South Australia's marine parks

5-year status report 2012-2017

SOUTH AUSTRALIA

Government of South Australia

National Parks South Australia

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Cover photography: Giant Australian Cuttlefish in the Upper Spencer Gulf Marine Park near Whyalla © Carl Charter

Foreword

The Department of Environment, Water and Natural Resources (DEWNR) is responsible for the management of the State's natural resources, ranging from policy leadership to on-ground delivery in consultation with government, industry and communities.

High-quality science and effective monitoring provides the foundation for the successful management of our environment and natural resources. This is achieved through undertaking appropriate research, investigations, assessments, monitoring and evaluation.

DEWNR's strong partnerships with educational and research institutions, industries, government agencies, Natural Resources Management Boards and the community ensures that there is continual capacity building across the sector, and that the best skills and expertise are used to inform decision making.

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Executive Summary

The Government of South Australia authorised a management plan for each of South Australia's 19 marine parks on the 29 November 2012. These plans provide for biodiversity conservation, ecologically sustainable development and use of marine resources. Management plans establish park zoning and also include management strategies to support achievement of the objects of the *Marine Parks Act 2007*. Under the Act, management plans must be reviewed within 10 years of authorisation.

The implementation of the 19 management plans is led by the Department of Environment, Water and Natural Resources (DEWNR), in collaboration with other government agencies, universities, and the community. The management plan strategies are divided into four management sub-programs: Protection (policy, planning, permitting and governance); Stewardship (education and engagement); Performance (monitoring, evaluation and reporting); and Compliance (investigation and enforcement). Activities to deliver the strategies are managed through the four sub-programs.

The marine parks program is a whole of Government initiative; collaborations and partnerships with other agencies and organisations are integral to its successful implementation and management. Existing partners include state and federal Government agencies, research institutions, as well as citizen science and community programs and organisations.

This Status Report assesses the first five years of progress since implementing the 19 marine park management plans in 2012. The report covers the period between 2012 and 2017. The Report will also inform the ongoing adaptive management of marine parks and will contribute to the 10-year review. It includes background information on the marine parks monitoring, evaluation and reporting (MER) program, a summary of marine parks budget expenditure, a summary of program activities, and a summary of trends and early outcomes from ongoing ecological and socio-economic monitoring.

Importantly, this Status Report does not undertake an evaluation of the effectiveness of the management plans in delivering the objects of the *Marine Parks Act 2007,* or an evaluation of the appropriateness of strategies, including zoning arrangements. A full evaluation will be undertaken as part of the 10-year evaluation report in 2021.

Since November 2012, marine parks expenditure has totalled about $14 million. Additional funding was allocated to a commercial fisheries voluntary catch/effort reduction program of just over $19 million. A further $2 million was provided to 107 projects to broadly improve experiences for recreational fishers and to encourage recreational fishing in marine parks. An additional $1 million was provided to trialling a shellfish reef restoration project and opening off-line reservoirs for recreational fishing.

The marine parks program has undertaken a substantial amount of activity in the five years between 2012 and 2017, including:

- Underwater Visual Census (UVC) monitoring has been undertaken in 11 sanctuary zones across seven marine parks with a total of 120 surveys.
- Baited Remote Underwater Video Systems (BRUVS) monitoring commenced in 2014 and has been undertaken in 18 sanctuary zones across 10 marine parks with a total of 496 surveys.
- Inventory mapping has been completed for 18 sanctuary zones and partially completed for another two.
- Since 2014/2015, $240,300 has been approved to fund 12 research partnership projects with universities.
- A total of 160 permits have been issued since the marine park management plans were implemented, 94 of these were for research.
- 26 citizen science projects have been undertaken involving approximately 500 community members.

- 71 marine park school eductation events reaching over 23, 000 students at 17 schools have taken place since 2012/13.
- An extensive recreational fishing education program has circulated over 300,000 copies of the Recreational Fishing Guide. Around 10,000 South Australian recreational fishing guide apps are downloaded annually providing access to information on locations of sanctuary zones.
- 107 marine park zoning signs were placed across the state at popular locations such as beach entry points and boat ramps to help maximise voluntary compliance.
- A total of 7299 shore, boat and aerial compliance patrols have been conducted since November 2014 when sanctuary zones were fully implemented. As of 30 June 2017, there have been 678 incidents identified, 34 education letters, 385 warnings and 9 expiation notices issued.
- Interviewed over 2000 people in annual phone surveys to gauge public support for and perceptions of marine parks in South Australia.
- 133 visits to the Adelaide Central Markets to collect fish price data between June 2014 and August 2017
- The marine parks team have given almost 130 oral presentations promoting marine parks to over 6000 community members.
- Since 2014/15 there has been over 120 marine park related community events reaching over 77,000 people across the state.
- Implemented the largest marine biodiversity monitoring program in the state's history
- Completed the first major marine biodiversity expedition to the state's iconic offshore islands since 2008.

The marine parks were designed principally for the conservation and protection of marine biodiversity and habitats. To determine if the management activities are resulting in expected/predicted changes to ecological values, a range of indicators are being monitored by the Marine Parks MER Program. Key findings of the ecological monitoring to date are:

- The marine parks ecological monitoring program has established an extensive dataset of biological indicators in seven of the eight marine bioregions and in 16 of the 19 marine parks.
- Sanctuary Zones have captured the biodiversity on offer in the marine park network as demonstrated by the similarity in the suite of species, their distribution and abundances between sites inside Sanctuary Zones and associated comparison sites.
- Mapping of the seafloor is continuing to add to our knowledge base by cataloguing benthic habitats contained in the marine park network.
- The ecological sampling program implemented is rigorous and capable of detecting meaningful biological changes and therefore appropriate for assessing the long term effectiveness of the marine park network.
- Preliminary trends indicate that marine parks are maintaining biodiversity and ecosystem function.
- Offshore islands are critical components of the marine park network. They are biodiversity hotspots and contain mostly intact plant and animal communities making them important reference sites.
- Sponge Gardens Sanctuary Zone is an important refuge for vulnerable, site attached iconic fish species such as blue groper, harlequin fish and blue devil.
- In general, insufficient time has passed since marine park implementation for changes in size, abundance and diversity of biota to be detected. An exception to this were the results from the rock lobster study at Cape du Couedic Sanctuary Zone which were consistent with predictions of change that lobsters will increase in size and abundance when fishing pressure is removed.

The marine parks were designed to minimise potential negative impacts on marine industries such as fishing, shipping and aquaculture, and to result in positive socio-economic benefits by providing opportunities for education, public appreciation and nature-based tourism. To determine if the management activities are resulting in expected/predicted changes to socio-economic values, a range of indicators are being monitored by the Marine

Parks MER Program. It is important to note that it is beyond the scope and scale of the MER Program to monitor for potential socio-economic impacts on individuals. However, holders of statutory authorisations who believe their conferred rights are affected may apply for compensation in accordance with Section 21 of the *Marine Parks Act 2007* and the *Marine Parks (Statutory Authorisation Compensation) Regulations 2015* (two compensation applications are currently being assessed).

In all of the socio-economic indicators that were monitored, the observed trends post-marine parks were consistent with predictions of maintaining or improving the pre-marine parks trend. Based on the socio-economic indicators that were tracked, there was no evidence of a negative regional impact that correlates with the time of implementation of marine park management plans. Key findings of the socio-economic monitoring to date are:

- The price of local fish has remained stable, commercial fisheries have maintained their catch and value, recreational fishing participation rates have remained stable, and regional house prices have continued to increase.
- Industries such as aquaculture and shipping, which were accommodated through the marine parks planning process and zoning arrangements, have continued to operate unaffected by marine parks.
- Public support for marine parks to protect the marine plants and animals has remained high over a 10-year period since 2006 with support at 91 per cent in 2017. The number of people who, in general, are not in favour of marine parks to protect marine plants and animals has reduced from ten to three per cent since 2015.
- There is only a small percentage of the public that believe that marine parks have had a negative impact on local businesses where they reside or visit (<9 per cent of all respondents in 2017) or on their rate of participation in recreational activities including fishing (<6 per cent of all respondents in 2017).
- Since 2014, four new nature-based tourism operators have commenced operations inside marine parks, the shark cage diving industry has continued to grow at the Neptune Islands Marine Park
- There has been an increase in protection for European cultural heritage sites (shipwrecks) through their inclusion in sanctuary zones

Information relating to the marine parks ecological values, socio-economic values, and the underpinning monitoring and evaluation approach have been documented in this Status Report and are now publicly available. The marine parks program is supported by a comprehensive, rigorous and effective MER program. The findings of this report highlight that the marine parks program is on track to meet its statutory obligations through the implementation of activities aligned with the strategies of the management plans. The program is currently observing the predicted outcomes expected from effective implementation of these strategies.

The Status Report will be used to develop recommendations that guide the direction of the marine parks program over the next five years leading up to the legislated 10-year review of the management plans by 2022.

1 Introduction

The Government of South Australia has implemented a network of 19 marine parks as the South Australian component of the National Representative System of Marine Protected Areas (Figure 1). In accordance with the *Marine Parks Act 2007*, the 19 marine parks provide for biodiversity conservation and public appreciation and allow ecologically sustainable development and use of marine resources.

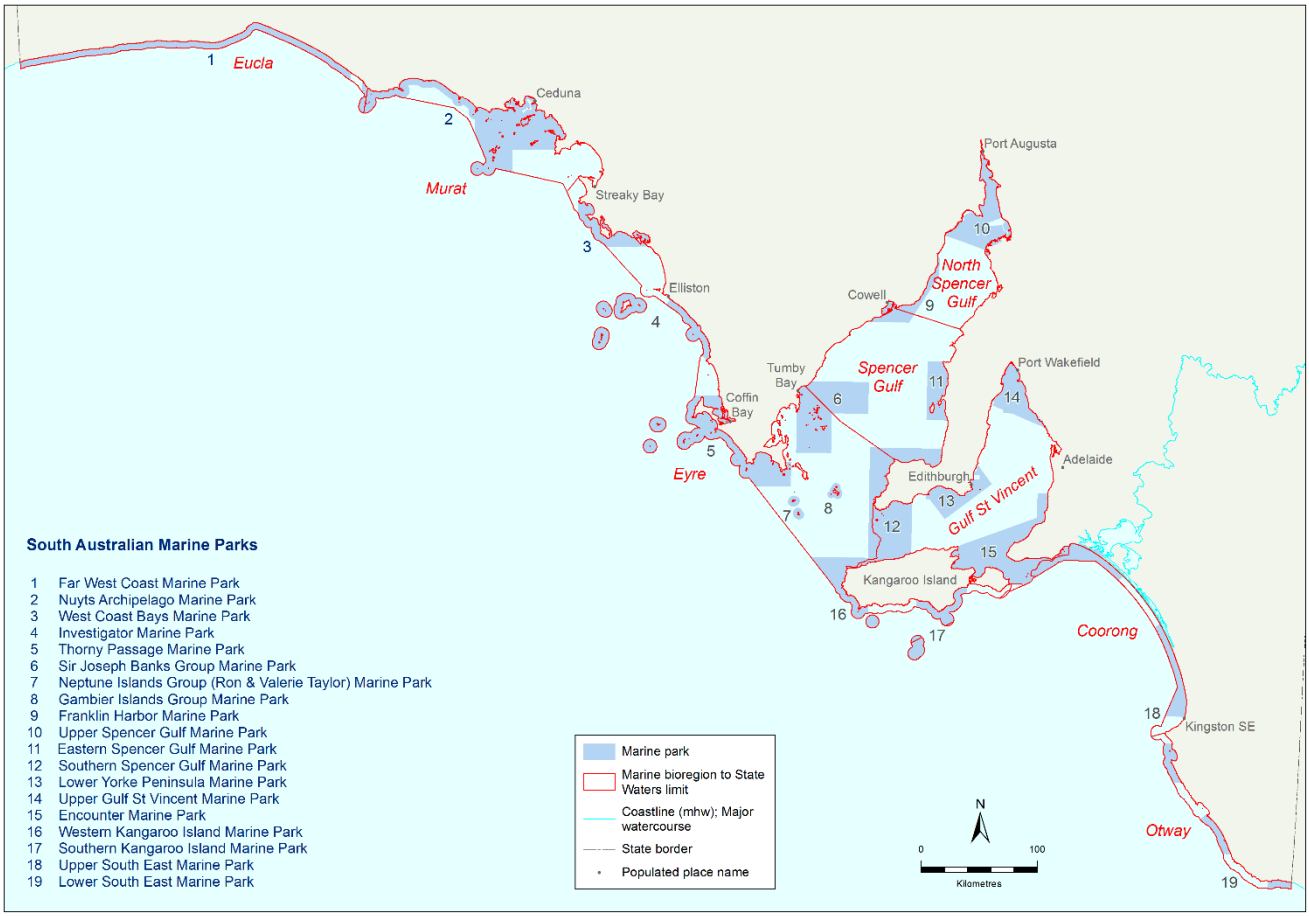


Figure 1. South Australia's network of 19 marine parks showing marine park outer boundaries and 8 marine bioregions 'clipped' to state waters

The management plans for South Australia's marine park network were authorised in November 2012 with fishing restrictions in sanctuary zones beginning on 1 October 2014 as prescribed by the *Marine Parks (Zoning) Regulations 2012* (Zoning Regulations).

The management plans were written in accordance with the requirements of the Marine Parks Act and the strategies included in the plans specifically support achievement of the objects of the Act listed below:

Part 2, Section 8, Clause (1) of the *Marine Parks Act 2007*

The objects of this Act are -

(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; and

(ii) the adaptation to the impacts of climate change in the marine environment; and

(iii) protecting and conserving features of natural or cultural heritage significance; and

(iv) allowing ecologically sustainable development and use of marine environments; and

(v) providing opportunities for public appreciation, education, understanding and enjoyment of marine environments.

The Act requires that the plans must be reviewed at least once in every 10 years, which means that the 19 plans must be reviewed by 2022 (Figure 2). The purpose of this report is to assess the progress of the Marine Parks Program after the first five (5) years of implementing the strategies of the nineteen (19) marine park management plans.

The outcomes of the assessment will enable DEWNR to identify any issues and adaptively manage the marine parks for effective delivery of the management plans (Figure 2). This assessment will be a major contributor to the Evaluation Report to be completed by 2021 (see Section 6).

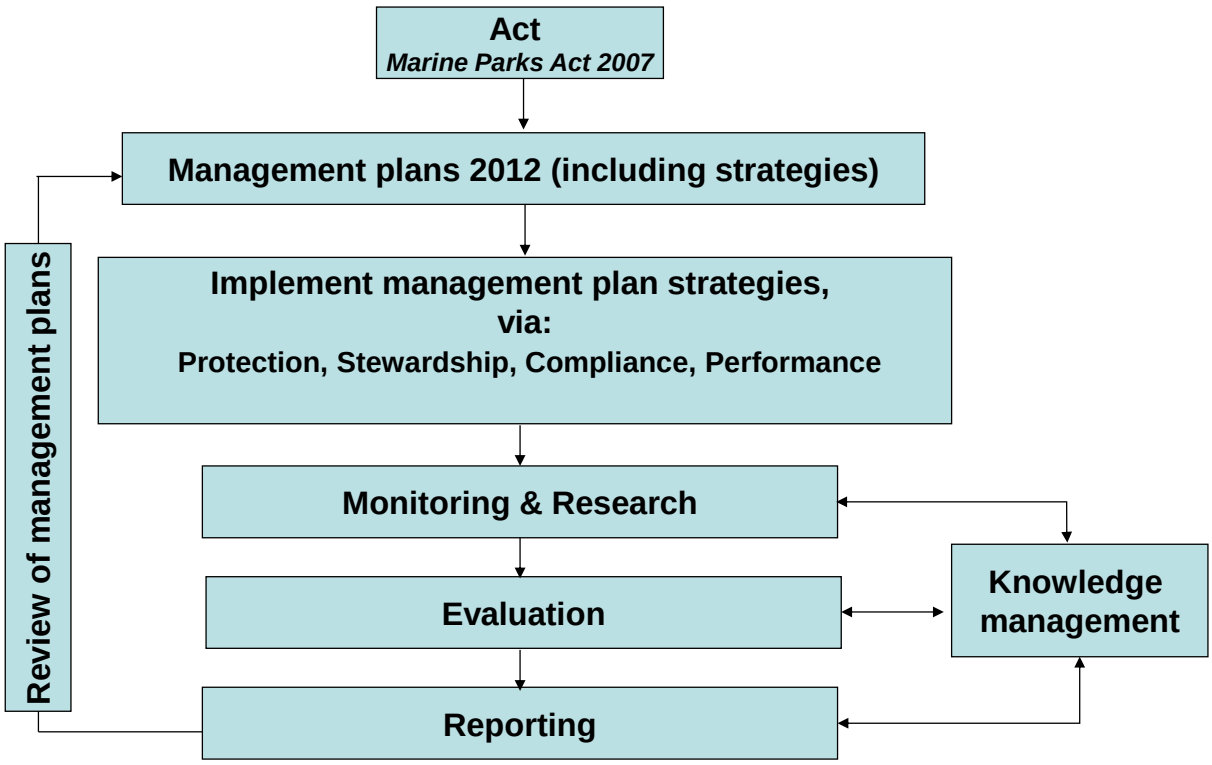


Figure 2. Adaptive management cycle for the marine parks program

1.1 The Status Report

This Status Report uses the marine parks Monitoring, Evaluation and Reporting (MER) Framework and MER Plan to define the expected immediate outcomes after five years (2017) of management plan implementation.

The Status Report includes:

- A summary of the activities undertaken across the marine parks program to implement the 15 management plan strategies and evaluation questions for each marine park;
- A summary of trends and early outcomes from ongoing socio-economic and ecological monitoring;
- A qualitative assessment of whether the management plan strategies are being adequately implemented and the immediate environmental and socio-economic outcomes are being realised;
- Summary of budget expenditure; and
- A summary of complementary activities and information available through research and/or stakeholder engagement used to inform the program.

Importantly, this Status Report will not be undertaking the following:

- Evaluation of the effectiveness of the management plans in delivering the objects of the Marine Parks Act 2007.
- Evaluation of expected intermediate (10-year) and long-term (20+ years) ecological and socio-economic outcomes.
- Evaluation of the appropriateness of strategies, including zoning arrangements.

A full evaluation will be undertaken as part of the 10 year evaluation report in 2021 and be informed by this Status Report.

2 Background

2.1 The Network

The marine parks network covers 26,655 km^2 or 44 per cent of South Australia's state waters, with 267km^2 of coastal lands and islands. The marine parks are multiple-use with different zones dictating the restricted activities in each marine park. The zones have differing levels of restrictions, ranging from General Managed Use Zone (GMUZ) – lowest level of restriction, through to Habitat Protection Zone (HPZ), Sanctuary Zone (SZ) and Restricted Access Zone (RAZ) – highest level of restriction. The network includes 27 RAZs (2.6 per cent of the total network area), 83 SZs (11 per cent of the total network area), 59 HPZs (55.7 per cent of the total network area) and 42 GMUZs (30.7 per cent of the total network area). SZs occupy 5 per cent of state waters. In addition, the parks include 52 Special Purpose Areas (SPAs) which are designated areas to allow for the activities that would otherwise be restricted as a consequence of the zoning. These activities include: harbor management, transhipment, significant economic development and/or shore-based recreational line fishing (Bryars et al. 2017a, b).

2.2 The component framework of predicted change

The component framework

The marine park baseline reports (e.g. Bryars et al. 2016, Baseline reports) provide the historical and current knowledge for each of the 19 marine parks, and present predictions and indicators of change based upon the relationship between six inter-related components (Figure 3).

1. marine park management plans
2. ecological values
3. social and economic (socio-economic) values
4. external physical drivers
5. external socio-economic drivers, and
6. human-mediated pressures

The MER Plan adopted this component-based approach and added a seventh component of assumptions which apply to the links and predicted changes across the whole framework (Figure 3). The MER program will require information on all seven components to answer the six key evaluation questions (KEQs) (see Section 5.2).

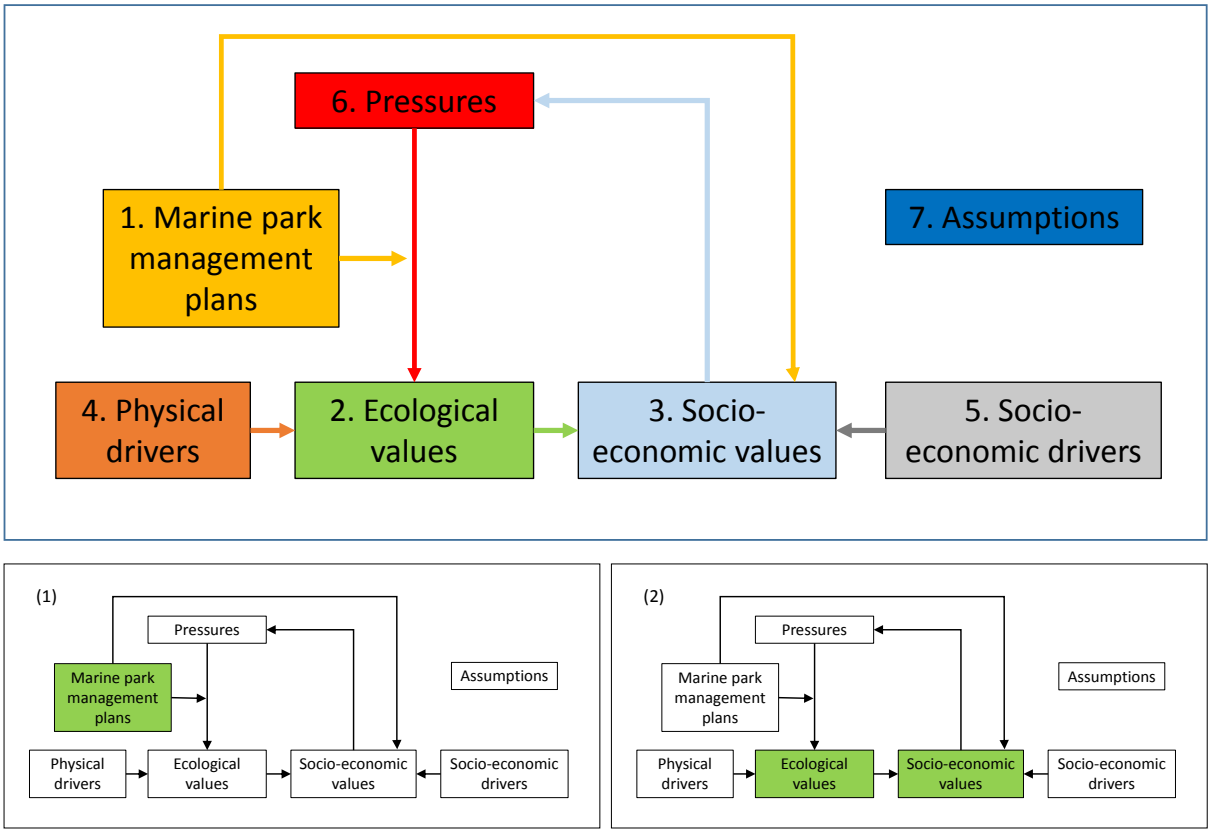


Figure 3. Framework for the seven components of the marine parks monitoring, evaluation and reporting program. See text for further details. The lower two boxes relate to the components being addressed in the Status Report (see section below).

The baseline reports summarised the available information on the values, drivers and pressures, any predicted changes in values, and represented these in conceptual models (Figure 4). At the core of the MER Program are the ecological and socio-economic values of the marine parks, and any predicted changes in these values due to implementation of the management plans (Figure 3, Figure 4). The direction and colour of the arrows indicates the influence of one component on another component or link. For example, the marine park management plan will directly influence socio-economic values but it will also indirectly influence ecological values by mitigating some (but not all) of the pressures on those values. External drivers that are not influenced by the marine park management plans are also considered as they may cause bigger changes to the values than what is caused by the management plans; for example, extreme weather events on marine biota, and fluctuating exchange rates on fisheries that export catch overseas. The assumptions component is shown in isolation as it encompasses the whole framework. Interested readers are directed to Bryars et al. (2016a-s; 2017a,b) for more information on baseline conditions, the theory of change, assumptions, and indicators and predictions of change in the marine park values due to marine park management plans. The technical reports by Bryars et al. (2016a-s; 2017a,b) were developed over several years and have been informed by a range of activities including independent workshops and reports (Bailey et al. 2012, Bryars 2013, Goyder Institute for Water Research 2016), the RIAS (Regional Impact Assessment Statement) for marine parks that was mandated by the state government (see Kosturjak et al. 2015), and rigorous external review.

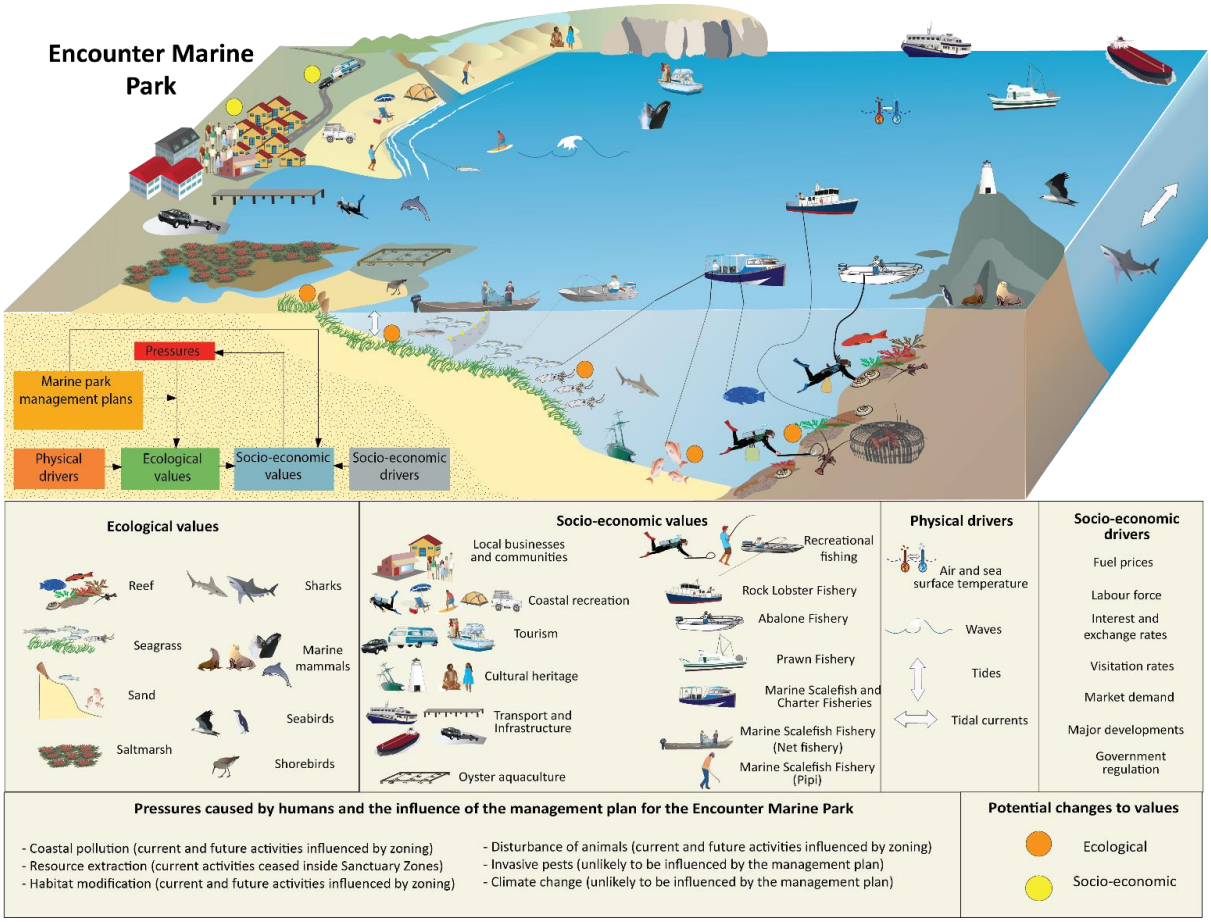


Figure 4. An example of a conceptual model of the ecological and socio-economic values, pressures, drivers and predicted changes taken from the Encounter Marine Park baseline report (Bryars et al. 2016o). Note that assumptions are not identified on this conceptual model.

Evaluating the effectiveness of the management plans

The ultimate aim of the MER Program is to evaluate the effectiveness of the management plans in supporting achievement of the six objects of the Marine Parks Act. To achieve this aim using the component framework of predicted changes (Figure 3), four steps are required, and Steps 1 and 2 (the first 3 components) are addressed in this Status Report (as highlighted in Figure 3):

1. To determine if the management plan strategies have been implemented

   The Status Report shows five years of activity measures since 2012 to demonstrate how management plan strategies are being implemented. Assessment of Step 1 requires appropriate indicators of management activity to be monitored and reported on. It does not involve an evaluation of whether the activities undertaken have been effective (i.e. indicators of outcomes) – this comes when the 10-year evaluation is undertaken.

2. To determine if the predicted changes in ecological and socio-economic values were observed

   The Status Report shows available monitoring information on indicators of ecological and socio-economic values to allow a comparison of observed changes against predicted changes since 2012 or 2014. In some cases an initial assessment can be made about the observed changes; mostly for socio-economic values in which change might be predicted in the first few years (particularly for cases of no predicted change or

negative impact) but less so for ecological values in which changes were often predicted to take many years.

3. To determine if the observed changes in ecological and socio-economic values were influenced by external drivers, pressures, inadequate marine parks management, and/or incorrect assumptions

   Assessment of Step 3 requires any observed changes in ecological and socio-economic values to be interpreted using information from the other monitoring components (physical drivers, socio-economic drivers, pressures, assumptions, and management) and research outcomes (assumptions).

   The Status Report does not present information on or specifically address Step 3.

4. To determine if the management plans were effective in achieving the objects of the Marine Parks Act

   Assessment of Step 4 requires a combination of information from Steps 1 to 3.
   A 'multiple-lines-of-evidence' approach will be taken to the final evaluation by using all relevant indicators and available information to address each of the six KEQs.

   The Status Report does not present information on or specifically address Step 4.

This Status Report focuses on Step 1 and part of Step 2 by monitoring and reporting on the activities and outputs that have been undertaken to deliver the strategies as part of the marine park management plans. It further considers some of the immediate outcomes and ongoing trends in changes to the ecological and socio-economic values as part of Step 2. The remaining steps will be addressed in the final evaluation report prior to the 10-year review. Work is on-going to collect the information necessary to conduct the final evaluation.

Assumptions

There are numerous assumptions inherent in the program logic, in the theory of change, and in being able to evaluate the effectiveness of the management plans (see Bryars et al. 2017a,b, Scholz et al. 2017). Some of these assumptions will be informed by routine monitoring activities as part of the MER Program but others may be able to be tested with targeted research or monitoring activities. Some assumptions may remain untested. Listed below are some of the key assumptions that underpin the predictions of change in ecological and socio-economic values, along with information on how they can be informed by the MER Program to determine if the assumptions are correct:

- The management plans (which include the zoning schemes and strategies) have provided for a comprehensive, adequate and representative system of marine parks. This assumption will be informed by a range of activities including baseline data on habitat statistics that informs comprehensiveness and representativeness (Bryars et al. 2017b), collection of routine monitoring data on ecological values from Step 2 that informs adequacy and which could update statistics for comprehensiveness and representativeness, and targeted research on adequacy from Step 3.

- The strategies of the management plans are implemented effectively, including:
  - There will be compliance with zoning regulations, particularly inside SZs. This assumption will be informed from collection of routine monitoring data on the performance of the compliance and protection sub-programs of the MER Program and changes in ecological values for Step 2.

  - When marine parks permits are issued, the conditions on the permits are adhered to. Consultation within DEWNR and with other government departments will be required to inform this assumption.

  - When referral advice is given on marine parks, the advice is taken up. Consultation within DEWNR and with other government departments will be required to inform this assumption.

- While not explicitly an object of the *Marine Parks Act 2007*, it is assumed that by providing opportunities for public appreciation, involvement, education, understanding and enjoyment of the marine environment, this will lead to increases in those values, and in community ownership and voluntary compliance. This assumption can be informed by collection of additional targeted monitoring or research data. For example, case studies could be conducted whereby people are surveyed to see if their knowledge and appreciation have been increased since the implementation of management plans.

- External factors outside the influence of the management plans do not affect predictions of change, including:
  - External physical drivers (e.g. sea surface temperatures, oceanic currents) will not change from the 2012 baseline trend or status. This assumption will be informed from collection of routine monitoring data on physical drivers for Step 3.

  - External socio-economic drivers (e.g., fuel prices, non-marine park government regulations, major developments) will not change from the 2012 baseline trend or status. This assumption will be informed from collection of routine monitoring information on socio-economic drivers for Step 3.

  - Pressures outside of the control of the management plan will either maintain the 2012 baseline trends or increase under a probable scenario of increasing human population, climate change, coastal development, and resource use (see Bryars et al. 2017b). This assumption will be informed from collection of routine and targeted monitoring data on pressures for Step 3.

3 Establishing a marine park network

The establishment of South Australia's network of marine parks was one of the most influential conservation initiatives ever undertaken in the state because it potentially affected existing and future users of the marine environments, such as commercial and recreational fishing, aquaculture, shipping, mining and commercial development, and indirectly affects many South Australians who rely on the marine environment for social and economic benefits. Consequently, a comprehensive community engagement process supported the development of the network to help ensure the views of all interested community members were considered. The work required the collaboration of interested South Australians, key stakeholders and the whole of government (Thomas and Hughes 2016). At every significant step in the marine parks establishment process the information, advice and feedback from the public was carefully considered by the government and used to make amendments for improved environmental, economic and social outcomes. This resulted in the development of 19 marine park management plans designed to achieve conservation outcomes whilst minimising impacts on the existing and future users.

In 2009 South Australia proclaimed the outer boundaries for 19 marine parks, with the next step to develop draft management plans and zoning for each park. During 2010 and 2011, extensive work was undertaken to ensure advice on possible zone locations was received directly from local communities, key stakeholders and relevant government agencies. To help guide this work, 14 design principles (DEH 2008) and a set of SA Government policy commitments (Government of South Australia 2009) were provided. The commitments, in particular, provided existing and future users, such as fishing, mining, aquaculture, shipping and developers, greater certainty and clarity about how their activities might be affected across the marine parks network. During the period from 2009 to 2012, over 35,000 face to face discussions were conducted with members of the South Australian public in relation to marine parks planning and development, making this one of the largest and most comprehensive consultation processes in the state's history (Thomas and Hughes 2016).

4 Marine park management

The marine park management plans include 15 strategies, aligned to four sub-programs and collectively designed to achieve the six objects of the Marine Parks Act. Each management plan has 15 strategies which are consistent across the management plans (refer to section 4). These strategies are grouped within the four sub-programs of Compliance, Stewardship, Protection and Performance. The four sub-programs are responsible for implementing the strategies of the management plans and ultimately delivering on the objects of the *Marine Parks Act 2007* (Figure 2). Each of these 15 strategies is outlined below against the relevant sub-program responsible for its delivery. Whilst each sub-program has responsibilities to undertake activities to deliver on their strategies it is recognised that an activity often delivers to more than one strategy. This is demonstrated throughout this Status Report using case studies.

4.1 Protection

The Marine Parks Act aims to provide protection to the marine environment, enforceable principally through the *Marine Parks (Zoning) Regulations 2012* (Zoning Regulations). Twelve state acts were amended by the Marine Parks Act to provide additional protection for the marine environment. These amendments required authorisations for particular activities in marine parks to be referred to the Minister for Sustainability, Environment and Conservation responsible for marine parks.

