due to significant improvements in economic efficiency.

Appendix Figure 3-11 Economic rent in the SA NZRL Fishery, 2002/03 to 2016/17 ($'000) [a]



[a] All indicators are expressed in real 2016/17 dollars.

Source: EconSearch 2018c

Some factors influencing the economic performance of the SA NZRL Fishery were sourced from EconSearch (2018c) and are described below.

The volume and value of Rock Lobster *exports* from SA have decreased significantly since 2007/08 (66 per cent decrease in volume and 26 per cent decrease in value). However, these data only include exports direct from SA and not product that is shipped interstate and then exported (i.e. more product seems to be shipped via Melbourne or Sydney rather than directly from Adelaide). Vietnam, China and Hong Kong are the main export destinations for SA Rock Lobster exports.

Factors that will continue to impact exports to these markets include the value of the Australian dollar (see detail below), economic growth rates in China and surrounding Asian regions, import tariffs and competition from lower-cost alternative product (Rock Lobster from South Africa and tropical Rock Lobster from Cuba and Vietnam), and the prices within other Australian states due to the cointegration of the Rock Lobster market.

A significant proportion of the SA Rock Lobster catch is exported overseas each year. The *value of the Australian dollar* can have a significant impact on the economic performance of the fishery since the Australian dollar influences the price of Australian exports overseas. Significant changes in the value of the Australian dollar, therefore, have the potential to influence the

demand for Australian Rock Lobster exports. The coefficient of correlation between the exchange rate (USD) and the price for SA Rock Lobster for the period 2002/03 to 2016/17 is 0.29. This indicates that there is no obvious inverse relationship between the two variables, although year to year movements can be observed. This implies, price growth for Rock Lobster has been from market changes rather than exchange rate volatility. In the long-run, price trends seen in the NZRL Fishery are not simply a function of exchange rate but shifts in the market supply and demand. Numerous factors have contributed to dynamics of this market over the time period shown, including tariff barriers, increasing affluence, and changes in the supply of products. However, short-run fluctuations in price can be explained, in part, by short-run fluctuations in the exchange rate.

Spencer Gulf and West Coast Prawn Fisheries

The catch levels shown in Appendix Table 3-4 indicate that total catch in the SG and West Coast (SGWC) Prawn Fisheries has been relatively stable over the period 2002/03 to 2016/17. However, from year to year the catch can be highly variable compared to other SA commercial fisheries. For example, a significant change in catch levels occurred between 2008/09 and 2009/10 when catch rose by 28 per cent, from 1,915 tonnes to 2,445 tonnes. Additionally, a 28 per cent increase in catch occurred between 2014/15 and 2015/16.

The value of the SGWC Prawn Fisheries was only 7 per cent higher in real terms in 2016/17 than it was in 2002/03. This was principally due to the significant increase in catch (46 per cent) because the real price for Prawns was 27 per cent lower in 2016/17 than in 2002/03.

Appendix Table 3-4 Catch, GVP and price of the SGWC Prawn Fisheries, 2002/03 to 2016/17[a]

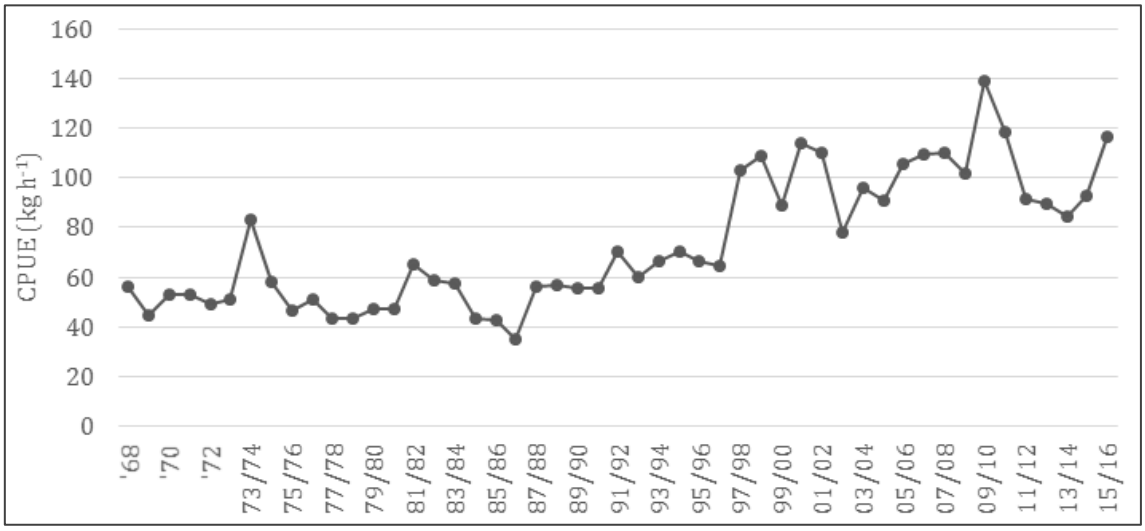
	Catch (t)	GVP ($m)	Price ($/kg)
1999/00	1,508	39.2	26.00
2000/01	1,958	54.5	27.84
2001/02	1,960	42.3	21.59
2002/03	1,891	43.2	22.86
2003/04	2,024	49.3	24.34
2004/05	2,088	39.4	18.87
2005/06	1,915	36.3	18.95
2006/07	2,445	32.7	13.39
2007/08	2,115	35.3	16.70
2008/09	1,840	29.2	15.89
2009/10	1,881	32.2	17.10
2013/14	1,805	30.9	17.12
2014/15	1,848	32.2	17.40
2015/16	2,357	42.0	17.83
2016/17	2,205	41.9	19.00

[a] GVP and prices are in real 2016/17 terms.

Source: EconSearch 2018d

Despite year to year fluctuations, SG Prawn Fishery CPUE followed an increasing trend over the period 1968 to 2015/16 (Appendix Figure 3-12).

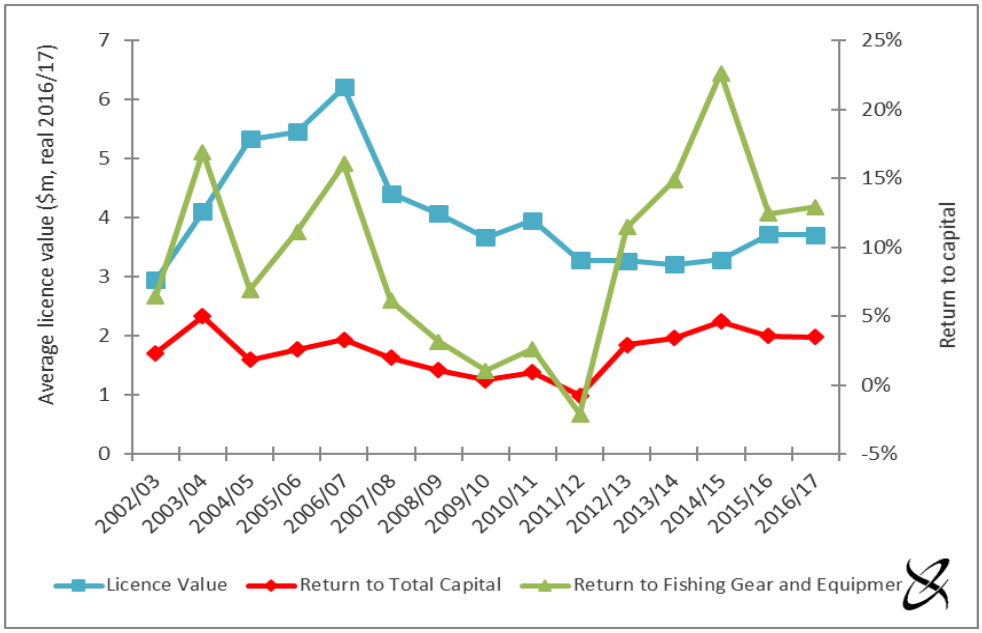
Appendix Figure 3-12 Spencer Gulf Prawn Fishery CPUE, 1968 to 2015/16



Source: Noell and Hooper 2017

The estimated rate of return to total capital for the SGWC Prawn Fisheries declined across the period 2002/03 to 2011/12. However, between 2011/12 and 2016/17 the estimated rate of return to total capital increased from -0.8 per cent to 3.5 per cent. This is a result of an increase in profitability in the fisheries. Despite the low rate of return on total capital it is worth noting, however, that the fisheries are still highly profitable and that the low return to total capital reported here is a result of high licence values (Appendix Figure 3-13 and EconSearch 2018d).

Appendix Figure 3-13 Licence values and return on capital in the SGWC Prawn Fisheries, 2002/03 to 2016/17

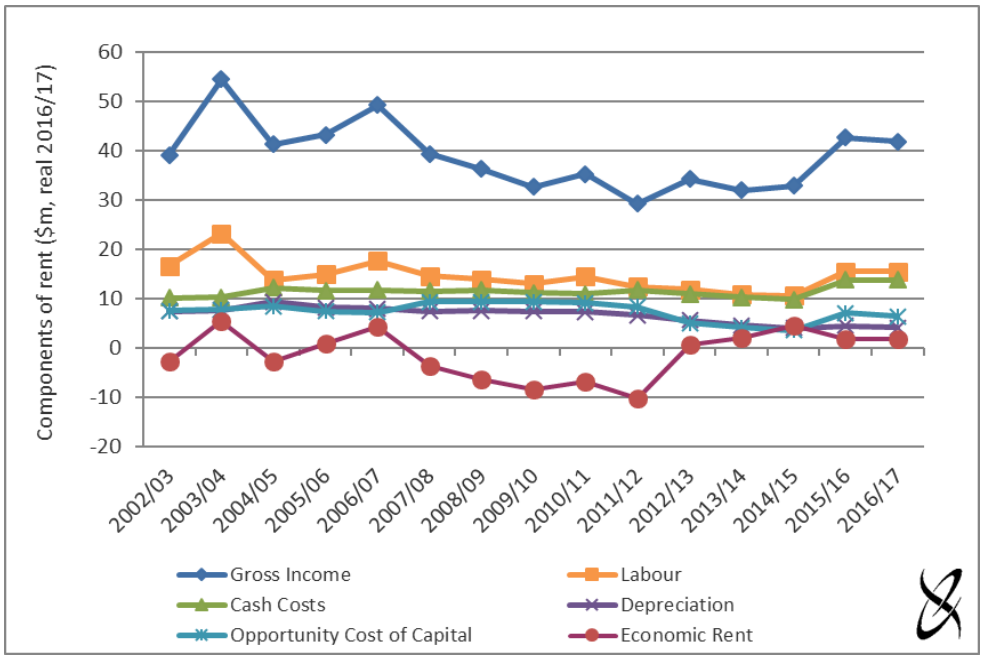


Source: EconSearch 2018d

Economic rent in the SGWC Prawn Fisheries has followed a decreasing trend, with some fluctuations between 2002/03 and 2011/12 but has increased since. Fluctuations in rent are

closely linked to fluctuations in fishery GVP (Appendix Figure 3-14). Labour costs are also linked to fishery GVP because the majority of fishing businesses pay crew a share of catch.

Appendix Figure 3-14 Economic rent in the SGWC Prawn Fisheries, 2002/03 to 2016/17 ($'000)[a]



[a] All indicators are expressed in real 2016/17 dollars.

Source: EconSearch 2018d

Some factors influencing the economic performance of the SGWC Prawn Fisheries were sourced from EconSearch (2018d) and are described below.

As a proportion of total Prawn catch in South Australia, Prawn *exports* from South Australia decreased from 82 per cent in 2002/03 to 3 per cent in 2016/17. This is attributable to a collection of factors that have shifted the Prawn market across this period, including:

- an increase in lower priced Prawn imports
- a decrease in catch levels
- a decrease in domestic price, increasing domestic consumption
- a higher exchange rate, reducing the competitiveness of domestic Prawns through making imported products more affordable.

The high quantity of *imported* Prawns can have a negative impact on the price of local product. The total quantity of Prawns imported into Australia increased by 65 per cent between 2002/03 and 2004/05 from approximately 18,000 tonnes to almost 30,000 tonnes but declined to just under 13,000 tonnes in 2008/09. This decline between 2004/05 and 2008/09 may be attributable to the quarantine measures on the importation of Prawns implemented by Biosecurity Australia in 2007. The quantity of Prawns imported increased again between 2008/09 and 2013/14 to reach almost 26,000 tonnes but has declined over the past three years and was only 15,797 tonnes in 2016/17, a 39 per cent decrease from 2013/14. The increase in

the quantity of prawns imported in 2012/13 and 2013/14 coincided with the closure of the GSV Prawn Fishery in these years and an increase in world prawn production.

Up until 2005/06 a significant proportion of the South Australian Prawn catch was exported overseas. Prior to 2005/06 shifts in the *value of the Australian dollar* would have a significant impact on the economic performance of the fishery due to its influence on the price of exports overseas. Now with minimal exports from South Australia exchange rates will impact the industry less.

Gulf St Vincent Prawn Fishery

Appendix Table 3-5 shows that total catch in the GSV Prawn Fishery decreased with significant variation from 232 tonnes in 2002/03 to 225 tonnes in 2016/17. The total catch was 125 tonnes in 2011/12 and the fishery was closed for the subsequent two years. The fishery was reopened in 2014/15 with a total catch of 249 tonnes.

The value of the GSV Prawn Fishery fell by 26 per cent in real terms over the period 2002/03 to 2016/17. This was principally due to the significant decline in the real price for Prawns (24 per cent lower in 2016/17 than in 2002/03). In 2016/17, the value of catch (almost $4.4 million) was more than double that of the year before the closure ($1.9 million in 2011/12).