The Protection sub-program ensures activities and uses within the parks are conducted in accordance with the Marine Parks Act and its supporting regulations and is responsible for the delivery of management plan Strategies 1 to 4:

1. *Manage activities and uses in the marine park in accordance with zoning and special purpose area provisions.*
2. *Influence activities and uses within and adjacent to the marine park to help mitigate threats to marine biodiversity and marine habitats.*
3. *Consider additional protections and/or temporary restrictions where necessary in circumstances of urgency to protect:*
    - *Listed species of plants or animals, or threatened ecological communities.*
    - *Features of natural or cultural heritage significance.*
    - *Public safety.*
4. *Introduce a permitting system to provide for the following activities:*
    - *Scientific research in a sanctuary or restricted access zone.*
    - *Tourism operations in a sanctuary zone.*
    - *Competitions and organised events in a sanctuary zone.*
    - *Commercial film-making (including sound recording and photography) in a sanctuary zone.*
    - *Installation of vessel moorings in a sanctuary zone.*

The program undertakes activities such as establishing and administering a permit system that allows certain activities to occur in the park, such as research within sanctuary zones; administering statutory and informal referrals; and, developing policies and procedures to effectively manage the parks.

The Status Report documents the activities that have been undertaken through the protection sub-program to ensure the delivery of these strategies.

4.2 Stewardship

The Stewardship sub-program helps provide opportunities for public appreciation, involvement, education, understanding and enjoyment of marine environments and is responsible for the delivery of management plan Strategies 5 to 9:

5. *Provide for public appreciation, understanding and enjoyment of marine parks.*
6. *Create and promote opportunities for sustainable nature-based tourism in the marine park.*
7. *Provide education to support the implementation of marine parks.*
8. *Seek to involve local communities and stakeholders in the day-to-day management and monitoring of marine parks.*
9. *Work cooperatively with Aboriginal communities to conserve country, plants, animals and culture.*

It is recognised that involving and educating the community is central to the success of South Australia's marine parks network and the sub-program has developed signs, brochures, mobile phone apps and more to help support this learning. It is also responsible for involving the community in day to day management and supporting general participation in recreational and tourism activities in the parks.
The Status Report documents the activities that have been undertaken through the stewardship sub-program to ensure the delivery of these strategies.

4.3 Performance

The Performance sub-program is responsible for establishing a monitoring, evaluation and reporting (MER) program to measure the effectiveness of each management plan in achieving the objects of the Marine Parks Act and is responsible for the delivery of management plan Strategies 10 to 14:

10. *Develop and implement a monitoring, evaluation and reporting (MER) program that measures the effectiveness of the marine park management plans and their contribution to South Australia's marine parks network (2011 baseline), and that:*
    - *is designed to measure the effectiveness of the management plans in delivering the predicted outcomes to inform adaptive management*
    - *includes linkages to relevant state, national and international monitoring, evaluation and reporting frameworks*
    - *sets out targets and indicators linked to strategies and outcomes for monitoring, which include ecological, socio-economic, environmental and management elements*
    - *monitors the delivery of education, research and governance mechanisms*
    - *assesses the effectiveness of compliance activities.*
11. *Foster partnerships to support the implementation of the MER Program incorporating opportunities for community and stakeholder involvement.*

12. *Ensure outcomes of the MER Program and research outcomes are made publicly available and inform decision making and periodic review of this management plan.*

13. *Conduct research and foster research partnerships to assess the integrity of knowledge frameworks that underpin the predicted outcomes.*

14. *Encourage Aboriginal people, local communities and stakeholders to preserve traditional and historic knowledge and, where appropriate, share this knowledge with others.*

The primary means of achieving these strategies is the establishment of the MER program. The sub-program collates environmental, economic, social and management information to enable an evaluation of the management plans in meeting the requirements of the Marine Parks Act.

The Status Report documents the activities that have been undertaken through the performance sub-program to ensure the delivery of these strategies.

4.4 Compliance

The Compliance sub-program is responsible for ensuring that the zoning regulations are enforced and the expected ecological outcomes can be achieved, especially in sanctuary zones. Effective compliance is vital for the success of the Marine Parks Program. The Compliance sub-program is responsible for the delivery of management plan Strategy 15:

15. *Develop and implement a compliance strategy for the marine parks that:*

    - *Is cost-efficient*
    - *Is focussed on sanctuary zones and other conservation priorities*
    - *Complements existing compliance efforts*
    - *Maximises voluntary compliance*
    - *Includes measures to address serious or repeat non-compliance.*

A compliance plan has been developed to provide targeted compliance activities based on risks to marine parks. This risk-based approach has flexibility, to enable staff to respond to new and emerging risks. Three guiding principles underpin the marine park Compliance sub-program:

- voluntary compliance improves when more people are educated about the marine park program
- collaboration across government will improve the compliance program
- monitoring and reviewing the effectiveness and efficiency of compliance activities improves future activities.

The Status Report documents the activities that have been undertaken through the compliance sub-program to ensure the delivery of these strategies.

5 Key and specific evaluation questions

The MER Program includes two key components, the program logic and the six key evaluation questions which frame the objectives of the program.

5.1 Monitoring, Evaluation and Reporting framework, Marine Parks Program

The document, Monitoring, Evaluation and Reporting framework for Marine Parks Program (Scholz et al 2017), outlines the key steps required to deliver the MER Program which will provide the basis for the statutory review of the Marine Parks management plans developed to achieve the Objects of the *Marine Parks Act 2007*.

The Framework adopts the monitoring, evaluation and reporting approach as defined by Markiewicz and Patrick (2016). The marine parks program has been developed using a program logic model which is concerned with how the program is delivered, by identifying the program inputs (activities) and subsequent outputs required to achieve the outcomes and objectives of the *Marine Parks Act 2007*. The logic model is based on an evidence base, valid reasoning (assumptions), and an understanding of the causative links between what the project does and the results intended. This logic model is used to inform the monitoring undertaken to track the progress of the Marine Parks Program, to evaluate the effectiveness of investments and activities, and to assist in determining the need for management changes. The logic model is adaptive by nature and will be progressively updated as understandings of the programs intent and findings are refined over time. As part of this process this Status Report can be used to assess the five year outcomes in the program logic and update the logic if required. This will inform effective delivery of the longer term 10 and 20 year outcomes of the program (Scholz et al 2017).

5.2 Key evaluation questions

The MER Program developed six key evaluation questions (KEQ) that are directly related to the objects of the Marine Parks Act. These KEQs provide clarity about the priorities for monitoring and guide how the Marine Parks Program should be evaluated. Each KEQ addresses specific outcomes and strategies in the context of effectiveness, impact, appropriateness and efficiency of the marine parks program.

Key evaluation questions

KEQ 1. To what extent has the legislated comprehensive, adequate, and representative (CAR) system protected and conserved marine biological diversity and marine habitats?

KEQ 2. To what extent have marine parks strategies contributed to the maintenance of ecological processes?

KEQ 3. To what extent have marine parks strategies contributed to enabling marine environments to adapt to impacts of climate change?

KEQ 4. To what extent have the marine parks strategies contributed to the ecologically sustainable development and use of the marine environment?

KEQ 5. To what extent have the marine parks strategies contributed to providing opportunities for public appreciation, education, understanding and enjoyment of marine environments?

KEQ 6. To what extent have the marine park strategies contributed to the protection and conservation of features of natural and cultural heritage significance?

The KEQs will be addressed in the final evaluation report (2021).

5.3 Specific evaluation questions

To inform the KEQs, **specific** evaluation questions (SEQs) have been developed. These questions identify the monitoring indicators and methods used for information collection; assist in prioritisation of monitoring activities; and, support evaluation and reporting of monitoring information. To answer the large number of SEQs, a range of indicators and methods was initially assessed. However, only a refined suite of indicators/methods has been included, based on a prioritisation process which considered the availability of information (noting that many types of information that may potentially be useful are simply unavailable), and the logistics, costs and practicality of information collection. (Bryars et al. 2017a). The Status Report documents available information on SEQs for the 15 management plan strategies and ecological and socio-economic values.

5.3.1 Specific evaluation questions – Management strategies

1. Have activities and uses in the marine park been managed in accordance with zoning and special purpose area provisions?
2. Have the activities and uses been actively influenced within and adjacent to the marine parks to help mitigate threats to marine biodiversity and marine habitats?
    a. Was the government policy framework to adjust the fishery to implementation of marine parks undertaken (to minimise displaced effort implemented)?
3. Have any additional protections and/or temporary restrictions been implemented when necessary circumstances: 1) urgency to protect a listed species of plant or animal or threatened ecological community or 2) a feature of natural and cultural heritage significance or 3) public safety?
4. Has a permitting system been introduced that allows for activities where they were not otherwise authorised?
5. Has public appreciation, understanding, and enjoyment of the marine parks been provided for?

    a. Were the government policy commitments to increase opportunities for recreational fishing in and around South Australian marine parks implemented?
6. Have opportunities for sustainable nature-based tourism in marine parks been created and/or promoted?
7. Has education on marine parks to support their implementation been provided for?
8. Have local communities and stakeholders been involved in the day-to-day management and monitoring of the marine parks?
9. Have we worked cooperatively with Aboriginal communities to conserve country, plants, animals and culture?
10. Has a monitoring, evaluation and reporting (MER) program been developed and implemented….
11. Have partnerships to support the implementation of the MER Program incorporating opportunities for community and stakeholder involvement been fostered (or established)?
12. Are outcomes from the MER Program and research publicly available and have the outcomes from the MER Program informed decision-making and periodic review of the management plans?
13. Has research been conducted to assess the integrity of knowledge frameworks that underpin the predicted outcomes?
14. Have Aboriginal people, local communities and stakeholders been encouraged to preserve, and where appropriate share, traditional knowledge?
15. Has a compliance strategy been written and implemented that: is cost-efficient; focussed on sanctuary zones and other conservation priorities; complements existing compliance efforts; maximises voluntary compliance; and, includes measures to address serious or repeat non-compliance?

5.3.2 Specific evaluation questions for monitoring change in ecological values

16. What biodiversity and habitats are included within the marine parks network?
17. Have sanctuary zones maintained or enhanced biodiversity and habitats?
18. Have habitat protection zones maintained biodiversity and habitats?
19. Have sanctuary zones maintained or enhanced ecological processes?
20. Have sanctuary zones enhanced resilience?

5.3.3 Specific evaluation questions for monitoring change in socio-economic values

21. Have local businesses and communities changed due to marine park management plans?
22. Has coastal recreation changed due to marine park management plans?
23. Has tourism changed due to marine park management plans?
24. Have Aboriginal heritage values changed due to marine park management plans?
25. Have European heritage values changed due to marine park management plans?
26. Has shipping changed due to marine park management plans?
27. Has aquaculture changed due to marine park management plans?
28. Has recreational fishing changed due to marine park management plans?
29. Have commercial fisheries changed due to marine park management plans?

6 MER Program reporting

6.1 Reporting Schedule

The Marine Parks Act mandates that management plans must be reviewed within a 10-year period. A range of activities and reporting through the MER Program are currently being undertaken or will be completed (including the Status Report) to inform the review (Table 1).

6.2 Spatial scale

When reporting on marine parks, multiple spatial scales are involved and need to be used. The scales range from small areas, such as sanctuary zones or ecosystem components to larger areas, such as marine bioregions, NRM regions and even at a statewide scale (refer to maps in Appendix C and D for examples). Reporting with spatial elements include:

- Ecosystem components, such as selected habitats and plant/animal assemblages and species
- Individual zones, particularly key designated sanctuary zones
- Nineteen marine parks
- Various administrative boundaries such as Local Government Areas, Australian Bureau of Statistics regions and NRM regions
- Eight marine bioregions (IMCRA Technical Group, 1998, Figure 1)
- Statewide network
- Relevant user sector impact/benefit derived from the marine parks.

6.3 Temporal scale

The temporal scale describes the duration and frequency of monitoring. Some monitoring of marine parks should be ongoing. The frequency of monitoring will be based on the information required to answer the evaluation questions. Different elements of monitoring will be conducted at different time intervals, depending on the information required and the variability and predicted rate of change of that information.

Table 1. Timeline of publicly available reporting that will be produced by the MER Program

Year	Product	Aim and content
RELEASED 2016	Baseline reports for each of the 19 marine parks	To provide a baseline from which to measure changes into the future. The reports outline predictions of change to ecological and socio-economic values that might occur due to implementation of marine park management plans, and present potential indicators that could be used to track these changes.
RELEASED 2017	MER framework	To provide direction and outline the steps and components that underpin the MER Program. The framework also provides for shorter-term adaptive management of activities and components contributing to implementation of management plans. Two critical components identified in the MER Framework are key evaluation questions and a program logic.
RELEASED 2017	Baseline report for the state-wide marine parks network	As for the individual baseline reports (see above) but across the state-wide marine parks network.
RELEASED 2017	MER Plan	Outlines the 'why, what, where, and when' of key information to be collected, evaluated and reported. The MER Plan should be used to guide ongoing implementation plans for the MER Program and encourage further partnerships and collaborations.
RELEASED 2017	First Annual Progress Summary	To communicate a snapshot of monitoring activities by the marine parks program.
RELEASED 2017	**Status Report (this document)**	**To assess the progress of the marine parks program after the first five years of implementation. The outcomes of the assessment will inform the adaptive management of the marine parks program.**
2018 - 2021	Annual progress summaries	As for the 2016 progress summary – with reporting to end of each previous calendar year.
2021	Evaluation of effectiveness of management plans	Final report to inform review of management plans within 10-year statutory timeframe (by 2022). The assessment will include analysis of the marine park network for the protection and conservation of biodiversity - comprehensiveness, adequacy and representativeness.

7 Collaboration and partnerships

The marine parks project is a whole of Government initiative, and while DEWNR is the lead agency, collaborations and partnerships with other agencies and organisations are integral to its successful implementation and management. Existing partners include state and federal government agencies, research institutions, as well as citizen science and community programs and organisations (see case study 9).

There have been successful examples of collaborations and partnerships throughout the first five years of implementation (refer to Assessments 11 and 5.1c and further highlighted in the case studies).

8 Marine park funding

In 2004 the Government of South Australia released the Blueprint for the South Australian representative system of Marine Protected Areas - November 2004. The Blueprint committed to the development of a representative system of marine protected areas, and to achieve this commitment government dedicated significant resources to the program through three phases of development:

1. **Planning phase** (2004 to November 2012) – this included the development of the Marine Parks Act (enacted in 2007); the design of the outer boundaries (completed in 2009); and the design of multiple use zoning (completed in November 2012). The planning phase cost approximately $20 million.
2. **Transition phase** (December 2012 to September 2014) – this included an intensive communication program (refer to Assessment 7) to engage and prepare the community for full implementation of sanctuary zones on 1 October 2014. In total over $22 million was spent during the transition phase, including $19 million to fulfil the catch and effort reduction program (refer to Assessment 2a).
3. **Implementation phase** (October 2014 to present) – this involves managing the network and delivering on the recreational policy commitments (refer to Assessment 5a). Just under $12 million has been spent over the past three years (2014/15 to 2016/17) during the implementation phase of marine park management plus an additional $3.25 million for the recreational fishing election commitment.

A total of approximately $56 million has been spent on marine parks since the announcement of the Blueprint in 2004. This Status Report covers the transition and implementation phases (as per above), totalling approximately $36 million (refer to Figure 6), and the funding provided to deliver the activities that have been undertaken to deliver on the strategies and ultimately the objects of the Act.

Since implementation in November 2012, expenditure to deliver on core management has been approximately $14 million. An average of 20 core staff have been employed by the program over the five years. To achieve a successful implementation there are 15 central staff who are responsible for the overarching management of the program and coordination and delivery of the four sub-programs: Protections, Stewardship, Performance and Compliance. In addition to these staff, there are six Regional Coordinators who deliver components from each sub-program (refer to Section 10) in and across their appointed Natural Resource Management (NRM) regions (refer to Appendix C State map marine park boundaries and NRM regions). With an additional $22 million in complementary funding (expressed in Assessment 2.a and 5.a in Section 9, refer to Figure 6).

In 2012/13 and 2013/14 majority of the core management funding was allocated to Stewardship sub-program, implementing the Enjoy Life in our Marine Park Campaign, ensuring community was educated and informed on marine park, zoning and on online apps and products that marine users could access to ensure they were abiding by the new zoning regulations (refer to Section 10, Assessment 7.1a and 7.1b). In 2014/15, 2015/16 and 2016/17 more funding was then allocated to implementation of the Performance and Compliance sub-programs whilst

also ensuring to continue to engage and educate community and manage program logistics through the stewardship and protection sub-programs, again this is documented in detail in Section 10.

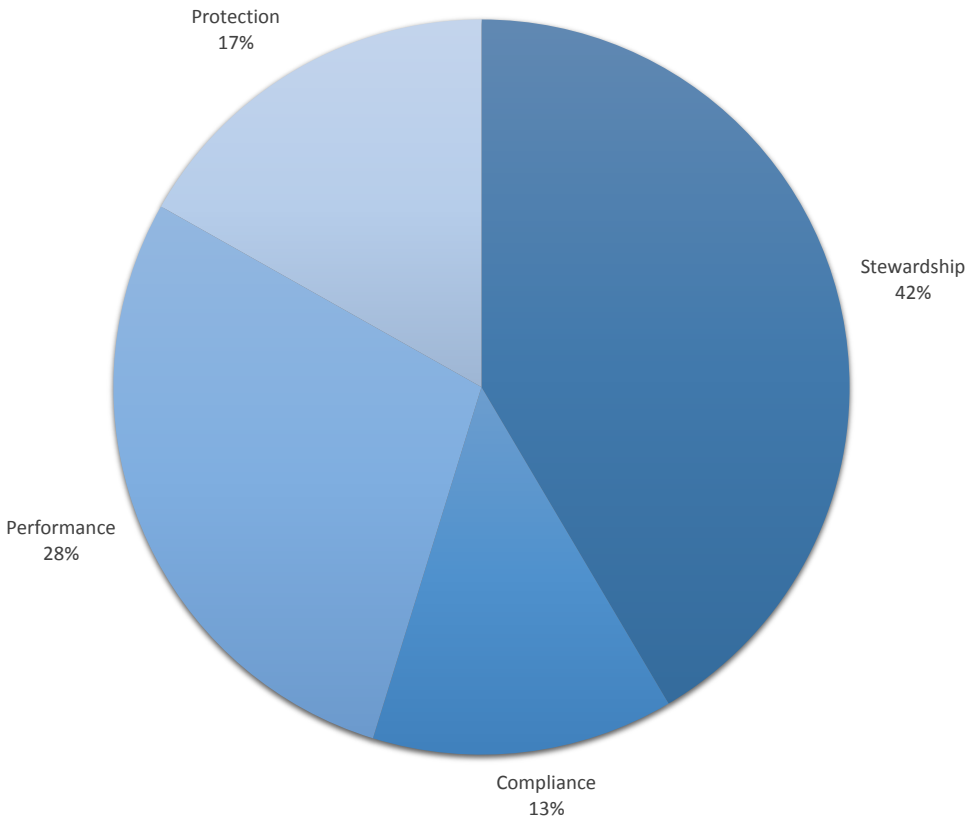


Figure 5. South Australia's Marine Parks Management allocation of $14 million in funding from 2012/13 to 2016/17 between the four sub-programs

In the 2012/13 and 2013/14 financial years the marine parks total annual budget was approximately $3 million. In 2014, the Marine Parks Program was further supported by the state Government with an election commitment for monitoring and compliance of approximately $1.5 million towards the implementation of the 19 management plans to maintain the annual budget at approximately $3 million for four additional years (Table 2).

Additional to the election commitment for monitoring and compliance the government allocated $3.25 million over three years to support recreational fishing in and around the parks by:

- developing an artificial reef
- investigating the potential to allow recreational fishing in SA Water reservoirs
- providing grants for community projects to improve recreational fishing opportunities.

(Refer to Table 3 and Assessment 5.1b for further details).

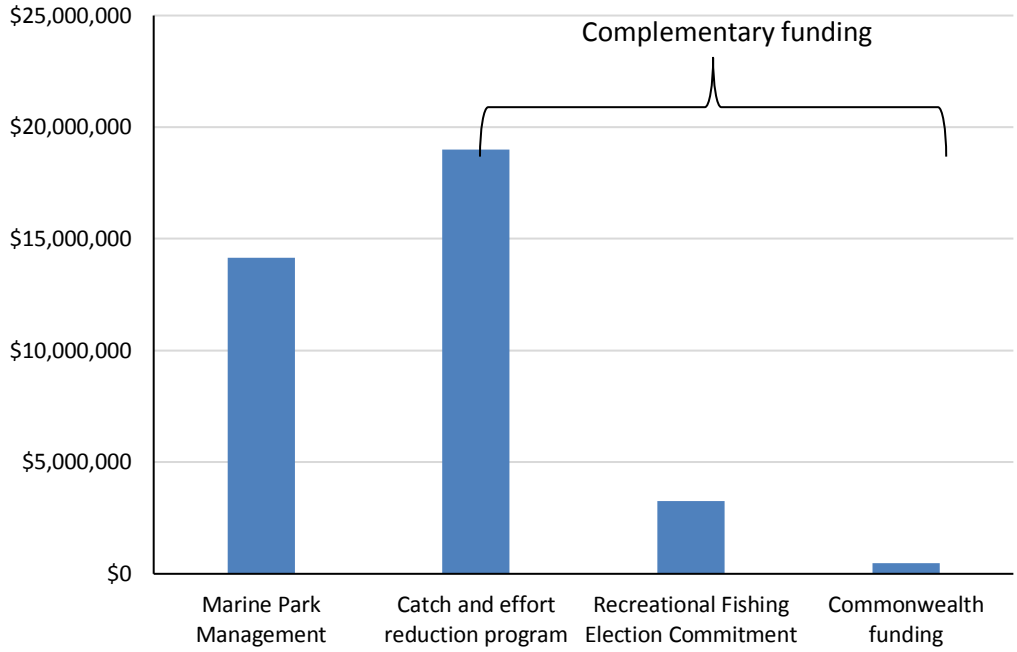


Figure 6. South Australia's Marine Parks core funding and complementary investment 2012/13 to 2016/17 – a total of almost $37 million

Table 2. Marine Park monitoring and compliance election commitments

Monitoring and compliance increased funding	Total allocation
Ecological Monitoring - Establish a baseline	$750,000
Conduct marine habitat surveys and prepare habitat maps for priority sanctuary zones	$100,000
Collating and processing data from partners	$70,000
Socio-economic monitoring (e.g. job impacts)	$130,000
Partnership with universities on marine research	$100,000
Citizen science projects – engaging community volunteers.	$120,000
Develop educational materials to promote the results of the monitoring program	$100,000
Targeted compliance activity at key monitoring locations	$100,000

Table 3. Recreational fishing election commitments

Project	Total funding	Funding year	Funding allocation
Reef trial	$600,000	2014/15	$600,000
Reservoirs	$400,000	2014/15	$200,000
		2015/16	$200,000
Recreational fishing grants	$2,250,000	2014/15	$750,000
		2015/16	$750,000
		2016/17	$750,000

9 Activities towards delivering management plan strategies

9.1 Overview

There are a range of management activities under the themes of Stewardship, Compliance, Protection and Performance that have and will be undertaken to deliver the strategies of the management plans. Management activities have been monitored across the marine parks program to enable evaluation of the effectiveness of the management plans and to assist with interpretation of monitoring data on ecological and socio-economic values, e.g. a lack of change in a reef community may be due to poor compliance of illegal fishing.

In order to address the need for indicators, a series of internal DEWNR workshops were held to develop a comprehensive suite of appropriate indicators. All indicators are aligned to Step 1 of the evaluation process (i.e. to determine if the management plan strategies have been implemented) (see Figure 7) with some indicators also being required for the final step of the evaluation (i.e. to determine if the management plans were effective in achieving the objects of the *Marine Parks Act 2007*).

The data has been collated using internal DEWNR information and data (e.g. budgets and permit information) and marine park officers documenting and monitoring their activities, in addition to some externally available data such as monitoring sites and research grants.

One activity can often deliver to more than one strategy—this is reflected in the assessments where often an assessment can refer to the results of another assessment, and/or an activity can be counted in more than one assessment. The connections are also demonstrated in case studies, where the highlighted activities and initiatives show links with multiple marine park management plan strategies, and the ecological and socio-economic outcomes, as a result of effective implementation of the marine park management plans.

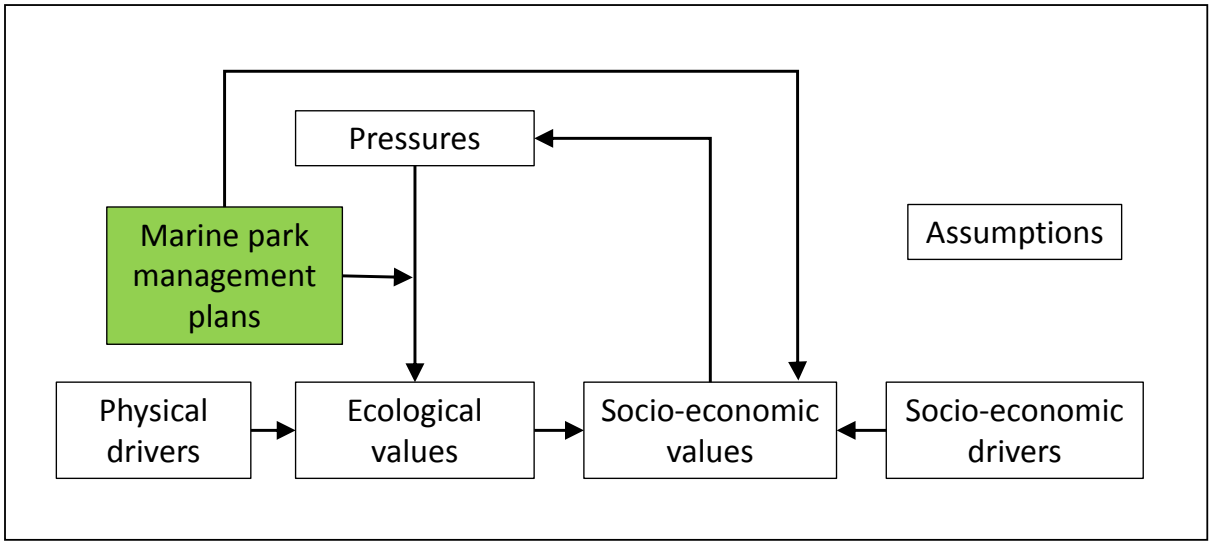


Figure 7. Framework for the seven components of the marine parks monitoring, evaluation and reporting program highlighting the marine park management plans component which is addressed in the current section

9.2 Protection sub-program activities: Strategies 1 to 4

This section presents the information for the specific evaluation questions for the Protection sub-program. It is not a comprehensive cover, but is representative of a significant amount of the programs achievements over the past five years. There is also overlap between some activities that address more than one evaluation question and they may therefore appear in more than one place.

9.2.1 SEQ 1 – Have activities and uses in the marine park been managed in accordance with zoning and special purpose area provisions?

Indicator 1.1

Other government agencies are actively managing their activities in accordance with zoning regulations

Measure 1.1a

Nature, number and names of agencies and their associated management activities referring to and/or abiding by marine parks regulations (e.g. PIRSA aquaculture and fisheries referrals)

Assessment 1.1a

The *Marine Parks Act 2007* commenced operation on 22 May 2008 and provides the legislative base for the protection of South Australia's marine environment, through the establishment and management of a network of marine parks.

To help integrate the management of marine activities, the Marine Parks Act amended 12 other Acts (refer to Table 4) with management responsibilities in the marine environment. The amendments require that actions taken under these Acts consider and seek to further the objects of the Marine Parks Act, and further requires the referral of some authorisations and policies to the Minister responsible for marine parks.

The finalisation of the 19 marine park management plans and the supporting *Marine Parks (Zoning) Regulations 2012* (zoning regulations) on 29 November 2012 established the means of implementing the marine parks network. Included in the regulations was the provision for fishing restrictions in marine park sanctuary zones, which commenced on 1 October 2014.

Table 4. Legislation and agencies supporting the Marine Parks Act

Amended acts which require concurrence or consultation with Minister for marine parks		
Agency	**Act**	**Responsibilities in relation to marine parks**
Primary Industries and Regions SA (PIRSA)	*Aquaculture Act 2001*	Managing and regulating commercial aquaculture including policy, leasing and licensing
	Fisheries Management Act 2007	Managing and regulating commercial and recreational fishing including policy, closures and prohibitions, exemptions, permits and licences
Department of Planning, Transport and Infrastructure (DPTI)	*Planning, Development and Infrastructure Act 2016* (formerly the *Development Act 1993)*	Planning and regulating development
	Harbors and Navigation Act 1993	Administration, development and management of harbours, provision of safe navigation for shipping and recreational use in South Australian waters
Department of Premier and Cabinet (DPC)	*Mining Act 1971*	Managing and regulating mining exploration and production
	Petroleum and Geothermal Energy Act 2000	Managing and regulating petroleum and geothermal exploration and production
Department of Environment, Water and Natural Resources (DEWNR)	*Coast Protection Act 1972*	Conservation and protection of South Australia's beaches and coasts
	Historic Shipwrecks Act 1981	Protection of historic shipwrecks and associated relics
	Natural Resources Management Act 2004	Establishment and promotion of integrated management of South Australia's natural resources
Environment Protection Authority (EPA)	*Environment Protection Act 1993*	Support of ecologically sustainable use and development of the environment by regulating uses and activities and regularly monitoring and reporting on environmental quality
Department of Premier and Cabinet (DPC)	*Offshore Minerals Act 2000*	Managing and regulating offshore mining exploration and production
	Petroleum (Submerged Lands) Act 1982	Managing and regulating petroleum and exploration and production offshore

Measure 1.1b

Number of breaches to zoning regulations

Assessment 1.1b

Breaches to zoning regulations are also managed through Strategy 15, Compliance. Other than documented compliance breaches, there have been no other known breaches to marine park zoning regulations officially reported.

Indicator 1.2

DEWNR is actively managing their activities in accordance with zoning regulations

Measure 1.2

Qualitative response: What is DEWNR doing to ensure activities are managed in accordance with zoning regulations?

Assessment 1.2

Since marine park management plans were authorised, DEWNR has been actively educating and informing broader agency staff about marine park obligations. In addition, marine park project staff were transferred into a number of Branches within DEWNR to build capacity and implement across the department. Capacity was also built across DEWNR to ensure activities within the marine environment abide by the zoning regulations.

Conservation, NRM and Protected Area Policy

As part of the operational implementation of marine parks marine parks team members form part of the DEWNR Conservation, NRM and Protected Area Policy Branch to support information and knowledge sharing across the Unit. Marine parks have been included in protected area policies prepared by this team (refer Assessment 1.4) and management of the shark cage diving operations at Neptune Islands.

All assessment of mining, geothermal and petroleum exploration and licence applications are processed by the Protected Areas Unit mining team. The Marine Parks Act requires the referral of such applications within or adjacent to marine parks from the Minister of Mineral Resources and Energy to the Minister for Sustainability, Environment and Conservation, and subsequent concurrence of the two Ministers. The consideration of such referrals relating to marine parks has been fully integrated into the current process, following early development of criteria for determining whether a Program for Environmental Protection and Rehabilitation (PEPR) is required for applications in, or affecting, marine parks.

Some applications were received during the development of marine park management plans and zoning. DEWNR negotiated with the applicants to place these applications on hold until the zone locations were finalised.

Coastal Management

The Coast Protection Board Policy (2016) objectives align with objectives of the Marine Parks Act such as: provision of ecologically sustainable development (ESD); conservation of biodiversity and resilience of ecosystems; and, enhancement of knowledge for resource management.

Alignment with the Marine Parks Act object to, "assist in the adaptation to the impacts of climate change in the marine environment" (s. 8(1)(b)(ii)), the Coast Protection Board Strategic Plan 2012-2017 has three strategic priorities, including planning for resilience in coastal ecosystems to adapt to the impacts of climate change.

Marine parks are directly referred to as one of the highest priorities on the DEWNR Coasts website. Internal processes have been developed between the Coastal Management Unit and the Protected Areas Unit whereby; coastal officers regularly consult with marine parks officers about Development Applications referred to them (under the Coast Protection Act*)* that are adjacent to or in marine parks, and forward any applications that may have significant impact on marine parks for comment. More routine applications that may have minor impact on marine parks are processed by the Coastal Management Unit using standard comments.

Crown Lands

Crown Lands permitting officers are aware of the implications of zoning for issuing of National Parks and Wildlife Act permits (commercial tour operators, commercial filming, commercial marine mammal interactions and events licences) and work with the Protected Areas Unit to integrate with marine parks permits and ensure legal obligations are met (refer to Assessment 1.3).

Development and Assessment Policy

An internal process has been established between the DEWNR Development and Assessment Policy Branch and the Protected Areas Unit to consider relevant Development Applications, *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) referrals and other matters. Marine parks officers provide comment on informal development proposals, major developments, Development Plan Amendments and other relevant matters that may be in, or affect, marine parks.

Environmental Science and Information

An internal DEWNR process has been developed to ensure referrals and marine park permit applications receive appropriate technical review. In addition, applications for research permits issued under the National Parks and Wildlife Act, which also occur within a marine park, are reviewed by Environmental Science Branch and Information Branch technical experts (refer to Assessment 1.3).

Heritage and Major Reform

Although not required by legislation, the maritime heritage officer regularly refers relevant permit applications to the Protected Areas Unit, such as applications to dive the *Zanoni* shipwreck (located in a sanctuary zone).

NRM regions

DEWNR Parks and Regions, regional offices have marine park coordinators responsible for delivering and managing local activities to support the strategies in the park management plans.

Other DEWNR regional officers (such as district rangers) also have demonstrated knowledge and actively enforce marine parks zoning as it applies to activities in their regions. An example of this is the active involvement of DEWNR rangers delivering the compliance requirements.

Indicator 1.3

Marine parks permits aligning with/complementing the existing DEWNR permitting system

Measure 1.3

Marine parks permit system integrated with other DEWNR permit systems (e.g. National Parks and Wildlife Act – tourism, research, marine mammals; and Historic Shipwrecks Act)

Assessment 1.3

DEWNR has legislative responsibility under a number of Acts for issuing permits or licences for a number of activities ranging from fauna permits (keeping of animals), hunting permits, and plant collection through to research, commercial tourism and events permits.

A number of these permits or licences, such as commercial marine mammal interactions, have relevance to marine parks. The zoning regulations recognised this and provide for a number of exemptions to sanctuary zone rules where an activity has been authorised by another permit (authority) issued under the National Parks and Wildlife Act or *Wilderness Protection Act 1992*. This applies to activities including commercial tourism activities, competitions, scientific research and commercial filming in sanctuary zones.

Since the commencement of the zoning regulations, effort has been made to integrate marine parks permitting into existing DEWNR permitting systems. As marine parks permits were a relatively recent addition to the DEWNR permits portfolio, the approach has been to learn from existing systems and integrate with them, rather than setting up new processes. For example, the marine parks permit application forms are compatible with other DEWNR permit application forms, the Permits page on the DEWNR website contains links to the marine parks permits web page and marine parks permitting information has been incorporated into DEWNR's financial systems to enable the collection of marine park permit application fees.

Scientific research

Under requirements of the National Parks and Wildlife Act and the Wilderness Protection Act, DEWNR issues permits for scientific research that occurs within reserves declared under those Acts, involves taking or interfering with a protected animal in the wild (including marine mammal interactions) and collecting native plant specimens from public land.

The zoning regulations prohibit research for commercial or professional purposes in sanctuary zones (with the aim of managing these activities under a permits system), but the regulations also provide that, where that research activity is authorised under the National Parks and Wildlife Act or the Wilderness Protection Act, a marine parks permit is not required.

A number of actions were implemented to ensure best practice implementation of the zoning regulations across DEWNR including:

- inclusion of reference to marine parks permits in the 'Other Permits and Approvals' section of the Scientific Research permit application form
- provision of reference to marine parks permit requirements and standard conditions in the DEWNR research permit template
- preparation of documents to assist assessment of permit requirements, such as aerial/spatial coverage check sheets.

A marine parks permits MS Access database was established, based on the Scientific Research permits database as there were many similarities with the data required to be collected and on the assumption that this may help further integration in the future.

Officers continue to notify each other of permit applications that may be relevant to their particular jurisdictions and liaise on requirements and issuing timeframes.