Appendix Table 3-5 Catch, GVP and price of GSV Prawn Fishery, 2002/03 to 2016/17[a]

Year	Catch (t)	GVP ($m)	Price ($/kg)
2002/03	232	5.9	25.39
2003/04	172	4.2	24.46
2004/05	213	5.0	23.32
2005/06	175	3.7	20.87
2006/07	209	4.1	19.57
2007/08	229	3.5	15.27
2008/09	273	4.1	15.03
2009/10	250	2.9	11.79
2010/11	178	2.3	13.11
2011/12	125	1.9	15.34
2012/13 [b]	0	0.0	-
2013/14 [b]	0	0.0	-
2014/15	249	4.2	16.91
2015/16	218	3.7	17.12
2016/17	225	4.4	19.41

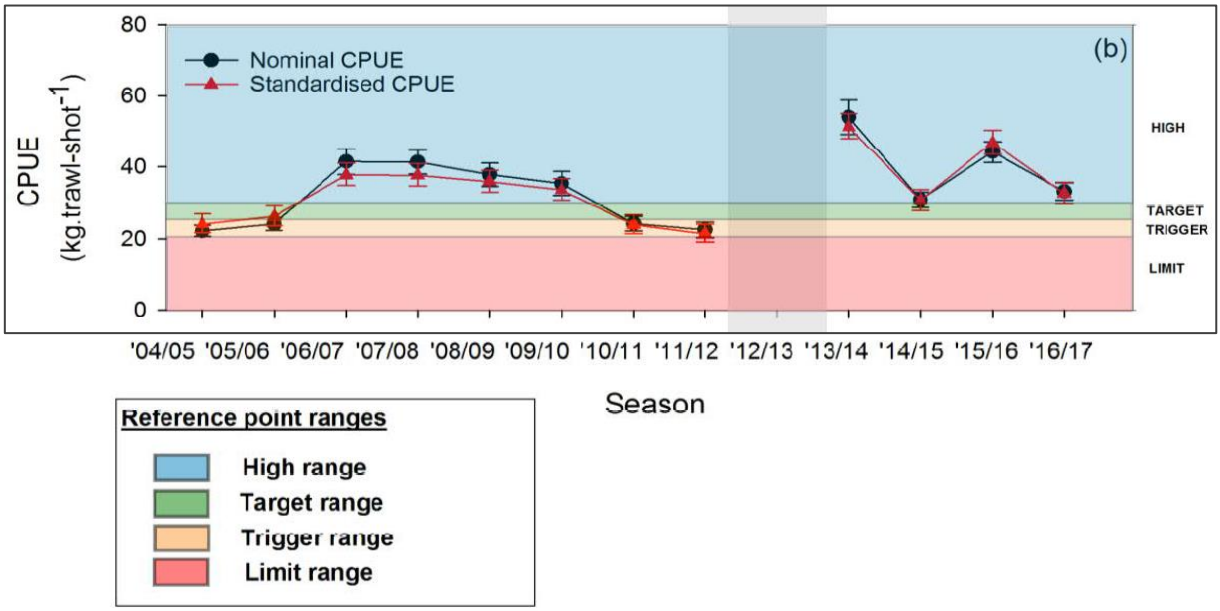
[a] GVP and prices are in real 2016/17 terms.

[b] Fishery closed.

Source: EconSearch 2018e

Both nominal CPUE and Standardised CPUE for the GSV Prawn Fishery (Appendix Figure 3-15) fell into the trigger range resulting in the closure of the fishery in 2012/13 and 2013/14. Since the fishery reopened (2014/15) both measures of CPUE have been in the high range.

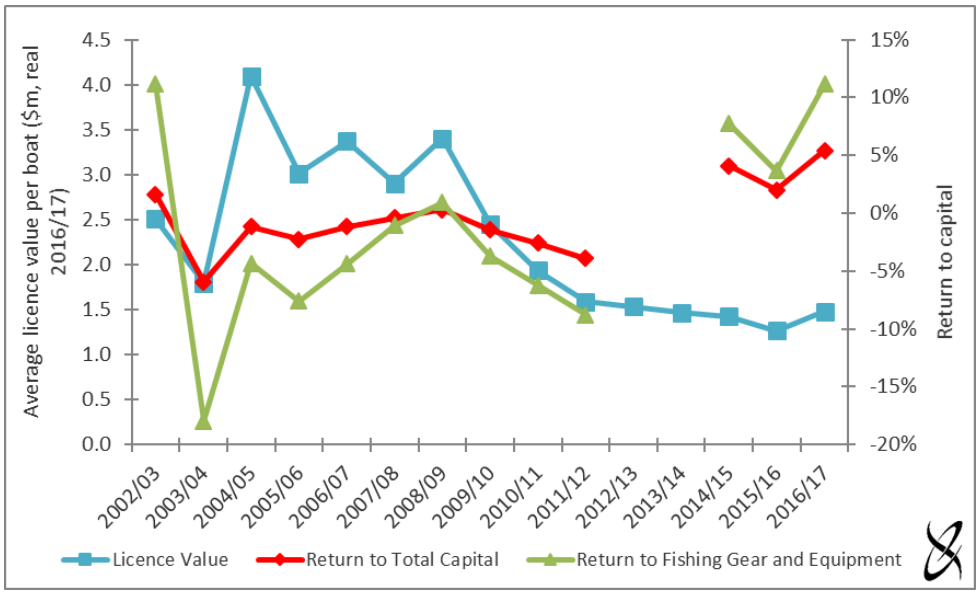
Appendix Figure 3-15 Standardised versus nominal CPUE (kg/trawl shot), GSV Prawn Fishery, 204/05 o 2016/17



Source: McLeay et al. 2017

The estimated rate of return to total capital for the GSV Prawn Fishery declined across the period 2002/03 to 2011/12 when the fishery was closed for a period of two years. Between 2011/12 and 2016/17 the estimated rate of return to total capital increased from -3.9 per cent to 5.4 per cent. This is a result of an increase in profitability in the fishery. Between 2004/05 and 2016/17 licence values have declined from over $4m per licence to around $1.5m per licence (Appendix Figure 3-16 and EconSearch 2018e).

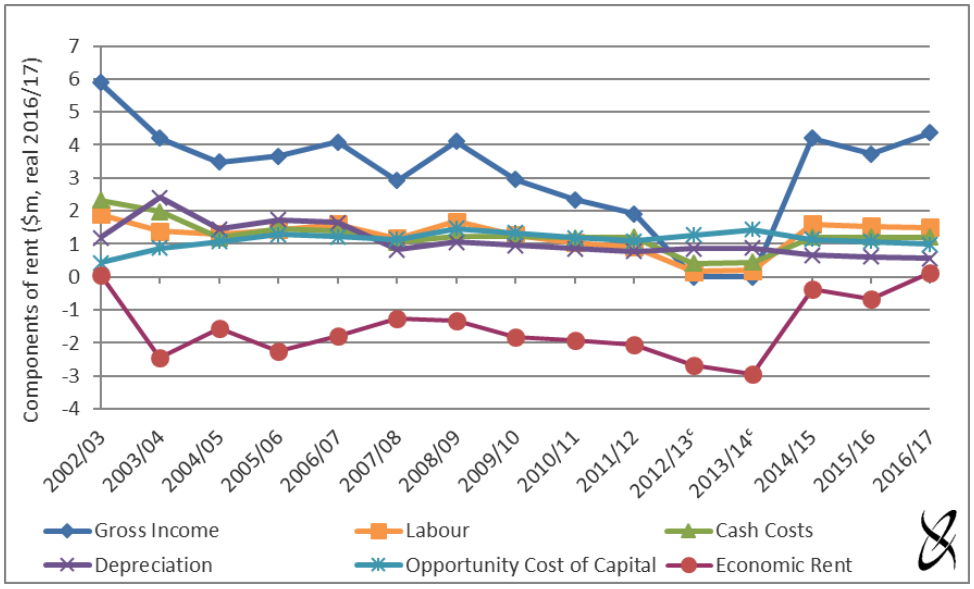
Appendix Figure 3-16 Licence values and return on capital in the GSV Prawn Fishery, 2002/03 to 2016/17



Source: EconSearch 2018e

Economic rent in the GSV Prawn Fishery (Appendix Figure 3-17) followed a decreasing trend, with some fluctuations through to 2013/14, the second year the fishery was closed. After the fishery reopened, economic rent increased to -$376,000 in 2014/15, declined once again in 2016/17 (-$664,000) before increasing to $113,000 in 2016/17. This is first time since 2002/03 that economic rent has been positive.

Appendix Figure 3-17 Economic Rent in the GSV Prawn Fishery, 2002/03 to 2016/17



[a] All indicators are expressed in real 2016/17 dollars.

Source: EconSearch 2018e

Some factors influencing the economic performance of the GSV Prawn Fishery were sourced from EconSearch (2018e) and are described below.

As a proportion of total Prawn catch in South Australia, Prawn *exports* from South Australia decreased from 82 per cent in 2002/03 to 3 per cent in 2016/17. This is attributable to a collection of factors that have shifted the Prawn market across this period, including:

- an increase in lower priced Prawn imports
- a decrease in catch levels
- a decrease in domestic price, increasing domestic consumption
- a higher exchange rate, reducing the competitiveness of domestic Prawns through making imported products more affordable.

The high quantity of *imported* Prawns can have a negative impact on the price of local product. The total quantity of Prawns imported into Australia increased by 65 per cent between 2002/03 and 2004/05 from approximately 18,000 tonnes to almost 30,000 tonnes but declined to just under 13,000 tonnes in 2008/09. This decline between 2004/05 and 2008/09 may be attributable to the quarantine measures on the importation of Prawns implemented by Biosecurity Australia in 2007. The quantity of Prawns imported increased again between 2008/09 and 2013/14 to reach almost 26,000 tonnes but has declined over the past three years

and was only 15,797 tonnes in 2016/17, a 39 per cent decrease from 2013/14. The increase in the quantity of prawns imported in 2012/13 and 2013/14 coincided with the closure of the GSV Prawn Fishery in these years and an increase in world prawn production.

Up until 2005/06 a significant proportion of the South Australian Prawn catch was exported overseas. Prior to 2005/06 shifts in the *value of the Australian dollar* would have a significant impact on the economic performance of the fishery due to its influence on the price of exports overseas. Now with minimal exports from South Australia exchange rates will impact the industry less.

Sardine Fishery

The catch levels shown in Appendix Table 3-6 indicate that total catch in the SA Sardine Fishery has increased significantly since 2002/03. Only 21,741 tonnes of Sardines were caught during 2002/03 after a significant Sardine mortality event occurring across the entire distribution of the Australian Sardine population during October 1998 to May 1999. South Australian Sardine stocks quickly regenerated resulting in a significant increase in catch in the following two years, reaching almost 57,000 tonnes in 2004/05. This significant increase in catch and value of catch was the result of the stock recovery and subsequent increases in TACC.

The increase in catch was underpinned by the development of a harvest strategy for the fishery that has used the quantification of the Sardine spawning biomass to set the TACC. Since 2005/06, the TACC has constrained catch in the Sardine fishery, and trends in total catch are closely linked to decisions about TACC. Being a forage fish fishery, TACC is constrained by sustainability implications for predator fish as well as for Sardines themselves.

A reduction in TACC for the 2006 to 2009 seasons resulted in a significant decline in the catch and value of catch in the fishery. TACC for the fishery was set at 32,000t for 2007 and a baseline TACC for 30,000t was established for 2008 and 2009. An additional 4,000t of quota (to be fished outside the traditional fishing areas) was made available for the 2010 to 2012 fishing seasons enabling a 31 per cent increase in catch between 2008/09 and 2009/10. Catch decreased slightly in 2010/11, by around 9 per cent, but increased in 2011/12 to 36,962t, the highest level since 2004/05. Catch was lower in 2012/13 (35,065t) and in 2013/14 (33,197t). In 2015 and 2016, TACC was increased to 38,000t resulting in the level of catch increasing to 36,020t for 2014/15 and 41,103t for 2015/16[112]. The TACC was increased once again in 2017 although catch in 2016/17 fell slightly to 39,745t.

The real value of the Sardine catch peaked in 2004/05 a 52 per cent increase on its 2002/03 value. GVP of the Sardine catch fell significantly in 2005/06, due to a 50 per cent reduction in TACC for the 2006 season. It fluctuated in subsequent years as a result of small changes in both the catch and price of Sardines but has followed a slight increasing trend overall since 2005/06. In 2016/17, GVP was estimated to be $23.8 million, a 9 per cent decline from the previous year.

[112] The economic indicators reports are based on financial years, while TACC is set for a calendar year. Some of the variation in catch recorded for financial years can be caused by this. Fishing effort is generally concentrated between January and June each year.

The nominal price for Sardines fluctuated between 2002/03 and 2008/09 but has been relatively stable since. A stable nominal price together with continuing inflation has led to a steadily decreasing real price since 2008/09. Note that in a market characterised by a high level of vertical integration, such as that for Sardines, the notional beach price may not accurately reflect the price that could be received in an open market.