Research applications for work in habitat protection zones which may harm or remove habitats/species also require marine parks permits and the zoning regulations do not provide an exemption for this work authorised under other Acts. In these instances, the researcher requires separate permits issued under the Marine Parks Act and the National Parks and Wildlife Act/Wilderness Protection Act. Options for streamlining are under consideration, including the issuing of joint permits or possibly a future amendment of the Regulations.

Commercial tourism

Commercial tour operators (CTO) are required to hold a licence, issued under the National Parks and Wildlife Act, to conduct tours for fee or reward in protected areas declared under that Act. A permit is

also required (under s. 68(2) of that Act) to conduct tours that interact with marine mammals (such as whale watching tours).

The zoning regulations prohibit the conduct of tours for fee or reward in sanctuary zones, but where the activity is authorised under the National Parks and Wildlife Act, a marine parks permit is not required.

DEWNR has worked to ensure references to marine parks requirements and relevant sanctuary zones (including sanctuary zones outside of marine mammal restricted areas) are included in the National Parks and Wildlife Act CTO permits.

DEWNR CTO officers refer the application and a draft permit (including marine parks requirements) to marine parks officers for comment and assistance with mapping and other queries.

A number of marine park sanctuary zones overlay National Parks and Wildlife Act reserves to some extent (such as the Neptune Islands Conservation Park). The majority of integrated permits issued have been for commercial marine mammal interactions such as whale watching, seal and sea lion viewing, dolphin viewing and swimming with seals or sea lions.

In regards to one of the biggest commercial eco-tourism operations in South Australia, cage diving with Great White Sharks at the Neptune Islands, in the Neptune Islands Group (Ron and Valerie Taylor) Marine Park, DEWNR has an established permitting process in place. Marine parks staff work closely with officers across the agency and participate in regular meetings with the shark researchers (refer to Case study 10 White sharks in the Neptune Islands Sanctuary Zone).

Commercial filming

Filming or photography for commercial purposes in parks and reserves declared under the National Parks and Wildlife Act requires a commercial filming agreement or commercial photography permit issued under that Act. Filming or photography is defined as commercial when the intention is to promote a product or service and/or achieve financial gain from the filming or photography.

Filming, photographing or recording sound for commercial purposes in sanctuary zones requires a permit issued under the Marine Parks Act unless that activity is conducted under an authorisation issued under the National Parks and Wildlife Act/Wilderness Protection Act.

Proposals for filming in locations which are protected under both the Marine Parks Act and the National Parks and Wildlife Act are infrequently received, with three submitted to 1 July 2017, and close liaison within DEWNR has ensured that applicants only need one permit, and that permits appropriately consider the requirements of both Acts.

The DEWNR Commercial filming and photography (parks and reserves) policy makes direct reference to marine park sanctuary zones.

Events and competitions

The holding of one-off or regularly conducted events in reserves declared under the National Parks and Wildlife Act requires an agreement issued under that Act. These events may include fishing or surfing competitions, fundraising walks or runs, product demonstration days or bike races.

The zoning regulations require a permit for fishing, swimming, surfing or boating competitions, speed trials or other organised sport in sanctuary zones.

There have not been many opportunities to integrate permitting for events or competitions, due primarily to legislative and spatial limitations. For example, a number of surfing clubs hold competitions in the Encounter Marine Park, mainly off Waitpinga Beach (adjacent to the Newland Head Conservation Park and GMUZ-6) and use Middleton Beach (adjacent to Encounter SZ) as a back-up for weather conditions. As they are running the event from the car park in the Newland Head

Conservation Park, they require a National Parks and Wildlife Act permit (but not a marine parks permit for the activity in the GMUZ). The National Parks and Wildlife Act permit does not cover them for any competitions that may be held in the sanctuary zone at Middleton, therefore a marine parks permit is also required.

Successful integration of permits occurred on one occasion with the issuing of a permit for a major endurance event involving running, cycling and kayaking through the southern Flinders Ranges and the Upper Spencer Gulf Marine Park.

Given the small number of integrated events and competitions, case-by-case liaison between responsible DEWNR officers will continue.

Shipwrecks

The Historic Shipwrecks Act was amended by the Marine Parks Act to require that, before making a decision on the application for a permit relating to a shipwreck, and if so required by the regulations, the Minister must consult with and have regard to the views of the Minister for marine parks.

The *Zanoni* shipwreck is located in a protected zone (declared under Section 7 of the Historic Shipwrecks Act) which is also in the Offshore Ardrossan Sanctuary Zone in the Upper Gulf St Vincent Marine Park. To enter/dive or undertake recreation in other ways in the Shipwreck zone the user requires a permit under the Historic Shipwrecks Act. Issued permits contain a condition that all persons participating in the activity have been properly briefed, among other things, on their general responsibilities under the Marine Parks Act. Although not required by legislation, there is an internal process of sending permit applications to dive the *Zanoni* to marine parks officers for comment (refer to Table 5).

The ex-HMAS Hobart was intentionally sunk off the coast of Yankalilla in 2002 to form a dive-tourism site. Up until 2014, the responsibility for managing diving at the wreck was held by the Minister for Tourism and was implemented by SATC. The zoning for the Rapid Head Sanctuary Zone encompassed the ex HMAS Hobart resulting in the powers and functions being formally transferred from the Minister for Tourism to the Minister for Sustainability, Environment and Conservation in September 2014 (under Section 15 of the Historic Shipwrecks Act – via the *Administrative Arrangements Act 1994*). DEWNR (via Marine Parks Adelaide and Mount Lofty Ranges) now holds responsibility for managing the site and facilitating dive based tourism. The main actions involved in this include managing the online permit system, maintaining and updating the website, ongoing maintenance of the system of buoys at the site and working with dive tour operators, dive shops and the recreational scuba diving sector to maintain and promote the site and ensure compliance with regulations (refer to Assessment 4.1).

Table 5. Number of permits per year

Year	Number of Zanoni permits	Number of ex-HMAS Hobart permits
2012	5	Not available as permits were managed by SATC
2013	4	Not available as permits were managed by SATC
2014	5	48 (for Nov–Dec 2014 after permit management was transferred to DEWNR)
2015	5	303
2016	4	277
2017		205 as at 1 August 2017

Indicator 1.4

DEWNR policies are developed that address marine park management

Measure 1.4

Number and nature of policies developed for internal DEWNR use in marine park management, including DEWNR wide policies that address marine parks (e.g. fencing, commercial photography)

Assessment 1.4

DEWNR prepares strategic, operational and regional policies to guide the administration and functioning of the department and to support fulfilment of legislative obligations. Since the authorisation of management plans and the commencement of the zoning regulations, a number of strategic and operational polices covering a broad range of activities have been written which include marine parks (refer Table 6 and Table 7).

Table 6. DEWNR strategic policies

Date	Policy	Content
2004	Living Coast Strategy for South Australia 2004	*Updated in 2011* Although written before the proclamation of the Marine Parks Act, the strategy recognises the need to conserve marine environments and for an integrated approach to coast and marine management. The strategy sets out the government's environmental policy directions for sustainable management of South Australia's coastal, estuarine and marine environments to be applied over five years and strategies to help protect and manage coastal areas, estuaries and marine ecosystems for their conservation and sustainable use. It identifies and addresses six key objectives for our coastal, estuarine and marine environments as well as a number of actions for government and lead agencies. • Strategies include development of coast and marine legislation and the marine planning framework.
2007	No Species Loss: A Nature Conservation Strategy for South Australia 2007–2017	*Originally written in 2007 with updates in 2010 and 2012*. This articulates the government's policy for reversing decline in the State's terrestrial, aquatic and marine biodiversity. This will be replaced by the new Nature of SA strategy and guiding principles and that the "intent of future policy development is that protected areas policy provides consistency and integration across marine and terrestrial protected areas, and that these reflect the principles being described by Nature of SA". (D Rogers (DEWNR) 2017, pers. comm., October 2017)
2012	People and Parks – A visitor strategy for South Australia's National Parks, Marine Parks and Reserves. September 2012	The parks referred to in this strategy are those categorised as parks or reserves under the National Parks and Wildlife Act, the Wilderness Protection Act and the Marine Parks Act . The strategy does not provide management strategies at an individual park level. By 2020 South Australia's parks will be celebrated for the benefits they provide to communities and the contribution people make to conservation. The strategy contains four goals with six underlying strategies:

Date	Policy	Content
		• Enriching our lives – our lives will be enriched by enjoyment of South Australia's national parks and reserves; • Enhancing parks – our enjoyment of parks will also benefit the conservation of parks; • Shared stewardship for parks – parks will be cared for by the community; • Growing community benefits and prosperity – parks will provide health, social and economic benefits for South Australians
2012	Conserving Nature 2012 – 2020: A strategy for establishing a system of protected areas in South Australia	No marine park reference. Only includes terrestrial and inland aquatic protected area system.

Table 7. DEWNR operational policies

Date	Policy	Content
27 August 2013	Commercial filming and photography (parks and reserves) policy (2013)	This strategy supports low impact commercial filming and photography in parks and reserves established under the National Parks and Wildlife Act, the Wilderness Protection Act and the Marine Parks Act and makes specific reference to marine park sanctuary zones.
21 July 2014	Boundary Fencing Policy (2014)	Describes the circumstances under which DEWNR may consider the survey, erection and maintenance of boundary fencing, or agree to contribute to costs, to prevent stock straying, prevent impacts on public land, and relocation of a boundary for management purposes. This policy is relevant because marine park boundaries can extend above high water mark where fences occur.
30 October 2014	Memorials policy (2014)	Establishes criteria for the granting of permissions for the placement of memorials in areas under the National Parks and Wildlife Act, Crown Land Management Act or Marine Parks Act.
29 April 2015	Marine Mammal intervention Policy (2015) and Procedures (2017)	This policy and procedures document describe DEWNR's position on human intervention in a marine mammal stranding (live or dead), entanglement, entrapment, injury, or a marine mammal showing abnormal clinical signs and other incidents that may compromise the welfare of a marine mammal(s) in the wild or the conservation of the species. It applies to all species of seals, sea lions, dolphins, porpoises and whales found stranded on land or found in coastal

Date	Policy	Content
		waters under the jurisdiction of the Government of South Australia. There are no specific requirements for implementing these within a marine park.
1 September 2015	Dogs in parks and reserves policy (2015)	This policy applies to all parks and reserves in South Australia. This includes areas proclaimed under the National Parks and Wildlife Act, Wilderness Protection Act, Marine Parks Act and land declared under Section 55 of the Crown Land Management Act 2009. It specifically refers to requirements for the management of dogs in National Parks and Wildlife Act reserves and marine park sanctuary zones.
31 December 2016	South Australian White Shark Tour Licensing Policy (2016)	A policy framework to guide licensing and to support a socially responsible, environmentally sustainable and economically progressive white shark tourism industry in South Australia. Applies within the Neptune Islands Conservation Park and Neptune Islands Group (Ron and Valerie Taylor) Marine Park and refers to the requirements of the zoning regulations and the marine park management plan.

9.2.2 SEQ 2 – Have activities and uses been actively influenced within and adjacent to the marine parks to help mitigate threats to marine biodiversity and marine habitats?

Indicator 2.1

Formal and informal advice on development proposals and applications

Measure 2.1

Number and nature of informal and formal advice provided on development proposals and applications, including the number of known cases where development advice was not sought (e.g. jetty/landing installed at Franklin Harbor without seeking advice from DEWNR)

Assessment 2.1

The Planning, Development and Infrastructure Act (formerly Development Act) was amended by the Marine Parks Act to require referrals to the Minister responsible for marine parks in relation to proposals for major developments that occur within or which are likely to have an impact on a marine park. These referrals are limited to advice given on Environmental Impact Statements (EIS), Public Environmental Reports (PER) and Development Reports (DR) and appointments to the Development Assessment Commission (DAC) in relation to persons with marine expertise. There is no required referral of development applications.

Formal advice

Since the proclamation of the marine parks outer boundaries in January 2009, 13 major developments relevant to marine parks have been formally referred to DEWNR (refer to Table 8, Table 9, Table 10, Table 11). The assessment process has been completed for seven of these, while four are still being assessed and the major development status for two has lapsed.
The major developments process involves several stages of agency and public comment which may take a number of years, depending on the complexity of the development and the issues to be resolved. In all of the major developments relevant to marine parks, comments and input have been made on:

- Draft guidelines for EIS, PER or DR
- Guidelines compliance check (ensuring that the draft report complies with the guidelines)
- Draft assessment report (EIS, PER or DR)
- Proponent's response document to comments on draft assessment report
- Assessment report prepared by the relevant government agency (Department of Planning, Transport and Infrastructure).

The guidelines for an EIS, PER or DR which direct the matters to be addressed in those reports, are primarily a template containing standard requirements for various matters, such as the marine and coastal environments where applicable. Advice on marine parks throughout the referrals process for major developments has generally covered the following areas:

- Legislative requirements – reference to relevant marine park zoning and the prohibitions and restrictions that apply in those zones, general duty of care and management strategies that apply
- Pollution and water quality – oil and fuel spillages from vessels, stormwater management, turbidity (from dredging and propeller wash) and discharges
- Operational activities such as lighting, machinery and shipping noises, and vessel movements
- Fauna – impacts on fauna such as marine mammals, giant Australian cuttlefish and birds

- Flora – impacts on marine flora such as seagrass and algae beds and mangrove, saltmarsh and reef communities.

The former Development Act required that the Minister responsible for marine parks was consulted when determining membership of DAC in relation to major developments with a view to including a person with extensive knowledge or experience with issues relevant to the protection and management of the marine environment (s. 10A(5)(c)). If a major development may have a significant impact on a marine park, a person must be appointed to DAC who has expertise in the marine environment, and that appointment must be approved by the Minister for marine parks (s. 10A(6)(c). These provisions were not included in the Planning, Development and Infrastructure Act which has replaced the Development Act.

DEWNR provided input on three occasions to the membership of DAC in relation to major developments, mainly for nominations of persons with marine expertise generally, either as a general appointment or triggered by the Port Bonython bulk export facility and the Kangaroo Island Golf Course Resort at Pennington Bay major developments.

Table 8. Summary of formal major developments referred to DEWNR relevant to marine parks

Type	Number	Status
Marina	2	1 has been built, 1 approval has lapsed
Mining related infrastructure	3	1 constructed, others deferred or lapsed
Port facility	5	1 approved, 3 being assessed, 1 lapsed
Resort	3	2 approved, 1 being assessed

Table 9. Location of formal major developments in relation to marine parks

Marine Park	In/adjacent to	Near	TOTAL
Nuyts Archipelago	1		**1**
Sir Joseph Banks Group		2	**2**
Upper Spencer Gulf	4		**4**
Eastern Spencer Gulf		1	**1**
Encounter	1	2	**3**
Upper South East	1	1	**2**
Total	**7**	**6**	**13**

Table 10. Major development types in or near marine parks

Marine Park		Marina	Mining related	Port facility	Resort
Nuyts Archipelago	In	1			
	Near				
Sir Joseph Banks Group	In				
	Near			2	
Upper Spencer Gulf	In		3	1	
	Near				
Eastern Spencer Gulf	In				
	Near			1	
Encounter	In				1
	Near			1	1
Upper South East	In				1
	Near	1			
Total		**2**	**3**	**5**	**3**

Table 11. Summary of major developments for which marine parks advice was given

Development	Description	Proponent	Marine Park	Marine parks advice
Cape Jaffa Anchorage	Commercial and recreational marina, waterfront land division and tourist accommodation	Kingston District Council / Cape Jaffa Development Company	13km from Upper South East, HPZ-2, HPZ-3	Comment on amendments to proposal to build a multi-purpose community facility at the marina
Ceduna Keys Marina and Community Centre proposal	Multi component marina with waterfront residential housing, community centre and facilities for tourists and commercial fishing and aquaculture industry	Ceduna Marina Development Company	Nuyts Archipelago, GMUZ-3	Comment on amendments to the assessment report based on the amended EIS

Development	Description	Proponent	Marine Park	Marine parks advice
Port Spencer (Sheep Hill) Deep Water Port Facility (Stage 1)	Proposal for stage one comprises construction of wharf/jetty structures and ship loading systems; storage buildings and facilities (for ore and grain); and a road transport access corridor	Centrex Metals Ltd	approx. 6 km N of Sir Joseph Banks Group, HPZ-1, SZ-1	Comments on response to PER submissions. Comments on draft assessment report.
Cape Hardy Iron Road deep sea port	Deep sea water port and associated infrastructure including a 150km infrastructure corridor and a village to accommodate workforce.	Iron Road Ltd	approx. 15km N of Sir Joseph Banks, HPZ-1, SZ-1	Advice on DAC membership. Comments on revised guidelines for EIS. Guidelines compliance check. Comments on draft EIS.
Port Bonython Bulk Export facility	Construction of a Bulk Export Facility at Port Bonython including wharf/jetty structures and ship loading systems, storage buildings and facilities for ore, a rail connecting the site with the existing Port Augusta–Whyalla line.	Spencer Gulf Port Link	Upper Spencer Gulf, GMUZ-2	Comment on draft EIS guidelines. EIS guidelines compliance check. Comments on draft EIS. Review and comment on EIS response document. Comments on clarification document for response to EIS.
Braemar bulk export infrastructure	Construction of a deep sea floating port/wharf facility consisting of fixed moorings to secure up to four floating processing, storage and offloading (FPSO) facilities and associated multi-purpose infrastructure	Braemar Infrastructure Pty Ltd	37 km N of Eastern Spencer Gulf, HPZ-1	Documents not yet released

Development	Description	Proponent	Marine Park	Marine parks advice
	corridor to the Braemar Region.			
Kangaroo Island Plantation Timber Port	Multi-user deep water port facility, storage facilities and associated infrastructure including boat ramp.	Kangaroo Island Plantation Timbers Ltd	17 km from Encounter, GMUZ-2	No comment
Olympic Dam Expansion	Expansion of the Olympic Dam Operations from 150,000 tpa to 350,000 tpa of copper and associated products. Potential for inclusion of desalination plant in the vicinity of Whyalla/Port Bonython	Western Mining Corporation (Olympic Dam Corporation Pty Ltd)	Upper Spencer Gulf, GMUZ-2	Comments on adequacy check for supplementary EIS
Port Pirie Smelter Transformation	Proposal to upgrade the existing Nyrstar smelter at Port Pirie (Mid North), primarily to reduce lead emission levels	Nyrstar Port Pirie Pty Ltd	adjacent Upper Spencer Gulf, GMUZ-2	Comments on draft PER guidelines Comments on final PER
Rare earths complex, Whyalla	Processing plant for rare earth oxides, gypsum, phosphoric acid and small amounts of uranium oxide. A small desalination plant would provide water for processing.	Arafura Resources Pty Ltd	Upper Spencer Gulf, GMUZ-2	Documents not released
Kangaroo Island Golf Course Resort, Pennington Bay	Proposal for the development of an international standard, links-style golf course resort on Kangaroo Island	Programmed Turnpoint Pty Ltd	Encounter, approx. 3 km S of SZ-9	Comments on draft guidelines. Advice on DAC membership. Guidelines compliance check. Comments on final PER.

Development	Description	Proponent	Marine Park	Marine parks advice
American River, Kangaroo Island Tourist resort	Tourist resort and associated infrastructure	City and Central Consulting Pty Ltd	Encounter, GMUZ-5, SZ-9	Comments on draft PER guidelines
Nora Creina Golf Course and Tourism resort	Development of an international standard, links style golf course and mixed tourism resort near Nora Creina (initial proposal included desalination plant)	Justin and Damian Scanlon	Upper South East, HPZ-4	Provision of preliminary advice. Comments on draft PER guidelines. Advice on DAC membership. PER adequacy check. Comments on PER. Comments on proponent response document on PER. Comments on DPTI assessment report.

Informal advice

Informal advice has been provided for development proposals that are not subject to legislative requirements of the Marine Parks Act or any of the Acts amended by it. This informal advice has either supported assessment of development applications referred to the Coast Protection Board or in relation to referrals to DEWNR Planning and Assessment Unit regarding development proposals or matters triggered by the Commonwealth EPBC Act. Marine parks officers and principal advisors have also provided advice on aquaculture matters relating to activities such as lease movements or variation to species that occur within existing aquaculture zones outside marine parks.

Developments proposals (coastal developments)

Applications for certain developments in coastal areas are required to be referred to the Coast Protection Board for assessment and comment. Through an informal process developed between marine parks officers and DEWNR Coast Protection Board officers, any applications for developments that may directly impact a marine park or for which the Board requires supporting information, are forwarded to the marine parks team for advice.

Since 2012 the Coast Protection Board has assessed over almost 800 development applications. Of these, just over 50% have been in areas adjacent to marine parks. A number of the applications relate to matters with minimal impact on marine parks such as proposals for land divisions and constructions near the coast. In addition, Coast Protection Board officers have taken on the responsibility of making assessments related to marine parks. As a result, the Board has only forwarded seven applications to marine parks officers for further comment or advice. These are summarised in the tables below (Table 12, Table 13, Table 14 and Table 15).

Table 12. Total number of DAs assessed by CPB, showing number adjacent to marine parks (2012 to 2017)

Marine Park	2012	2013	2014	2015	2016	2017	Total per MP
Far West Coast	0	0	0	0	0	0	**0**
Nutys Archipelago	4	15	5	5	4	7	**40**
West Coast Bays	0	0	0	0	3	0	**3**
Investigator	0	0	2	0	0	0	**2**
Thorny Passage	3	3	5	8	9	7	**35**
Sir Joseph Banks Group	0	1	0	1	0	0	**2**
Neptune Islands Group	0	0	0	0	0	0	**0**
Gambier Islands	0	1	0	0	0	0	**1**
Franklin Harbor	5	3	4	4	12	2	**30**
Upper Spencer Gulf	11	13	9	5	5	9	**52**
Eastern Spencer Gulf	0	0	0	2	0	1	**3**
Southern Spencer Gulf	2	1	3	4	13	10	**33**
Lower Yorke Peninsula	0	1	0	1	2	2	**6**
Upper Gulf St Vincent	16	10	11	10	15	6	**68**
Encounter	25	16	27	25	22	17	**132**
Western Kangaroo Island	0	0	0	0	0	0	**0**
Southern Kangaroo Island	1	0	0	0	0	0	**1**
Upper South East	3	0	0	3	3	1	**10**
Lower South East	1	3	0	0	0	0	**4**
Total per year adjacent Marine Parks	**71**	**67**	**66**	**68**	**88**	**62**	**422**
TOTAL DA's / year	134	144	129	134	151	103	**795**
% relevant to MPs	***53***	***47***	***51***	***51***	***58***	***60***	***53***

Table 13 Coasts DAs forwarded to marine parks for comment (by park) (November 2012 to June 2017)

Marine Park	Date received	Development	Address	Suburb
Nuyts Archipelago	14-Apr-14	Floating pontoon with rolling gangway	Fowlers Bay Jetty	Fowlers Bay
Thorny Passage	02-Oct-14	Pontoon and gangway	Esplanade	Coffin Bay
Franklin Harbor	19-Dec-16	Earthworks for foreshore re-development	Esplanade and Thompson Drive	Cowell
	10 Jan 17	Development application for Cowell foreshore redevelopment	Esplanade	Cowell
Upper Spencer Gulf	16-Jul-12	Expansion of transhipping operations	Spencer Gulf	Whyalla
Encounter	17-May-16	Extension and upgrade of car park at Bluff Boat Ramp	Encounter Bay Road	Encounter Bay
	20-Jun-17	Relocation of existing oyster aquaculture lease		Nepean Bay

Development proposals (other)

Informal advice has been provided on an additional 5 development proposals adjacent to or within marine parks. The majority of these have related to marine or energy infrastructure.

Table 14. Developments – informal advice by marine park (November 2012 to June 17)

Marine Park	Date received	Development	Location	Applicant
Nuyts Archipelago	1-Jul-16	Export offloading and marina facility	Thevenard	DEWNR Crown Lands
Encounter	1-Jun-14	Proposed marina and boat ramp	Bridge Terrace, Victor Harbor	Victor Harbor Council
	29-Jul-15	Proposed port facility,	Ballast Head, Kangaroo Island	DPTI
	1-Jul-16	Kangaroo Island undersea power cable project	Backstairs Passage	SA Power Networks
	6-Jul-16	Harbor maintenance dredging,	Penneshaw, Kangaroo Island	DPTI

EPBC Act

Advice has been provided on 7 different occasions on EPBC Act matters relating to developments potentially affecting the marine environment or marine parks. These (which have included declared major developments) have mainly been associated with port and harbor proposals and mineral processing infrastructure (Table 15).

Table 15 EPBC Act advice provided (November 2012 to June 2017)

Marine Park	Date	Development proposal
Not in marine park	12-Nov-12	Ceres Wind Farm, Yorke Peninsula - comment on requirement for EPBC referral
	23-Jul-13	Port Spencer - EPBC Assessment by Preliminary Documentation
	11-Nov-16	Smith Bay multiple user deep water port, Kangaroo Island Plantation Timber Ltd - requirement for EPBC Act assessment
adjacent to Upper Spencer Gulf	19-Mar-13	Nyrstar Port Pire Smelter Upgrade - comment on requirement for EPBC referral
	12-Mar-14	Extension to Wiluna Uranium Mine, WA - road transport - comments on MNES assessment
Franklin Harbor	24-May-17	Franklin Harbor foreshore development - requirement for EPBC Act assessment
Upper South East	20-Jun-14	Nora Creina integrated golf course and tourism development - EPBC Act, MNES comments

Advice or comments were provided on two EPBC Act matters relating to policy or legislation (ie other than development) such as amendments to threatened species lists, draft recovery plans or EPBC Act nominations.

Aquaculture

Aquaculture activities, such as licence applications, lease movements and lease variations that occur within existing aquaculture zones do not require formal referral in relation to marine parks. However, advice has been provided on 39 such activities, primarily in the Sir Joseph Banks Marine Park or for activities in proximity but not located in a marine park.

Advice not sought

There has been one known occasion where advice on a development affecting a marine park was not sought from DEWNR. Although this development was not significant, it does raise the issue about tracking such proposals (either through local Council development application registers, Council minutes or other compliance resources such as DEWNR Regional Officers) to ensure any impacts on marine parks are minimised.

Indicator 2.2

Advice on referrals given

Measure 2.2

Number and nature of (known) referrals for which marine park advice was provided (e.g. carpark expansion at Victor Harbor boat ramp)

Assessment 2.2

A number of the Acts amended by the Marine Parks Act require that formal referrals are made to the Minister responsible for marine parks for certain activities (see Assessment 1.1). These referrals are triggered by the activity occurring within, or potentially affecting a marine park rather than being in specific marine park zones. However, when preparing responses to these referrals, marine parks zoning has been a primary consideration, along with potential impacts of the activity.

Aquaculture

The drafting or amending of aquaculture policies under the Aquaculture Act that apply within marine parks must be formally referred to DEWNR (refer to Table 16). Aquaculture is permitted by marine parks zoning regulations in HPZ and GMUZ. Until recently PIRSA had avoided placing new aquaculture zones in HPZ, however the recently drafted policy for Eastern Spencer Gulf has resulted in inclusion of aquaculture zoning in HPZ in the Eastern Spencer Gulf Marine Park.

There are currently 12 Aquaculture Zone Policies in place with two draft zone policies in preparation. Advice has been provided on six of these.

Table 16. Aquaculture zone policies in marine parks

Policy	Referred to DEWNR	Came into operation	Type of aquaculture	Marine Park	Comments
Cape D'Estrees	unknown	23 November 2006	filter feeding molluscs, algae	*Now in Nuyts Archipelago*	Makes mention of future potential for marine parks zoning and PIRSA/DEH consultation around this
Smoky Bay	unkown	4 October 2007	molluscs other than bivalve	*Now in Nuyts Archipelago*	Makes mention of future potential for marine parks zoning and PIRSA/DEH consultation around this
Coffin Bay	unknown	2 October 2008	molluscs other than bivalve, algae	Thorny Passage	Marine Parks Act and potential future zoning mentioned in report supporting the draft policy
Fitzgerald Bay	unknown	4 December 2008	other than wild caught tuna, feeding, take of molluscs, algae	Upper Spencer Gulf	Marine Parks Act and potential future zoning mentioned in report supporting the draft policy
Tumby Bay	Dec 2010	10 September 2015	other than wild caught tuna, feeding, take of molluscs, algae	Sir Joseph Banks	Marine parks referred to in the report supporting the draft policy
Lacepede Bay	January 2011	10 May 2012	other than abalone and wild caught tuna, feeding	Upper South East	Marine Parks Act and potential future zoning mentioned in report supporting the draft policy

Policy	Referred to DEWNR	Came into operation	Type of aquaculture	Marine Park	Comments
Lower Eyre Peninsula	September 2011	14 February 2013	finfish, shellfish, algae	Sir Joseph Banks	Marine parks referred to in the report supporting the draft policy
Eastern Spencer Gulf	May 2016	20 June 2017	filter feeding molluscs, mussels	Eastern Spencer Gulf Southern Spencer Gulf	Extensive consultation with DEWNR in review process
Ceduna (draft)	November 2014	2015	aquatic animals (other than mussels) that does not involve regular feeding, algae	Nuyts Archipelago	Extensive reference to marine park zoning in the report supporting the draft policy
Franklin Harbor (draft)	October 2012	2015	bivalve molluscs other than mussels, algae	Franklin Harbor	Marine parks zoning referred to in the report supporting the draft policy

Development

In addition to formal referrals relating to membership of the Development Assessment Commission (DAC) and EIS, PER and DR for major developments (see Assessment 2.1), the former Development Act, now the Planning, Development and Infrastructure Act, also requires that a Development Plan Amendment (DPA) be referred to the Minister responsible for marine parks where it relates to any part of a marine park (refer to Table 10).

A number of DPAs for 15 of the 23 local Councils adjacent to marine parks have been formally referred to DEWNR since the proclamation of the outer boundaries, including Statements of Intent (SOI) (for amendments initiated by Councils). Referrals have also been received for DPAs applying statewide (refer to Table 17 and Table 18).

Table 17. Development plan amendments referred to DEWNR

Council	Date referred	Description	Marine Park
Ceduna	2010	SOI for the District Council of Ceduna - Decres Bay Rural Living and Minor Amendments DPA	Nuyts Archipelago
	2010	SOI for the District Council of Ceduna - Laura Cove DPA	Nuyts Archipelago
	2012	Ceduna Industry & Miscellaneous Amendments DPA SOI	Nuyts Archipelago

Council	Date referred	Description	Marine Park
Coorong	2010	Coorong Better Development Plan	Upper South East, Lower South East
Franklin Harbor	2017	Franklin Harbor General (Part 1) DPA SOI	Franklin Harbor
Kingston	2011	Kingston DC Residential (Golf Course) & Rural Living DPA & SOI	Upper South East
Lower Eyre Peninsula	2010	District Council Lower Eyre Peninsula - Coffin Bay Deferred Urban Zone DPA	Thorny Passage
Onkaparinga	2010	City of Onkaparinga Better Development Plan (BDP) Zones and General Amendments DPA	Encounter
	2011	Regulated Trees DPA	Encounter
Port Augusta	2010	City of Port Augusta West DPA - Agency Consultation	Upper Spencer Gulf
	2012	Comments - draft Port Augusta West DPA	Upper Spencer Gulf
Port MacDonnell	2013	Port MacDonnell and Environs DPA SOI	Lower South East
Port Pirie	2011	Port Pirie Regional Council Industrial Zoning DPA	Upper Spencer Gulf
Robe	2010	District Council of Robe Better Development Plan (BDP) & General DPA	Upper South East
Streaky Bay	2013	Comments - Streaky Bay BDP Conversion & Coastal DPA SOI	West Coast Bays
Tumby Bay	2017	Tumby Bay Township DPA - comments	Sir Joseph Banks
Wattle Range	2011	SOI Coastal Conservation DPA, Wattle Range Council	Lower South East
Whyalla	2012	Port Nonowie SOI, Whyalla Council	Upper Spencer Gulf
Yorke Peninsula	2011	Yorke Peninsula BDP & General DPA	Eastern Spencer Gulf, Southern Spencer Gulf, Lower Yorke Peninsula, Upper Gulf St Vincent
Statewide	2011	Ministerial DPA - Statewide Wind Farms	All
	2011	SOI Regional Integrated Water Management DPA	All
	2012	Statewide Windfarms DPA	All

Table 18. Summary of development plan amendments referred to DEWNR

Marine Park	Number of DPAs or SOIs referred
Nuyts Archipelago	3
West Coast Bays	1
Thorny Passage	1
Sir Joseph Banks	1
Franklin Harbor	1
Upper Spencer Gulf	10
Eastern Spencer Gulf	1
Southern Spencer Gulf	1
Lower Yorke Peninsula	1
Upper Gulf St Vincent	1
Encounter	2
Upper South East	1
Lower South East	1
All	3
Not in marine park	2

Note that one DPA may apply to more than one marine park (so totals will be different)

Fisheries

The Fisheries Management Act requires referral to the Minister responsible for marine parks for licence, permit or registration applications, permits for activities involving noxious species and exemptions from the Act and its regulations. The requirement for referral applies to marine parks, regardless of marine park zoning, hence referrals began with when the outer boundaries were proclaimed (refer to Table 19). The majority of referrals received from PIRSA have been for exemptions or variations to them and research and commercial fisheries activities have been the primary purpose of the referrals. No referrals for licences have been received.

Table 19. Fisheries referrals by purpose by year

Purpose	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Commercial	8	5	6	9	4	5	8	12	9	**66**
Other	3	7	0	5	5	3	4	1	0	**28**
Research	6	8	4	8	16	21	15	15	10	**103**
Surveys	0	0	0	3	3	7	9	4	1	**27**
Traditional	0	0	0	2	1	2	2	2	1	**10**
Total	**17**	**20**	**10**	**27**	**29**	**38**	**38**	**34**	**21**	**234**

These referrals have applied in all marine parks across the network

Aquatic activities licences

Applications for aquatic activities licences issued under the Harbors and Navigation Act must be referred to the Minister responsible for marine parks. These licences allow an organisation or individual to use, in accordance with the terms and conditions of the licence, any waters within the jurisdiction for the purposes of an aquatic sport or activity or for any other purposes stated in the licence.

Since November 2012, four aquatic activities licences have been referred to DEWNR in relation to marine parks. These have consisted of applications for a swimming competitions, a jet ski demonstration and fireworks displays (Table 20).

Table 20. Aquatic activities licences referred to DEWNR

Date referred	Date of activity	Activity	Location	Marine Park
20 Nov 2012	9 Dec 2012	Surf Life Saving carnival, Surf Life Saving SA	Middleton	Encounter
5 Dec 2012	29 Dec 2012	Franklin Harbor Pyrotechnics Big Bang, Howard & Sons Pyrotechnic Displays Pty Ltd	Cowell boat ramp	Franklin Harbor
5 Dec 2012	31 Dec 2012	NYE fireworks display, Ballistic Fireworks	Granite Island causeway	Encounter
5 Nov 2014	15 Nov 2014	Jet ski on water demonstration, Whyalla Foreshore Marine	Adjacent to Whyalla Marina	Upper Spencer Gulf

Mining and geothermal

Activities regulated under the Mining Act and the Petroleum and Geothermal Energy Act are managed differently to other activities. This is because each individual lease or licence issued is required to be approved with the concurrence of the Minister responsible for marine parks and the Minister responsible for minerals and energy. The referrals process provides advice to inform these concurrence considerations. To provide certainty to industry and other users as proposals are developed, the government prepared a list of mining, petroleum and geothermal activities that are likely to be acceptable in each of the four marine park zones. This information is included in the marine parks zoning table as a guide, noting that the approval of leases and licences for these activities is still subject to the two Ministers' concurrence process.

The Mining Act requires that applications and renewals for exploration licences, mining and retention leases, miscellaneous purpose licences and use of declared equipment adjacent to or within a marine park must be referred to the Minister responsible for marine parks (refer to Table 21).

Following the commencement of the Marine Parks Act, processing of marine parks mining referrals was integrated into the existing system for receiving and responding to Mining Act referrals within DEWNR. Marine parks officers have been involved in providing advice and supporting material for this process where applicable.
During the time leading up to the finalisation of marine park zoning, a number of applications were deferred pending implementation of marine parks zoning with subsequent applications including boundary changes to accommodate (avoid) sanctuary zones.

All formal mining referrals relevant to marine parks have been exploration licence applications. A number of these applications have now expired, and none of those in marine parks have resulted in actual exploration activity in marine parks.

Table 21. Number of mining referrals received in relation to Marine Parks

Marine Park	In	Adjacent	Total
Far West Coast		1	**1**
Nuyts Archipelago		3	**3**
West Coast Bays		3	**3**
Investigator	1		**1**
Thorny Passage		4	**4**
Sir Joseph Banks			
Neptune Islands Group			
Gambier Islands Group			
Franklin Harbor	3	3	**6**
Upper Spencer Gulf	4	11	**15**
Eastern Spencer Gulf	3	8	**11**
Southern Spencer Gulf	1	4	**5**
Lower Yorke Peninsula	1		**1**
Upper Gulf St Vincent	2		**2**
Encounter	2		**2**
Western Kangaroo Island			
Southern Kangaroo Island			
Upper South East			
Lower South East			
Not in marine park			**6**

Note that there will be duplication – some ELAs affected more than one marine park

Indicator 2.3

Reduction of land based impacts/threats due to the influence of management plans

Measure 2.3

Number and nature of projects/activities that reduce threats from land-based impacts on marine park biodiversity and habitats

Assessment 2.3

In the first five years DEWNR anticipated new Local Government Area (LGA) Development Plans and NRM Plans would be developed in alignment with reference to the Marine Parks Act and relevant Marine Park Management Plans. Newly developed NRM plans have been reviewed to determine their alignment. Since November 2012, three new NRM Plans have been developed:

EP NRM Strategic plan 2017-2027(EP NRM 2017)
Makes direct marine park reference in their required actions under Goal 2: Healthy and resilient land, sea and water ecosystems. In addition there are required actions that will contribute to the objects of the Marine Parks Act under Goals 1: sustainable management and use of land, sea and water and Goal 3: Active participation in natural resource management.
Goal 2 D: Supporting management of land, sea and water to maintain or improve condition.
Required actions
D1. Protect and restore coast and marine habitats, particularly for priority areas identified in the Coastal Action Plan and marine park management plans
D3. Facilitate whole of catchment management planning and supporting works to restore riparian and wetland ecosystems, and reduce water quality impacts
D7. Partner with Local Government to undertake urban stormwater planning and implementation focusing on water sensitive urban design that reduces water quality impacts.

KI NRM Strategic Plan 2017-2027 (KI NRM 2017)
Acknowledges the four marine parks within the KI NRM region and their contribution to biodiversity protection and economic contribution (via tourism opportunities) and management requirements and directly references the Marine Parks Act and the Management Plans. In addition, the Plan identifies marine parks as part of the strategies to deliver on:
Objective: 2.5 Kangaroo Island's marine and coastal environment is maintained and enhanced to conserve its wild and relatively pristine nature and to support a wide range of environmental, cultural, social and economic benefits.
(2m) Identify and prioritise threats, management requirements and strategic interventions to reduce the negative impacts and stress on Kangaroo Island's coastal and nearshore marine environment.

AMLR NRM Strategic Plan 2014-15 to 2023-24 (AMLR NRM 2013)
Acknowledges the two marine parks within the AMLR NRM region and seven of 12 regional targets that will contribute to the objects of the Marine Parks Act.
Target 1 The region will have the system capacity to harvest up to 35 GL of stormwater and 50 GL of wastewater per annum
Target 8 Extent of functional ecosystems (coastal, estuarine, terrestrial, riparian) increased to 30% of the region (excluding urban areas)
Target 9 Improvement in conservation prospects of native species (terrestrial, aquatic, marine) from current levels
Target 10 Land based impacts on coastal, estuarine and marine processes reduced from current levels
Target 11 Halt the decline of seagrass, reef and other coast, estuarine and marine habitats, and a trend towards restoration

Target 12 All coast, estuarine and marine water resources meet water quality guidelines to protect defined environmental values
Target 13 Increase participation in natural resources management activities by 20% community support for NRM, building capacity of natural resources managers.

In addition, Assessment 2.2 highlights how formal and informal referrals have provided an opportunity to ensure threats to marine parks from land-based impacts are minimised and/or prevented.

9.2.3 SEQ 2a – Was the government policy framework to adjust commercial fisheries for full implementation of marine parks undertaken?

Indicator 2a

The government policy framework was implemented as suggested.

Measure 2a.1

Zoning that accommodated concerns of commercial fisheries.

Measure 2a.2

Quantum of catch/effort removed versus suggested amount.

Measure 2a.3

GVP was less than 5 per cent.

Assessment 2a.1, 2 and 3

One of the fundamental marine park SA Government policy commitments made in 2009 to support the implementation and success of proclaiming 19 marine park management plans was that marine parks zoning would have no more than a 5 per cent economic impact on the commercial fishing industry's statewide gross value of production (GVP). This commitment was met with the estimated impact of the final zoning across all parks of 1.98% Displaced Catch Gross Value of Production (Econsearch 2014).

To ensure the economic impact was no more than 5% the government's policy framework for the management of displaced commercial fishing effort used the following steps (from Government of South Australia 2011):

- 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.

An extensive consultation phase, over three years, that included targeted workshops and meetings with the representatives from the commercial fishing industry along with ensuring commercial fishers were members on the Local Advisory Groups resulted in a pragmatic zoning design that accommodated existing commercial fishing use and minimised displacement.

To support commercial and recreational fishers to make the changes in fishing practices required by the zoning regulations, the restrictions on fishing in sanctuary zones, commenced on 1 October 2014, two years following the authorisation of the 19 management plans in November 2012. This delay also provided the opportunity for the government to focus on the residual impact of displaced commercial fishing by implementing the South Australian Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program (Government of South Australia 2013).

Guided by fisheries managers and scientists, the commercial fishing effort expected to be displaced by the full implementation of sanctuary zones was calculated and applications were sought for the

voluntary surrender of licences and quota in the relevant fishing sectors (Ward *et al.* 2012). Details of the targets are summarised on the PIRSA website, catch effort reduction program. Considerably more applications were received than required for five of the six fisheries involved. 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 government invested over $20M in a successful catch and effort reduction program (summarised in Agency Statements, Volume 4, 2014-15 Budget Paper ($15.7 million) and Agency Statements, Volume 4, 2015-16 Budget Paper 4 ($3.3 million)). For all fisheries included in the program (Abalone, Rock Lobster, Marine Scalefish and Charter Boat), the reduction exceeded the estimated displacement and buyback target (SeeTable 22, Table 23, Table 24,
Table 25 below, Kosturjak et al. 2015). For the Prawn, Blue Crab, Sardine and Recreational Fisheries, PIRSA indicated that catch and effort which was previously associated with the closed zones could be redistributed without impacting on the sustainability of those fisheries (PIRSA 2011).

Table 22. Abalone Fishery: Historical total effort, estimated effort displacement by sanctuary zones and effort removed, Western Zone and Central Zone (data from Kosturjak et al 2015)

	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. As a consequence the reduction was shared equally across all licence holders.

Table 23. Rock Lobster Fishery: Historical total effort, estimated effort displaced by sanctuary zones and effort removed, Northern Zone and Southern Zone (data from Kosturjak et al 2015 with additional information on Southern Zone from A. Burnell (DEWNR) pers. comm. February 2017.

	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

Table 24. Marine Scalefish Fishery: Historical total effort, estimated effort displaced by sanctuary zones and effort removed, South Australia (data from Kosturjak et al 2015)

	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 (Kosturjak et al 2015)

Table 25. Charter Boat Fishery: Historical total effort, estimated effort displaced by sanctuary zones and effort removed, South Australia (data from Kosturjak et al 2015)

	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

9.2.4 SEQ 3 – Have any additional protections and/or temporary restrictions been implemented when necessary in circumstances of urgency to: 1) protect a listed species of plant or animal; 2) protect a feature of natural or cultural heritage significance; or 3) protect public safety?

Indicator 3

Additional protections and/or temporary restrictions implemented when required.

Measure 3.1

Number and nature of additional protections and/or temporary restrictions established.

Assessment 3.1

Section 18 of the Marine Parks Act provides that the Minister may issue notices to prohibit or restrict activities in a marine park.

The purpose of these notices is:

a) to protect a species of plant or animal;
b) to protect a feature of natural or cultural heritage significance; or
c) to protect public safety.

A notice may be issued for a maximum of 90 days, and the maximum period that a prohibition or restriction may operate is 180 days. A notice may be amended, extended or revoked.

Five prohibition notices have been issued, all of which have been for the purpose of protecting public safety (Table 26).

Table 26. Prohibition notices that have been issued

Notice Date	Subject	Details	Reason	Marine Park
28 March 2014 and 26 June 2014	Oceanlinx Wave Generator	On 2 March 2014 a wave generator structure being towed from Port Adelaide to Port MacDonnell became unstable during transport and a decision was made to take it into shallow water about 1km off Carrickalinga Head (Figure 8). Serious concerns were identified about the potential risks to members of the public if the convertor (weighing 3000 tonnes and measuring 20 m x 20 m) was accessed, especially underwater. The first notice was issued at the request of the Department of Planning, Transport and Infrastructure (DPTI), the managers of the government response to this incident. DPTI identified that there was no simple and quick means of prohibiting public access to the convertor	To protect public safety	Encounter, HPZ-5

Notice Date	Subject	Details	Reason	Marine Park
		available under the Harbors and Navigation Act. A prohibition notice was issued under the Marine Parks Act, which prohibited members of the public from entering into or upon the generator or to enter the designated zone around the generator. The Harbors and Navigation Regulations 2009 were amended on 18 September 2014 to include the wave generator in a restricted area (Yankalilla Bay) prescribed in Schedule 5 of the Regulations.		
9 December 2014	Mass whale stranding	In early December 2014 seven sperm whales became stranded and died on a beach near Ardrossan (Parara Beach). Members of the public (other than a public authority) were prohibited from approaching within 50 m of a marine mammal if that carcass was located anywhere within the boundaries of the Upper Gulf St Vincent Marine Park. Samples were collected by the SA Museum and the remains were buried nearby.	To protect public safety	Upper Gulf St Vincent, GMUZ-1
15 December 2014 and 19 March 2015	Dredging at the Murray Mouth	In early December 2014 a decision was made by both state and federal environment ministers to start dredging the Murray Mouth for environmental reasons. A notice was subsequently issued, prohibiting members of the public from entering, remaining in or undertaking any activity in parts of the Special Purpose Area at the Murray Mouth from 19 December 2014 until 19 March 2015, to ensure their safety while dredging operations were being undertaken in the channels leading to the Murray Mouth. Dredging continued until October 2016 when high and increasing flows improved conditions at the mouth and reduced the need for dredging. A second prohibition order was issued on 19 March 2015 which expired on 17 June 2015.	To protect public safety	Encounter, SPA-8, HPZ-7

Figure 8. Oceanlinx wave generator off Carrickalinga Head, 4 March 2014

9.2.5 SEQ 4 – Has a permitting system been introduced that allows for activities where they were not otherwise authorised?

Indicator 4

Permit system implemented successfully that allows for activities where they are not otherwise authorised

Measure 4.1

Permit regulations commenced

Assessment 4.1a

Section 19 of the Marine Parks Act provides that the Minister for Sustainability, Environment and Conservation may issue a permit to allow an activity that would otherwise be restricted or prohibited. The Act requires that zoning regulations must be made to establish these prohibitions and restrictions. These prohibitions and restrictions are identified in the zoning regulations.

Issuing of permits ensures conservation values are maintained, cumulative impacts of activities are considered and provides a mechanism that supports consistency of management practices across the marine parks network.

Marine park management plans provide general guidelines for the granting of permits for various activities that might be allowed within a park. As indicated in each management plan, favourable consideration will be given to the granting of permits for the following activities:

- scientific research in a sanctuary zone or restricted access zone
- competitions and organised events in a sanctuary zone
- tourism operations in a sanctuary zone
- commercial film making (including sound recording and photography) in a sanctuary zone
- installation of vessel moorings in a sanctuary zone.

To support the establishment of a permit system, supporting regulations were proclaimed on 2 October 2014 and commenced on 2 February 2015.

The Regulations, incorporated into the already existing administrative *Marine Parks Regulations 2008*, support the orderly administration of permits under the Marine Parks Act, enable permit application fees to be charged or waived, and breaches of permit conditions to be expiated. The establishment of reasonable application fees is an important component of a robust permitting system and will help attract applicants with a genuine interest in supporting marine park management objectives.

An expiation fee has also been established for breaches of permit conditions. Without the Regulations, the Minister is limited to revoking permits or pursuing prosecutions through the courts (maximum penalty $100,000 or imprisonment for two years). The capacity to expiate permit breaches is provided as a management option to increase efficiencies. It is expected that more severe penalties would be imposed in appropriate circumstances.

The *Marine Parks Regulations 2008* are updated annually to incorporate CPI increases in permit fees.

Measure 4.1b

A permit application process is accessible to the public

Assessment 4.1b

In September 2013 information was sent to 37 key stakeholders (such as universities, environmental non-government organisations (ENGO), and sporting associations) explaining the requirements for marine parks permits for certain activities in marine parks.

A separate 'Permits' page was subsequently included on the marine parks website. This page provides information on requirements for each of the five types of permits referred to in the management plans, criteria for fee waiver, and a permit application form. The website address is: www.environment.sa.gov.au/marineparks/permits

A specific inbox for marine parks permits was established to provide a single point of contact for applicants. This inbox is accessible to a number of DEWNR staff to enable quick responses to be provided.

The website and associated documents are updated periodically to accommodate various changes, such as fee increases or to improve the process. Improvements include updates to the application form to include more specific questions with the aim of helping applicants to provide more detailed information that will assist the assessment of their application.

To facilitate the collection of permit application fees, marine parks permitting information was also incorporated into DEWNR's financial systems to enable the collection of fees through the EFTPOS system RetailTouch. Marine parks permit fees are incorporated into DEWNR's financial reporting.

Also, refer to Assessment 1.3 and Assessment 6.2

Measure 4.1c

Internal assessment process established

Assessment 4.1c

The assessment process for permits has been documented in a simple table format, to assist other DEWNR officers who may need to assess permit applications. The table documents the process from receipt of applications, liaising with or notifying other areas of DEWNR (such as marine park regional coordinators, DEWNR research permit officers), assessing the application, preparing documents for Delegate's approval, and issuing the permit.

All permit applications are sent to the relevant marine park regional coordinators for their information and advice, and to avoid conflict with any other operational or conservation activities that may be occurring.

Applications requiring scientific advice are also referred to the Performance sub-program within the DEWNR Science and Information Group. A specific risk assessment process is applied to these applications. This includes criteria for the provision of technical advice (activity involves the take or death of plants or animals, causes direct or indirect damage to habitats, or involves attracting, catching or trapping animals). The risk assessment process developed enables consideration of the proposed activity in relation to achievement of the objectives of each type of marine park zone. The risk of activities in each zone has been determined as a function of consequence (insignificant to significant) x likelihood (rare to likely). A matrix of threshold risk ratings for each zone allows a quick assessment of the potential risk of the activity in each zone type.

An MS Access database has been established to manage marine parks permit data and to enable a means of reporting on multiple aspects. The database is stored on the DEWNR corporate intranet and contains information about all permits issued (including permit type, applicant, applicant type, activity, regulations, location, conditions, species where relevant) as well as administrative information such as issuing and expiry dates, fees paid, and reports required and received (see appendix F).

Measure 4.1d

Number, nature, location and category of permit applications requested and approved. If possible, include a measure of number of known breaches of permit conditions that lead to expiation or permit cancellation.

A total of 160 permits have been issued since the marine park management plans were implemented, 94 of these were for research (Table 27, Figure 9). Research permits have been issued in all marine parks. Filming, tourism and competitions have occurred in Nuyts Archipelago, Thorny Passage, Upper and Southern Spencer Gulf and Encounter Marine Parks.

Table 27. Number of permits issued for each category

Category	No. of permits issued
Research	94
Competition	24
Filming	6
Tourism	12
Other*	24
Total	**160**

*Other, includes activities such as acoustic monitoring and sediment sampling

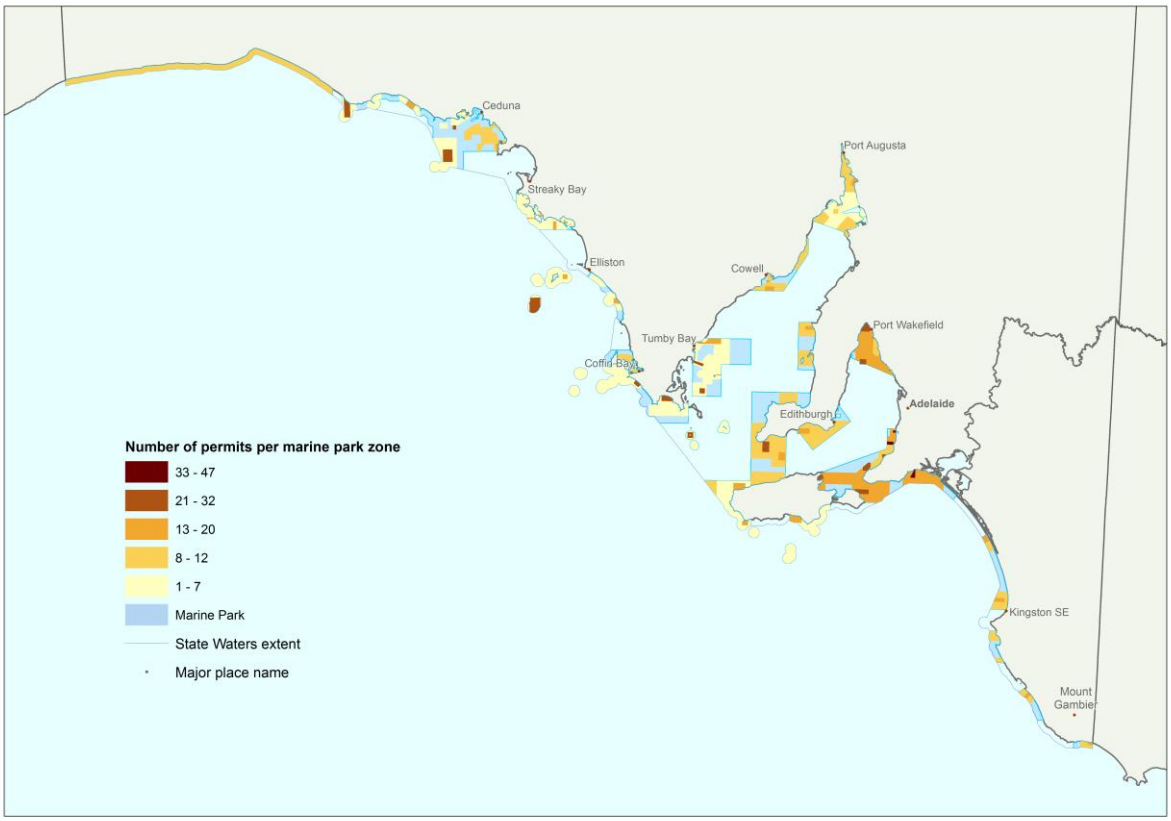


Figure 9. Marine park permit heat map, showing the number of permits issued in South Australia's marine parks

9.3 Stewardship sub-program activities: Strategies 5 to 9

This section presents the information addressing the specific evaluation questions for the Stewardship sub-program. Highlighting the sub-programs achievements in delivering the five management plan strategies which aim to provide opportunities for public appreciation, involvement, education, understanding and enjoyment of marine parks and the marine environment. The section highlights the activities that have been undertaken over five years from November 2012 to June 2017 to deliver on these strategies. It is not a comprehensive cover, but is representative of a significant amount of the programs achievements. There is also overlap between some activities that address more than one evaluation question and they may therefore appear in more than one place.

9.3.1 SEQ 5 – Has public appreciation, understanding, and enjoyment of the marine parks been provided?

Indicator 5.1

Stewardship activities provided for public appreciation, understanding and enjoyment.

Measure 5.1a

Number and nature of products developed to assist in public appreciation, understanding and enjoyment (e.g. interpretive signage installed and number of visitors to that site per year; number of stewardship products produced, printed, and supplied e.g. brochures)

Assessment 5.1a

One of the mechanisms used to provide for public appreciation and awareness of marine parks is the development of interpretive and educational products. A total of 47 interpretative and stewardship products were developed between 2013 and 2017. These include interpretive signage, brochures, handouts, website articles, and videos (Table 28, Table 29).

Since 2013/14 there have been six interpretive signs that provide information on the habitats and species, and/or the cultural significance, within the associated sanctuary zones. The signs are placed in strategic locations across the state, along with two signs developed in collaboration with the SA Whale Centre at Victor Harbor (refer to map in Assessment 15.8).

Three interpretive signs have been installed on the Admirals Arch boardwalk adjacent to the Western Kangaroo Island Marine Park. These signs potentially reach an annual audience of 120,000 people (based on park entrance numbers), and highlight the importance of strategic placement of information regarding marine parks in terms of reaching large numbers of marine users.

There have been 15 promotional and educational videos created in collaboration with commercial tourism operators, schools, the Australian Government and NRM regions.

In addition, 26 brochures/guides/maps/booklet-style products have been developed (Table 28).

A key product developed to provide for public understanding was the Recreational Fishing Guide which had over 300,000 copies printed and has been regularly distributed to various outlets since November 2012. This includes an initial distribution of 270,000 copies in the Sunday Mail newspaper (23 June 2013), plus several reprints distributed to nearly 400 fishing, retail and tourist outlets.

Thirty-two reports have been produced, including marine park baseline reports, MER plan, Regional Impact Assessment Statement, as well as other technical and monitoring reports. These products inform the public about the technical aspects of marine parks, and increase community understanding

regarding species ecology and the monitoring activities surrounding the marine parks program (Table 28).

Table 28. Annual and regional summary of interpretive and stewardship products and reports produced

Region/sub program	Brochures postcards posters, guides, maps and booklets etc.	Signs	Videos	Reports	TOTAL
AMLR					
2013/14			1		1
2014/15			2		2
2015/16	3	1	2		6
2016/17	3	1			4
Compliance					
2015/16	6				6
EP (East)					
2013/14			1		
2014/15			1		
2015/16	2		1		2
2016/17	2			1	3
EP (West)					
2013/14	1			1	2
2014/15		1		2	3
2015/16	1	1		1	3
2016/17					0
KI					
2014/15	1				1
2015/16	1	1	1		3
2016/17	1	3			4
NY					
2013/14	1				1
2014/15					0
2015/16					0
2016/17					0
Performance					
2014/15			2		2
2015/16				1	1
2016/17			1	26	27
Stewardship					
2012/13			2		
2013/14	1				1
2014/15					0
2015/16	1				1
2016/17	2		1		2
Grand Total	26	6	15	32	75

Table 29. Marine Park promotional videos and YouTube links (Note 14 videos shown, 1 has no link)

Video produced	Link to video
Enjoy life in our marine parks	https://www.youtube.com/watch?v=-YgsqFQv_MM
Why marine parks are important for all South Australian	https://www.youtube.com/watch?v=0brkYTKT-Kg
Encounter Bay SZ video clip	https://www.youtube.com/watch?v=-dPAIj9Qzq8
Noarlunga Reef SZ video clip	https://www.youtube.com/watch?v=kIALwXQC7m4
Aldinga Reef SZ video clip	https://www.youtube.com/watch?v=SxMjfKOMkvI
Isles of St Francis Science Expedition video clip	https://www.youtube.com/watch?v=EEiVgQcMlP0
BRUVS video clip	https://www.youtube.com/watch?v=teHVCbbfUZI&sns=em
KI marine parks and local community action video clip	https://www.youtube.com/watch?v=uawGDVlnj_U
Big Duck CTO video clip testimonial	https://www.youtube.com/watch?v=7LFpCRAZFlc
SNUBA CTO video clip testimonial	https://www.youtube.com/watch?v=fr58-C14Vfc
A line in the sand - Australian sea lion video	https://www.youtube.com/watch?v=FDUVfI7NqN4
Immerse Yourself in the Neptune Islands	https://www.youtube.com/watch?v=7xkE_8zdLf4
Scientists for a Day – Thorny Passage Marine Park	https://www.youtube.com/watch?v=k8pe9KmhScM
Creating a lasting connection with the ocean.	https://www.youtube.com/watch?v=djZM3WM2T7w&index=22&list=PL6clHG9-myz3W7rQO-FIJxBAqYkoxSHP

Measure 5.1b

Number and nature of products developed for third-party users

Assessment 5.1b

Third parties can provide quality information to their audiences to assist in raising awareness about marine parks. DEWNR has assisted in the development of products specifically to assist third parties, including:

- Testimonial videos of Big Duck and Port Noarlunga SNUBA CTOs were developed that were able to be used by the tour operators as well as promote marine parks.
- Underwater snorkelling slate developed in partnership with the City of Onkaparinga, Reef Watch and Experiencing Marine Sanctuaries (EMS) in raising awareness of underwater species.
- Products for EMS to help with public education such as maps of cuttlefish coast, and briefing notes for EMS volunteers.
- Sea lion video in partnership with Australian and South Australian Governments to be used at Seal Bay Visitor Centre, and on social media.

In addition, the program provides promotional material to organisations who are able to promote marine conservation and marine parks at events, for example to: EMS for Science Alive, PIRSA for boating shows and to Adelaide Dolphin Sanctuary for community events.

Measure 5.1c

Number and nature of stewardship-focused citizen-science projects supported, and number of citizens who participate (e.g. dolphin counts; Hooded Plover surveys)

Assessment 5.1c

Complementary monitoring is built into the marine parks MER plan to enable collaboration with both research agencies and community groups through citizen science projects. Citizen science projects aim to achieve research, education and engagement outcomes, although they generally focus on one or two of these themes as a priority, dependent on the purpose. Within the stewardship-context citizen-science projects serve a dual purpose: to accumulate additional information about marine parks that is not captured as part of the core marine parks monitoring program, and to provide opportunities to increase public appreciation, understanding and enjoyment of marine parks (see Assessment 11.1).

Since 2013/14, there have been 26 citizen science projects around the state. These projects have involved approximately 500 community members (Figure 10). Citizen science projects have been undertaken primarily in the South East NRM region (11) followed by Northern and Yorke (7) and AMLR (3) (Figure 11).

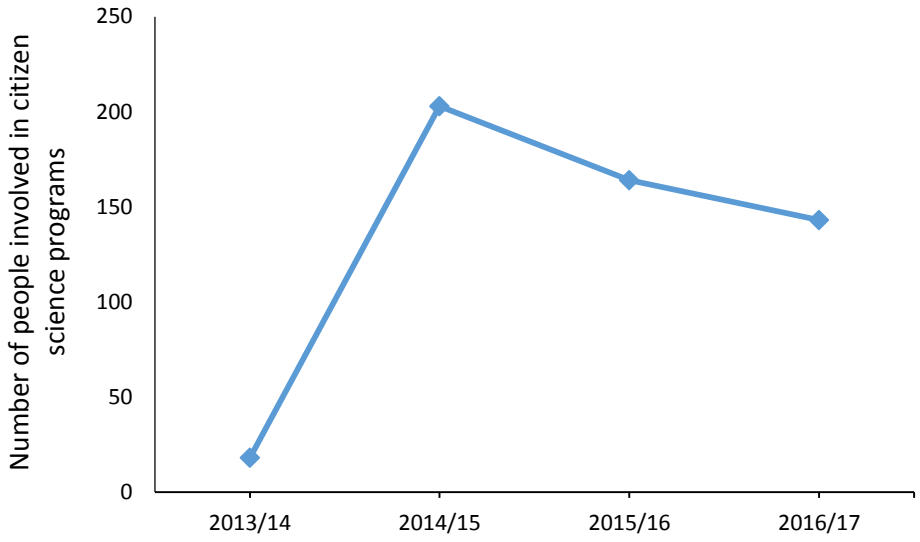


Figure 10. Number of people involved in marine parks citizen science projects each year in South Australia

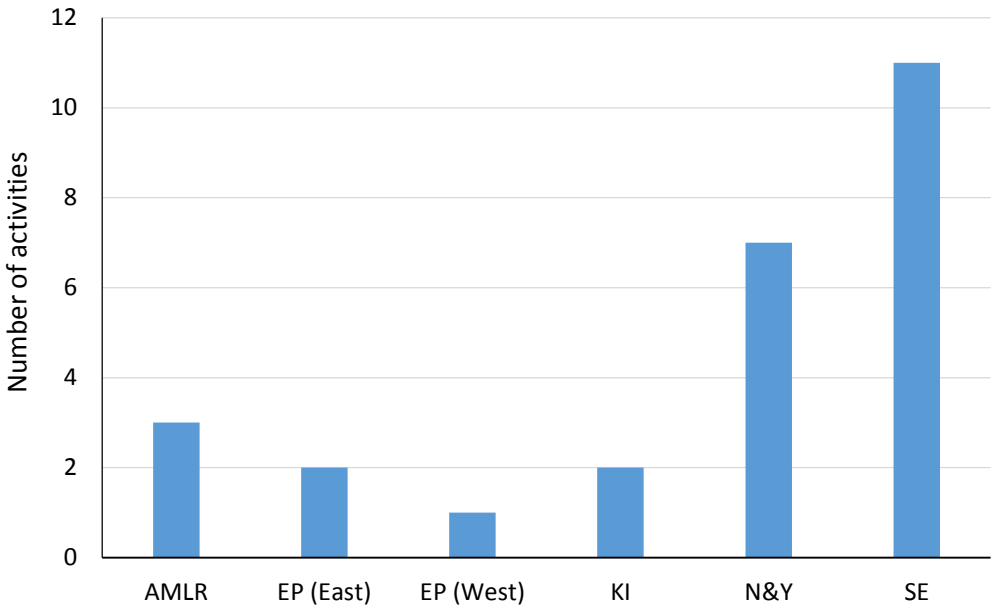


Figure 11. Number of marine parks citizen science projects in South Australia's NRM regions since 2013

Of these 26 citizen science projects, 17 are classified as stewardship-focused and account for the bulk of people involved (439). Stewardship citizen science projects are an opportunity to educate the community on marine parks while involving them in research and engagement activities that will benefit the parks. These activities do not necessarily contribute to 'core monitoring program' but still provide useful complementary data.

Two examples of Stewardship citizen science projects are described in more detail below.

Beach clean-up citizen science: Beach clean-ups include the collection of marine debris which is then categorised, counted and weighed (refer to Figure 12). The results are entered into an online database detailing the type and location of waste along South Australia's coast line. Since 2014/15 there have been 11 beach clean-up citizen science events involving nearly 300 people. There were five clean-ups in the upper South East Marine Park, one in the Eastern Spencer Gulf Marine Park and five in the Southern Spencer Gulf Marine Park (refer to media article Figure 13).

Shorebird survey citizen science: Since 2014 there have been nine citizen science projects involving over 200 community members that monitor shorebirds across the state led by Natural Resources Northern and Yorke, Adelaide and Mt Lofty, South East, and Kangaroo Island regional staff, with support from marine park regional coordinators. These projects provide baseline and ongoing data on populations of a number of local and migratory bird species, including the vulnerable Hooded Plover.

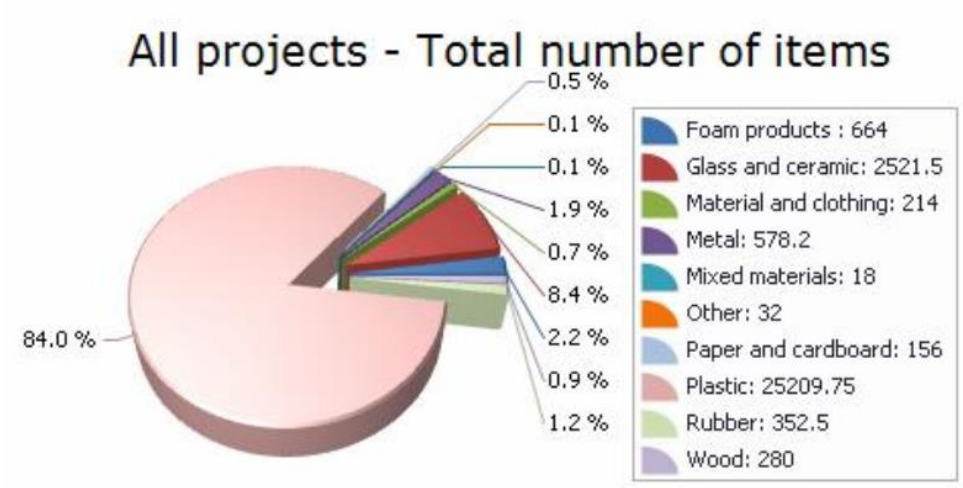


Figure 12. Example of waste collected from coastal areas as part of the citizen science marine debris project. Source: http://marinedebris.amlr.waterdata.com.au/

Protecting the coast at Formby Bay

CLEAN-UP... Student Rachel Pedler drags marine debris off the beach during a clean-up and planting day at Formby Bay.

STUDENTS from Yorketown Area and Warooka Primary Schools joined forces recently to help conserve and protect the fragile coastal environment at Formby Bay, south of Corny Point.

Students planted a variety of seedlings, propagated at Corny Point, enjoyed environmental and coastal interpretive activities and cleaned up the beach.

"It was a great day with students able to get outdoors and participate in a variety of activities that enabled contextual learning to take place, give students opportunities to contribute to community environmental initiatives and work with different age groups," teacher Stephen Talbot said.

Formby Bay Environment Action Group spokesperson Ed Satanek said many people put in a lot of effort to organise the day.

"Thanks to the principals of Yorketown and Warooka schools for their support, the Northern and Yorke Natural Resources Management Board for funding the bus, the Formby Bay Environment Action Group for supplying the seedlings, Hart Bros, and local volunteers as well as staff assisting students with their efforts," he said.

"It is hoped the program may continue in some form into the future."

Figure 13. An article from a beach clean-up day on the Yorke Peninsula, on one of the beaches in the Southern Spencer Gulf Marine Park

Measure 5.1d

Number, nature, and, media platform used for marine park media releases (produced or instigated by DEWNR).

Assessment 5.1d

DEWNR media releases are often picked up by television, radio and newspapers at both regional and state scales (see example Figure 14, Figure 15 and Figure 16). Since 2014/15, about 95 releases or related news articles/stories/radio interviews have been completed. News articles or media releases were predominantly from eastern Eyre Peninsula (32), Northern and Yorke (16), western Eyre Peninsula (14) and Kangaroo Island (12) (see Table 30). Releases range in topic from stories about citizen science projects, to general information/education and events being held in marine parks. Reader/listenership varies depending on the media outlet that runs a story on marine parks. Table 31 indicates some of the media articles, and the potential reach of the media outlets picking up marine park stories. On occasion, some stories (such as the closure of the Far West Coast and Great Australian Bight Marine Parks at the start of whale season) are run by multiple media platforms or picked up by interstate papers, increasing the overall reach.

Table 30. Number of media articles per region between 2014/15 to 2016/17

NRM region	Number of media articles since 2014/15
Eyre Peninsula (west)	14
Eyre Peninsula (east)	32
Northern and Yorke	16
Adelaide and Mt Lofty Ranges	8
Kangaroo island	12
South East	7
Stewardship/Performance	6
Total	**95**

Table 31. Potential readership from various media platforms

(Readership/leadership numbers are sourced from DEWNR media report summaries)

Media platform	Approximate potential reader/listenership (2014-17)	Example of media release
Herald Sun	300,000	Whales in marine parks
Daily Telegraph	170,000	Whales in marine parks
Sunday Mail	200,000	Sea lion conservation and research at Bunda Cliffs
Advertiser	140,000	Monitoring in Encounter Marine park
Weekend Advertiser	180,000	FWC and GAB closures
Southern Times	60,000	Compliance
Pt Lincoln Times	5,000	Local school education initiatives
West Coast Sentinel	3,000	Whale related information
Victor Times	6,000	Compliance and monitoring
The Islander	1,500	Articles about what is protected by marine parks and what can be done in marine parks.
South Eastern Times	2,000	Information regarding sanctuary zones
Yorke Peninsula Times	8,000	Shore birds
5AA radio	20,000	Parks week
ABC news	70,000	Citizen science projects
ABC Adelaide radio	30,000	Marine park research Specialty events i.e. Seaweek
ABC online	280,000	Squid breeding season

The following pages contain examples of the media outreach since full implementation in 2014.