Appendix Table 3-6 Catch, GVP, price and TACC of the Sardine Fishery, 2002/03 to 2016/17[a]

	Catch (t)	GVP ($m)	Price ($/kg)	TACC (t) [b]
2002/03	21,741	24.8	1.14	36,000
2003/04	33,160	30.4	0.92	40,000
2004/05	56,952	37.6	0.66	51,100
2005/06	28,626	20.4	0.71	26,000
2006/07	30,355	23.2	0.76	32,000
2007/08	29,692	19.5	0.66	30,000
2008/09	27,850	20.7	0.74	30,000
2009/10	36,573	26.4	0.72	34,000
2010/11	33,220	21.3	0.64	34,000
2011/12	36,962	22.6	0.61	36,000
2012/13	35,065	22.5	0.64	32,000
2013/14	33,197	19.9	0.60	34,000
2014/15	36,020	22.1	0.61	38,000
2015/16	41,103	26.3	0.64	38,000
2016/17	39,745	23.8	0.60	42,750

[a] GVP and prices are in real 2016/17 terms.

[b] TACC set by calendar year.

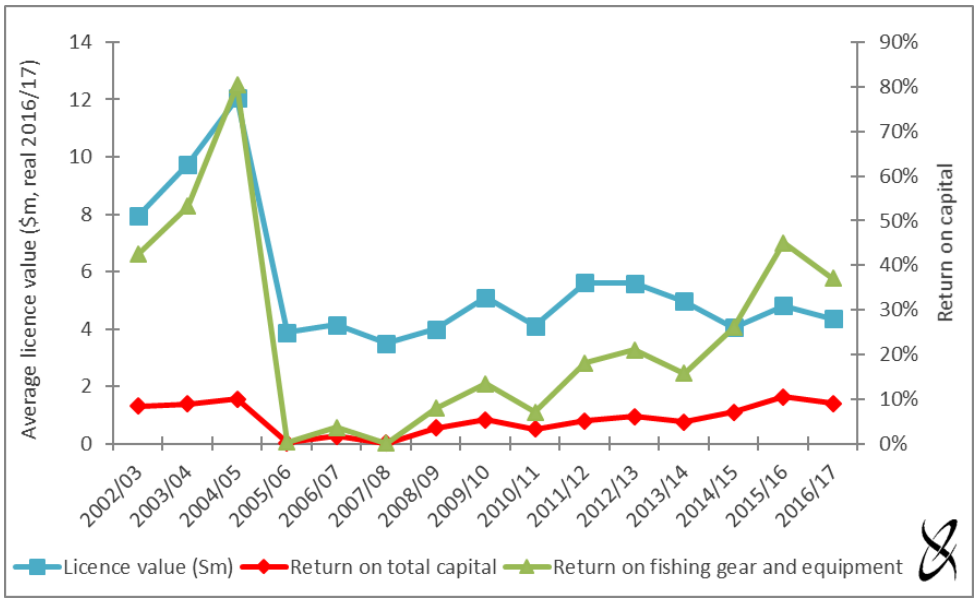
Source: EconSearch 2018f

Mean annual CPUE has followed an increasing trend from approximately 30t/net set to over 40t/net set (Ward et al. 2017).

Between 2002/03 and 2004/05 the estimated rate of return on total capital for the Sardine Fishery increased from 8 per cent to 10 per cent then fell significantly in 2005/06 with the significant reduction in quota but has improved in subsequent years (despite fluctuations). In 2016/17, return on total capital was estimated to be 9 per cent. Since the average licence value comprises most of the average total capital value, its movements are closely linked to changes in the estimated profitability of the fishery (Appendix Figure 3-18 and EconSearch 2018f).

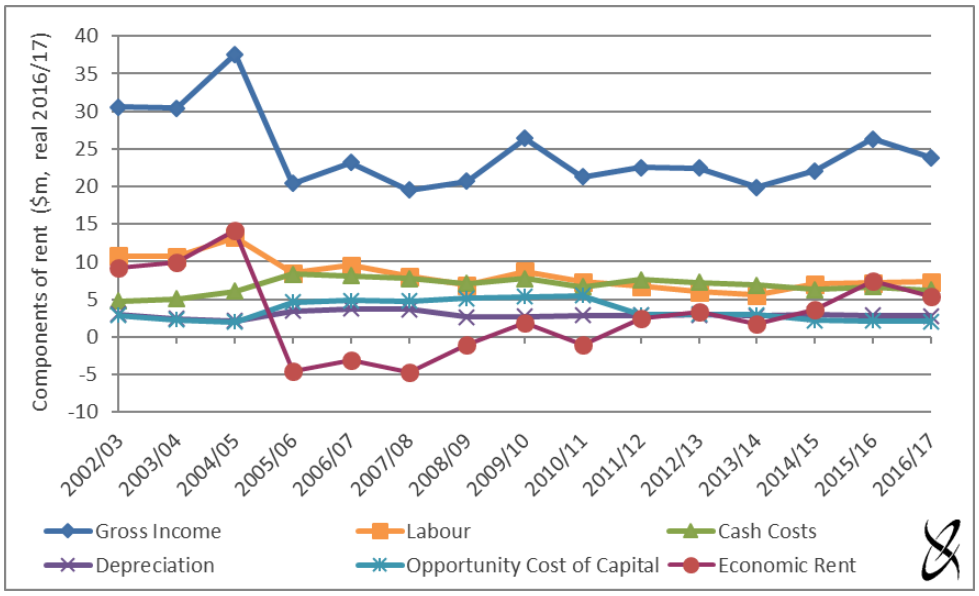
Real economic rent in the Sardine Fishery increased from $9.2 million in 2002/03 to $14.1 million in 2004/05, but fell dramatically in 2005/06 to -$4.5 million. Since 2005/06 economic rent has fluctuated but has generally followed an increasing trend. The increasing trend was largely due to decreasing opportunity cost of capital, depreciation and labour costs, in real terms. Economic rent was approximately $5.4m in 2016/17 (Appendix Figure 3-19).

Appendix Figure 3-18 Licence values and return on capital in the SA Sardine Fishery, 2002/03 to 2016/17



Source: EconSearch 2018f

Appendix Figure 3-19 Economic rent in the SA Sardine Fishery, 2002/03 to 2016/17



[a] All indicators are expressed in real 2016/17 dollars.

Source: EconSearch 2018f

Some factors influencing the economic performance of the Sardine Fishery were sourced from EconSearch (2018f) and are described below.

Since the majority of Sardine catch in SA is used as Tuna fodder, *changes to the SBT TACC* have the potential to affect the demand for SA caught Sardines. There has been an increase in the price of Sardines between 2011/12 and 2016/17. Licence holders indicated in the 2013 and 2016 surveys that demand for SA caught Sardines is likely to remain stable or increase slightly because

SA Sardines are better quality than imported Sardines, which in turn leads to better quality Tuna. However, if SA caught Sardines are unable to supply the entire requirements for tuna fodder then imported Sardines will be required to make up the shortfall in supply.

An additional 4,000 tonnes of *quota* was made available for the 2010 to 2014 fishing seasons. A further additional 2,000 tonnes of quota was 'borrowed' from the 2013 fishing season and used in the 2012 season to meet a shortage of fodder for Tuna farms. Licence holders indicated that this flexibility from management was of significant help to both the Sardine industry and the Tuna industry. In 2015 and 2016 the quota was increased to a total of 38,000t, and in 2017 it was increased once again to 42,750, the highest level since 2005.

Marine Scalefish Fishery

The catch and gross value of the major Marine Scalefish species shown in Appendix Table 3-7 represent the catch of all Marine Scalefish species taken by licence holders in the SA MSF (MSF). Adjustments have been made to exclude the catch and value of Blue Swimmer Crabs and Sardines taken by specialist fishers which are reported in the economic indicator reports for those fisheries. Total catch also excludes catch from the Miscellaneous Fishery (e.g. Giant Crabs, Seaworms and Fish Roe) and Commonwealth managed fisheries.

The total catch of Marine Scalefish species in 2016/17 was 2,519 tonnes, a 1 per cent decrease compared with the previous year (2,550 tonnes). The GVP of the MSF in 2016/17 was almost $22.8 million, slightly higher than in 2015/16 ($22.7m). This was a result of a small increase in average price despite the slight reduction in catch.

Appendix Table 3-7 Catch, GVP and price of the SA MSF, 2002/03 to 2016/17[a]

	Catch (t)	GVP ($m)	Ave Price ($/kg) [b]
2002/03	4,243	29.7	7.01
2003/04	4,221	31.1	7.36
2004/05	3,857	27.9	7.24
2005/06	3,234	22.5	6.97
2006/07	2,855	23.3	8.16
2007/08	2,925	23.9	8.18
2008/09	2,998	25.3	8.44
2009/10	3,330	26.4	7.92
2010/11	3,068	24.4	7.94
2011/12	3,208	25.5	7.94
2012/13	2,603	25.5	9.80
2013/14	2,302	22.5	9.79
2014/15	2,582	24.5	9.49
2015/16	2,550	22.7	8.89
2016/17	2,519	22.8	9.03

[a] GVP and prices are in real 2016/17 terms.

[b] Average price across all species.

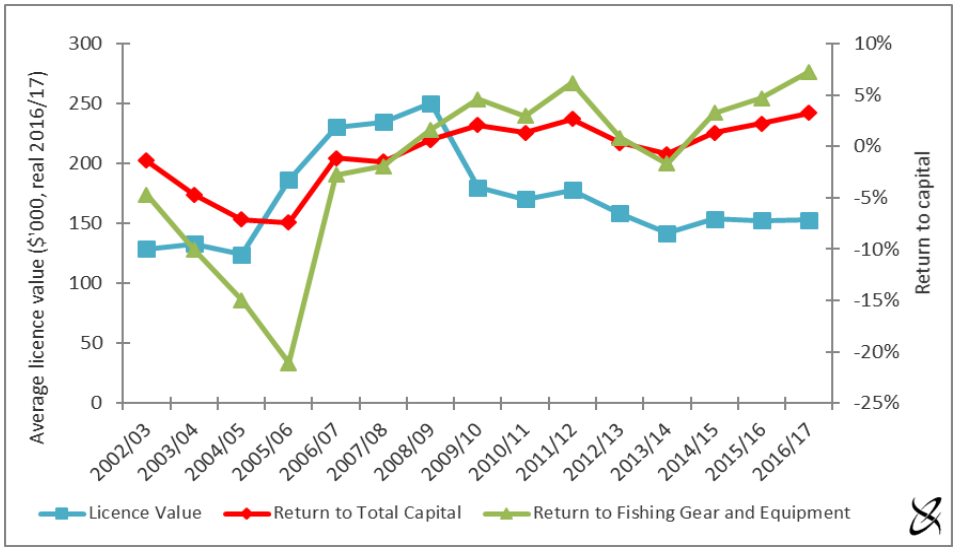
Source: EconSearch 2018g

Management arrangements have resulted in changing fleet dynamics for the SA MSF, with the biggest change being the decline in fishing effort resulting from the licence amalgamation

scheme in 1994 and the two voluntary net buy-back initiatives in 2005 and 2014. Since 1994, 3999 active licences have been removed from the SA MSF representing a 56 per cent reduction in total fishing effort. Declining productivity of key species has seen effort switch from Snapper, King George Whiting and Southern Garfish towards Southern Calamari (Steer et al. 2018).

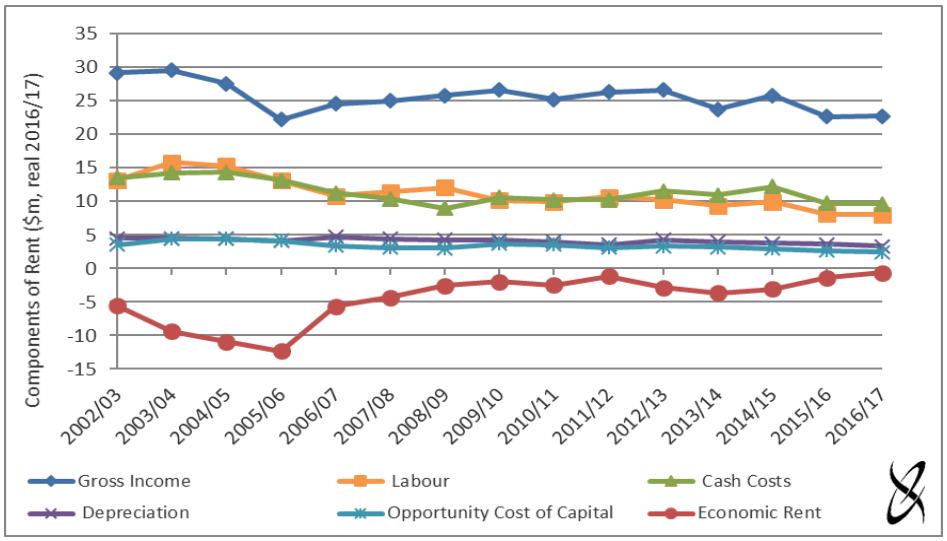
Overall, the rate of return to total capital for the SA MSF has fluctuated year to year but has generally followed an increasing trend. The average value of licences in the fishery increased steadily between 2002/03 and 2008/09 despite year to year variation. Since 2008/09, licence values have followed a generally decreasing trend in real terms. On-going negative economic rent, such as those achieved in the MSF, can be expected to lower licence values (Appendix Figure 3-20 and EconSearch 2018g).

Appendix Figure 3-20 Licence values and return on capital in the SA MSF, 2002/03 to 2016/17



Source: EconSearch 2018g

Appendix Figure 3-21 Economic rent in the SA MSF, 2002/03 to 2016/17



[a] All indicators are expressed in real 2016/17 dollars.

Source: EconSearch 2018g

The economic rent in the SA MSF fluctuated between years but improved overall between 2002/03 and 2016/17. In 2002/03, economic rent in the fishery was estimated to be -$5.6 million (real 2016/17 dollars) while in 2016/17 it was -$0.7 million (Appendix Figure 3-21)

An additional factor influencing the economic performance of the SA MSF was sourced from EconSearch (2018g) and is described below.