Figure 14. Example of a DEWNR media release being picked up by the media in 2015. This article was about a two week trip recording biodiversity of marine parks from the Isles of St Francis, near Ceduna, to Cape du Couedic Kangaroo Island.

Marine dive success

BY **LOUIS MAYFIELD**

SNORKELERS recently gathered together to get a glimpse of Whyalla's signature marine animal.

A number of dives were held in Point Lowly as part of Giant Cuttlefish Dive held by Experiencing Marine Sanctuaries (EMS).

Despite cold weather, hundreds of divers packed the shores in hope of glimpsing the critters, with many returning with spectacular photographs. Organiser Carl Charter said he was happy to see divers from all around the state coming down to participate in the dive.

"We've had a really good turnout, the Giant Australian Cuttlefish is what they came to see and they'll be telling everyone how incredible the colours are," he said.

"They might never have put a mask and snorkel on before, this is their opportunity to get their face under the water and experience marine life for the first time."

"People usually see these things on TV and don't actively participate in the activity, we provide that safe and supervised experience so they feel comfortable to get into the water and experience it for themself."

Mr Charter said the cuttlefish provide divers with a 'kaleidoscope' of colours when sighted underwater.

"You see the females ducking down to lay their eggs, all the colour which falshes around their skin, it's just incredible to watch," he said.

"I had someone tell me they went to film the Pyramids in Egypt and they thought this was much better than seeing the Pyradmids."

The dive was 85 per cent subsidized by the Department of Natural Resources. Natural Resources Eyre Peninsula Officer Kate Brocklehurst said it is 'really important' for residents to get out and experience the Giant Australian Cuttlefish.

"Not only so they can learn about them, but to increase the awareness and importance of how rare they are as a species," she said.

"This is the only place we know of in the world where so many Giant Australian Cuttelfish come to mate, not even on the other side of the Spencer Gulf, just in Point Lowly."

Ms Brocklehurst said more cuttlefish had gathered at Point Lowly in 2016 than in the past five years.

DIVE: Shelly Harrison, Eric St. Martins, Carl Charter, Kate Brocklehurst, Walter Van Viechenhuizen and Chris Brocklehurst.

Figure 15. Example of a DEWNR media release being picked up by the media in July 2016. This article was about the EMS program providing opportunities for the community to snorkel with cuttlefish protected by the Cuttlefish Coast Sanctuary Zone in the Upper Spencer Gulf Marine Park.

Water exploration

MARINE parks across the state are offering an opportunity to discover South Australia's underwater world this summer.

The Immerse Yourself program, a joint initiative funded by state and federal government and natural resources boards across SA, will allow more people to enjoy the network of marine parks that are helping to preserve our incredible marine environment.

Activities will include snorkelling days, guided tours of SA's coasts, building sand castle competitions, recreational fishing, seagrass planting and kayaking events.

Environment Minister Ian Hunter said summer was the ideal time to explore SA's picturesque beaches.

"Summer is the perfect time to learn about our unique marine environments," he said.

"The state's 19 marine parks and 83 sanctuary zones are home to Australia's most iconic species such as bottlenose dolphins, leafy sea dragons and Australian fur seals, as well as mangrove forests and seagrass meadows."

"Make the most of your local marine park this summer and immerse yourself in SA's incredible underwater world to see nature at its best."

For more information or to register for the program visit www.marineparks.sa.gov.au.

Figure 16. Example of a DEWNR media release being picked up by the media in January 2017. This article is promoting getting out amongst our marine parks and learning about the marine environment through the Immerse Yourself in Marine Parks Program

Measure 5.1e

Number of hits on the Marine Parks website

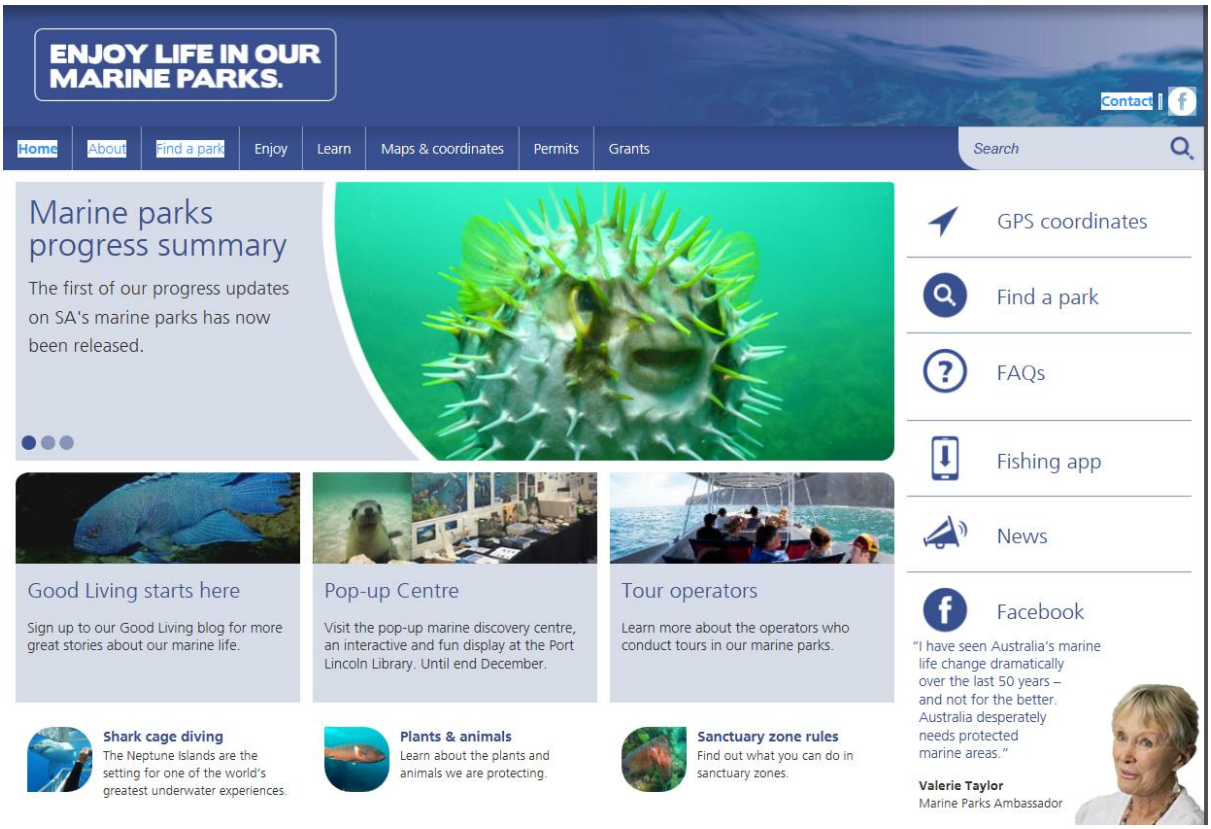


Figure 17. Homepage of the DEWNR Marine Parks website

5.1e Assessment

In the period for which data are available (October 2015 to August 2017), the marine parks website had 234,667 page views from 76,809 users over 102,559 sessions (Figure 18). The webpage is most active through the warmer months of the year (December to April) where marine use is likely higher due to the warmer weather, and in more recent years the **Immerse Yourself** calendar of events. The top three pages visited are the Home page (40,303 views), Maps & coordinates (27,294 views) and the Find a park page (17,085 views). Out of the top 10 viewed pages on the site (excluding the Home page, Figure 17), five pages contain content on marine park boundaries and coordinates (68,765 views), three pages contain content on things to do in the marine park (e.g. snorkelling, 25,818 views) and one page contained information regarding the recreational fishing grants program (4987 views).

The marine parks website has a number of downloadable products that have been accessible since 2012. In 2017 (January to August) the most downloaded products were sanctuary zone maps for a number of regions (Yorke Peninsula (805), Fleurieu Peninsula (654), Eyre Peninsula (595), Upper Spencer Gulf (559), Far West Coast (279) and Kangaroo Island (257)). Other products regularly downloaded are management plan summaries (660), the Encounter Marine Park brochure (878) and the recreational fishing guide (485, Figure 19).

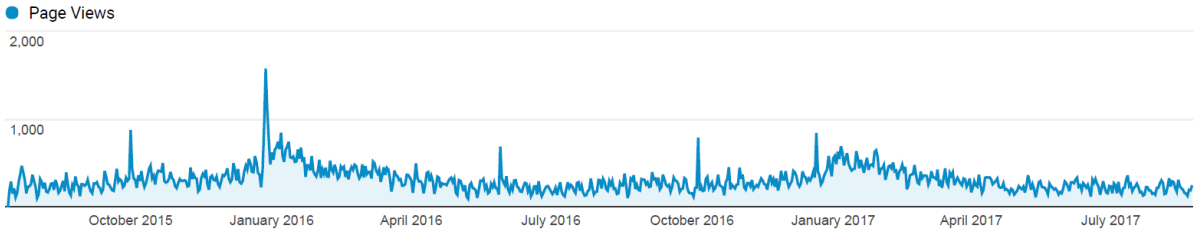


Figure 18. Total page views since October 2015 for the marine parks webpage

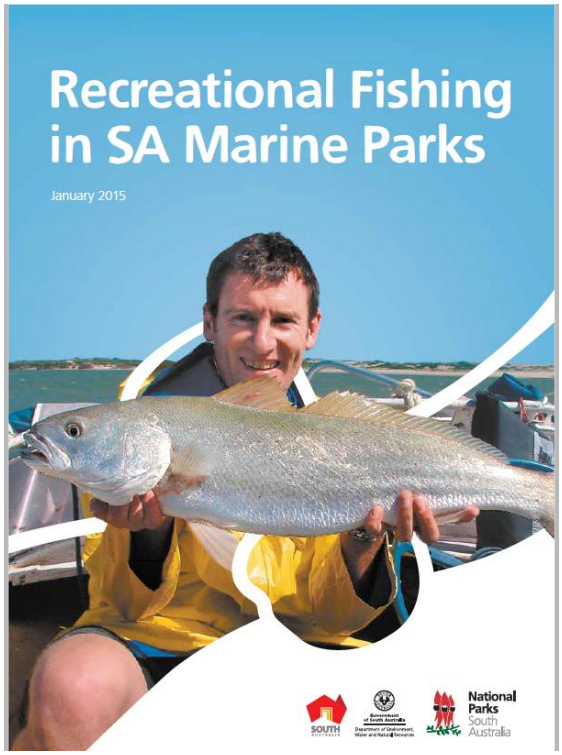


Figure 19. The Recreational Fishing Guide, was first produced in 2013. Over 300,000 copies have been printed and distributed.

Measure 5.1f

Information on SA Marine Parks is available on multiple DEWNR websites (e.g. NRM websites)

Assessment 5.1f

Access to the marine parks webpage can be navigated to from seven out of eight regional NRM webpages (not from SAMDB); from the DEWNR Enviro Data SA website, and from the DEWNR YouTube channel. In addition, the marine parks website can also be accessed, from non-DEWNR sites such as; PIRSA, councils and non-government organisations. Between 1 January and 23 August 2017, 893 and 232 sessions on the marine parks webpage were a result of traffic coming from the PIRSA and NRM websites respectively. External websites also link to the marine parks webpage. In order from highest to lowest (from 1st Jan 2017-23rd Aug 2017), the marine parks page has been accessed by sites such as Facebook (422), Adelaide scuba (227), EX-HMAS Hobart (168), Onkaparinga council (132), Play & Go (119), and yorkpeninsula.com (88).

Measure 5.1g

Number, nature, and forum of presentations or posters given at conferences and/or community events

Assessment 5.1g

Attending and presenting at conferences, forums and clubs is an effective way to provide information to a targeted audience about the SA Marine Parks network.

Since 2012/13 there have been 127 oral presentations promoting marine parks to over 6000 community members (Table 32 and Table 33). There were 54 oral presentations in the AMLR region, 23 on the Eyre Peninsula and 13 from the Performance team. There were eight separate presentations given at the NRM conference in 2016 with a combined audience of over 1000 people. Oral presentations include presentations at conferences, training events and presentations to community groups such as the divers association. In addition, since 2014/15 there have been 10 poster presentations at various environment-focused events and country shows.

Table 32. Number of oral and poster presentations given at conferences and community events

Year	Oral presentations	Poster presentation
2012/13	5	#N/A
2013/14	22	#N/A
2014/15	30	4
2015/16	39	5
2016/17	31	1
Total	127	10

Table 33. Number of presentations per region (or sub-program) and approximate attendees

	Oral presentations	Attendees
AMLR	54	1869
EP (west)	15	480
Performance	13	1780
SE	11	317
KI	9	251
EP (east)	8	600
Stewardship	9	582
NY	7	197
Compliance	1	150
Total	127	6226

Measure 5.1(h)

Number of community events supported and type of support, such as: people, funding or products.

Measure 5.1i

Number and type of community events attended and number of people (potentially/actually reached)

Assessment 5.1h and 5.1i

Marine Park staff have been active in attending and supporting community events. Since 2014/15 there have been 13 field excursions, including beach clean-up days, coastal protection and restoration work, and specialty events. The DEWNR Stewardship team has undertaken 120 events since 2014/15 (Table 34 and Table 35). This includes work done with the Immerse Yourself in marine parks events (refer to more detail below) and Experiencing Marine Sanctuaries (EMS) program (refer Case study 4: Experiencing marine Sanctuaries and Figure 20 below), in addition to attending open days, fairs/festivals, fishing events, regional and city show days as well as numerous other specialty events (Figure 21 and Figure 22). These activities have reached over 77,000 people. In addition a further 63 events reaching about 16,000 students have taken place since 2014/15 as part of the school education program (see section for SEQ 7).

The flagship engagement program called "Immerse Yourself" commenced in Dec 2015 and over 6000+ people have participated since commencement. The program is designed to increase the number of South Australians valuing marine parks through providing opportunities for involvement in fun and educational activities in marine parks across the state. The program has two objectives for DEWNR:

1) to develop a calendar of fun and engaging events targeting school kids and families over the summer school holidays in SA's marine parks
2) engage with marine based tourism businesses that operate in marine parks to assist with integrating marine park information into their activities.

The key elements of the **Immerse Yourself** summer program includes events and activities delivered by partners including the following:

- A series of 'come and try snorkelling' days in the Natural Resources AMLR and EP – run by Experience Marine Sanctuaries
- Nature Play SA's Park of the Month for January – Encounter Marine Park
- Onkaparinga Council's Eco Beach and Aquatic Adventure Day at Port Noarlunga (2016)
- A number of activities around the state such as seagrass planting and drop-in days on Kangaroo Island, and a 'Coastal connections' conference on the South East.

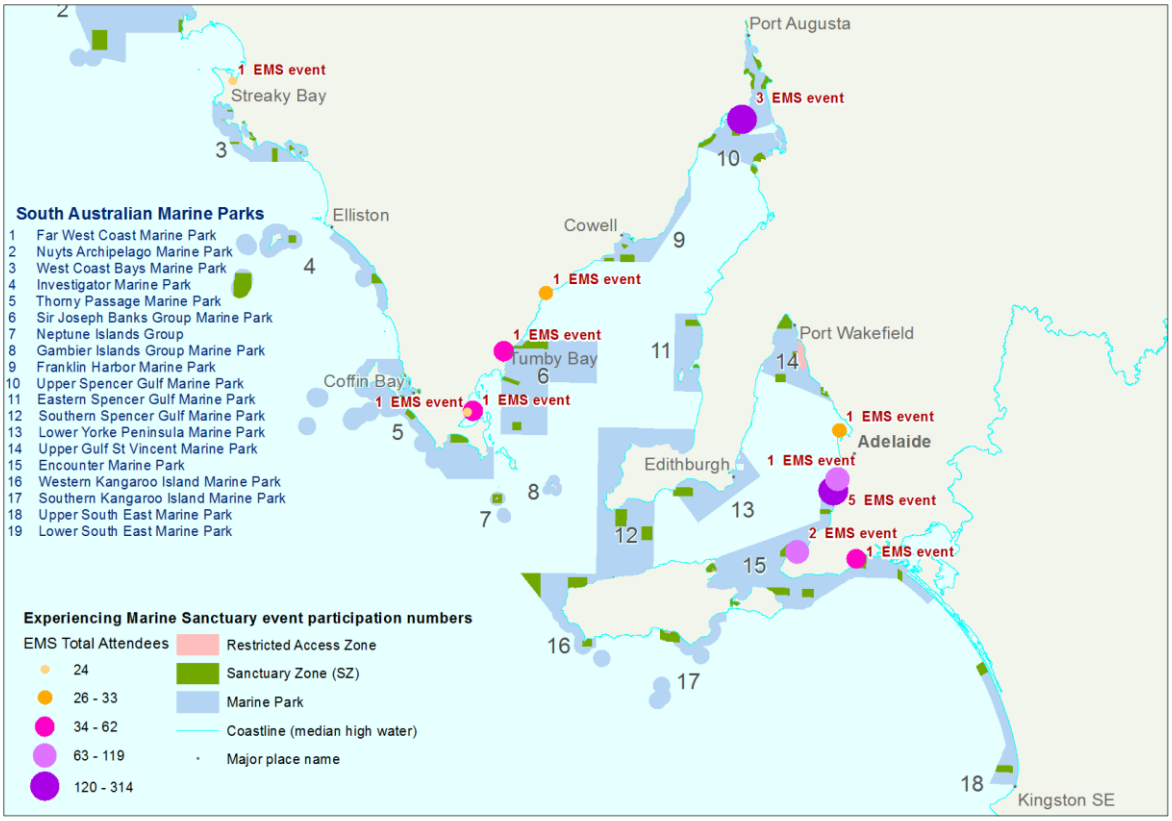


Figure 20. Showing location and number of attendee's at EMS events statewide

Figure 21. Eco Beach day January 2016 (partnering with City of Onkaparinga, Fishcare volunteers, Nature Play SA, EMS, AMLR NRM and Port Noarlunga Surf Lifesaving Club)

Figure 22. Marine Fun Day 1 October 2014

Table 34. Annual summary of stewardship events (including field excursions) and school education events undertaken since 2014/15

Year	Stewardship Events	School education
2014/15	30	25
2015/16	50	14
2016/17	40	24
Grand total	120	63

Table 35. Regional and sub-program summary of Stewardship events (including field excursions) and school education events undertaken since 2014/15

Region/sub-program	Stewardship event	School education
AMLR	45	3
EP (east)	25	45
EP (west)	2	3
KI	12	9
NY	7	
SE	13	2
Stewardship	16	1
Grand total	120	63

Measure 5.1j

Nature and topics of social media posts (e.g. posts on FB, Twitter, Blogs, and YouTube)

Assessment 5.1j

Marine parks online presence is increasing and is recognised as an important tool in assisting the public to appreciate and understand marine parks. Social media is a cost effective form of outreach to a large audience. Marine parks have an online presence through the marine parks website and through various social media platforms, such as Facebook (both regional pages and the National Parks South Australia page), DEWNR Twitter and DEWNRs good living blog. Since 2015 there have been approximately 130 posts related to marine parks on social media such as; the Good Living blog, National Parks and regional Facebook pages, and through DEWNR's Twitter account (Table 36).

Table 36. Social media activity since 2015.

Social media outlet	Total posts
Good Living Blog	22
Facebook	26
Twitter	80

National Parks Facebook page: The National Parks Facebook page has around 40,000 followers. Individual posts specific to marine parks have reached up to 30,000 people and received over 500 likes. Popular posts are about marine animals that use the sanctuary zones like whales and cuttlefish. A post in 2015 on cuttlefish breeding received nearly 100 comments, over 103 shares and over 9000 views (Figure 23). A post during whale season on Southern Right Whales in the Noarlunga Reef Sanctuary Zone, was shared by National Parks Facebook and then on-shared from there 620 times (Figure 24).

Figure 23. Giant Australian cuttlefish in the Upper Spencer Gulf Marine Park had 9200 video views

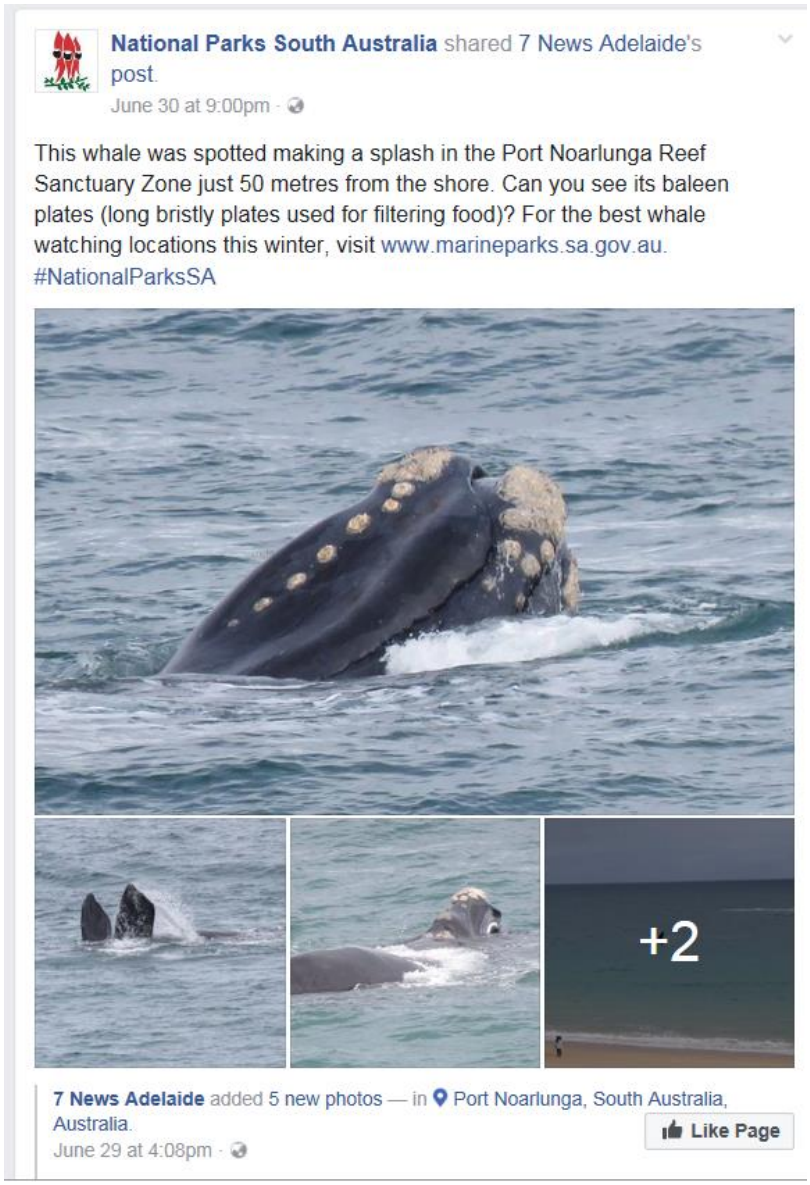


Figure 24. Southern Right Wales in Noarlunga Reef Sanctuary Zone had 69 comments, 620 shares

DEWNR Twitter: DEWNR has its own Twitter account with 625 following and 3200 followers. There have been five and a half thousand tweets from DEWNR's account since 2014, 80 of which were related to marine parks. A typical tweet receives up to 20 likes and around 5 retweets (Figure 25).

Figure 25. DEWNR Twitter banner

DEWNRs Good Living blog: The Good Living blog has existed since 2015 and is growing in readership and reach. The website publishes articles on a range of topics related to enjoying the outdoor environment. On average a marine parks related story is published once a month.

Marine Parks blog stories that have been successful in terms of unique page views include: '7 rock pools to explore in SA' (5361 unique page views), '10 things to look for when beachcombing' (3726, Figure 26), 'Top spots for whale-watching' (2841), and 'How to stay safe near stingrays' (1173).

Figure 26. Example of a Good Living blog article

9.3.2 SEQ 5a – Were the government policy commitments to increase opportunities for recreational fishing in and around SA Marine Parks implemented?

Indicator 5a.1

Recreational fishing grants scheme implemented

Measure 5a.1

Dollar amount budgeted for grants project; how project was implemented; amount allocated to grants; grant details – who, where, what?

Assessment 5a.1

As part of the SA Labour Government's incoming election commitments, to enhance experiences for recreational fishers and encourage more use of marine parks, the government committed to offering grants to support recreational fishing in and around marine parks. In addition, to minimise possible impact on existing users, the government committed to: trialling a new artificial reef (now shellfish reef restoration); and, opening offline reservoirs to recreational fishing (see case study3).

DEWNR 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 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.

AMLR and NY NRM regions received the most government funding (>$440,000) and had the most projects (32 and 30 respectively) supported by the recreational fishing grants schemes (Table 37, Table 38, Figure 27).

Table 37. Government funding approved and co-contributions towards projects approved as part of the recreational fishing grants scheme

	2015		2016		2017		
Region	**Government contribution**	**Co-contribution**	**Government contribution**	**Co-contribution**	**Government contribution**	**Co-contribution**	**Total**
AMLR	$291,300.00	$295,460.00	$119,200.00	$119,736.20	$86,830.00	$102,600.00	$1,015,126.20
EP	$77,200.00	$50,350.00	$190,525.00	$91,500.00	$49,686.00	$2,500.00	$461,761.00
KI	$36,000.00	$24,720.00	$39,634.00	$40,365.00	$4,925.00	$4,925.00	$150,569.00
NY	$139,000.00	$92,014.00	$243,494.00	$87,204.83	$58,115.00	$16,295.00	$636,122.83
SAMDB	$96,150.00	$109,922.00	$60,000.00	$64,000.00	$279,153.45	$176,245.00	$785,470.45
SE	$34,400.00	$28,950.00	$62,826.00	$94,430.20	$23,135.00	$9,800.00	$253,541.20
AW	$0.00	$0.00	$3,500.00	$8,000.00	$0.00	$0.00	$11,500.00
Statewide	$71,670.00	$26,310.00	$10,650.00	$41,020.00	$17,200.00	$10,500.00	$177,350.00
Total	**$745,720.00**	**$627,726.00**	**$729,829.00**	**$546,256.23**	**$519,044**	**$322,865.00**	**$3,491,440.68****

** For the purposes of this table, projects that are over more than one NRM region have had funding equally divided between the regions involved. This is the total less $250,000 provided in contractor, advertising and administrative costs. Actual total = $3.74 million.

Table 38. Regional breakdown of projects approved as part of the recreational fishing grants scheme

NRM REGION	2015	2016	2017	Total
AMLR	17	8	7	32
EP	5	8	1	14
KI	3	2	1	6
NY	12	15	3	30
SAMDB	5	2	11	18
SE	2	4	2	8
AW	0	1	-	1
Statewide	4	1	1	6
Total	48	41*	26 *	115*

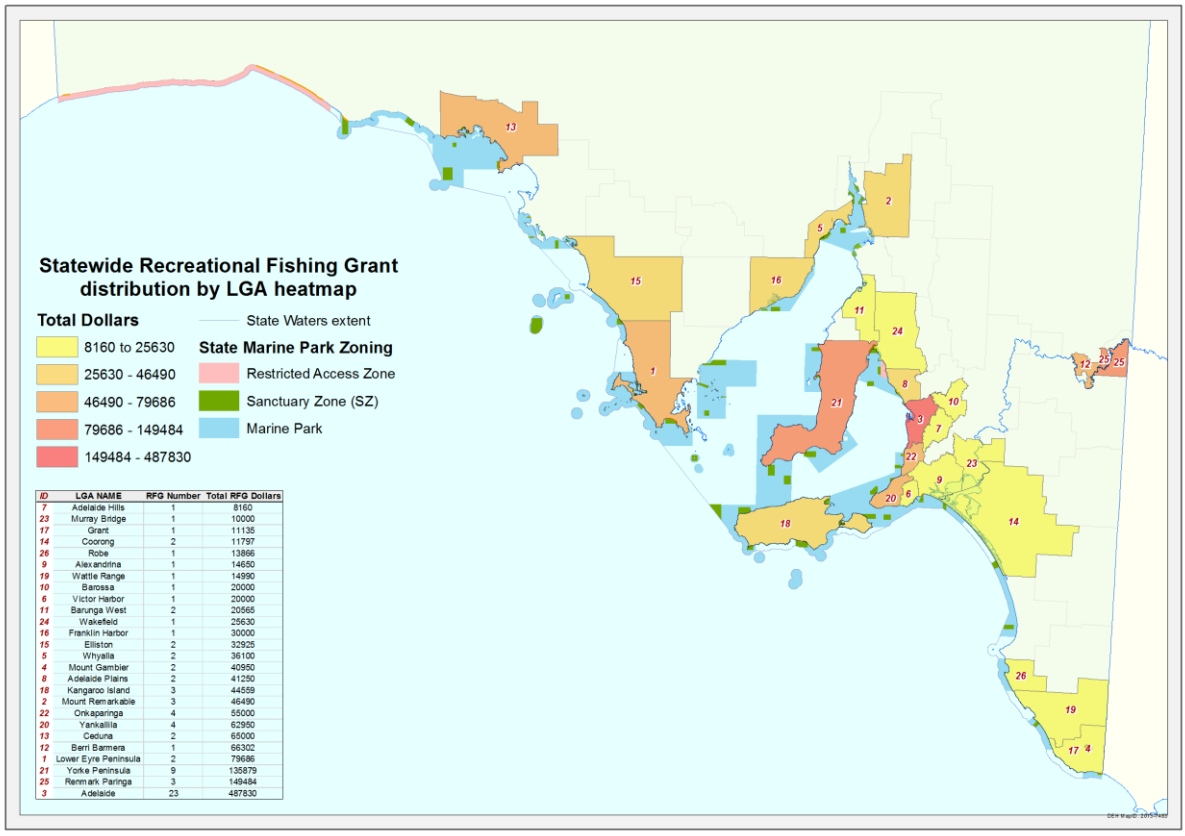
Denotes values that are higher than the actual number of projects funded in table 3, as some projects are over multiple NRM regions and have been counted twice (26 = 22, 41* = 37, 115* = 107).

Projects that improved fishing access and infrastructure as well as fish stocking and fishing programs to increase education received the bulk of grant money. Other funded projects included habitat restoration projects, competitions, events and investment in fishing websites (Table 39).

Table 39. Indicates the type of projects to which recreational fishing grants have been allocated

	2015		2016		2017		Grand total	
	Projects	**Grant**	**Projects**	**Grant**	**Projects**	**Grant**	**Projects**	**Grant**
Fishing education	15	$215,670	7	$84,155	9	$109,275	31	$409,100
Fish stocking	7	$139,900	5	$155,600	2	$142,180	14	$437,680
Habitat improvement	2	$32,750	1	$45,000	-	-	3	$77,750
Access infrastructure	9	$131,100	6	$135,620	4	$65,611	19	$332,331
Improvement infrastructure	11	$170,500	16	$287,604	5	$188,818	32	$646,922
Fishing Competitions	1	$5600	1	$5100	1	$5000	3	$15,700
Miscellaneous	3	$50,200	1	$16,750	1	$8160	5	$75,110
Total	48	$745,720	37	$729,829	22	$519,044	107	$1,994,593

Fishing education Includes funding for interactive displays, signage, educational events, fishing website development, online fishing maps and guides; **Stocking** Includes stocking fish in the Murray River, and freshwater dams proposed for recreational angling; **Habitat improvement** Includes projects to restore or enhance fish habitats; **Access infrastructure** Includes infrastructure to improve access to fishing sites. E.g. boardwalks, levelling rock wall surfaces, improvements to boat ramps, lighting and pontoons; **Improvement infrastructure** Includes large and small infrastructure to improve fishing areas such as fish and boat cleaning stations, shelters, permanent rod holders, safety ladders, seats, Hook line and thinker bins, and toilets; **Fishing competitions** Includes contributions to specific fishing competitions; **Miscellaneous** Includes other events or spending, e.g. disabled fishing programs, fishing camps, maintenance of fishing websites.



ID	LGA NAME	RFG Number	Total RFG Dollars
7	Adelaide Hills	1	8160
23	Murray Bridge	1	10000
17	Grant	1	11135
14	Coorong	2	11797
26	Robe	1	13866
9	Alexandrina	1	14650
19	Wattle Range	1	14990
10	Barossa	1	20000
6	Victor Harbor	1	20000
11	Barunga West	2	20565
24	Wakefield	1	25630
16	Franklin Harbor	1	30000
15	Elliston	2	32925
5	Whyalla	2	36100
4	Mount Gambier	2	40950
8	Adelaide Plains	2	41250
18	Kangaroo Island	3	44559
2	Mount Remarkable	3	46490
22	Onkaparinga	4	55000
20	Yankalilla	4	62950
13	Ceduna	2	65000
12	Berri Barmera	1	66302
1	Lower Eyre Peninsula	2	79686
21	Yorke Peninsula	9	135879
25	Renmark Paringa	3	149484
3	Adelaide	23	487830

Figure 27. Recreational Fishing Grant funding distribution by Local Government Area (LGA)

Indicator 5a.2

Artificial Reef Project implemented

Measure 5a.2

Budget committed and a qualitative account of what has happened to date (where; what; additional funds leveraged)

Assessment 5a.2

The South Australian Government is investing a total of $3.25 million towards boosting recreational fishing and tourism including $600,000 towards restoring native oyster beds in Gulf St Vincent that were prevalent before European settlement (see PIRSA website for more details). 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.

In 2017, Maritime Constructions who are based in Port Adelaide were awarded $550,000 to build a four hectare native shellfish reef, consisting of limestone rubble and 60 custom made concrete reef structures (reef balls, Figure 28). The reef was placed near Rogues Point south of Ardrossan. Construction began in May 2017 and installation began in June 2017. The initial four hectares was completed in July 2017 with oysters to be placed on the reef later in 2017.

Over time, the new reef will attract marine life by providing new habitats for numerous species, and aid with improving water quality, preventing erosion and increasing recreational fishing opportunities

(Figure 29). The 20 hectare reef extension is proposed to be finished by the end of 2018. The reef has been named Windara Reef, for more information refer to the Windara Reef Recreational Fishing Guide.

Figure 28. Examples of artificial reef structures (left) reef ball, (right) limestone rubble

Artificial reef a win for local fishers and visitors

Jenny OLDLAND
JOURNALIST

LAST week's announcement the state's first artificial shellfish reef will be built off Ardrossan is a win for local fishers and visitors.

PIRSA expects the $600,000 project to be completed by the end of the year.

"The impacts from marine parks, with four of the state's 19 parks located within our region, and snapper spatial closures have all had a detrimental impact on recreational fishing and subsequently tourism in our area," YP Council CEO Andrew Cameron said.

"The council and wider community are excited at the opportunities and benefits this project will provide."

During the consultation process, the Ardrossan site was most popular with fishers who provided feedback.

"This is a great result after much lobbying, and I congratulate Andrew Cameron and councillors for their work on achieving this result," Ardrossan Progress Association president John Sandercock said.

"It is a significant step toward sustainable fish stocks in Gulf St Vincent and finally a win for local fishers and visitors."

While the reef will provide significant tourism opportunities, Yorke Peninsula Tourism manager Brooke Liebelt said the announcement has also created positive PR for the region.

"Ardrossan Progress, council, YP Tourism and the Country Times really lobbied for this decision and it's great to see the work and effort put in achieve things," she said.

"While fish will be attracted to the new reef within months it's a long-term project that will provide for future generations.

"We're thrilled to see this development in the region and it's really good timing given the launch of our new YP Fishing Guide.

"YP Tourism has been, and will continue to, work closely with PIRSA and DEWNR to maximise future opportunities."

Local businesses are hoping the reef will encourage fishers to make the peninsula their preferred destination.

"It's a big thing for the region," Stuart Lee, Ardrossan Independent Hardware, said.

"We put a lot of effort into our fishing tackle section to make sure it's still successful but it would be down on past years.

"General foot traffic is down which could be attributed to the fishing changes."

GOOD NEWS... Stuart Lee, Ardrossan Independent Hardware, is hoping the construction of an artificial reef off Ardrossan will boost tourism and local business.

Figure 29. Example of a positive feedback for the proposed oyster reef from July 2016

Indicator 5a.3

Reservoirs opened for recreational fishing

Measure 5a.3

Budget committed and a qualitative account of what has happened to date (e.g. number of reservoirs researched for potential to open; budget expended; number of reservoirs open)

Assessment 5a.3

The third component of the government policy commitments to increase opportunities for recreational fishing involved assessing the potential of five offline reservoirs for use as fishing destinations for South Australia's estimated 277,000 anglers.

Reservoir upgrades

The reservoirs initially proposed to be upgraded to facilitate recreational fishing were the Warren (Williamstown), Tod (Port Lincoln), Bundaleer (Spalding), Hindmarsh Valley (near Victor Harbor) and Baroota (near Port Germein) reservoirs. Of the five dams originally proposed as freshwater recreational fishing sites, two have been withdrawn as options (Baroota and Hindmarsh Valley) and the government has committed to investigate the Beetaloo (between Port Pirie and Laura) and Aroona reservoirs as replacements (near Leigh Creek), with the review being completed by the end of 2017).

The State Government allocated up to $400,000 with a further $210,000 from the Commonwealth Government to improve access and amenities at the proposed fishing reservoir sites. The Warren and Bundaleer reservoirs have 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.

Fish stocking

Funding for stocking the reservoirs was secured through the recreational fishing grants (Measure 5.1a). A total of 209,300 fish at a cost of around $205,100 have been, or are proposed to be, stocked into the opened reservoirs from DEWNR grants. The reservoirs will be stocked with a variety of native fish such as Murray cod, Silver perch, Golden perch and Australian bass. The Bundaleer will also be stocked with Rainbow trout. Co-funding provided to Recfish SA will allow additional fish to be purchased and stocked into these reservoirs. In addition, a further 238,000 Murray cod at a cost of $250,000 are funded to be stocked into the South Australian section of the Murray River. Approximately $450,000 in total is being invested in stocking reservoirs.

Reservoir access

Currently the Warren and Bundaleer reservoirs are the only reservoirs opened for fishing.

Fishing permits purchased for the Warren reservoir have increased since 2013/14 with a 156 per cent increase in sales as a result of the stocking in 2016 funded by the recreational fishing grants (Figure 30). This additional fishing opportunity for South Australia's 277,000 recreational anglers has been well received with fishers willing to travel considerable distances to fish in the dam. Recently interstate anglers have also purchased licenses to fish in the Warren.

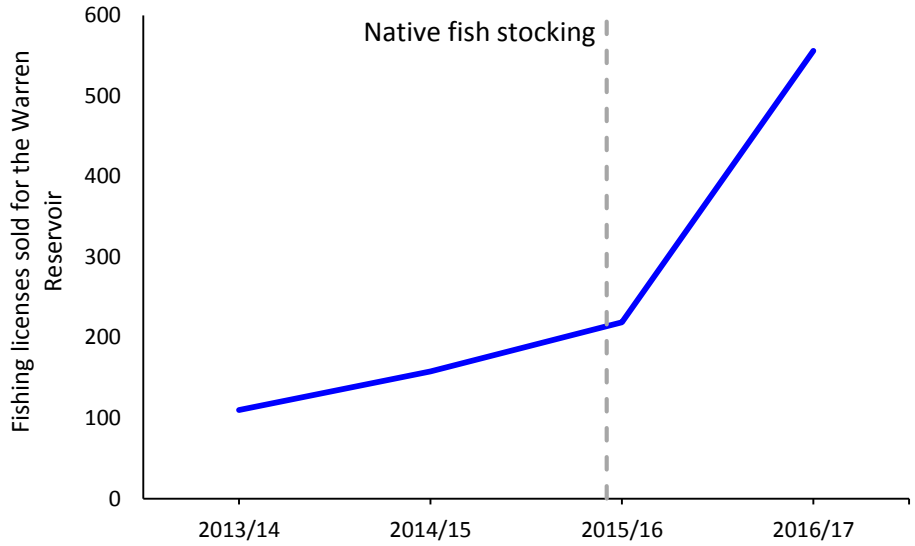


Figure 30. Number of licences sold to fish in the Warren reservoir. Dotted line represents when native fish stocking commenced.

9.3.3 SEQ 6 – Have opportunities for sustainable nature-based tourism in marine parks been created and/or promoted?

Indicator 6.1

Nature-based tourism created and/or promoted by the marine parks program

Measure 6.1

Number and nature of opportunities for sustainable nature based tourism in marine parks created and/or promoted (e.g. information on the Australian Tourism Data Warehouse; collaborative work with Regional Development Australia; collaborative work with South Australian Tourism Commission)

Assessment 6.1

Marine Commercial Tourism Operator Forum was held in August 2016 co-ordinated in collaboration with the South Australian Tourism and Industry Council (SATIC). The Forum has been recognised as a successful engagement activity for DEWNR in advancing the nature-based tourism agenda.

DEWNR Marine Parks Coordinators have been active in the Oceanic Victor experience in Encounter Marine Park, along with promotional images and brochures for use in their newly renovated interpretative centre.

The Australian Tourism Data Warehouse is a digital database and distribution platform, owned and managed by all state government tourism bodies across Australia. The database stores tourism data, products and destination information and has over 40,000 listings across 11 product categories. The marine parks program has included the Port Noarlunga Reef Sanctuary Zone, in the Encounter Marine Park, and shark cage diving in the Neptune Islands Group (Ron and Valerie Taylor) Marine Park in this database.

Measure 6.1a

Nature of nature-based tourism operators promoted on SA Marine Parks website and/or promoting SA Marine Parks website on their pages?

Assessment 6.1a

There is a dedicated Marine Park Tour Operators webpage on the Marine Parks website with links to videos about two of the Marine Park Tour operators (Figure 31):

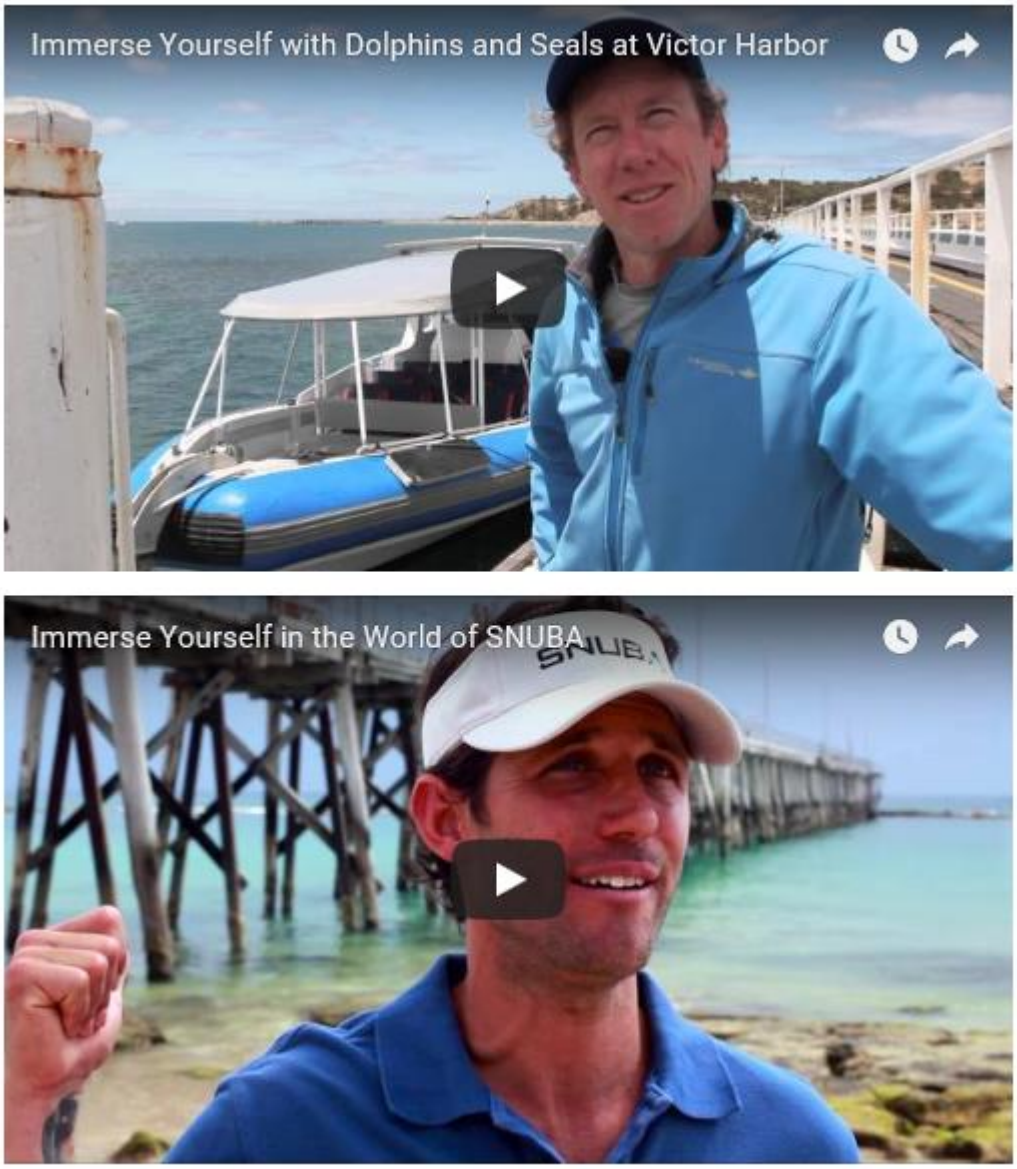


Figure 31. Two videos of marine park tour operators can be viewed from the Marine Parks website http://www.environment.sa.gov.au/marineparks/enjoy/tours

There is also a list and links to all tour operators who are licenced to operate in marine parks (including some in sanctuary zones). Out of the 15 businesses linked to from the Marine Parks webpage only two mention marine parks or sanctuary zones (Calypso Star Charters and Port Noarlunga SNUBA).

Indicator 6.2

Established a permitting system to ensure nature-based tourism activities within sanctuary zones are conducted in a sustainable manner.

Measure 6.2

Qualitative response on how and why permit system was implemented

Assessment 6.2

A permit system was implemented to ensure Nature based tourism activities within sanctuary zones are conducted in a sustainable manner (refer to Assessment 1.3 and Assessment 4.1).

9.3.4 SEQ 7 – Has education about marine parks been provided to support their implementation?

When marine park management plans were authorised on 29 November 2012, community engagement shifted from community participating in decision making for park management planning to awareness raising and participation in activities associated with park implementation.

Notwithstanding the extensive early engagement process, marine parks remained (and still remain) a new concept for many in the community and continue to represent a change in the way they view and use the marine environment.

DEWNR's primary community engagement objective during the roll-out phase of marine park implementation was to ensure that the wider South Australian community understood:

- the park establishment process is complete;
- what they can do in a marine park;
- where the sanctuary zones are; and
- fishing restrictions in sanctuary zones took effect from October 2014.

Indicator 7.1

Marine park educational activities/initiatives undertaken and material developed and promoted

Measure 7.1a

Number and nature of marine park educational products developed. Refer to Assessment 7.1 a b (below).

Measure 7.1b

Number and nature of products developed and activities/initiatives undertaken to assist in implementation and user understanding of zone locations and uses.

Assessment 7.1 a b

On 29 November 2012 a targeted community awareness campaign **Enjoy Life In Our Marine Parks Campaign** was launched to inform South Australians:

- of the finalisation of marine park management plans following years of public engagement
- that marine parks are places to visit and enjoy, and still allow fishing in most areas.

Key features of the campaign included:

- statewide newspaper advertisements
- television, cinema and web commercials
- shopping centre information stands
- printed materials including maps, regional brochures and fishing guides.

Collaboration with RecFish SA was critical to the two-year period from management plan authorisation in March 2013 to full implementation on 1 October 2014. Engagement opportunities included:

- RecFish SA partnered with DEWNR in the June Adelaide Boat Show and provided excellent support in discussions with the public about the final zoning with recreational fishers.
- The full colour publication *Recreational Fishing in SA Marine Parks* was produced by RecFish SA with support from DEWNR. A total of 270,000 copies were distributed across the state as an insert in the Sunday Mail (23 June 2013 edition).
- RecFish SA Executive Officer and Chairman at the time conducted visits to regional and metropolitan fishing tackle and boat retailers across the state, providing a folder of marine park maps, copies of the recreational fishing guide, brochures for the **My Parx** smartphone app and GPS coordinate CD-ROMs.

As part of the process for distributing the GPS coordinates, My Parx smartphone app information and key messages relating to the October 2014 commencement of fishing restrictions in sanctuary zones, full colour advertisements were booked in the following statewide publications: Fishing SA magazine (spring and summer editions); SA Waters and Leisure magazine (summer/autumn edition); and Greg James' Fishing Guide and Almanac for South Australia (2014 edition).

In 2013 a marine parks implementation plan was adopted by DEWNR. The implementation plan signalled DEWNR's intent to develop and deliver a suite of actions and programs to implement the marine park management plans.

In addition, other external engagement activities undertaken include:

- DEWNR presented benefits and opportunities associated with marine parks at a national forum of local government staff and elected members in April 2013 at Victor Harbor
- Guest lectures at universities, including: a coastal management course at the University of Adelaide that resulted in four Masters students focusing on marine parks as their major project
- Field days, boat shows and events that are held statewide were (and are still) used as opportunities to engage face to face and distribute information, including events such as Boat Days; Southern Flinders Outdoor Expo and Lifestyle Show; Paskeville Field Day; SARDI Open Day
- Marine Discovery Centre Henley Beach, fee for service contract for next 12 months renegotiated. MDC provides a marine conservation education service for 7000 children and 15 adults annually
- Distribution of marine park information: regional local government offices and regional visitor centres for provision to local communities and visitors to the region.

The pre full-implementation engagement phase concluded with a 'marine fun day' at the SA Museum with up to 2000 people attending. This was an acknowledgement of marine protection and education with activities ranging from art and craft, science, touch tables and storytelling.

There have been 18 educational products developed which promote the use and unique nature of South Australia's marine parks, including: interpretive signs (7), visitors guides/booklets and webpages and blogs. There are 119 products developed to assist in the implementation and educate community members about where zones are located and the type of activities that can be engaged in within the marine park. These are provided in the form of compliance signs (107), posters, brochures and maps (Table 40).

Table 40. Summary of educational products promoting things to do in marine parks and marine park zone and permitted activities between November 2012 and June 2017

7.1 (a) Educational products	7.1(b) Marine park zones education
EX-HMAS Hobart website content planning	107 compliance signs
"Things to do in Kangaroo Island marine parks" brochure	Handout on Bay of Shoals SZ produced an included as a handout in The Islander
Nature Play Park of the Month - Coffin Bay National Park - 20 Things to Discover included things to do in the Thorny Passage Marine Park adjacent to NP	Port Noarlunga Reef SZ poster
Interpretive panel on marine life installed at FCNP	Encounter Marine Park brochure
Nature Play Park of the Month - Lincoln National Park - 20 Things to Discover included things to do in the Thorny Passage Marine Park adjacent to NP	AMLR SA Marine Parks SZ maps
Installation of whale information & marine mammal regulation signage	SE SA Marine Parks SZ maps
Updated McLaren Vale Visitors Guide with MP content released	KI SA Marine Parks SZ maps
Beachcombing guide booklet	SAMDB SA Marine Parks SZ maps
Fleurieu Visitor Guide EMP content provision	NY SA Marine Parks SZ maps
Snorkelling guide booklet	EP SA Marine Parks SZ maps
Kangaroo Island snorkelers guide	Recreational fishing guide
Encounter Marine Park 40 things to do brochure distributed (produced by Nature Play)	
Three new interpretation panels on marine parks have been installed along Admiral Arch boardwalk	
Junior Ranger - Marine themed postcard - nudibranch and leafy seadragon	
Junior Ranger - Marine themed postcard - cuttlefish	
Point Labatt Car Park Upgrade - Point Labatt SZ sign and Wirangu Dreamtime story sign Wardu (wombat) and Balgurda (seal)	

Indicator 7.2

Marine parks introduced into the school education system.

Measure 7.2

Number and nature of school curriculum activities supported via person and/or funded.

Assessment 7.2

School education is an important component of informing and educating the community about marine parks. As the focus shifts from informing marine users (i.e. fishers) about marine park zoning

for short-term outcomes, more time can be invested in increasing school education for longer-term outcomes. Seventeen schools have been involved with the SA marine parks program (Table 41). Schools are engaged through oral presentations, field trips, class work and workshops. Since 2014/15 to 2016/17 there has been an average of 22 educational events per year and a total of 72 events recorded since 2012/13 (Table 42). Most activities occur in the Eyre Peninsula (East, 54 (73%)). Activities are comprised mostly of events/field trips and presentations (refer to Case study 1: Ocean Eyre). Other engagement in schools include, helping with class work, workshops, providing funding for events or school programs (such as the Marine Discovery Centre at the Star of the Sea School in Henley Beach which engages 7000 students annually (Table 43), and providing work experience opportunities. In Port Lincoln, marine parks education is now part of the Year 10 science curriculum.

Table 41. Schools that have interactions with the marine parks program

Schools that have been involved to date with marine parks program	
Lake Wangary Primary school	Millicent High School
Port Lincoln High School	Kingscote (Kangaroo Island Community Education)
Marine Discovery centre Henley Beach	Cleve Area School
Yalata Community	Kingston Primary School
Cummins Area School	Streaky Bay Area School
Cowell Area School	Stuart High School Whyalla
St Joseph's School Port Lincoln	Navigator College Port Lincoln
Samaritan College Whyalla	

Table 42. Annual breakdown of school education activities and attendance since 2012/13

Year	School education activities	School education attendance
2012/13	2	120
2013/14	7	7327
2014/15	25	13,275
2015/16	14	1628
2016/17	24	855
Total	72	23,205

Table 43. Regional breakdown of school education activities and attendance since 2012/13

Region	School education activities	School education attendance
AMLR	4	14,340**
EP (east)	52	8371
EP (west)	4	220
KI	9	213
SE	2	61
Stewardship	1	0
Total	72	23,205

**Numbers in the AMLR are increased by the Marine Discovery Centre at the Star of the Sea School in Henley Beach which engages 7000 students annually (Table 43)

Table 44. Regional breakdowns of school involvement since 2012/13

Region	Financial support	Class work	EMS/ Event/ Field trip	Presentation	Product	Workshop	Work experience	Total
EP (West)	0	0	3	1	0	0	0	4
EP (East)	3	4	11	26	0	7	3	54
AMLR	2	0	1	1	0	0	0	4
KI	0	2	3	4	0	0	0	9
SE	0	0	2	0	0	0	0	2
Stewardship	0	0	0	0	1	0	0	1
Total	5	6	20	32	1	7	3	74*

Note* Financial support covers two categories, therefore the total is 74 when there are only 72 activities reported (Table 44)

9.3.5 SEQ 8 – Have local communities and stakeholders been involved in the day-to-day management and monitoring of the marine parks?

Indicator 8.1

Local communities and stakeholders involved in day-to-day management and monitoring of marine parks

Measure 8.1

Number and nature of citizen science (monitoring) projects that involve communities.

Assessment 8.1

A summary of all citizen science projects can be seen in Section 5.1c. Monitoring programs (through citizen science) can help with future decisions regarding the management of marine parks. Of the 26 projects, nine are monitoring-focused citizen science projects. These projects have covered a number of species within marine parks with surveys being conducted on rock lobsters, mulloway, cockles and reef systems.

Yalata mulloway tagging citizen science project: The mulloway tagging and marine fisher survey was a citizen science project conducted in the Yalata indigenous protected area and Far West Coast marine park from 2009–13. The project involved surveying recreational fishers to establish catch and effort, catch composition of target and non-target species, release rate, and population structure and movement patterns of mulloway on the west coast. The project also aimed to promote indigenous stewardship and cooperation with the Yalata Anangu people and the Yalata Land management team. The results from the project are documented in a technical report by SARDI and used to provide advice and baseline information relevant to future monitoring and management of mulloway stocks (Figure 32).

Measure 8.2

Number and nature of management or monitoring activities that involve stakeholders

Assessment 8.2

A number of stakeholders have been involved in the everyday management and monitoring of marine parks. For example, the collaboration with SARDI, PIRSA and the rock lobster industry to monitor rock lobsters in the Cape du Couedic sanctuary zone (refer to Case study 8: Rock lobster in Cape du Couedic Sanctuary Zone). Robust monitoring provides valuable information that can help in future management decisions.

Other examples include collaborations to conduct citizen science in marine parks. Local volunteers from Reef Watch were trained by DEWNR staff to conduct underwater diver monitoring as part of the Reef Life Survey. This collaboration provides complementary datasets to DEWNR's monitoring program to improve the ability to assess change and manage marine parks.

Local councils are also involved with day to day management of marine parks. Involvement can include infrastructure planning and development within the marine park such as alterations to the

Noarlunga jetty and the installation of interpretive signs that make up the whale trail within the Adelaide Mount Lofty Ranges Natural Resource management Region.

Measure 8.3

Number of compliance incidents reported via community and or community clubs.

Assessment 8.3

Compliance incidences are regularly reported through PIRSA's community fish watch program. Incidents related to marine parks are then forwarded to DEWNR's compliance teams. A total of 128 incidents have been reported since 2014/15. See section on SEQ 15 for further compliance details.

Figure 32. Front cover of the SARDI report derived from the Yalata Mulloway tagging citizen science project

9.3.6 SEQ 9 – Have we worked cooperatively with Aboriginal communities to conserve country, plants, animals and culture?

Indicator 9.1

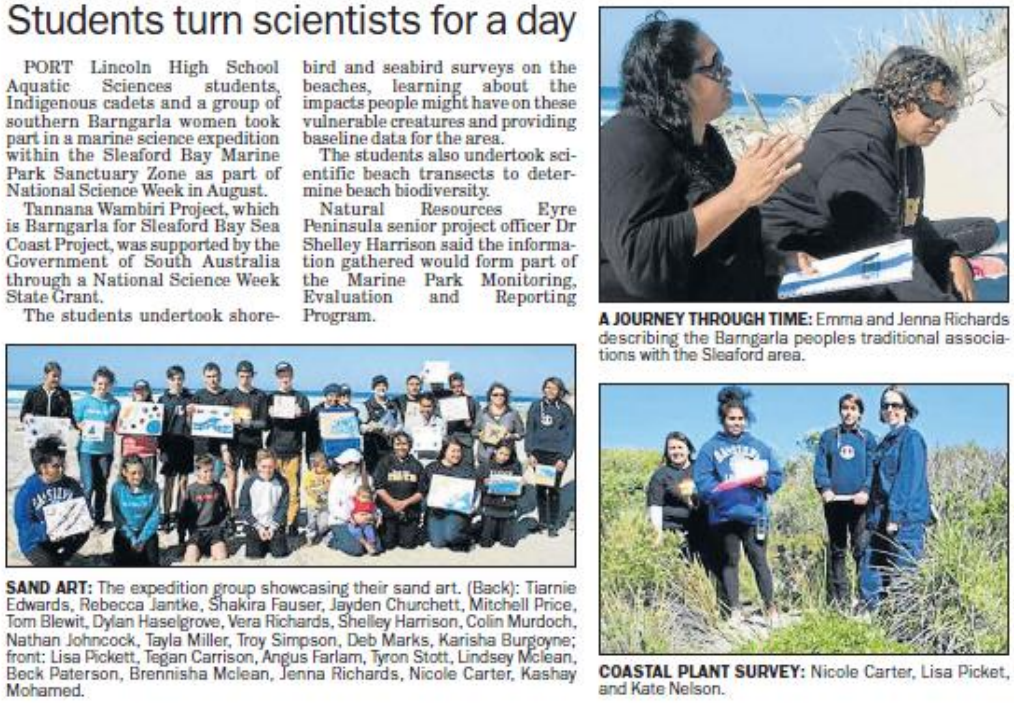
Activities undertaken that work cooperatively with Aboriginal communities to conserve country, plants, animals and culture.

Measure 9.1

Nature of activities that demonstrate working cooperatively with Aboriginal communities to conserve country, plants, animals and culture.

Assessment 9.1

Cultural significance formed part of the marine parks design principles (DEH 2008) and is also reflected in the objects of the Act. DEWNR has engaged with the aboriginal communities of SA in a number of different ways including; engagement at committee meetings, involvement with tours, beach clean-ups, school excursions and citizen science projects (Figure 33). Dreamtime stories have been incorporated into some of the signage in marine parks. Refer to Assessment 14.1 listing activities the marine parks program have worked collaboratively and cooperatively with Aboriginal communities to conserve country; plants animals and culture (refer to Case study 1: Ocean Eyre).



Students turn scientists for a day

PORT Lincoln High School Aquatic Sciences students, Indigenous cadets and a group of southern Barngarla women took part in a marine science expedition within the Sleaford Bay Marine Park Sanctuary Zone as part of National Science Week in August.

Tannana Wambiri Project, which is Barngarla for Sleaford Bay Sea Coast Project, was supported by the Government of South Australia through a National Science Week State Grant.

The students undertook shorebird and seabird surveys on the beaches, learning about the impacts people might have on these vulnerable creatures and providing baseline data for the area.

The students also undertook scientific beach transects to determine beach biodiversity.

Natural Resources Eyre Peninsula senior project officer Dr Shelley Harrison said the information gathered would form part of the Marine Park Monitoring, Evaluation and Reporting Program.

SAND ART: The expedition group showcasing their sand art. (Back): Tiarnie Edwards, Rebecca Jantke, Shakira Fauser, Jayden Churchett, Mitchell Price, Tom Blewit, Dylan Haselgrove, Vera Richards, Shelley Harrison, Colin Murdoch, Nathan Johncock, Tayla Miller, Troy Simpson, Deb Marks, Karisha Burgoyne; front: Lisa Pickett, Tegan Carrison, Angus Farlam, Tyron Stott, Lindsey Mclean, Beck Paterson, Brennisha Mclean, Jenna Richards, Nicole Carter, Kashay Mohamed.

A JOURNEY THROUGH TIME: Emma and Jenna Richards describing the Barngarla peoples traditional associations with the Sleaford area.

COASTAL PLANT SURVEY: Nicole Carter, Lisa Picket, and Kate Nelson.

Figure 33. News article from September 2014 on Port Lincoln High School Aquatic Science Students learning about local aboriginal culture from the Barngarla women

9.4 Performance sub-program activities: Strategies 10 to 14

This section presents information for the specific evaluation questions for the Performance sub-program. It is not a comprehensive cover, but is representative of a significant amount of the programs achievements over the past 5 years. There is also overlap between some activities that address more than one specific evaluation question and they may therefore appear in other sections of the Status Report.

9.4.1 SEQ 10 – Has a monitoring, evaluation and reporting (MER) program been developed and implemented that includes the required specifications as outlined in Strategy 10 of the management plans?

Indicator 10.1

A monitoring, evaluation and reporting (MER) program has been developed and implemented that includes the required specifications as outlined in Strategy 10 of the management plans.

Measure 10.1a

A MER Plan that includes the required specifications is written

Assessment 10.1a

The South Australian Marine Parks Monitoring, Evaluation and Reporting (MER) Plan was released in June 2017 (Bryars et al. 2017a). The MER Plan outlines the key information needs to enable the statutory 10-year review of the 19 management plans, and the 'why, what, where, and when' of information to be collected, evaluated and reported.

The scope of the MER Plan is guided by a number of factors including the regulatory and legislative framework, logistics, available resourcing, community expectations, other monitoring programs already underway, predictions of change due to the marine park management plans, and risk assessment/prioritisation of undertaking selected activities.

The MER Plan focuses on the relationship between the seven components of: (1) marine park management plans, (2) ecological values, (3) socio-economic values, (4) physical drivers, (5) socio-economic drivers, (6) pressures, and (7) assumptions. A 'multiple-lines-of-evidence' approach using information from the seven components will enable an evaluation of the effectiveness of the 19 marine park management plans in achieving the objects of the *Marine Parks Act 2007*, and in particular whether the marine parks have been effective in protecting and conserving marine biodiversity and habitats.

Strategy 12 in the management plans states that outcomes of the MER Program and research outcomes must be made publicly available and inform decision making and periodic review of the management plans. Thus, a number of publicly-available reporting products will be produced by DEWNR prior to the 10-year review (e.g. this mid-term 5-year Status Report and for further info see Evaluation and Reporting).

Measure 10.1b

Amount and nature of monitoring, evaluation and reporting that is being undertaken (e.g. number of sites being monitored using BRUVS, number of monitoring trips undertaken, reports produced).

Assessment 10.1b

Ecological monitoring program

An ecological monitoring program has been established to collect rigorous and robust information required to assess the effectiveness of the management plans in delivering the Objects of the Marine Parks Acts 2007 and to inform the ongoing adaptive management of the marine parks.

In accordance with the objects of the *Marine Parks Act 2007*, marine parks provide for biodiversity conservation, public appreciation, and allow for ecologically sustainable development and use of marine resources. The primary objective of the marine parks program is to achieve the object (hereafter referred to as 'Object 1'): "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). The collection of ecological data and its synthesis is pivotal to assessing whether this objective has been achieved.

The main elements and goals of the ecological monitoring program are documented in the South Australian Marine Parks Monitoring, Evaluation and Reporting Plan (MER Plan, Bryars et al. 2017a).

A number of specific evaluation questions (SEQs) as outlined in the introduction to the Report have been identified to guide the collection of ecological data to assess change in ecological values (Table 45).

Table 45. Specific Evaluation Questions being used to assess for change in ecological values

16. What biodiversity is included within the marine parks network?
17. Have sanctuary zones maintained or enhanced biodiversity of reef, seagrass and sand communities?
18. Have habitat protection zones maintained biodiversity of reef, seagrass and sand communities?
19. Have sanctuary zones maintained or enhanced ecological processes in reef, seagrass and sand ecosystems?
20. Have sanctuary zones enhanced resilience in reef, seagrass and sand ecosystems?

As outlined in the MER plan it is not feasible to conduct ecological monitoring in all parks and zones across the entire state. Consequently, given current resourcing and predicted changes as outlined in the Marine Parks Baseline Reports (Bryars et al. 2017b) the ecological monitoring will primarily target priority sanctuary zones (SZs) and Habitat Protection Zones (HPZ's) and General Managed Use Zones (GMUZ's) to a lesser extent and the three habitat types of reef, seagrass and sand. A range of criteria (ecological, social and predicted change) was used to identify priority SZs for monitoring and mapping (Bryars et al. 2017a).

Priority SZ identified for monitoring

The priority SZs that were identified in the MER Plan for monitoring are shown in Table 46.

Table 46. Priority sanctuary zones identified for ecological monitoring

Marine Park	Sanctuary Zone	Marine Park	Sanctuary Zone
Nuyts Archipelago	Isles of St Francis	Southern Spencer Gulf	Chinamans Hat
Nuyts Archipelago	Nuyts Reef	Upper Gulf St Vincent	Clinton Wetlands
Investigator	Pearson Isles	Encounter	Aldinga Reef
Investigator	Top-Gallant Isles	Encounter	Bay of Shoals
Thorny Passage	Kellidie Bay	Encounter	Encounter Bay
Thorny Passage	Eely Point	Encounter	Rapid Head
Neptune Islands Group	North Neptune Islands	Encounter	Sponge Gardens
Sir Joseph Banks Group	Dangerous Reef	Encounter	The Pages
Sir Joseph Banks Group	Point Bolingbroke	Encounter	Carrickalinga Cliffs
Sir Joseph Banks Group	Salt Creek	Western Kangaroo Is.	Cape Borda
Upper Spencer Gulf	Cuttlefish Coast	Western Kangaroo Is.	Cape du Couedic
Eastern Spencer Gulf	Cape Elizabeth	Southern Kangaroo Is.	Seal Bay
		Upper South East	Cape Dombey

Once operational plans were prepared some amendments were made to the list of priority SZ based on feasibility and resourcing; Table 47 summarises these amendments. Six sanctuary zones are not currently being monitored because they either lack suitable habitat, control sites or are logistically too resource intensive to access. However, these sanctuary zones can still be monitored via community and/or through research. A good example of this is Neptune Islands Group (refer to Case study 10, White Sharks in the Neptune Islands Sanctuary Zone). Three sanctuary zones were included for monitoring to ensure adequate representation of soft sediment habitats in the ecological monitoring program (Table 47).

Table 47. Amendments to priority sanctuary zones identified for ecological monitoring

Marine Park	Sanctuary Zone	Status
Nuyts Archipelago	Nuyts Reefs	not currently being monitored
Neptune Islands Group	North Neptune Islands	not currently being monitored
Sir Joseph Banks Group	Dangerous Reef	not currently being monitored
Sir Joseph Banks Group	Point Bolingbroke	not currently being monitored
Encounter	Encounter Bay	not currently being monitored
Southern Kangaroo Island	Seal Bay	not currently being monitored
Franklin Harbour	Port Gibbon	Included for monitoring
Upper Spencer Gulf	Fairway Bank	Included for monitoring
Upper South East	Lacepede Bay	Included for monitoring

Ecological monitoring methods

A range of methods are used to collect ecological data. The core ecological monitoring program uses underwater visual census (UVC) monitoring conducted by divers to collect ecological data (Figure 34) and baited remote underwater video systems (BRUVS, Figure 35). BRUVS and UVC are undertaken singly or together in a standardized manner in all priority sanctuary zones where feasible.

Figure 34. DEWNR Marine Parks diver conducting underwater visual census monitoring of reef communities

Figure 35. DEWNR Marine Parks staff conducting BRUVS monitoring

In cases where habitats, target species or local pressures are not adequately captured using the core monitoring methods, additional 'complementary' methods are utilised. Complementary monitoring projects include the use of baited pots for measuring lobster abundance (see Rock Lobster Case Study 8) and direct counts of cockles by citizen scientists. For more information on the approach and methods used in the ecological monitoring program see the Marine Parks MER Plan (Bryars et al. 2017a).

Habitat mapping is a key component of the ecological monitoring program. Currently a large portion of the sea floor (~60%) inside marine parks remains unmapped. The mapping program currently targets these unmapped areas to improve the knowledge and understanding on what is included in the marine parks network. Mapping is undertaken using a range of techniques that include interpretation of aerial photography, underwater video drops and swathe sonar mapping (for more information see Marine Parks MER plan 2017).

Core ecological monitoring activity – BRUVS and UVC

Since 2012, UVC monitoring have been undertaken in 11 SZs across 7 marine parks while BRUVS monitoring commenced in 2014 and have been undertaken in 18 SZs across 10 marine parks (Table 48).

Table 48. Sanctuary zones where baited remote underwater video systems (BRUVS) and underwater visual census (UVC) monitoring have been undertaken by year

Sanctuary Zone	12/13		13/14		14/15		15/16		16/17	
	BRUVS	UVC	BRUVS	UVC	BRUVS	UVC	BRUVS	UVC	BRUVS	UVC
Bay of Shoals										
Rapid Head										
Sponge Gardens										
The Pages										
Aldinga Reef										
Carrickalinga Cliffs										
Chinamans Hat										
Offshore Ardrossan										
Clinton Wetlands										
Cuttlefish Coast										
Fairway Bank										
Cape Elizabeth										
Port Gibbon										
Lacepede Bay										
Cape Dombey										
Kellidie Bay										
Eely Point										
Pearson Isles										
Cape Du Couedic										
Isles of St Francis										

In terms of effort there have been a total of 120 UVC and 496 BRUVS surveys conducted since 2012 (Figure 36).