Monthly Variation of SA MSF prices can impact the economic performance of the fishery. The following was observed for the key species in 2016/17:

- King George Whiting prices peaked between December and April and were lowest in July and August.
- Snapper prices were variable throughout 2016/17 with peak prices over $11/kg in July, August, September and April.
- Southern Calamari prices peaked in February and March at over $16/kg.
- Garfish prices were higher over spring/summer (October to January) but lower in 2017 (February to June).

Charter Boat Fishery

The total number of clients in 2016/17, as detailed in Appendix Table 3-8, was 14,459 persons, the lowest level recorded since 2005/06. The total number of clients in the fishery decreased between 2005/06 and 2016/17, from 19,540 clients in 2005/06 to 14,459 clients in 2016/17 (26 per cent decline or an average annual decline of 2.7 per cent). There has also been significant change through time in participation rates in recreational fishing in SA. Some of this change may relate to extended seasonal closures for Snapper (in recent years) but demographic changes are affecting recreational participation rates more broadly and that this may have also contributed to the decline in the number of charter customers (Giri and Hall 2015).

Following a similar pattern to the number of clients, real GVP has decreased overall between 2005/06 and 2016/17 In 2016/17 the estimated GVP was approximately $3.7m, the second lowest level over the period 2005/06 to 2016/17.

Appendix Table 3-8 Clients, GVP and price of the SA Charter Boat Fishery, 2002/03 to 2016/17[a]

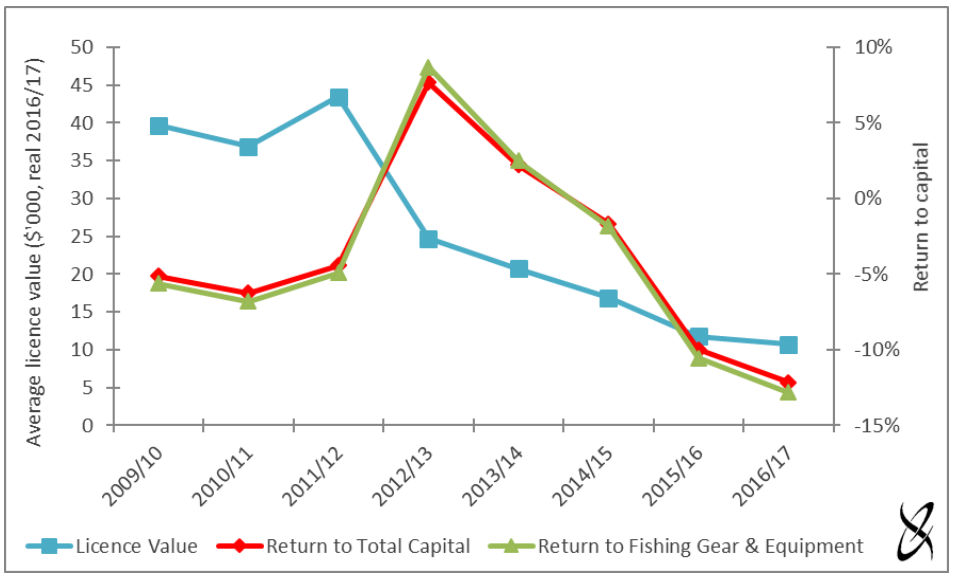
	Clients (No.)	GVP ($m)	Ave Price ($/client)
2005/06	19,540	5.4	276
2006/07	21,697	6.0	276
2007/08	21,962	5.1	230
2008/09	21,430	5.0	233
2009/10	21,822	5.3	244
2010/11	20,097	4.8	241
2011/12	23,711	5.3	224
2012/13	23,525	5.3	226
2013/14	19,227	4.5	233
2014/15	15,129	3.6	240
2015/16	15,597	4.1	264
2016/17	14,459	3.7	259

[a] GVP and prices are in real 2016/17 terms.

Source: EconSearch 2018h

The rate of return to total capital for the Charter Boat Fishery increased between 2009/10 and 2012/13 but declined steeply in the four years to 2016/17. The average value of licences in the fishery increased between 2009/10 and 2011/12 but has declined considerably since. It was suggested that due to the large amount of latent effort in the fishery (41 licences were inactive in 2016/17) the market value of licences is low and declining. However, the value of licences in this fishery represents a small proportion (5 per cent) of the total capital used by each licence holder (Appendix Figure 3-22 and EconSearch 2018h).

Appendix Figure 3-22 Licence values and return on capital in the SA Charter Boat Fishery, 2009/10 to 2016/17



Source: EconSearch 2018h

APPENDIX 4 SOCIO-ECONOMIC DATA

A socio-economic profile is presented to provide context for the social values and economic impacts. A statistical summary of key economic and social information for the Focus SZs is presented by analysing data from the closest Local Government Areas (LGA) as described below.

Nuyts Reef and Isles of St Francis – Ceduna

Pearson Isles - Elliston

North Neptune Islands– Port Lincoln

Salt Creek – Tumby Bay

Clinton Wetlands - Wakefield

Rapid Head - Yankalilla

Bay of Shoals, Sponge Gardens, The Pages, Cape Borda and Cape du Couedic – Kangaroo Island

These LGAs are referred as adjacent LGAs for the remainder of the appendix.

Comparative regions have also been included as part of the socio-economic profile. This consists of the LGAs of Tatiara, The Coorong, Naracoorte and Lucindale, Clare and Gilbert Valleys, Kingston, Robe, Mount Remarkable, Streaky Bay, Murray Bridge, Port Augusta and Port Pirie.

To provide appropriate comparison, the adjacent and comparative LGAs have been grouped by estimated resident population (ERP) in 2016/17. Table 4-1 lists the grouping of the LGAs.

Table 4-1 Adjacent and comparative LGAs, by comparison groups

Group	Adjacent LGAs	Comparative LGAs
Large regional towns (ERP >10,000)	Port Lincoln	Murray Bridge Port Augusta Port Pirie City and Districts
Medium sized regional towns (ERP between 5,000 and 10,000)	Wakefield Yankalilla	Tatiara The Coorong Naracoorte and Lucindale Clare and Gilbert Valleys
Small regional towns (ERP <5,000)	Ceduna Elliston Tumby Bay Kangaroo Island	Kingston Robe Mount Remarkable Streaky Bay

Source: EconSearch Analysis

Estimated Resident Population

Over the last 10 years (2007/08 to 2016/17) change in ERP for the adjacent and comparative LGAs is shown in Appendix Figure 4-1, Appendix Figure 4-2 and Appendix Figure 4-3. This can be described as follows:

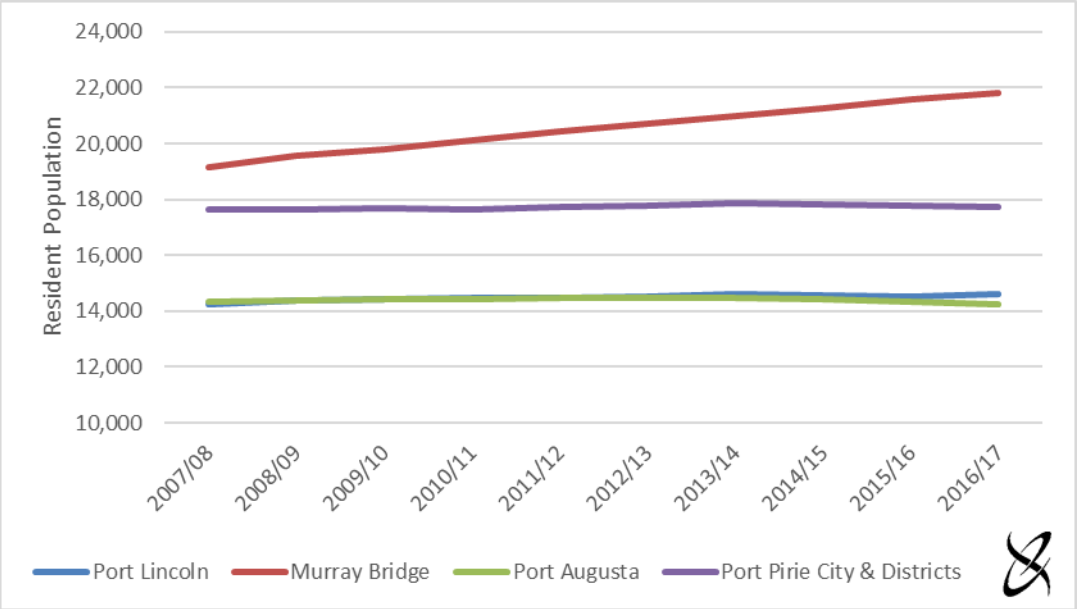
Adjacent LGAs – large regional towns

- Port Lincoln: increased by 2.4 per cent (from 14,256 to 14,592)

Comparative LGAs – large regional towns

- Murray Bridge: increased by 14.1 per cent (from 19,144 to 21,836)
- Port Augusta: decreased by 0.6 per cent (from 14,348 to 14,267)
- Port Pirie City and Districts: increased by 0.6 per cent (from 17,619 to 17,718)

Appendix Figure 4-1 Estimated resident population, large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: ABS 2018 and EconSearch Analysis

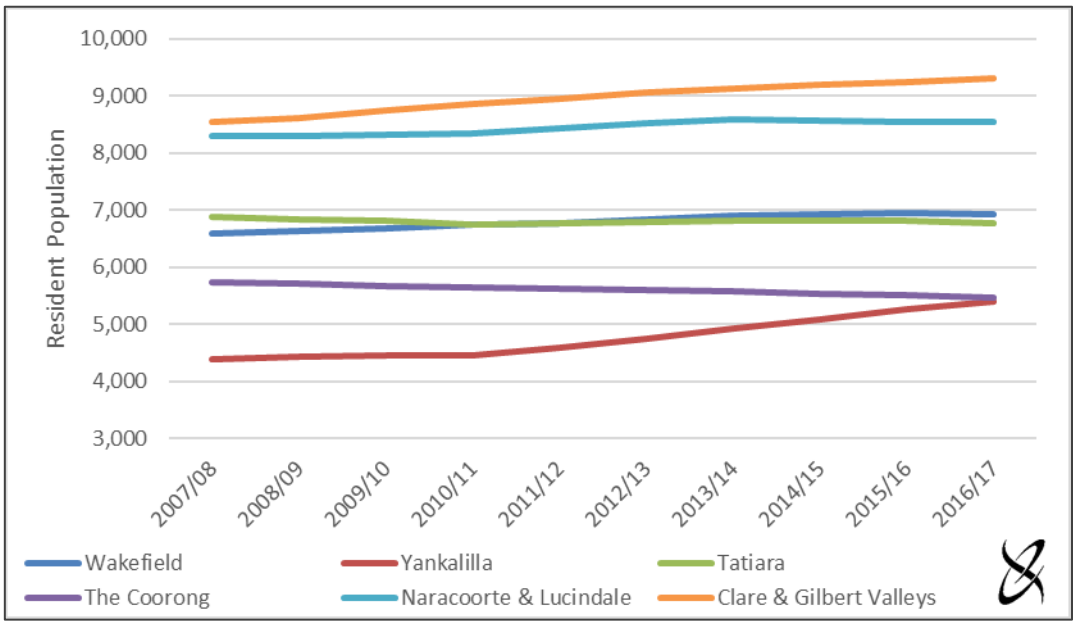
Adjacent LGAs – medium sized regional towns

- Wakefield: increased by 5.1 per cent (from 6,585 to 6,919)
- Yankalilla: increased by 22.9 per cent (from 4,396 to 5,401)

Comparative LGAs – medium sized regional towns

- Tatiara: decreased by 1.7 per cent (from 6,891 to 6,773)
- The Coorong: decreased by 4.7 per cent (from 5,749 to 5,479)
- Naracoorte and Lucindale: increased by 3.1 per cent (from 8,294 to 8,552)
- Clare and Gilbert Valleys: increased by 9.1 per cent (from 8,537 to 9,317)

Appendix Figure 4-2 Estimated resident population, medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: ABS 2018 and EconSearch Analysis

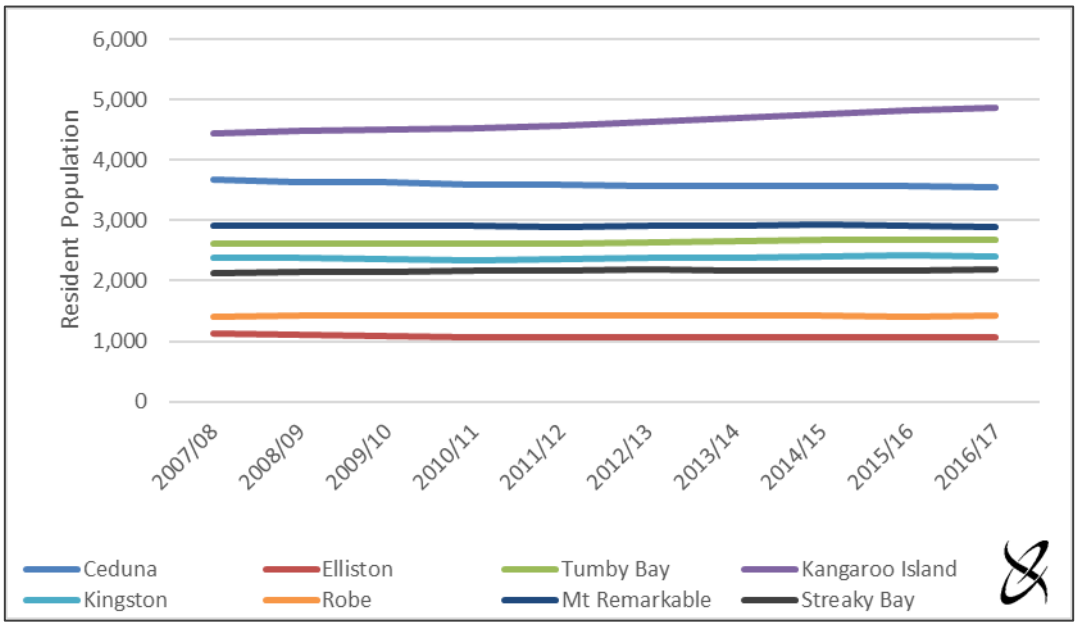
Adjacent LGAs - small regional towns

- Ceduna: decreased by 3.3 per cent (from 3,672 to 3,549)
- Elliston: decreased by 6.8 per cent (from 1,131 to 1,054)
- Tumby Bay: increased by 2.9 per cent (from 2,612 to 2,688)
- Kangaroo Island: increased by 9.6 per cent (from 4,451 to 4,877)

Comparative LGAs - small regional towns

- Kingston: increased by 1.0 per cent (from 2,381 to 2,406)
- Robe: increased by 1.0 per cent (from 1,408 to 1,422)
- Mount Remarkable: decreased by 0.4 per cent (from 2,915 to 2,902)
- Streaky Bay: increased by 2.6 per cent (from 2,126 to 2,181)

Appendix Figure 4-3 Estimated resident population, small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: ABS 2018 and EconSearch Analysis

Population Projections

The projected change in resident population for the adjacent and comparative LGAs over a 15 year period (from 2015/16 to 2030/31, is shown in Appendix Table 4-2, Appendix Table 4-3 and Appendix Table 4-4. This can be described as follows:

Adjacent LGAs – large regional towns

- Port Lincoln: to increase by 4.2 per cent (from 14,591 to 15,201)

Comparative LGAs – large regional towns

- Murray Bridge: to increase by 16.5 per cent (from 21,836 to 24,640)
- Port Augusta: to increase by 4.6 per cent (from 14,651 to 15,329)
- Port Pirie City and Districts: to increase by 3.7 per cent (from 17,951 to 18,615)

Appendix Table 4-2 Population projections, large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2,016	2,021	2,026	2,031	Change from 2016 (%)
Adjacent LGAs					
Port Lincoln	14,591	14,845	15,021	15,201	4.2%
Comparison LGAs					
Murray Bridge	21,158	22,367	23,541	24,640	16.5%
Port Augusta	14,651	14,881	15,107	15,329	4.6%
Port Pirie City & Districts	17,951	18,320	18,454	18,615	3.7%

Source: DPTI 2016 and EconSearch Analysis

Adjacent LGAs – medium sized regional towns

- Wakefield: to increase by 3.2 per cent (from 6,873 to 7,093)
- Yankalilla: to increase by 22.6 per cent (from 4,911 to 6,021)

Comparative LGAs – medium sized regional towns

- Tatiara: to decrease by 9.1 per cent (from 6,598 to 5,995)
- The Coorong: to decrease by 6.3 per cent (from 5,582 to 5,233)
- Naracoorte and Lucindale: to decrease by 0.2 per cent (from 8,427 to 8,411)
- Clare and Gilbert Valleys: to increase by 10.1 per cent (from 9,037 to 9,947)

Appendix Table 4-3 Population projections, medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2015/16	2020/21	2025/26	2030/31	Change from 2016 (%)
Adjacent LGAs					
Wakefield	6,873	6,951	7,029	7,093	3.2%
Yankalilla	4,911	5,310	5,702	6,021	22.6%
Comparison LGAs					
Tatiara	6,598	6,427	6,226	5,995	-9.1%
The Coorong	5,582	5,483	5,370	5,233	-6.3%
Naracoorte & Lucindale	8,427	8,468	8,464	8,411	-0.2%
Clare & Gilbert Valleys	9,037	9,352	9,648	9,947	10.1%

Source: DPTI 2016 and EconSearch Analysis

Adjacent LGAs – small regional towns

- Ceduna: to increase by 3.7 per cent (from 3,636 to 3,771)
- Eilliston: to decrease by 9.4 per cent (from 1,039 to 941)
- Tumby Bay: to increase by 0.1 per cent (from 2,639 to 2,637)
- Kangaroo Island: to increase by 12.2 per cent (from 4,682 to 5,252)

Comparative LGAs – small sized regional towns

- Kingston: to decrease by 1.4 per cent (from 2,354 to 2,320)
- Robe: to increase by 0.4 per cent (from 1,447 to 1,453)
- Mount Remarkable: to decrease by 4.5 per cent (from 2,932 to 2,801)
- Streaky Bay: to increase by 8.2 per cent (from 2,260 to 2,445)

Appendix Table 4-4 Population projections, small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2015/16	2020/21	2025/26	2030/31	Change from 2016 (%)
Adjacent LGAs					
Ceduna	3,636	3,665	3,720	3,771	3.7%
Elliston	1,039	1,002	967	941	-9.4%
Tumby Bay	2,639	2,630	2,632	2,637	-0.1%
Kangaroo Island	4,682	4,856	5,051	5,252	12.2%
Comparison LGAs					
Kingston	2,354	2,356	2,343	2,320	-1.4%
Robe	1,447	1,454	1,456	1,453	0.4%
Mt Remarkable	2,932	2,909	2,867	2,801	-4.5%
Streaky Bay	2,260	2,320	2,394	2,445	8.2%

Source: DPTI 2016 and EconSearch Analysis

Labour Force

Over the last 10 years (2007/08 to 2016/17) change in the average annual labour force for the adjacent and comparative LGAs is shown in Appendix Figure 4-4, Appendix Figure 4-5 and Appendix Figure 4-6. This can be described as follows:

Adjacent LGAs – large regional towns

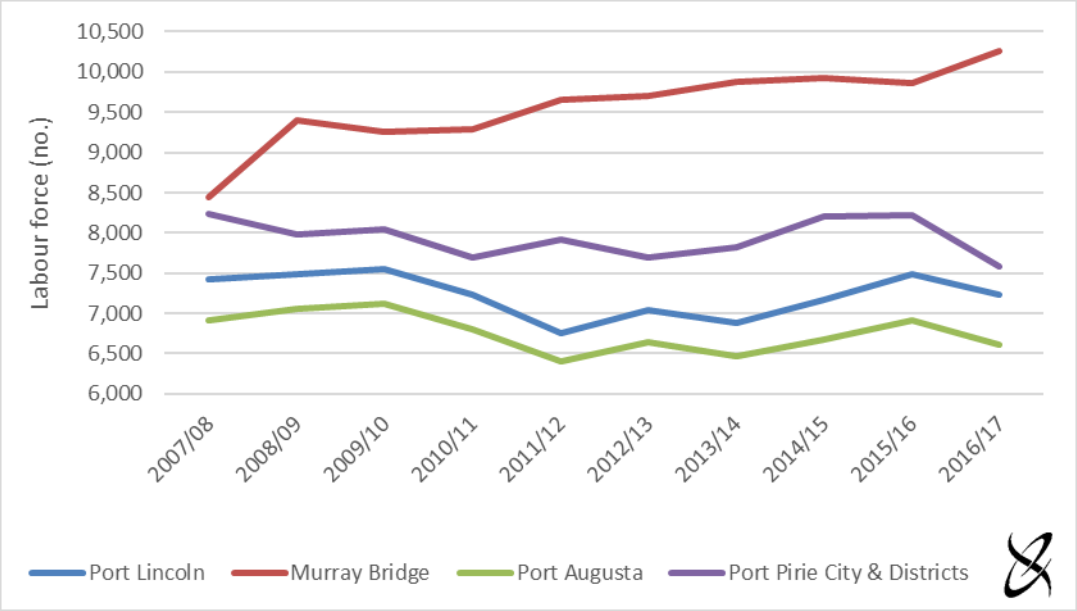
- Port Lincoln: decreased by 2.6 per cent (from 7,424 to 7,233)

Comparative LGAs – large regional towns

- Murray Bridge: increased by 21.6 per cent (from 8,440 to 10,263)
- Port Augusta: decreased by 4.2 per cent (from 6,908 to 6,616)

- Port Pirie City and Districts: increased by 7.8 per cent (from 8,229 to 7,588)

Appendix Figure 4-4 Labour force (number of people), large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

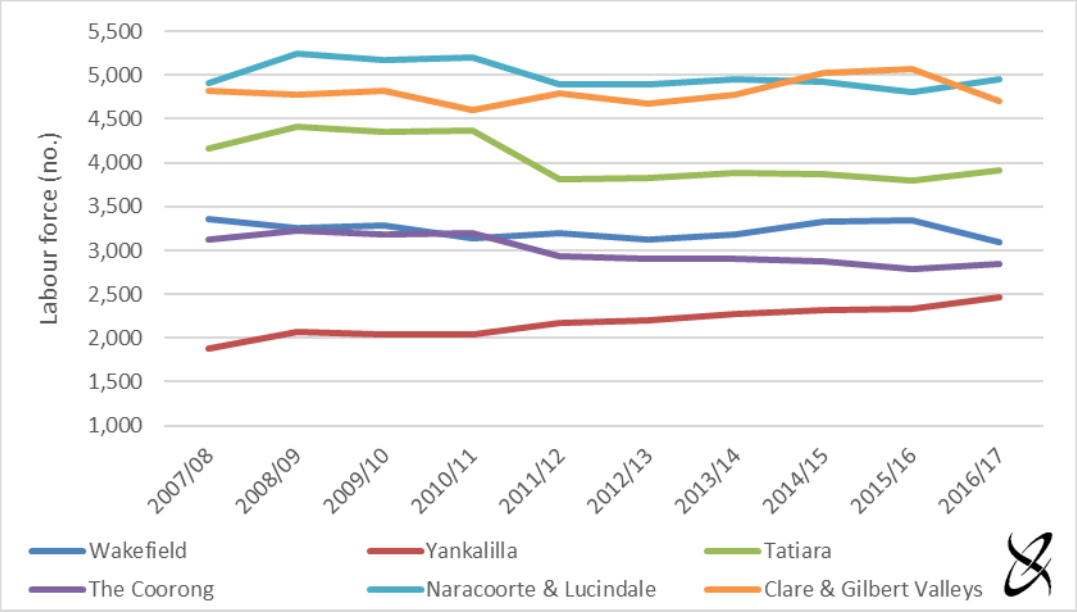
Adjacent LGAs – medium sized regional towns

- Wakefield: decreased by 7.7 per cent (from 3,358 to 3,100)
- Yankalilla: increased by 31.5 per cent (from 1,872 to 2,462)

Comparative LGAs – medium sized regional towns

- Tatiara: decreased by 6.0 per cent (from 4,163 to 3,912)
- The Coorong: decreased by 8.9 per cent (from 3,129 to 2,851)
- Naracoorte and Lucindale: increased by 0.9 per cent (from 4,907 to 4,948)
- Clare and Gilbert Valleys: decreased by 2.4 per cent (from 4,819 to 4,703)

Appendix Figure 4-5 Labour force (number of people), medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

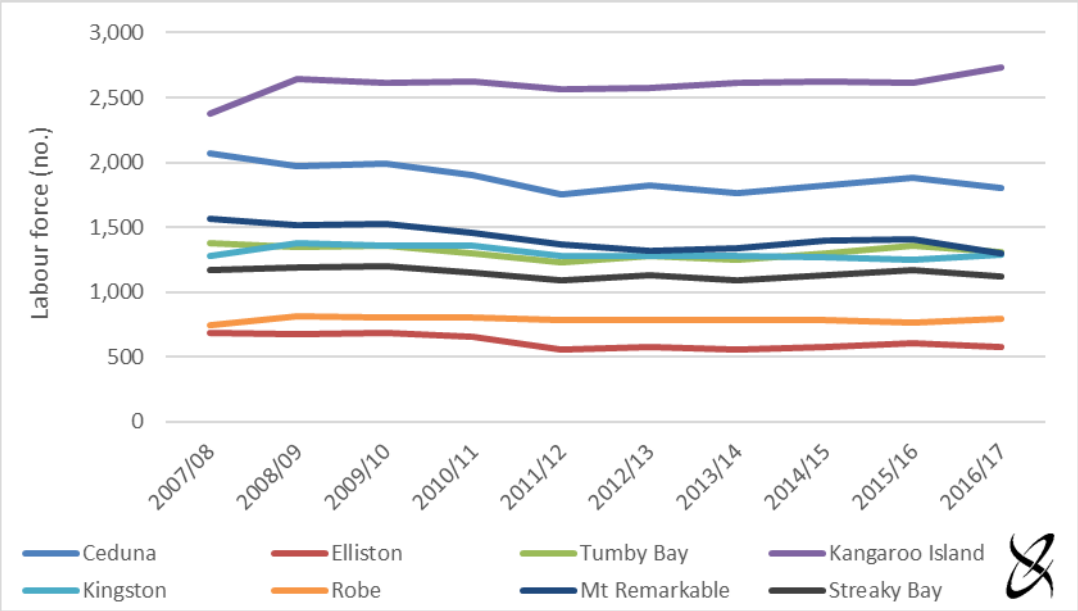
Adjacent LGAs - small regional towns

- Ceduna: decreased by 13.1 per cent (from 2,072 to 1,801)
- Elliston: decreased by 16.3 per cent (from 686 to 574)
- Tumby Bay: decreased by 4.8 per cent (from 1,374 to 1,309)
- Kangaroo Island: increased by 14.6 per cent (from 2,381 to 2,728)