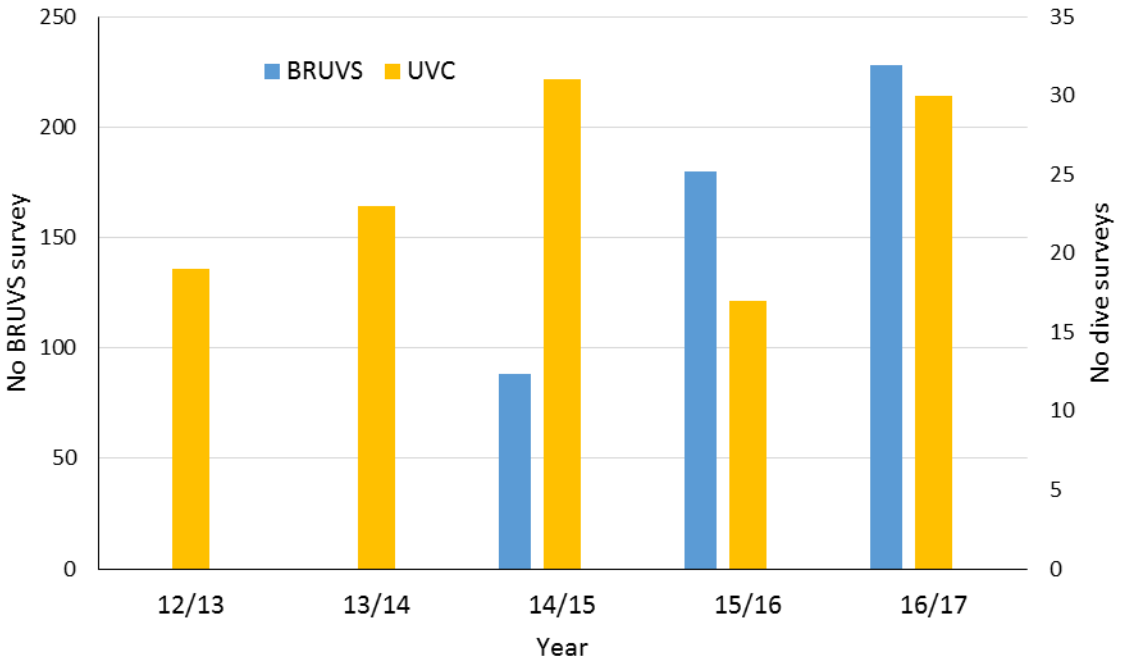


Figure 36. Amount of underwater visual census (UVC) and baited remote underwater video systems (BRUVS) monitoring effort since 2012/13

As it is not possible to monitor all priority SZs in a single calendar year, a rolling program of BRUVS and UVC monitoring was implemented to ensure that priority SZs in each Marine Bioregion are revisited every four years. The proposed monitoring program since marine park implementation in 2014/15 and degree of completion is shown in (Table 49).

The ecological monitoring program has successfully completed nearly all planned BRUVS and UVC ecological monitoring work to date with 26 out of 28 planned monitoring activities completed. Two sanctuary zones, Cape Dombey in the Otway Bioregion and Lacepede Bay in the Coorong Bioregion were not monitored as planned in 16/17.

In addition, as part of the UVC monitoring, over 6000 photo quadrats of all UVC monitoring sites has been collected and will be processed in the upcoming years.

Monitoring in Habitat Protection Zones

Although the priority in the first 5 years has been on the SZ's, work has also been undertaken using UVC and BRUVS in HPZ's and GMUZ's as 'control' or comparison sites for the SZ's (see Table 50, Table 51). It is anticipated that additional work will be undertaken on the effectiveness of HPZs in protecting habitats over the next 5 years (see Section 4.2.1.5 in the MER Plan, Bryars et al. 2017).

Table 49. Level of completion of planned core monitoring activities (UVC and BRUVS) since parks became fully operational in 2014/15

Marine Park	Sanctuary Zone	Bioregion	12/13	13/14	14/15	15/16	16/17
Encounter	Bay of Shoals	GSV				X	X
Encounter	Rapid Head	GSV	X	X	X	X	X
Encounter	Sponge Gardens	GSV			X	X	X
Encounter	The Pages	GSV				X	X
Encounter	Aldinga Reef	GSV				X	
Encounter	Carrickalinga Cliffs	GSV	X	X	X	X	X
Southern Spencer Gulf	Chinamans Hat	GSV	X			X	
Upper Gulf St Vincent	Clinton Wetlands	GSV			X	X	X
Upper Spencer Gulf	Cuttlefish Coast	Nth Spencer Gulf					X
Upper Spencer Gulf	Fairway Bank	Nth Spencer Gulf					X
Eastern Spencer Gulf	Cape Elizabeth	Spencer Gulf	X				X
Franklin Harbour	Port Gibbon	Spencer Gulf					X
Upper South East	Cape Dombey	Otway		X			X
Lower South East	Piccanninie Ponds	Otway					X
Upper South East	Lacepede Bay	Coorong		X			X
Investigator	Pearson Isles	Eyre		X	X		
Investigator	Top-Gallant Isles	Eyre			X		
Western Kangaroo Island	Cape Du Couedic	Eyre			X		
Nuyts Archipelago	Isles of St Francis	Murat			X		

X	Completed
X	Not completed

Table 50. SA marine parks zones underwater visual census sites

Zone	Number of sites	Number of zones
GMUZ	6	3
HPZ	42	10
SZ	41	11

Table 51. SA marine parks baited underwater remote video monitoring sites

Zone	Number of sites	Number of zones
GMUZ	6	2
HPZ	31	7
SZ	41	18

Mapping

Mapping of the seafloor is an important component of the ecological monitoring program as it underpins the location of monitoring sites and provides information to answer the SEQs.

The scale of the task and resource limitations have necessitated a pragmatic, staged approach with a primary focus on sanctuary zones and prioritizing the rapid assessment of unmapped areas. In the medium to long term, the program aims to collate existing data (aerial imagery etc) that could be used to help address the needs of the MER Program and to target priority areas identified in Table 46 for high resolution full cover mapping.

Inventory mapping (rapid assessment method; see Miller et al. 2017 in review) has been used in the first five years of the program to identify the nature and extent of habitats present in previously unmapped sections or entire SZs or sections of SZs where previous mapping was deemed to be unreliable. Since 2012, inventory mapping has been completed for 18 SZs and partially completed for another two (Table 52).

This inventory mapping program has been successful in the first 5 years as there is now some level of mapping available for all priority SZs that are included within the UVC and BRUVS programs. Combined with mapping undertaken prior to 2012, 80 SZ have some level of mapping completed (i.e. basic mapping that provides an estimate of the habitats present and their approximate proportions). Nonetheless, much work remains to gain a better understanding of habitats in many of the SZs and to address the SEQ of 'What biodiversity and habitats are included within the marine parks network?' Three of the offshore SZs still have no mapping at all: Point Labatt, Anxious Bay, and Kangaroo Island Upwelling. The intent of the mapping program should be to fill these knowledge gaps when and where possible, e.g. a planned research expedition to Pearson Island in 2018 will include some inventory mapping of the Pearson Isles SZ for which only a limited amount of mapping has been done.

Table 52. Sanctuary zones where inventory mapping has been completed or partially completed since 2012 (processing for Offshore Franklin Harbor and Port Gibbon Sanctuary Zones is still being completed)

Marine Park	Sanctuary Zone	Monitoring Year	Extent of mapping
Nuyts Archipelago	Isles of St Francis	2015	completed
Nuyts Archipelago	Lound Island	2015	completed
Franklin Harbor	Offshore Franklin Harbor	2017	Approx. 70%
Franklin Harbor	Port Gibbon	2017	Approx. 50%
Southern Spencer Gulf	Chinamans Hat	2015	completed
Southern Spencer Gulf	Orcades Bank	2015	completed
Lower Yorke Peninsula	Port Davenport	2016	completed
Upper Gulf St Vincent	Clinton	2013	completed
Upper Gulf St Vincent	Middle Spit	2013	completed
Upper Gulf St Vincent	Offshore Ardrossan	2013	completed
Eastern Spencer Gulf	Cape Elizabeth	2017	completed
Encounter	Aldinga Reef	2013	completed
Encounter	Pt Noarlunga Reef	2013	completed
Encounter	Carrickalinga Cliffs	2013	completed
Encounter	Rapid Head	2013	completed
Encounter	Encounter	2013	completed
Encounter	The Pages	2014	completed
Encounter	Bay of Shoals	2012	completed
Encounter	Sponge Gardens	2014	completed
Western Kangaroo Island	Cape du Couedic	2015	completed

An example of an inventory mapping output is shown in Figure 37. All other inventory maps that have been completed to date can be found in Section 10 Ecological monitoring and ongoing trends.

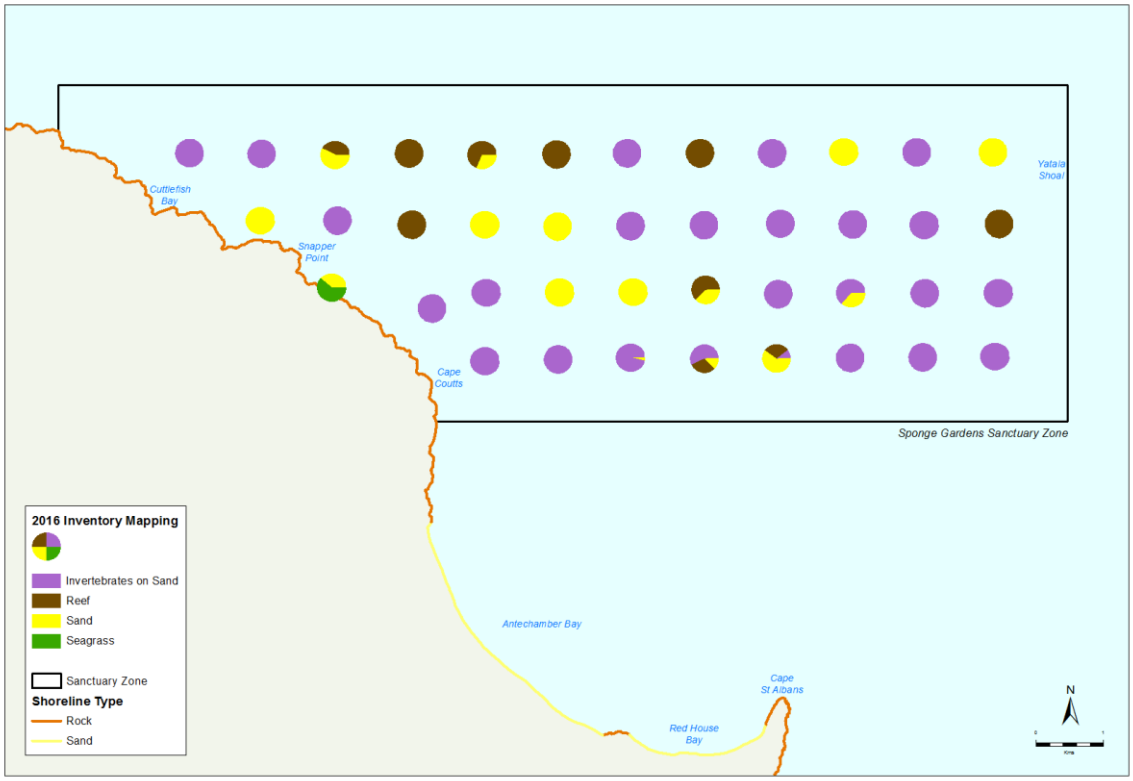


Figure 37. Inventory map of Sponge Gardens SZ

High-resolution full-cover swath mapping has been conducted in a small number of priority sanctuary zones. These zones were partially surveyed (based on available time and resources during monitoring) to produce full cover digital elevation models (DEM) and acoustic backscatter (texture mapping) of the area surveyed (Table 53). Resultant maps and data provide detailed baseline information used for education, assistance in locating monitoring sites and in analysis of monitoring data (refer to Section 10 for example image of SWATH mapping).

Table 53. Sanctuary zones where swath mapping has been conducted since 2012

Marine Park	Sanctuary Zone	Monitoring year	Approx. zone coverage	Focus of monitoring
Nuyts Archipelago	Isles of St Francis	2015	<5%	Petrel Bay
Encounter	Aldinga Reef	2009	5%	Drop-off area
Encounter	Carrickalinga Cliffs	2013	5%	Nearshore reef
Encounter	Rapid Head	2013	<5%	Nearshore reef
Encounter	Sponge Gardens	2012	<10%	Nearshore reef & western end of trench
Western KI	Cape du Couedic	2015	40%	Western half of SZ
Upper South East	Lacepede Bay	2014	5%	Monitoring sites

Summary of ecological monitoring activity

Since 2012/13 monitoring and mapping activities have been undertaken in seven marine bioregions, with the exception of Eucla. UVC/BRUVS monitoring has been conducted in:

- 20 sanctuary zones
- 12 Habitat Protection Zones
- 11 marine parks
- 7 Marine Bioregions

And mapping has been undertaken in:

- 20 sanctuary zones
- 9 marine parks
- 5 Marine Bioregions (Figure 38)

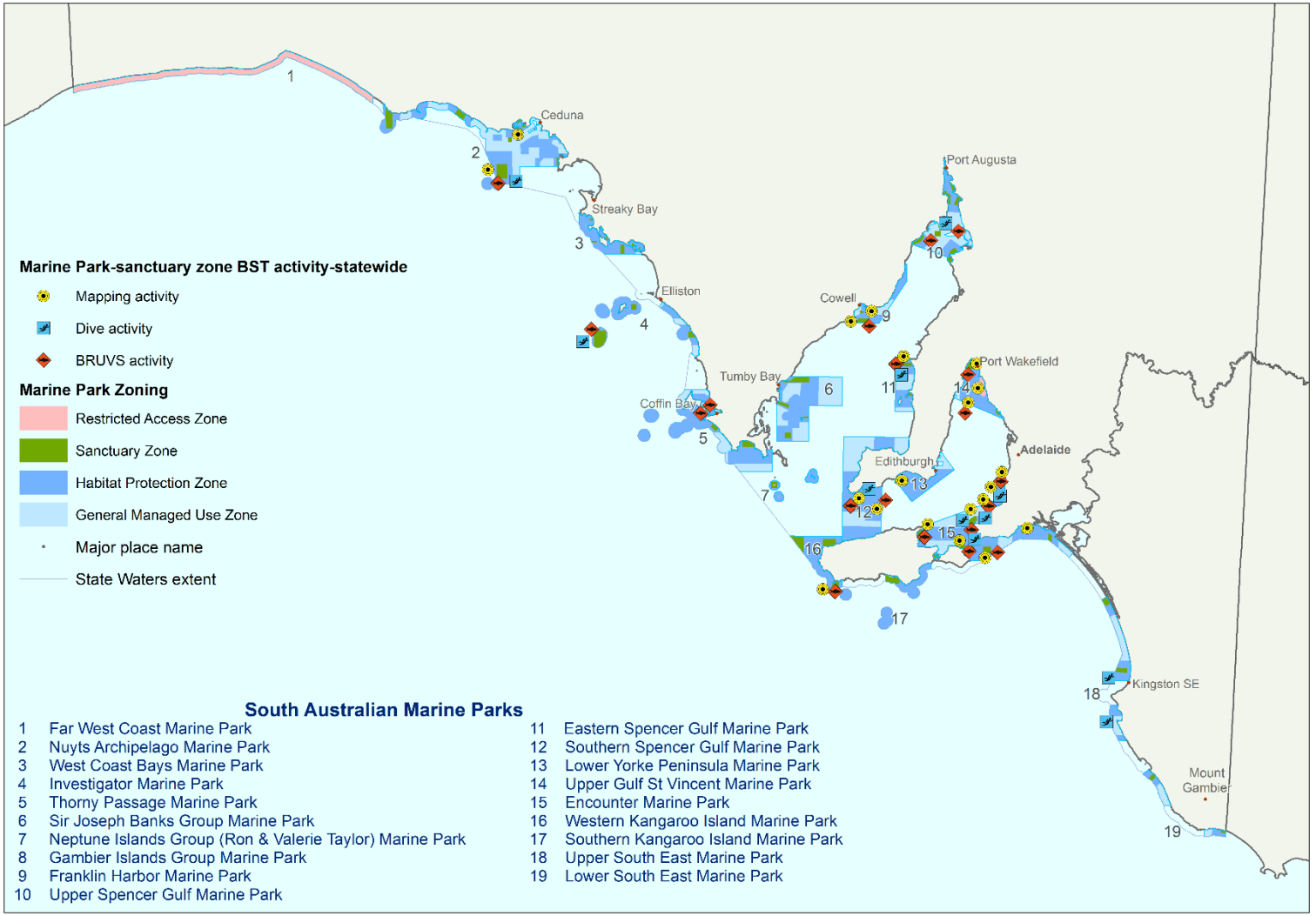


Figure 38. Biological survey activity statewide from 2012 to 2017

Socio-economic monitoring program

A socio-economic monitoring program has been established to collect rigorous and robust information required to assess the effectiveness of the management plans in delivering the Objects of the Marine Parks Acts 2007 and to inform the ongoing adaptive management of the marine parks. In accordance with the objects of the *Marine Parks Act 2007*, marine parks provide for biodiversity conservation, public appreciation, and allow for ecologically sustainable development and use of marine resources. The collection of socio-economic data and its synthesis is pivotal to assessing whether these objectives have been achieved.

The main elements and goals of the socio-economic monitoring program are documented in the South Australian Marine Parks Monitoring, Evaluation and Reporting Plan (MER Plan, Bryars et al. 2017a). A number of specific evaluation questions (SEQs) as outlined in the introduction to the status report have been identified to guide the collection of socio-economic data to assess change in socio-economic values.

Methods

The marine park baseline reports (Bryars et al. 2016a-s, 2017b), MER workshop report (Goyder Institute for Water Research 2016) and MER Plan (Bryars et al. 2017a) identified the indicators that will be used to monitor changes in socio-economic values. Socio-economic values are summarised according to eight broad categories: local businesses and communities, coastal recreation, tourism, cultural heritage, transport and infrastructure, aquaculture, recreational fishing, and commercial fishing. These values have been monitored across the marine parks network, and final evaluation of these data in conjunction with other information will determine whether any changes were caused by the marine parks.

The majority of data has been collated from sources external to the Department of Environment, Water and Natural Resources (DEWNR) such as the Australian Bureau of Statistics and South Australian government agencies, and augmented by data collected by DEWNR.

The frequency of socio-economic data collection varies for the different indicators, depending on how often the external agencies report or release information (typically annually or quarterly). Some annual data are presented in publically available reports and databases on either calendar years (January to December) or financial years (July to June) and thus vary between the different indicators used in the MER Program.

Information on socio-economic indicators is available at a wide range of spatial scales. In many cases information is available only at a spatial scale that is larger than, or doesn't align well with, the marine park, but is nonetheless monitored as it may be relevant to marine parks and regional changes. In addition, for many of the socio-economic indicators it may be hard to attribute any observed change as a direct cause of marine parks as there are often other external factors and drivers involved in causing socio-economic change.

In addition to external datasets, DEWNR collects a range of socio-economic information on marine parks. Since 2006, DEWNR has conducted regular phone surveys through an external market research agency (McGregor tan Pty Ltd. (2006-08) and Square Holes (2009-2017)) to gauge the public's understanding, support for and perceptions of marine parks (Table 54).

Over the years some questions have changed or been added depending on the stage of marine park development, or the information needs of a particular year. Since 2012, four surveys have been conducted with a total of 2129 respondents (Table 54). The latest survey was conducted in October 2017.

Table 54. Years in which marine park phone surveys were conducted and total number of respondents

Year of survey	Number of respondents
2006	918
2007	800
2008	900
2009	1600
2010	800
2011	807
2012	801
2013	414
2014	NA
2015	909
2016	406
2017	400
Total	7955

Retail prices of six popular species of locally-caught fish have been recorded at three major fish processor outlets in the Adelaide Central Market since June 2014. Prices have been recorded approximately weekly, generally on a Friday or before major dates (e.g. Christmas) when product is readily available. Both whole and fillet prices (when available) were recorded for King George whiting (KGW), Snapper, Garfish, Yellowfin whiting (YFW), Snook, and Calamary (whole price only). Data were not collected during the autumn of 2016. Every attempt was made to record locally-sourced product which is usually labelled accordingly (e.g. Figure 39) but it is possible that product from interstate was sometimes recorded. Product from overseas (notably snapper from New Zealand) was excluded from the study. Data were adjusted for the effect of the Consumer Price Index as per recommendation from the South Australian Centre for Economic Studies. Six data sets were analysed because they had good data coverage across the time series and across the three stores; KGW fillet, Garfish fillet, YFW fillet, Snapper whole, Snook whole and Calamary whole.

Figure 39. Example of fish price collection for locally-caught snapper

DEWNR has also collected information on a range of activities including numbers of shark cage diving visitors to the Neptune Islands, number and nature of tour operators that use marine parks, and also harvested data from a range of publically-available sources on population, employment, housing, recreation and tourism, shipping, aquaculture, and recreational and commercial fisheries (for further details see Section 11 on socio-economic monitoring).

Summary of socio-economic monitoring activity

Since 2012, DEWNR has collected a range of socio-economic monitoring information including:

- Four annual phone surveys with responses from over 2000 South Australian's to gauge their understanding, support for and perceptions of marine parks
- 133 visits to the Adelaide Central Markets to collect fish price data between June 2014 and August 2017
- Inventories of coastal and marine tourism operators across South Australia in 2014 and 2017
- Annual counts of visitor numbers to the Neptune Islands for white shark cage diving
- Harvesting of data from a range of publically-available sources on population, employment, housing, recreation and tourism, shipping, aquaculture, and recreational and commercial fisheries.

9.4.2 SEQ 11 – Have partnerships to support the implementation of the MER Program incorporating opportunities for community and stakeholder involvement been fostered (or established)?

Indicator 11.1

Partnerships to support the implementation of the MER Plan established

Measure 11.1

Nature of partnerships established (includes name of partner; type of stakeholder sector, name of project; funding and/or in kind resources contributed)

Assessment 11.1

The MER Program encourages partnerships and collaborations that enable the Program to expand and evolve thereby providing a more comprehensive evaluation of the SA marine parks network. Existing partners include state and federal Government agencies, research institutions, along with citizen-science and community programs and organisations. Partnerships assist with conducting marine parks monitoring activities, interpreting monitoring results, and disseminating monitoring information. Current partnerships are listed in Table 55 below.

Table 55. MER Program partnerships and collaborations

Project name	Partner(s)	Project details	DEWNR contribution – cash or (in-kind, cash)
Reef Life Survey Monitoring citizen science monitoring	Reef Life Survey Foundation	Reef Life Monitoring (RLS) is an international citizen science program that trains volunteer divers to assess rocky reef communities to a scientifically rigorous standard (http://reeflifemonitoring.com/). This program has been particularly successful and resulted in several peer reviewed publications and awards in the last decade (Edgar et al. 2014, Soler et al. 2015, Stuart-Smith et al. 2015). DEWNR's marine parks program has partnered with RLS to establish a pool of locally-trained volunteer divers who can assist in monitoring reefs and eventually help expand the spatial and temporal coverage of the marine park subtidal reef monitoring program.	Cash; in-kind logistical and technical support
University of Tasmania (UTAS) and	UTAS and Reef Life Survey Foundation	Marine Parks Performance partners with UTAS and the Reef Life Survey Foundation to provide information that contributes to their international	Cash; in-kind logistical and technical support

Project name	Partner(s)	Project details	DEWNR contribution – cash or (in-kind, cash)
Reef Life Survey Monitoring		program while in return receiving regional scale analyses that contributes to understanding the drivers that affect reef ecosystems in our Marine Parks Network.	
Rock Lobster Pot Sampling	SARDI/PIRSA And Northern Zone Rock Lobster Industry	PIRSA, SARDI and the Rock Lobster Industry undertook a rock lobster pot-sampling program in the Cape du Couedic sanctuary zone during the summer of 2016/17. The report (Rock Lobster Report) was finalised and released on 24 October 2017 (McLeay et al. 2017). This study has demonstrated that sanctuary zones can be effective in enhancing biodiversity even in relatively short time frames. See Case study 8: Rock Lobsters in Cape du Couedic Sanctuary Zone.	Cash; in-kind technical support
Oyster Reef Restoration	The University of Adelaide	The marine parks performance program is involved in a collaboration with The Nature Conservancy, The University of Adelaide and PIRSA to undertake ecological monitoring of the oyster reef restoration site.	In-kind logistical and technical support
Collaborative management of State and Commonwealth marine parks	Department of the Environment and Energy Australian Government	Marine parks program partners with the Department of the Environment and Energy, marine parks to deliver collaborative management of State and Commonwealth marine parks. Projects such as Australian sea lion and Southern right whale monitoring in the Far West Marine Park; research (see case study 2) papers; and in 2018 a scientific expedition is planned	Cash; in-kind logistical and technical support
Underwater Visual Census Monitoring	Environmental Protection Authority, South Australian Government	Marine parks have a joint collaboration with the EPA to monitoring key reef sites in the Fleurieu region. The data collected from this monitoring can be used to report both on the effectiveness of marine park sanctuary zones and the status of reefs in the Fleurieu region more generally.	Logistical and technical support

Project name	Partner(s)	Project details	DEWNR contribution – cash or (in-kind, cash)
Pipi citizen science monitoring	South-east community	Pipis (*Donax deltoides*) occur along large areas of the state's South East sandy coastline and are an important commercial/recreational mollusc species. A citizen science project has been established in partnership with the community and DEWNR South East Natural Resources to compare pipi abundance and size structure inside the Piccaninnie Ponds SZ compared to outside using standardized rapid methods (James & Fairweather 1995).	Cash; in-kind logistical and technical support
Hooded Plover surveys (Kangaroo Island)	Kangaroo Island community	In collaboration with Birdlife Australia, the KI marine parks regional unit have run two island-wide citizen science surveys of the EPBC-listed hooded plover, covering 74 sites with multiple sites within each marine park around KI. 50 volunteers were involved in 2015/16 and a further 60 volunteers in 2016/17.	In-kind logistical and technical support
Southern Right Whale Research – contributes to ongoing monitoring	Parks Australia, SARDI Aquatic Sciences	2013 & 2014, Aerial monitoring program of southern right whales using photo identification to assess spatial and temporal use of the GAB aggregation area	Cash; in-kind logistical and technical support
Australian sea lion – contributes to ongoing monitoring	Parks Australia, Global Unmanned Systems	2012-2016 Clifftop survey of pup production at Bunda Cliffs sea lion colonies; 2013 2014 – Participation in statewide census of ASL pup production (in kind & logistical support from DEWNR); 2017 onwards – Remotely Piloted Aircraft surveys of Australian sea lion colonies at Bunda Cliffs.	Cash; in-kind logistical and technical support

Collaborating with the community supports a number of program strategies whilst also delivering to outcomes of Strategy 11, for example the marine parks program has initiated and/or been involved in over 26 citizen science projects across the state (refer to Assessment 5.1c). To assist in planning for citizen science projects, in collaboration with Phil Roetman from the Discover Circle, the University of Adelaide, the Marine Parks Performance program developed an internal Citizen Science Project Proposal template. By populating the template the Coordinator considers the alignment of the citizen science project to the program deliverables, the style and aim of a project and how participating or developing the project aligns with one or more of the six key evaluation questions.

In addition, Marine Parks Performance staff are also actively involved in broader state and commonwealth marine initiatives, including active members and/or representatives on the following committees:

Marine Innovation Southern Australia (MISA): An initiative of the Government of South Australia established in 2005, brings together South Australia's top aquatic institutions and research scientists to pool our resources and knowledge, and grow the seafood industry more efficiently.

Spencer Gulf Ecosystem and Development Initiative (SGEDI): A multi-year program led by the Environment Institute to help facilitate change and maintain the integrity of the Spencer Gulf.

Australian Marine Sciences Association (AMSA): Australia's peak professional body for marine scientists from all disciplines promoting all aspects of marine science in Australia

National Environmental Science Programme (NESP) Marine Biodiversity Hub: Research hub for understanding and managing Australia's marine biodiversity.

Marine Biosecurity SA: Led by PIRSA, protects SA's aquatic environment from pests and diseases.

9.4.3 SEQ 12 – Are outcomes from the MER Program and research publicly available and have the outcomes from the MER Program informed decision-making and periodic review of the management plans?

Indicator 12.1a

MER Program and research outcomes available to the public

Measure 12.1a

Number, nature (data, reports) and information platform(s) (e.g. web, reports) of MER Program and research outcomes made available to public.

Assessment 12.1a

The marine parks program manages the data and information in accordance with Government of South Australia and DEWNR requirements through alignment with *State Records Act 1997*, Information Management Framework (IMF) and Monitoring Environmental Knowledge (MEK) guidelines. These principles have been developed by DEWNR and adapted from whole of government frameworks and are designed to be broad and enduring.

In addition, the marine parks program follows the Managing Environmental Knowledge Procedure a procedure developed to manage environmental data and knowledge for enduring use that is guided by both the DEWNR Information Management Framework and the government's Declaration of Open Data. One of the primary components of this is ensure information is shared to external DEWNR audiences and available for community viewing and use (refer to MER Framework Marine Parks).

The marine parks program distributes data, information and reports through the following online platforms:

South Australia's marine parks website: provides information on the marine parks program, links to reports, maps, data and general things to do and know about South Australia's marine parks, the program and the general marine environment.

Enviro Data SA the gateway to data and information relating to the science and monitoring of South Australia's environment and natural resources. The site provides access to data, documents and links relating to South Australia's coastal regions

Nature Maps: NatureMaps is an initiative of DEWNR that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format. Relevant marine and marine park spatial information is viewable, accessible and many layers downloadable from this site.

Reef Life Survey Data Portal Reef Life Survey (RLS) data (including data collected and processed by SA marine parks survey team) are freely available to the public for non-profit purposes, so not only managers, but also groups such as local dive clubs or schools may use these data to look at changes over time in their own local reefs.

Biological Databases of South Australia: Biodiversity information in DEWNR is predominantly stored in the Biological Databases of South Australia (BDBSA) which manages specimen and observation records and includes taxonomic systems for South Australian flora and fauna.
Corporate storage of the authoritative BRUVS dataset for the marine parks monitoring program is in BDBSA. Data from field work and the processing of video footage is validated and manipulated into a

format that is readily uploaded and stored in BDBSA. From this corporate storage point the data is available through DEWNR's "Fauna Supertable", Atlas of Living Australia, spatial layers, and internally through a purpose built database that links directly to BDBSA to produce data in a format for analysis and other purposes.

The marine parks program has produced a series of public reporting products that describe the objectives and methods of the MER program and the status of marine park assets (Table 56).

This Status Report provides the best example to date of how outcomes from the MER Program and research have been made publicly available.

For Research outcomes made available please refer to Specific Evaluation Question 13. In addition, a condition of the Research Permits to conduct research in marine parks is that all data; results; and reports will be made available upon request of the department.

Information is also shared from DEWNR Facebook pages; DEWNR Twitter accounts; and the Goodliving Blog in addition to newspaper and journal articles and presentations (refer Assessments Assessment 5.1d and Assessment 7.2)

Indicator 12.1b

MER outcomes informed decision-making (and periodic reviews)

Measure 12.1b

Qualitative – examples/case studies of where MER outcomes have informed decision-making.

Assessment 12.1b

This Status Report provides numerous examples of where MER outcomes have informed decision-making and the report itself will be used to make decisions on the direction of the marine parks program (including the MER Program) and will also form the basis for the Final Evaluation Report that will be used to inform the 10-year review of the management plans.

The application of science investigations focuses on defining cause and effect process which describes the 'theory of change' how and why change occurs. The MER Program also uses the 'Program logic' approach which links the theory of change to management objectives, interventions (actions) and outcomes; and the efficiency and effectiveness in meeting those objectives and outcomes. This aligns the science evidence and outcomes to inform planning, policy and investment.

The MER reporting and communications plan ensures information from the program is available and presented at all stages of the planning and investment cycle (project managers, DEWNR executive, SA government and the community). This includes reporting on the planning aspects of the program and the appropriateness and efficiency of design and methods; Annual status reporting on implementation; Mid-term reporting on objectives achieved and status of change and long-term reporting on effectiveness of meeting objectives and the impact and sustainability of results.

Table 56. Marine Park Performance completed reports

Year	Product	Aim and content
2016	Baseline reports for each of the 19 marine parks	To provide a baseline from which to measure changes into the future. The reports outline predictions of change to ecological and socio-economic values that might occur due to the marine park management plans, and present a range of potential indicators that could be used to track these changes.
2017	MER framework document	To provide direction and outline the steps and components that underpin the MER Program. The framework also provides for shorter-term adaptive management of activities and components contributing to implementation of management plans. Two critical components identified in the MER Framework are key evaluation questions and a program logic.
2017	Baseline report for the statewide network of marine parks	As for the individual baseline reports (see above) but across the statewide network of marine parks.
RELEASED 2017	MER Plan	Outlines the 'why, what, where, and when' of key information to be collected, evaluated and reported. The MER Plan should be used to guide ongoing implementation plans for the MER Program and encourage further partnerships and collaborations.
2017	First Annual Progress Summary	To communicate to the general public and stakeholders a snapshot of monitoring activities by the marine parks program with the intent of providing assurance that DEWNR is actively implementing the strategies of the marine parks management plans. Information will be presented for each of the four marine parks sub-programs with specific case studies and highlights up to the end of 2016.
2017	Baited Remote Underwater Video Systems (BRUVS): Application and data management for the South Australian marine parks program	A report describing the approach taken to monitoring, deployment of BRUVS in the field and further documents the analysis, curation and storage of data collected into the DEWNR's corporate database system.
2017	Underwater visual census (UVC): Application and data management for the South Australian marine parks program.	A report describing how the underwater visual census (UVC) by SCUBA divers is applied in the South Australia's marine parks program to monitor subtidal reefs. It documents the process of UVC data capture, processing and storage in a Department of Environment, Water and Natural Resources (DEWNR) corporate database.

9.4.4 SEQ 13 – Has research been conducted to assess the integrity of knowledge frameworks that underpin the predicted outcomes?

Indicator 13.1

Research funded that assesses the integrity of knowledge frameworks that underpin the marine park predicted outcomes

Measure 13.1

Number and nature of research projects that have been funded (includes lists of research reports and budget).

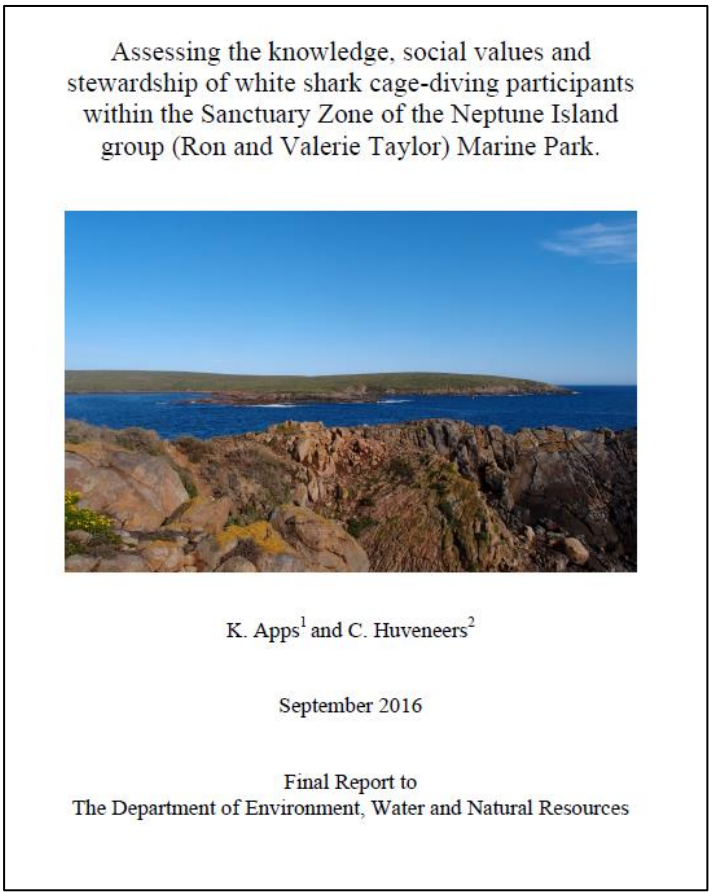
Assessment 13.1

The marine parks research program is complementary to the MER Program, it aims to both build partnerships with the research community and provide an additional and external source of skills and experience to inform the management of marine parks. It will contribute data and information to address the key evaluation questions, fill key knowledge gaps and improve the knowledge base of the marine parks (Scholz et al).