Comparative LGAs - small regional towns

- Kingston: increased by 0.4 per cent (from 1,282 to 1,287)
- Robe: increased by 6.1 per cent (from 743 to 789)
- Mount Remarkable: decreased by 17.0 per cent (from 1,562 to 1,297)
- Streaky Bay: decreased by 3.9 per cent (from 1,170 to 1,125)

Appendix Figure 4-6 Labour force (number of people), small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

Unemployment

Over the last 10 years (2007/08 to 2016/17) change in the average annual unemployment rate for the adjacent and comparative LGAs is shown in Appendix Figure 4-7, Appendix Figure 4-8 and Appendix Figure 4-9. This can be described as follows:

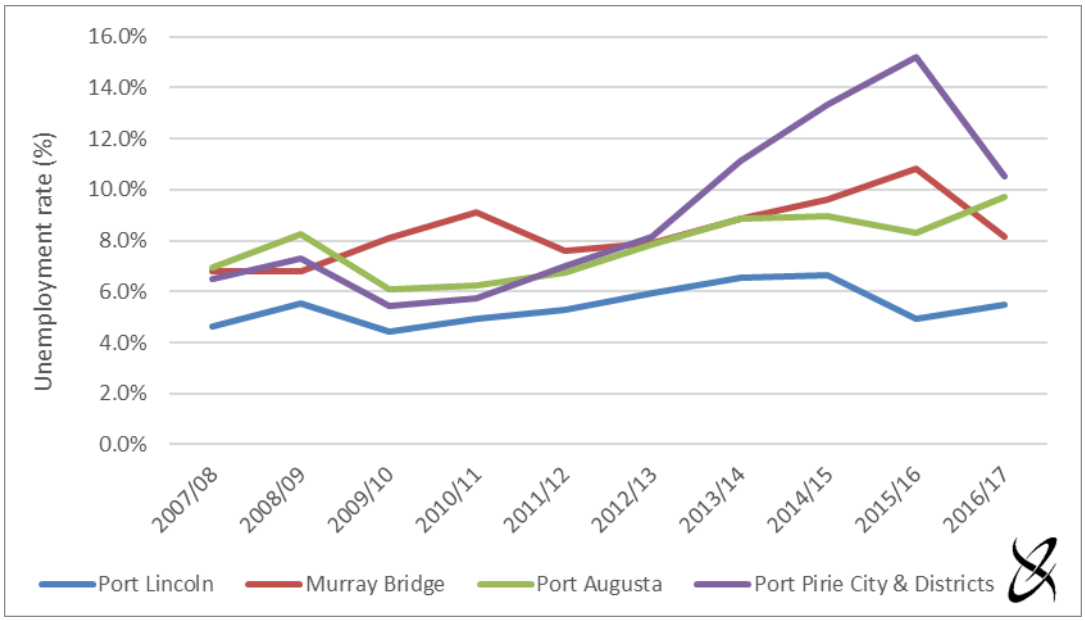
Adjacent LGAs – large regional towns

- Port Lincoln: increased by 0.8 percentage points (from 4.7 to 5.5 per cent)

Comparative LGAs – large regional towns

- Murray Bridge: increased by 1.4 percentage points (from 6.8 to 8.2 per cent)
- Port Augusta: increased by 2.8 percentage points (from 6.9 to 9.7 per cent)
- Port Pirie City and Districts: increased by 4.0 percentage points (from 6.5 to 10.5 per cent)

Appendix Figure 4-7 Unemployment rate, large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

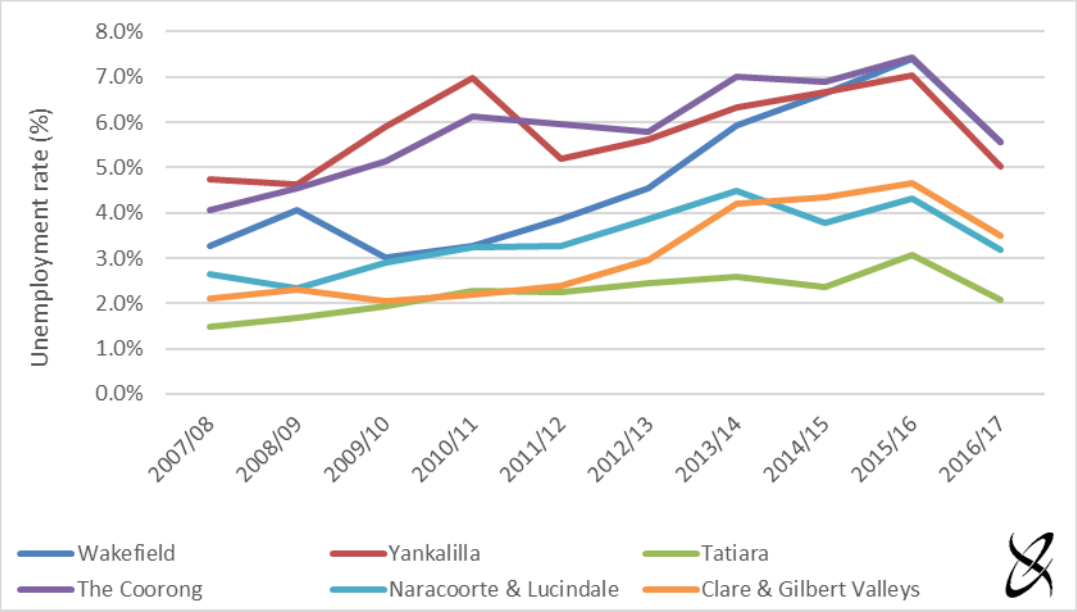
Adjacent LGAs – medium sized regional towns

- Wakefield: increased by 2.3 percentage points (from 3.3 to 5.6 per cent)
- Yankalilla: increased by 0.3 percentage points (from 4.8 to 5.0 per cent)

Comparative LGAs – medium sized regional towns

- Tatiara: increased by 0.6 percentage points (from 1.5 to 2.1 per cent)
- The Coorong: increased by 1.5 percentage points (from 4.1 to 5.6 per cent)
- Naracoorte and Lucindale: increased by 0.5 percentage points (from 2.6 to 3.2 per cent)
- Clare and Gilbert Valleys: increased by 1.4 percentage points (from 2.1 to 3.5 per cent)

Appendix Figure 4-8 Unemployment rate, medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

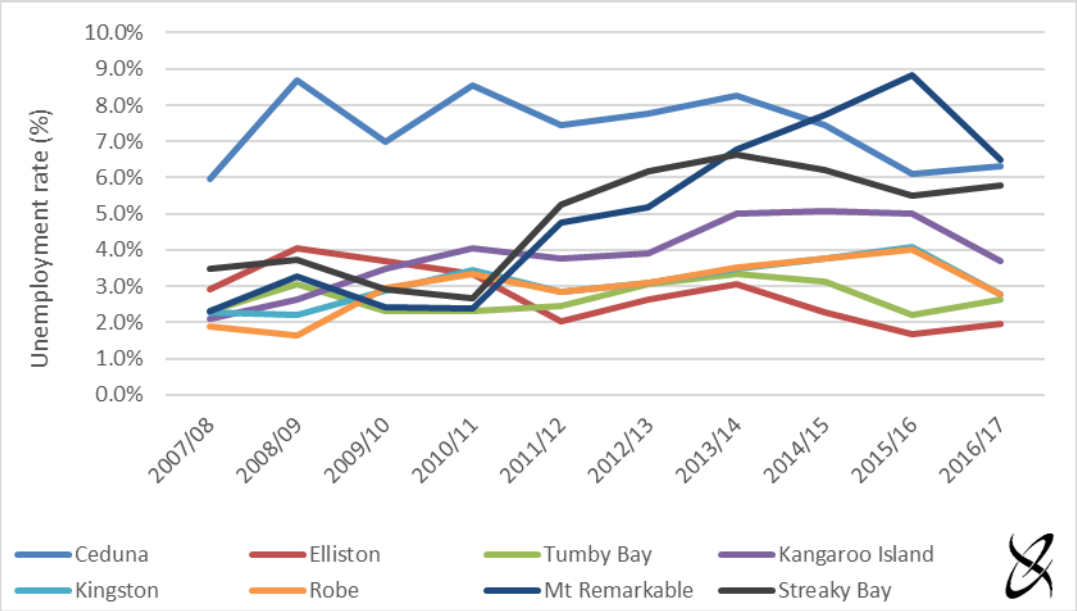
Adjacent LGAs - small regional towns

- Ceduna: increased by 0.3 percentage points (from 6.0 to 6.3 per cent)
- Elliston: decreased by 0.9 percentage points (from 2.9 to 2.0 per cent)
- Tumby Bay: increased by 0.3 percentage points (from 2.3 to 2.6 per cent)
- Kangaroo Island: increased by 1.6 percentage points (from 2.1 to 3.7 per cent)

Comparative LGAs - small regional towns

- Kingston: increased by 0.5 percentage points (from 2.3 to 2.8 per cent)
- Robe: increased by 0.9 percentage points (from 1.9 to 2.8 per cent)
- Mount Remarkable: increased by 4.2 percentage points (from 2.3 to 6.5 per cent)
- Streaky Bay: increased by 2.3 percentage points (from 3.5 to 5.8 per cent)

Appendix Figure 4-9 Unemployment rate, small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



Source: DE 2018 and EconSearch Analysis

Property Prices

Over the last 10 years (2007/08 to 2016/17) change in real property prices (2016/17 dollars) for the adjacent and comparative LGAs is shown in Appendix Figure 4-10, Appendix Figure 4-11 and Appendix Figure 4-12. This be described as follows:

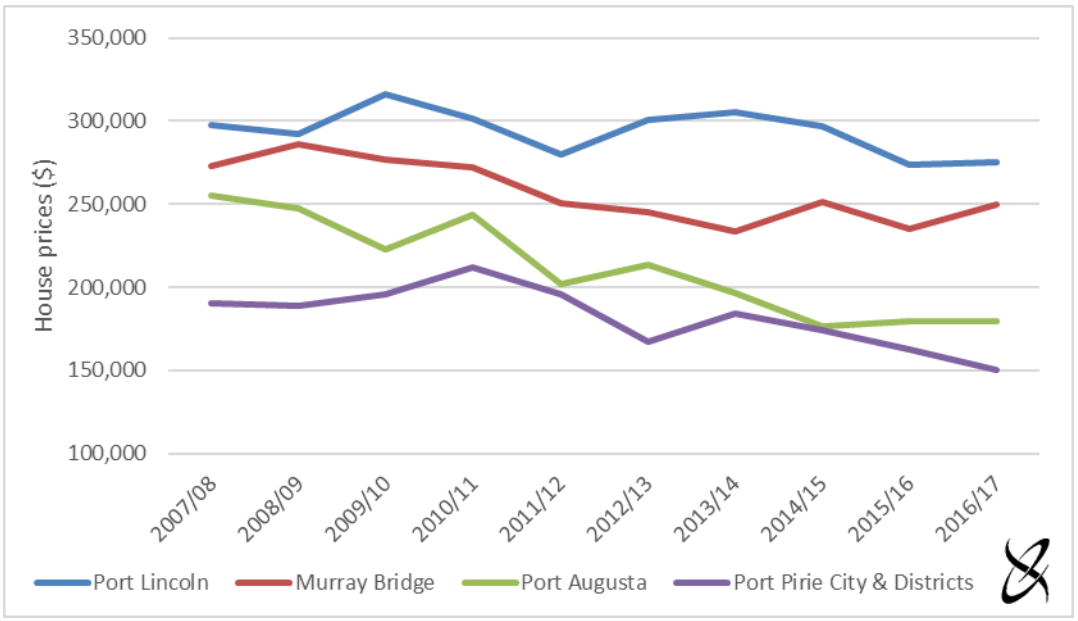
Adjacent LGAs – large regional towns

- Port Lincoln: decreased by 7.6 per cent (from $297,750 to $275,000)

Comparative LGAs – large regional towns

- Murray Bridge: decreased by 8.3 per cent (from $272,750 to $250,000)
- Port Augusta: decreased by 29.5 per cent (from $255,250 to $180,000)
- Port Pirie City and Districts: decreased by 21.4 per cent (from $190,750 to $150,000)

Appendix Figure 4-10 Real median house prices, large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17[a]



[a] Prices are in 2016/17 dollars

Source: Corelogic RP data (2018) and EconSearch Analysis

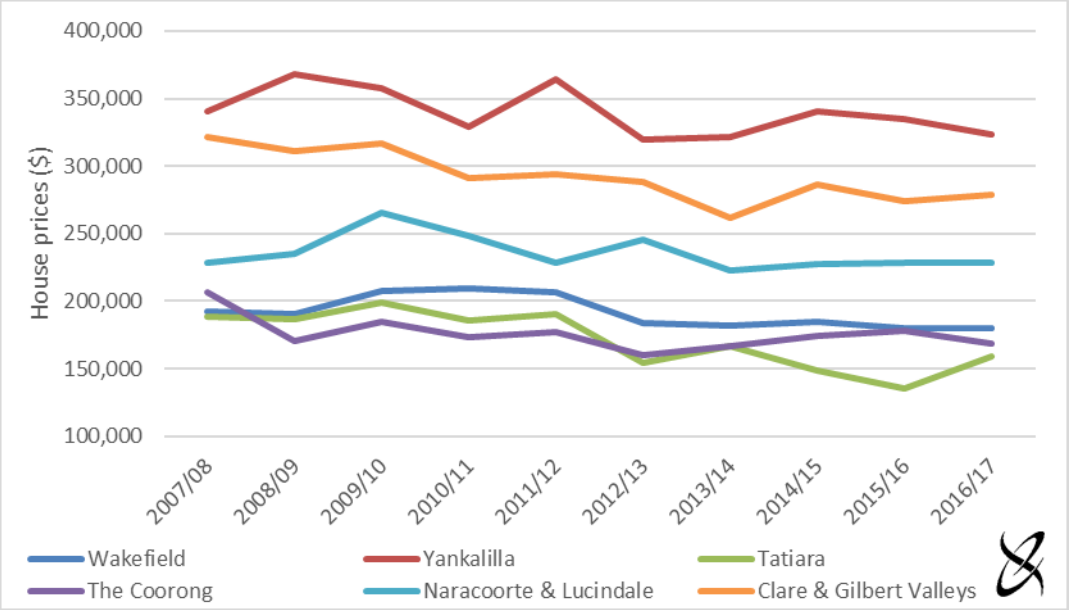
Adjacent LGAs – medium sized regional towns

- Wakefield: decreased by 6.5 per cent (from $192,500 to $180,000)
- Yankalilla: decreased by 4.9 per cent (from $340,250 to $323,500)

Comparative LGAs – medium sized regional towns

- Tatiara: decreased by 15.3 per cent (from $188,250 to $159,500)
- The Coorong: decreased by 18.3 per cent (from $206,500 to $168,750)
- Naracoorte and Lucindale: decreased by 0.2 per cent (from $228,500 to $228,000)
- Clare and Gilbert Valleys: decreased by 13.4 per cent (from $322,000 to $279,000)

Appendix Figure 4-11 Real median house prices, medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



[a] Prices are in 2016/17 dollars

Source: Corelogic RP data (2018) and EconSearch Analysis

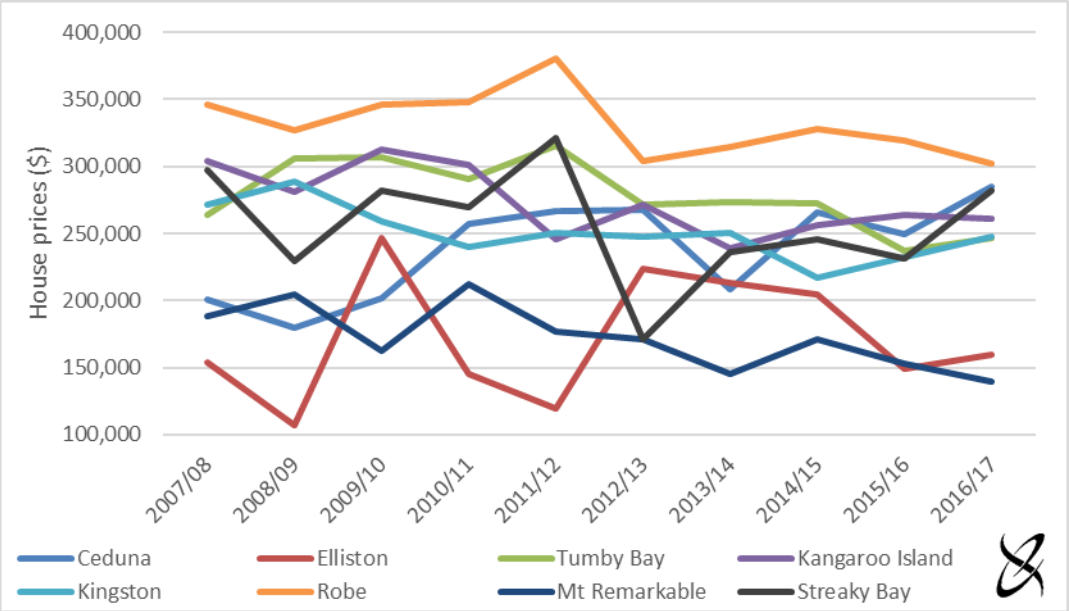
Adjacent LGAs - small regional towns

- Ceduna: increased by 41.8 per cent (from $201,000 to $285,000)
- Elliston: increased by 3.7 per cent (from $154,250 to $160,000)
- Tumby Bay: decreased by 6.8 per cent (from $264,250 to$ 246,250)
- Kangaroo Island: decreased by13.9 per cent (from $303,750 to $261,500)

Comparative LGAs - small regional towns

- Kingston: decreased by 8.8 per cent (from $272,000 to $248,000)
- Robe: decreased by 12.6 per cent (from $346,250 to $302,500)
- Mount Remarkable: decreased by 25.6 per cent (from $188,250 to $140,000)
- Streaky Bay: decreased by 5.1 per cent (from $297,750 to $282,500)

Appendix Figure 4-12 Real median house prices, small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2007/08 to 2016/17



[a] Prices are in 2016/17 dollars

Source: Corelogic RP data (2018) and EconSearch Analysis

School Enrolments

The change in school enrolments over the last 10 years (2006, 2011 and 2016 censuses) for the adjacent and comparative LGAs is shown in Appendix Table 4-5, Appendix Table 4-6 and Appendix Table 4-7. This can be described as follows:

Adjacent LGAs – large regional towns

- Port Lincoln: decrease by 4.5 per cent (from 2,838 to 2,710)

Comparative LGAs – large regional towns

- Murray Bridge: increase by 7.6 per cent (from 3,642 to 3,917)
- Port Augusta: decrease by 10.7 per cent (from 2,721 to 2,429)
- Port Pirie City and Districts: decrease by 8.2 per cent (from 3,631 to 3,333)

Appendix Table 4-5 School enrolments, large regional towns (ERP > 10,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2006	2011	2016	Change (%)
Adjacent LGAs				
Port Lincoln	2,838	2,896	2,710	-4.5%
Comparison LGAs				
Murray Bridge	3,642	3,850	3,917	7.6%
Port Augusta	2,721	2,480	2,429	-10.7%
Port Pirie City & Districts	3,631	3,560	3,333	-8.2%

Source: ABS 2017 and EconSearch Analysis

Adjacent LGAs – medium sized regional towns

- Wakefield: increase by 1.3 per cent (from 1,332 to 1,349)
- Yankalilla: increase by 13.3 per cent (from 670 to 759)

Comparative LGAs – medium sized regional towns

- Tatiara: decrease by 16.6 per cent (from 1,557 to 1,299)
- The Coorong: decrease by 15.7 per cent (from 1,154 to 973)
- Naracoorte and Lucindale: decrease by 6.0 per cent (from 1,745 to 1,640)
- Clare and Gilbert Valleys: increase by 1.3 per cent (from 1,708 to 1,731)

Appendix Table 4-6 School enrolments, medium sized regional towns (ERP between 5,000 and 10,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2006	2011	2016	Change (%)
Adjacent LGAs				
Wakefield	1,332	1,382	1,349	1.3%
Yankalilla	670	709	759	13.3%
Comparison LGAs				
Tatiara	1,557	1,419	1,299	-16.6%
The Coorong	1,154	1,015	973	-15.7%
Naracoorte & Lucindale	1,745	1,664	1,640	-6.0%
Clare & Gilbert Valleys	1,708	1,789	1,731	1.3%

Source: ABS 2017 and EconSearch Analysis

Adjacent LGAs – small regional towns

- Ceduna: decrease by 14.8 per cent (from 742 to 632)
- Eilliston: decrease by 32.7 per cent (from 275 to 185)
- Tumby Bay: decrease by 2.5 per cent (from 441 to 430)
- Kangaroo Island: decrease by 12.9 per cent (from 843 to 734)

Comparative LGAs – small regional towns

- Kingston: decrease by 27.2 per cent (from 471 to 343)
- Robe: decrease by 11.8 per cent (from 238 to 210)
- Mount Remarkable: decrease by 21.3 per cent (from 592 to 466)
- Streaky Bay: decrease by 1.2 per cent (from 403 to 398)

Appendix Table 4-7 School enrolments, small regional towns (ERP < 5,000 in 2016/17), adjacent and comparative LGAs, 2015/16 to 2030/31

	2006	2011	2016	Change (%)
Adjacent LGAs				
Ceduna	742	731	632	-14.8%
Elliston	275	211	185	-32.7%
Tumby Bay	441	443	430	-2.5%
Kangaroo Island	843	788	734	-12.9%
Comparison LGAs				
Kingston	471	387	343	-27.2%
Robe	238	240	210	-11.8%
Mt Remarkable	592	513	466	-21.3%
Streaky Bay	403	406	398	-1.2%

Source: ABS 2017 and EconSearch Analysis

APPENDIX 5 ACTIVITIES AND USES TABLE

Appendix Table 5-1 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.

RECREATION, EDUCATION AND OTHER

	GMUZ	HPZ	SZ	RAZ	Limits / Permits / Exceptions
Animal feeding/baiting/berleying [1]					
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)					

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
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					
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					

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
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).

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 (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

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
– 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
– seabed dredging	*				* Will depend on nature of proposal and its location
– pit-type extraction	*				* 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
Processing	□	□	□	□	

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
– 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 6 HANSARD TABLE

Park name	Park no.	Zone	SZ name	Fisheries identified (from Hansard)	Estimated economic impact (from Hansard)	Estimated economic impact (EconSearch)
Nuyts Archipelago	2	SZ-1	Nuyts Reef	Rock lobster Abalone	"the area fished within these two zones represent 34.31 per cent or 8,248 kilograms of the average annual greenlip abalone catch and 17.19 per cent or 2,592 kilograms of the blacklip abalone catch" "The NZRL: the impact of those two SZs will lead to a loss of 7,335 kilograms" Impacts fishing operations	Rock lobster 3,630kg Abalone 10,850kg (1.91% of catch)
Nuyts Archipelago	2	SZ-8	Isles of St Francis	Rock lobster Abalone	See above	See above
Investigator	4	SZ-2	Pearson Isles	Rock lobster	"will result in a loss of up to 5,900 kilograms" Impacts fishing operations	Rock lobster 9,300kg
Sir Joseph Banks Group	6	SZ-1	Salt Creek	Sardines	Impacts fishing operations	Concurs (257,000kg or 1.11%)
Neptune Islands Group	7	SZ-1	North Neptune Islands	Rock lobster	"impact from between six to seven tonnes" Impacts fishing operations	Concurs (6,900kg)
Upper Gulf St Vincent	14	SZ-1	Clinton Wetlands	MSF	"16 marine scale fishers from that area, a loss of 35 tonnes of garfish ($315,000), 20 tonnes of yellowfin whiting ($160,000), 33 tonnes of calamari ($396,000), 80 tonnes of snapper ($720,000), 20 tonnes of salmon ($50,000), nine tonnes of King George whiting ($107,000), and 13 tonnes of other species ($66,000), for a total of $1.8 million"	MSF $485,000
Encounter	15	SZ-5	Rapid Head	MSF	"displace 2.5 marine scale fishers with a loss of 15 tonnes of calamari at $180,000 and five tonnes of garfish at $35,000. "	MSF $19,000
Encounter	15	SZ-8	Bay of Shoals	MSF	"displace three marine scale fishers with the loss of annual catch of some 24 tonnes at $195,000. "	MSF $12,000

Encounter	15	SZ-10	Sponge Gardens	MSF Charter	”displacement of half a marine scale fisher with a loss of five tonnes of shark and five tonnes of snapper”	No comparable data
Encounter	15	SZ-11	The Pages	Abalone	”This particular zone and SZ 3 in Marine Park 16 will have a very heavy impact on the Central Zone Abalone Fishery with losses of 5,606 kilograms of blacklip and 5,543 kilograms of greenlip at a combined export value of $464,000”	No comparable data
Western Kangaroo Island	16	SZ-1	Cape Borda	Rock lobster MSF	”displace one marine scale fisher with a loss of 3.5 tonnes of marine scale species. It is also a very important NZRL fishery with an average annual harvest of 13,228 kilograms”	MSF – no comparable data Rock lobster 690kg
Western Kangaroo Island	16	SZ-3	Cape du Couedic	Rock lobster Abalone	”Central Zone Abalone Fishery, that this is that area, and the two combined would lead to loss of some $464,000 in blacklip and greenlip” Rock lobster: ”estimated that 15,794 kilograms would be lost, affecting up to 16 fishermen. ” Impacts fishing operations	Abalone $217,000 Rock Lobster 7,300kg

Source: APPENDIX 2 and Parliament of South Australia 2014

APPENDIX 7 DESIGN PRINCIPLES

Bioregional Framework

In addition to the national commitment to a NRSMPA made by South Australia in 1992, a key catalyst for marine parks development in South Australia was the endorsement of the national Interim Marine and Coastal Regionalisation for Australia (IMCRA) by the Australian and New Zealand Environment and Conservation Council (ANZECC) in 1998. The IMCRA was developed through the collaborative efforts of Commonwealth, State and Northern Territory marine conservation and research agencies and classified Australia's coast and marine environment into 60 distinct marine biogeographical regions (IMCRA, 1998). Each marine biogeographical region, or bioregion contains biological and physical characteristics distinct from those elsewhere in Australia (ANZECC, 1999). In order to maximise the conservation outcomes of the NRSMPA, the national guidelines recommend that one or more examples of ecosystems within each bioregion in Australia should be represented in a marine protected area (ANZECC, 1999). Based on the national IMCRA marine bioregions developed in 1998, eight marine bioregions have been recognised by the previous South Australian Government for the State's marine waters.

The previous South Australian Government determined that the State's network of marine parks be developed within the marine bioregional framework. It was designed to encompass the major ecosystems and habitat types within and between each bioregion (DENR, 2008). 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 (Figure 3-1). The physical and biological features of the network include areas of different depths, sea surface temperatures, shoreline types, shoreline exposures and marine benthic habitats.

Design Principles and CAR

To develop a representative network of marine parks for South Australia, the previous SA Government was guided by a set both biophysical and community principles in order to meet the objective:

> *Marine parks program is to protect and conserve our State's marine environment while minimising impacts on existing marine users and ensuring ongoing use of the marine environment.*

In 2008, based on advice from the SWG and the MAC, a set of 14 Design Principles were finalised to assist with the formulation of South Australia's marine park boundaries. The principles guided the development of the marine park outer boundaries and zoning. The principles were developed by assessing and reviewing over 30 years of international and national discussion, published research and practical management experience in protected areas. The principles are

based on national guidelines and are designed to meet the objects[113] of the *Marine Parks Act 2007*.

The 14 Design Principles are split between 7 biophysical principles and 7 community principles:

The biophysical design principles have been categorised into primary and secondary principles. The primary biophysical design principles (1 to 4 listed below) are overarching principles that guide the boundary network as a whole. The secondary biophysical design principles (5 to 7 listed below) may apply at a system-wide level, but more often serve to focus the program on key or irreplaceable areas within regions that should also be included within the system. The secondary principles may also help in the preferential nomination of areas where a number of similar locations all contribute effectively to a representative system.

1. **The Precautionary Approach**: Plan, anticipate and take action early to safeguard against possible impacts.
2. **Comprehensiveness**: Cover the full range of ecosystems and habitats.
3. **Adequacy**: Maintain ecological integrity and ecosystem functioning.
4. **Representativeness**: Reflect the biodiversity and variability naturally present.
5. **Connectivity and Linkages**: Provide for sharing of plants, animals and materials between sites.
6. **Resilience and Vulnerability**: Protect features that are more sensitive to change.
7. **Ecological importance**: Include important and unique features.

The community design principles recognise varied users of the marine environment and seek to align marine parks so that those uses continue and are sustainable in the future.

8. **Seek synergies with existing protected areas**: Establish ecological links between land and sea, e.g. aligning marine parks and national parks.
9. **Seek to complement existing land and marine management practices**: e.g. international conventions and current management under Fisheries, Aquaculture and NRM for example.
10. **Give consideration to the full diversity of marine uses**: e.g. commercial and recreational fishing, other recreational activities, and research.

[113] a) "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; and
b) to assist in—
i. the maintenance of ecological processes in the marine environment;
ii. the adaptation to the impacts of climate change in the marine environment;
iii. protecting and conserving features of natural or cultural heritage significance;
iv. allowing ecologically sustainable development and use of marine environments; and
v. providing opportunities for public appreciation, education, understanding and enjoyment of marine environments."

11. **Respect indigenous interests and culture**: e.g. significant sites, Native Title and Indigenous Land Use Agreements.
12. **Give consideration to cultural heritage**: e.g. World Heritage sites and historic shipwrecks.
13. **Ensure ease of identification, compliance and enforcement**: Align boundaries with visible features on the shoreline and consider boundary shape and methods for defining them.
14. **Provide for education, appreciation and recreation**: e.g. align marine parks close to schools with active marine programs.

The document Design Principles: Guiding Development of South Australia's Marine Park Boundaries is available at: www.environment.sa.gov.au/coasts/marineparks.html

There are four biophysical design principles based on national priorities: Precautionary Approach, CAR. These principles and the other 11 were used to develop the current Marine Park zoning (DEH 2008). This CAR feature of the network is captured in the *Marine Parks Act 2007* "management of a comprehensive, adequate and representative system of marine parks".

The 'Design Principles' document (DEH 2008) defines:

The Precautionary or Anticipatory Approach

For the purposes of marine parks design, the precautionary approach should be applied to avert known risks of harm and/or potential harm to the marine environment. An additional component of the precautionary approach is that unknown risks may also exist and that reasonable scientific hypotheses should support decision making to anticipate, plan for and subsequently adapt to previously unforeseen risks to biodiversity conservation. An example of how the precautionary approach may be applied is the inclusion of unmapped areas within marine parks now, rather than waiting until habitat mapping programs can reveal more information about the areas of uncertainty.

Comprehensiveness

"To achieve comprehensiveness, the network of marine parks should have comprehensive coverage of the full range of ecosystems and habitats that are characteristic of South Australia's marine environment. For comprehensiveness to be attained, each marine park should establish or improve the coverage of the full range of ecosystems and habitats occurring within each bioregion."

Adequacy

"For the marine parks network to be adequate, it should provide for the maintenance of the ecological viability and integrity of populations, species and communities. To create an adequate network of marine parks, selected areas must ensure the continuance of natural processes that are characteristic of the bioregion they are representing. For a marine park to achieve adequacy, whole areas of representative habitats need to be encapsulated within marine park boundaries.

One of the main factors contributing to adequacy for marine park design is the size of marine parks.

For an area to be seen to be of adequate size, it must ensure that natural processes will persist and that the populations, communities and species protected are ecologically viable. 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. Although some protected area managers specify a percent area target to guide marine parks size, the inherent variability in marine ecosystems in South Australia makes it difficult to specify minimum sizes with certainty. The South Australian Government's preferred approach is to determine marine park size on a park-by-park basis, allowing greater flexibility to create parks that are large enough to protect viable ecosystems but that minimise impacts on marine users where possible."

Representativeness

"For a network of marine parks to be representative, the network must reflect the biodiversity and variability naturally present in our marine environment. As there is still much to learn about the biodiversity of the marine environment, the ecosystems and habitat types that characterise the marine environment are included as a substitute or 'surrogate' for biodiversity.

To achieve representativeness, marine parks design should include large, uniform areas of each of the ecosystem and habitat types that are typically found in each bioregion (and their borders). By incorporating multiple marine parks within each bioregion, altogether the marine parks should reflect and encapsulate the environmental variability within each bioregion. In turn, by developing marine parks within and across each bioregion the network of marine parks should represent the biodiversity and variability across the state."

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). 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).

By modifying the activities or zoning arrangements to allow fishing or other activities inside a SZ, it will alter the balance of habitats and features represented in the different zones of the park network. Any changes to zoning will have to a greater or lesser extent an impact on the how the Marine Park network satisfies the criteria for a "comprehensive, adequate and representative system of marine parks ".

For the current report, some general features of CAR and design principles are summarised for the 83 SZs, while some features of CAR were able to be investigated in more detail for the 12 focus SZs:

- The size (spatial area) of the SZ relative to other SZs in the network (with the assumption that larger is better)
- Whether the SZ has replication at the bioregion and network scales.

- Whether the SZ has connectivity
    - with Commonwealth Marine National Parks
    - as an important transitory zone/location
    - of habitats within the SZ; for example transition from saltmarsh, mangrove breeding and nursery habitats to the connected deeper seagrass adult habitat.
- Whether the SZ has unique features at the bioregion and network scales.

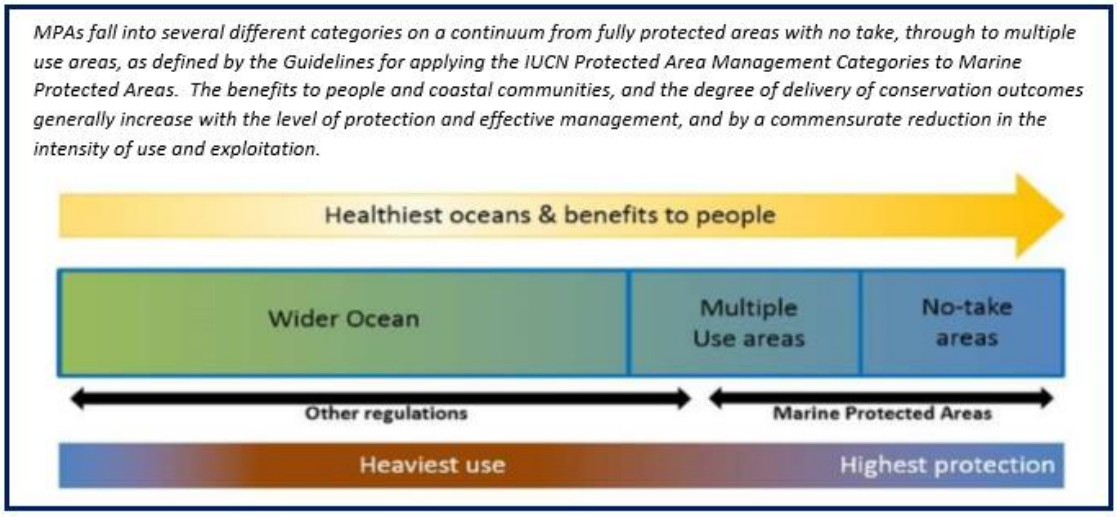
Reduced ability of network to satisfy CAR design requirements

A number of design principles were used to develop the current Marine Park zoning such that the network is CAR (DEH 2008). This feature of the network is captured in the *Marine Parks Act 2007* "management of a comprehensive, adequate and representative system of marine parks".

By modifying the activities or zoning arrangements to allow fishing or other activities allowed in a HPZ, it will alter the balance of habitats and features represented in the different zones of the park network. Any changes to zoning will have to a greater or lesser extent an impact on the network meeting the objects of the *Marine Parks Act 2007*.

MPAs are part of a suite of management options needed to help sustain ocean health. MPAs provide high quality, in situ, and targeted nature conservation, and can range from fully protected areas, to areas that zone and allow for some multiple use. The strategy and focus for MPAs and MPA networks should be protection of those areas most important for conserving marine biodiversity. The key difference between MPAs and other area-based measures is that, whatever form the MPAs take, the primary focus must be conservation of biodiversity. Area based measures where the primary goals are something else, such as sustainable fishing, do not qualify as an MPA. If fishing or other extractive activities are compatible with a MPA's objective(s), and are permitted within the MPA, they must have a low ecological impact, be sustainable, be well managed as part of an integrated approach to management, and fit within the definition and category of an IUCN protected area. Any industrial activities and infrastructural developments (e.g. mining, industrial fishing, oil and gas extraction) are not compatible with MPAs.

Appendix Figure 7-1 MPAs Categorisaion



Source: IUCN's Global Conservation Standards to Marine Protected Areas
https://www.iucn.org/sites/dev/files/content/documents/applying_mpa_global_standards_final_version_050418.pdf

APPENDIX 8 EXPLANATORY INFORMATION FOR ENVIRONMENTAL VALUES ASSESSMENT

A.8.1 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.2.12.4). 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.8.2 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 8-1).

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 8-1).

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 8-1).

Appendix Table 8-1 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 8-2). 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 8-2).

Appendix Table 8-2 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 8-3). 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 8-3 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 8-4).

Appendix Table 8-4 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 8-5).

Appendix Table 8-5 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.8.3 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.8.4 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 9 MAP METADATA

Appendix Table 9-1 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

APPENDIX 10 PRELIMINARY AND FINAL SANCTUARY ZONE STATISTICS

Appendix Table 10-1 Preliminary and final sanctuary zone statistics

Marine Park	Marine park area (km²)	Preliminary SZs				Final SZs			
		Area (km²)	No.	% within marine park boundaries	% within State waters	Area (km²)	No.	% within marine park boundaries	% within State waters
Far West Coast	1,690	778	3	46%	1.3%	712	3	42%	1.18%
Nuyts Archipelago	3,998	982	19	25%	1.6%	342	9	9%	0.57%
West Coast Bays	788	202	9	26%	0.3%	68	9	9%	0.11%
Investigator	1,184	324	5	27%	0.5%	219	3	18%	0.36%
Thorny Passage	2,472	660	15	27%	1.1%	98	8	4%	0.16%
Sir Joseph Banks Group	2,628	739	7	28%	1.2%	172	5	7%	0.29%
Neptune Islands Group	146	42	1	29%	0.1%	34	1	24%	0.06%
Gambier Islands Group	120	32	3	27%	0.1%	0	0	0%	0%
Franklin Harbor	635	186	5	29%	0.3%	70	4	11%	0.12%
Upper Spencer Gulf	1,606	443	10	28%	0.7%	206	9	13%	0.34%
Eastern Spencer Gulf	784	221	4	28%	0.4%	41	3	5%	0.07%
Southern Spencer Gulf	2,974	761	9	26%	1.3%	145	3	5%	0.24%
Lower Yorke Peninsula	849	288	5	34%	0.5%	72	2	9%	0.12%

Marine Park	Marine park area (km^2)	Preliminary SZs				Final SZs			
		Area (km^2)	No.	% within marine park boundaries	% within State waters	Area (km^2)	No.	% within marine park boundaries	% within State waters
Upper Gulf St Vincent	966	275	5	28%	0.5%	135	4	14%	0.22%
Encounter	3,121	749	21	24%	1.2%	282	11	9%	0.47%
Western Kangaroo Island	1,021	270	6	27%	0.4%	219	3	21%	0.36%
Southern Kangaroo Island	673	233	5	35%	0.4%	77	1	11%	0.13%
Upper South East	906	217	5	24%	0.4%	87	3	10%	0.14%
Lower South East	360	114	4	32%	0.2%	34	2	10%	0.06%
Totals	**26,922**	**7,517**	**141**	**28%**	**12.5%**	**3,014**	**83**	**11%**	**5%**

Source: Various sources (ref APPENDIX 9)