Critically the marine parks program logic and the MER plan have identified key assumptions that support the cause and effect relationships (theory of change) that underpin the MER Program. More recently, specific research has been targeted in the program to provide rigour where these assumptions are critical for determining the effective outcomes of the program or where the evidence base supporting these assumptions is lacking (for example**:** Research into statistical methods applicable to Marine Parks Monitoring in South Australia and Assessing connectivity on South Australia's marine parks network, see Table 57).

The marine parks program is a high profile program with a number of election commitments to deliver. One of the commitments is that an annual amount of $100,000 would be allocated towards "Partnerships with Universities on marine park research". This election commitment aligns with the marine parks research prospectus, *Forging the Links*, that sets out the need for rigorous ecological, social, cultural and economic scientific research and monitoring that will form the foundation for ongoing review of the marine parks program.

Since 2014/2015, $240,300 has been approved to finance 12 projects (Table 57, noting that dedicated research funding did not become available until 2014/15 eg Figure 40). These projects have aided in building a greater understanding of; baseline ecological data, socio-economic issues around tourism and governance (see case study 5), methods of monitoring marine parks, and of the connectedness of the marine park network.



Assessing the knowledge, social values and stewardship of white shark cage-diving participants within the Sanctuary Zone of the Neptune Island group (Ron and Valerie Taylor) Marine Park.

K. Apps[1] and C. Huveneers[2]

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The Department of Environment, Water and Natural Resources

Figure 40. Example of a research report produced for the marine parks program

Table 57. Marine Park Performance research grants; funding; public availability and how the research can inform the knowledge framework

PROJECT	START DATE	END DATE	DEWNR FUNDING Approved	SEQ12 Outcomes publicly available?	SEQ12 Outcomes informed decision-making or review?	SEQ13 To assess knowledge frameworks?
Kirin Apps: Assessing the social values of white shark cage-diving within the sanctuary zone of the Neptune Island group (Ron and Valerie Taylor) Marine Park.	Jun-14	Sep-16	$5,000	Completed Honours thesis and journal paper: http://www.tandfonline.com/doi/abs/10.1080/08927936.2016.1152714	Outcomes have influenced the decision to provide more educational materials and training to tour operators.	Informs the theory of change on educating people about marine parks and the marine environment through nature-based tourism.
Nathan Janetski: Inventory of rock types, habitats and biota on rocky seashores in the SA marine parks network	Jul-14	Dec-16	$2,000	http://www.int-res.com/abstracts/meps/v505/p131-143/		Informs the baseline knowledge behind the conceptual models and theory of change for the marine parks network.
Sasha Whitmarsh: Description of fish assemblages in key sanctuary zones and other protected areas prior to zoning implementation in South Australia's marine parks	Aug-14	Dec-17	$5450	Data not publically available yet but students intent is that data will be on the DEWNR BDBSA site upon completion.	Outcomes have validated the use of benthic BRUVS by the MER Program	Informs the baseline knowledge behind the conceptual models and theory of change for the marine parks network.

PROJECT	START DATE	END DATE	DEWNR FUNDING Approved	SEQ12 Outcomes publicly available?	SEQ12 Outcomes informed decision-making or review?	SEQ13 To assess knowledge frameworks?
Dr Graham Edgar: Functional responses of rocky reef communities to effects of fishing and other anthropogenic stressors	Oct-14	2020	$100,000	Underway	Outcomes will inform decisions around the adequacy of the compliance sub-program, and inform the review on the effectiveness of sanctuary zones in protecting biodiversity.	Informs the theory of change and predictions on temperate reef communities when protected from fishing and other anthropogenic stressors.
Rosemary DeVos: Analysing the effectiveness of governance approaches in South Australia's marine parks	Jun-15	Cancelled 03/17	$11,000	Not completed	NA	NA
Beverly Clark: An investigation into the socio-cultural dimension of determining MPA effectiveness	Jun-15	Aug-16	$5500	Completed	Will be informing future perception monitoring.	Informs the theory of change on educating people about marine parks and the marine environment through stewardship. And informs MER Program on perception survey techniques and outcomes.
Dr Steve Delean: Research into statistical methods applicable to Marine Parks Monitoring in South Australia	Jun-15	1-Dec	$22,000	Underway	Outcomes have validated the current sampling design using UVC in the MER Program.	Testing the assumption that the monitoring design is rigorous enough to detect a cause and effect.

PROJECT	START DATE	END DATE	DEWNR FUNDING Approved	SEQ12 Outcomes publicly available?	SEQ12 Outcomes informed decision-making or review?	SEQ13 To assess knowledge frameworks?
Professor Peter Fairweather: Baseline characterisation of Coffin Bay (Thorny Passage MP).	May-16	ONGOING	$27,000	Underway	Outcomes will be used to direct future monitoring activities of the MER Program within Coffin Bay.	Informs the baseline knowledge behind the conceptual model and theory of change for the Thorny Passage Marine Park.
Dr Alice Jones: Development of a research plan and feasibility proposal to undertake a joint Commonwealth marine reserve and South Australian Marine parks research expedition	Jun-16	Jun-16	$15,000 (Common-wealth funding)	Completed	Outcomes have enabled strategic decision-making on the scope of the Pearson Island research expedition planned for 2018.	Informs the baseline knowledge behind the conceptual model and theory of change for the Investigator Marine Park.
Professor Bronwyn Gillanders: Quantifying fish assemblages in South Australian marine protected areas	Jan-17	Nov-17	$10,000	Underway	Outcomes will inform decisions about future monitoring activities by the MER Program.	Informs the baseline knowledge behind the conceptual models and theory of change for the marine parks network.
Dr. Alice Jones Assessing connectivity in South Australia's marine parks network	May-17	Oct-17	$31,000	Underway	Outcomes will enable decision-making on future expenditure of the research budget of the marine parks program.	To ensure that future research projects will inform the testing of the assumption of adequacy within the CAR system of marine parks.

PROJECT	START DATE	END DATE	DEWNR FUNDING Approved	SEQ12 Outcomes publicly available?	SEQ12 Outcomes informed decision-making or review?	SEQ13 To assess knowledge frameworks?
Professor Sabine Dittmann: Subtidal soft sediment macrofauna assessment collected as part of Coffin Bay Coastal waters study within the Thorny Passage Marine Park	Jun-17	Sep-17	$6350	Underway	Outcomes will inform decisions about future monitoring methods and activities by the MER Program.	Informs the baseline knowledge behind the conceptual model and theory of change for the Thorny Passage Marine Park.
		Total	**$240,300**			

9.4.5 SEQ 14 – Have Aboriginal people, local communities and stakeholders been encouraged to preserve, and where appropriate share, traditional knowledge?

Indicator 14.1

Activities where Aboriginal people, local communities and stakeholders have been encouraged to preserve and share traditional knowledge

Measure 14.1

Case studies including nature and number of activities where Aboriginal people, local communities and stakeholders have preserved and shared traditional knowledge

Assessment 14.1

DEWNR recognises Aboriginal interests in marine parks implementation, during the first five years of marine parks implementation a number of activities have been undertaken to encourage Aboriginal people, local communities and stakeholders to preserve, and where appropriate share, traditional knowledge. The region that has been most pro-active in this space is the Eyre Peninsula, both west and east. The Great Australian Bight Marine Park, also known as the Far West Coast Marine Park (in State waters) is a co-managed park and has a history of working with Aboriginal people and the local communities. Marine Park Regional Coordinators have continued this relationship and built on this in other communities, activities undertaken include:

- Whale days with Yalata community at the Head of the Bight Whale Watching Centre. Children are taught about whale biology, view whales from the boardwalk, as well as through drones used by Murdoch University researchers. The women's group paint a collaborative, traditional art piece of a southern right whale (Figure 41 and Figure 42).
- Beach clean-ups are conducted with Yalata youth group and/or the Yalata women's group. Debris is sorted and weighed developing quantitative skills in youths, then turned into art pieces by the Yalata women's group.
- Collaboration on the creation of interpretive signage at Point Labatt Sanctuary Zone, the sign depicts the Wirangu Dreamtime story sign of the Wardu (Wombat) and Balgurda (Seal, Figure 43).
- In the lower Eyre Peninsula region the Barngarla community has been working with DEWNR staff to share traditional knowledge, a number of events have been undertaken that provides an opportunity to learn about local Barngarla culture by hearing stories and people speaking in the Barngarla language, learning about traditional use of the coast and marine environment such as traditional fishing and fish traps, as well as making and eating traditional foods and engaging in traditional art sessions , events included:
    - Science Week activities that provide
        - Port Lincoln High School Aboriginal Cadets - presentation prior to field trip (14/15)
        - Sleaford Bay Field Trip with Port Lincoln High School Year 10 Aquatic Science Class and Aboriginal Cadets and Barngarla Community (14/15)
        - Cleve Area School Year 7 class. Joint workshop with Barngarla community on Aboriginal culture/Indigenous Science, Sea Country and marine parks. (15/16)
    - Sanctuary zone launch workshop at Port Lincoln Library that included a joint session with Barngarla Aboriginal community and marine parks (14/15).
    - Cleve Area School Year 7 class participated in a Bioblitz field trip to Point Bolingbroke to learn about the Barngarla culture and perform beach bioblitz, sand dune vegetation and beach morphology of the Point Bolingbroke SZ.
    - Port Lincoln High School Year 10 Aquatic Science class Bioblitz field trip to Point Bolingbroke to learn about the Barngarla culture and perform beach measurements of the Point Bolingbroke SZ. (15/16)

- Port Lincoln Primary School Year 7s participated in a 'Bioblitz' field trip to Point Bolingbroke to learn about the Barngarla culture and perform beach bioblitz, sand dune vegetation and beach morphology of the Point Bolingbroke SZ.
- Launch of Tannana Wambiri (Sleaford Bay Project) DVD at Marine Park's 1-year celebration with the Minister. Showcasing the National Science Week Sleaford Bay Field Trip with the Barngarla community and Port Lincoln High School.
- World Oceans Day launch of marine parks: creating a lasting connection with the ocean DVD by Minister Hunter which showcases the work above.

- Port Lincoln Children's Centre undertook two mini museum guided tours for Aboriginal kindergarten children – learning about the values of the coast and marine environment and making connection between culture and conservation.

- Immerse Yourself in a marine park – Tunarama Event – Sea Country Craft and Beach Detective sessions that allowed community to learn about Barngarala Sea Country culture and undertake craft activities using traditional art methods.

Figure 41. Whale Day at the Head of the Bight, Far West Coast Marine Park

Figure 42. Whale Day at the Head of the Bight, Far West Coast Marine Park

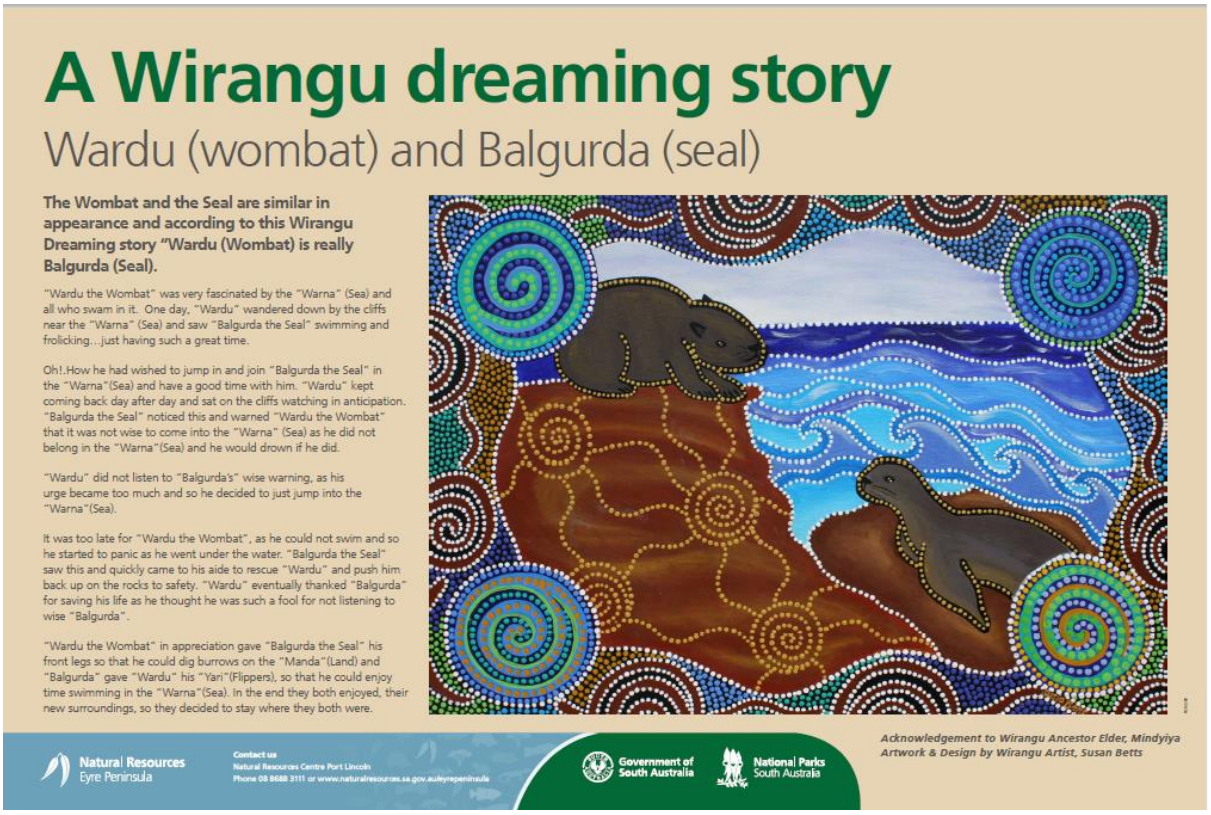


Figure 43. Sign at Point Labatt designed in collaboration with Wirangu community

9.5 Compliance sub-program activities: Strategy 15

This section presents information for the specific evaluation questions for the Compliance sub-program. It is not a comprehensive cover, but is representative of a significant amount of the program's achievements over the past five years. There is also overlap between some activities that address more than one specific evaluation question and they may therefore appear in other sections of the Status Report.

9.5.1 SEQ 15 – Has a compliance strategy been written and implemented that: is cost-efficient; focussed on sanctuary zones and other conservation priorities; complements existing compliance efforts; maximises voluntary compliance; and, includes measures to address serious or repeat non-compliance?

Indicator 15.1

A compliance strategy is written and implemented that is cost-efficient; focussed on sanctuary zones and other conservation priorities; complements existing compliance efforts; maximises voluntary compliance and includes measures to address serious or repeat non-compliance

Measure 15.1a

A compliance strategy developed that includes required specifications (cost-efficient; focussed on sanctuary zones and other conservation priorities; complements existing compliance efforts; maximises voluntary compliance and includes measures to address serious or repeat non-compliance) is written and being implemented.

Assessment 15.1a

Most South Australians support conservation of our marine environment because they recognise the importance of ensuring its long-term viability. The Compliance Strategy (Compliance Strategy) reflects community attitudes to marine parks and prioritises voluntary compliance supported by education and awareness (also delivered through the Stewardship Strategies 5 to 9) followed by effective deterrence and appropriate enforcement (Figure 44). The underlying ethos of South Australia's Marine Parks Network Compliance Strategy is to achieve the highest possible level of compliance with the Act through three guiding principles:

1. Maximise voluntary compliance through communication and education to improve awareness
2. Create effective deterrents through the optimal use of enforcement action which is proportional to the severity of offending
3. Monitor and review compliance activities to inform improvements.

Figure 44. Pictorial representation of the compliance strategy to prioritise education and awareness followed by effective deterrence and appropriate enforcement

Measure 15.1b

Annual reports / risk assessments and/or additional project plans written are produced as required.

Assessment 15.1b

Risk assessments have been conducted annually since 2014/15 on a sanctuary zone by sanctuary zone basis (Table 58). The assessments take into consideration the likelihood of an offence and the consequence or impact of an offence to the ecosystem, the level of community visitation, whether the site is a key monitoring site for the monitoring program, and the number of incidents reported for a site in the previous year. Compliance monitoring is then focused on zones ranked highest for compliance priority.

Measure 15.1c

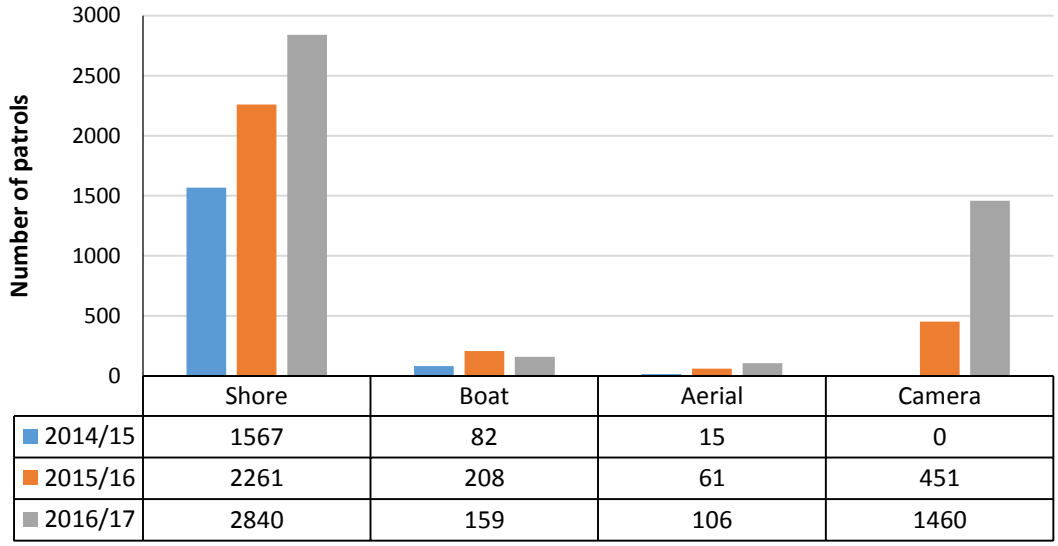
Number of patrols

Assessment 15.1c

Community support and voluntary compliance is integral to the success of marine parks. DEWNR conduct regular patrols of high risk locations seeking to educate community members and catch repeat offenders. The number of patrols has increased since 2014/15 utilising shore based, boat and aerial methods of assessing activities in sanctuary zones. Time-lapse cameras were introduced in 2015/16 as a cost effective way of monitoring activities at selected locations. Cameras have been effective in determining general levels of compliance and the need for increased patrols to an area (Figure 45). Shore based patrols are the most common form of surveillance due to their cost effectiveness and alignment with other forms of DEWNR business. For example, regions where sanctuary zones are in proximity to national parks or conservation parks can be patrolled regularly as rangers are already in the area (Figure 45). Sanctuary zones of this nature include: Chinamans Hat Sanctuary Zone (Innes National Park, Lower Yorke Peninsula, Southern Spencer Gulf Marine Park); Seal Bay Sanctuary Zone (Southern Kangaroo Island Marine Park) and Kellidie Bay Sanctuary Zone (Coffin Bay, Thorny Passage Marine Park).

Table 58. Example risk assessment for compliance in Upper and Lower South East sanctuary zones

Marine Park	Zone		Zone priority	Non-Compliant Activity (NCA)	(Jul-Sep)	(Oct-Dec)	(Jan-Mar)	(Apr-Jun)	Prior year incidents	Visitation
Upper South East	SZ-3	Cape Dombey	High	Rec. Fish - Boat	1	4	4	2	Low	High
				Rec. Fish - Shore	1	1	1	1		
				Rec. Fish - Dive	1	1	1	1		
				Motorised water sport	1	1	1	1		
Lower South East	SZ-1	Canunda	Low	Rec. Fish - Shore	2	4	4	4	Low	Med
				CF-Rock Lobster		4	4	4		
				Rec. Fish - Boat	1	4	2	2		
				Rec. Fish - Dive	1	4	2	2		
				Littering/Dumping	2	2	2	2		
				Off road vehicles	1	1	1	1		



	Shore	Boat	Aerial	Camera
2014/15	1567	82	15	0
2015/16	2261	208	61	451
2016/17	2840	159	106	1460

Figure 45. Number and type of marine park compliance patrols between financial years 2014/15 and 2016/17

Of the 84 zones on the 2016/17 patrol spreadsheet, 76 zones were visited at least once (Table 59).

Table 59. Summary of patrols per NRM region

Region	Total SZ/RAZ	Three total highest (excluding cameras)
EP West (AW)	20	Deep Cork Bunda Germein Island
EP East	22	Kellidie Bay Yangie Bay Eely Point
Northern & Yorke	17	Chinamans Hat Clinton Wetlands Cape Elizabeth
AMLR	9	Noarlunga Reef Aldinga Reef Onkaparinga River
Kangaroo Island	10	Seal Bay Cape du Couedic Bay of Shoals
South East	6	Cape Dombey Canunda Piccaninnie Ponds

DEWNR has successfully partnered with PIRSA, SAPOL, DPTI and the EPA to conduct partner patrols on an ad hoc or as needs basis. These may not be reported to DEWNR if no infringements are observed. Partner Patrols occur when specific actions are required. For example, in 2015, there was increasing community concern about illegal activity occurring on the *Zanoni* wreck site. Patrols from SAPOL PIRSA and DEWNR identified a number of boats illegally at the site (inside the protected zone) and a number of offenders were subsequently prosecuted (refer to Case study 6, Section 9.7).

Measure 15.1d

Number of vessel owners spoken to (boat ramp outreach)

Assessment 15.1d

The majority of boat ramp outreaches have occurred on the Yorke Peninsula. Between 2015 and 2017, 170 boat owners were approached by DEWNR staff who provided education about the marine parks in the area (Table 60). In addition, there was a targeted boat ramp outreach with the intent of protecting the *Zanoni* shipwreck which lies within the Offshore Ardrossan sanctuary zone. A total of 130 vessel owners were spoken to across the seven sessions conducted. This included 11 commercial vessels (marine scale fishers) and included vessels leaving from both sides of the Gulf St Vincent, from ramps in Ardrossan, North Haven and St. Kilda (Table 61). Feedback was positive, particularly at Ardrossan where it was appreciated that DEWNR was acting on the concern of the local community at the *Zanoni* site.

Table 60. Boat ramp outreach locations and number of owners spoken with

Year	Location	Number of boat owners
2015/16	Ardrossan	35
2015/16	Port Hughes	25
2015/16	Coffin Bay	15
2016/17	Ardrossan	30
2016/17	Port Hughes	35
2016/17	Coffin Bay	30

Table 61. Targeted boat ramp outreach for Offshore Ardrossan SZ, site of Zanoni historic shipwreck

Targeted *Zanoni* education effort December 2015	
Location	**Number of boat owners**
Ardrossan	45
North Haven	62
St Kilda	23

Measure 15.1e

Number documents/webpages produced/updated

Assessment 15.1e

Educating the community about marine parks relies on information being easily accessible. Two primary means of information distribution is via the web and hard-copy products.

Web-based

Community members need easily accessible and speedy access to websites so that they can acquire a good understanding of the locations of marine parks, the location of different zones inside the marine parks, and an explanation of the activities that can be engaged in within the marine park.

DEWNRs main webpage is located at http://www.environment.sa.gov.au/marineparks/home
(See example from website, Figure 46, Figure 47 and Figure 48)

Within the Marine Parks website there is access to:

1) Simple maps which just show the location of the marine park
2) Detailed zoning maps which also highlight the activities that are permitted within each marine park zone.
3) Maps with exact GPS locations of park boundaries

4) The SA recreational Fishing Guide App is also accessible from the marine park website and provides the abovementioned information (see Assessment 15.1f) http://www.environment.sa.gov.au/marineparks/home.

5) Marine park zoning GPS coordinates can be downloaded in four different formats:

- Google Earth (KMZ)
- GPS Exchange (GPX)
- MaxSEA
- ArcGIS Spatial layers

6) A recreational Fishing Guide was produced in 2013 (refer Assessments 5.1a). Over 300,000 copies were distributed statewide, in regional and metropolitan fishing-related outlets around the state. In addition, over 30,000 Marine Park Zoning Brochures were printed and made available at boat shows, field days, in DEWNR/NRM regional offices and other community events and are available electronically

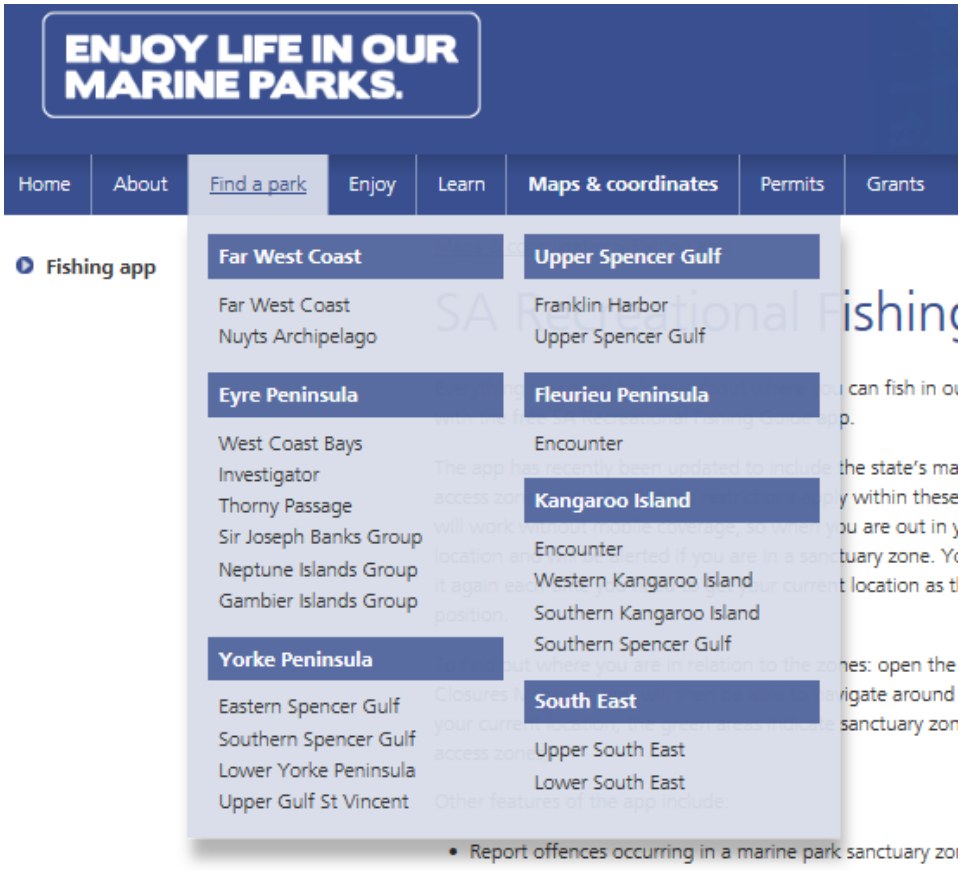


Figure 46. Find a park section of the marine parks website showing marine parks sorted by region

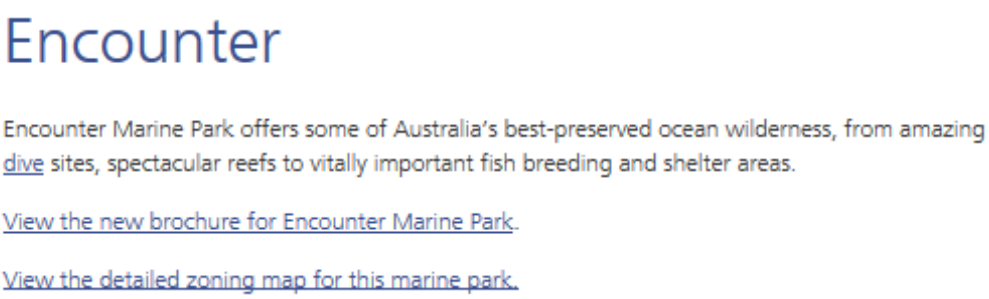


Figure 47. Clicking on a park (i.e. from Figure 46) will give the user options for downloading maps and educational information

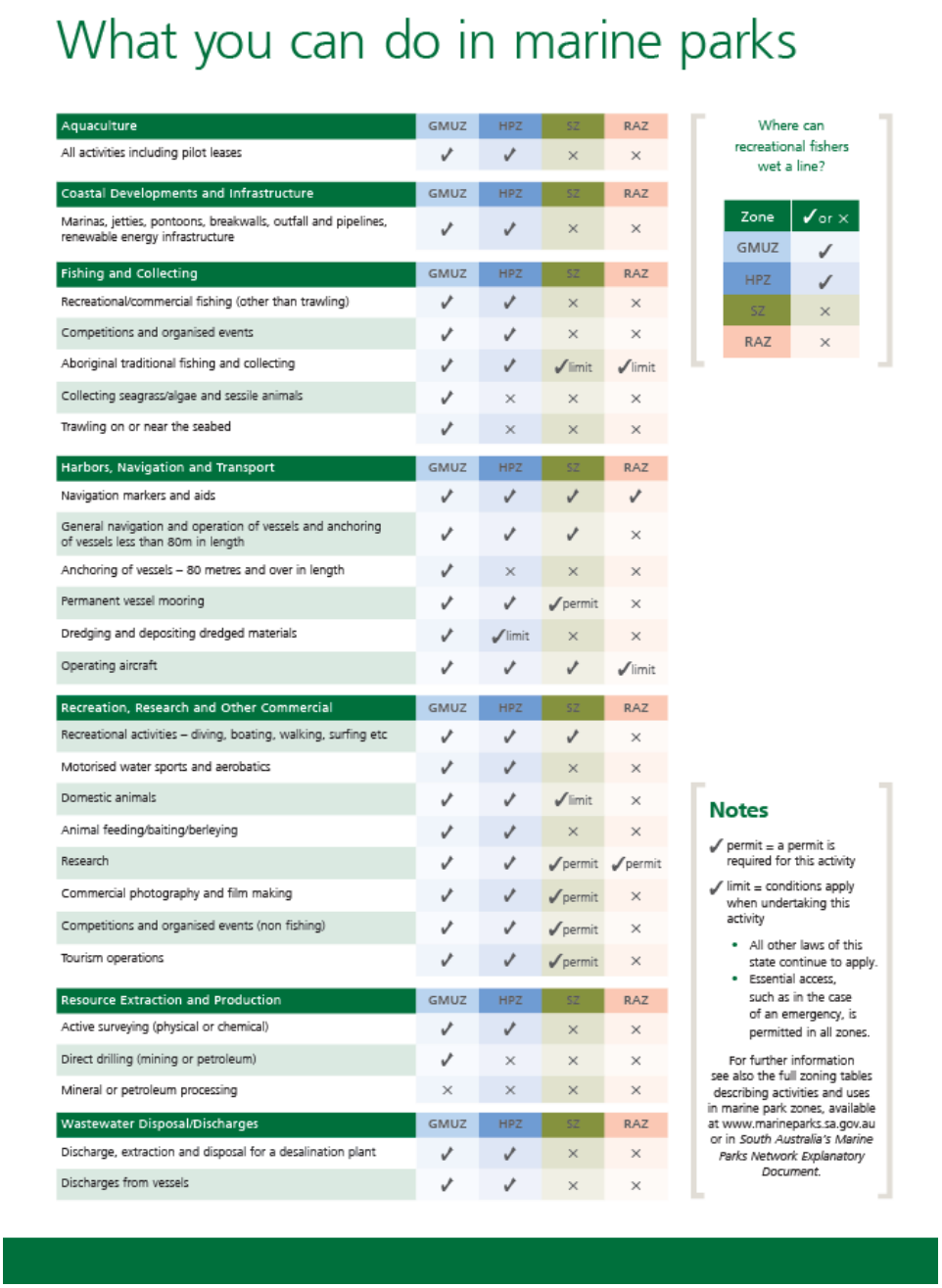


Figure 48. Example image from educational maps showing what activities can occur legally in the different zones of marine parks

Access to the marine parks webpage can also be navigated to from the Enviro Data SA website, from the PIRSA website, from 7 out of 8 regional NRM webpages (not from SAMDB) and from DEWNR YouTube channel.

Measure 15.1f

Number of applications downloads of both the **My Parx** app and the PIRSA-developed SA Recreational Fishing Guide APP (PIRSA)

Assessment 15.1f

My Parx is an App that provides general information on thousands of parks in a number of countries, and was updated to include South Australia's marine parks in mid-2013. The App allows the user to identify and track their location within a marine park and see where they are in relation to the following zone types:

- Sanctuary zones
- Restricted access zones
- Commonwealth Marine Reserve zones (adjacent to marine parks)
- Existing aquatic reserves (within marine parks)
- Shore-based recreational line fishing exemptions within some sanctuary zones

The My Parx App is currently still available to use, although the focal App is now the SA Recreational Fishing Guide App provided by PIRSA since mid-2014. As well as alerting the user to restricted fishing areas the SA Recreational Fishing Guide App also provides:

- Up to date rules for fishing in South Australia from PIRSA
- Legal bag limits, size limits and fishing rules
- Searchable list of species currently affected by size or bag limit restrictions
- Full colour fish illustrations
- Fishing gear illustrations and descriptions
- Latest marine weather and warnings
- A personal Angler Diary that enables you to photo record your catches and list your favourite fishing spots
- Latest information on alerts and season reminders from PIRSA's Fisheries and Aquaculture Division.

The SA Recreational Fishing Guide App has currently been downloaded 40,624 times since 2014 from Apple, Android and Windows devices (Table 62). The number of south Australians who have downloaded the My Parx App is not available.

Table 62. SA Recreational Fishing Guide app download numbers. *denotes data to end of June 2017.

Year	Android	Apple	Windows	Total
2014	4574	5403	1315	11,292
2015	5750	4883	629	11,262
2016	5618	3836	309	9763
2017*	6197	2108	2	8307
Totals	22,139	16,230	2255	40,624

Measure 15.1g

Number and nature of compliance media releases

Assessment 15.1g

One avenue for increasing voluntary compliance and providing effective deterrents is through promotion and education of the programs compliance activities via media publications. Since 2012 there have been 11 media releases that highlight compliance activities in marine parks. These include compliance regarding activities around aquatic mammals, breaches to sanctuary zones i.e. fishing at Port Noarlunga Reef sanctuary zone, and highlighting the presence of sanctuary zones that protect species like cuttlefish during their breeding season. Media releases can be accessed through the DEWNR website and the stories are often picked up by newspapers and TV stations. For instance Channel 9 ran a story on monitoring and compliance at Rapid Head, and a compliance article at Aldinga Reef made front page of the Victor Times and Southern Times Messenger (see examples Figure 49, Figure 50, Figure 51).

Compliance related media releases since 2012:

1) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/170605-endangered-sea-lions-video
2) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/170608-status-report-sa-marine-parks
3) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/170514-watch-whales-winter
4) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/170427-shipwreck-protection
5) http://www.environment.sa.gov.au/Home/Full-newsevents-listing/News-Events-Listing/161228-marine-parks-summer-programme
6) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/161006-watch-out-for-whales
7) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/160825-fined-for-entering-historic-wreck-zone
8) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/160505-whale-watching
9) http://www.environment.sa.gov.au/Home/Full_newsevents_listing/News_Events_Listing/160118-zanoni-fines
10) http://www.environment.sa.gov.au/marineparks/home/media/articles/140625-october-fishing-restrictions
11) http://www.environment.sa.gov.au/marineparks/home/media/articles/121129-finalisation

Figure 49. Channel 9 news story on compliance at Rapid Head Sanctuary Zone

Figure 50. Marine parks compliance media release was run on the front page of the Southern Times

20 Oct 2016
Port Lincoln Times, Port Lincoln SA

Author: Olivia Barnes • Section: General News • Article type : News Item
Classification : Regional • Audience : 4,639 • Page: 4 • Printed Size: 196.00cm²
Market: SA • Country: Australia • ASR: AUD 436 • Words: 331 • Item ID: 674402428

Leave fish sanctuary alone

BY **OLIVIA BARNES**

YELLOWTAIL kingfish have made their annual migration back to Coffin Bay and fishers looking for a big catch are being reminded to stay out of the six sanctuary zones in the area.

The kingfish are thought to migrate to Coffin Bay to spawn in its protected, shallow bays and Natural Resources Eyre Peninsula marine parks regional coordinator Shelley Paull said the seasonal phenomena was "a remarkable sight".

"Kellidie Bay has been the traditional fishing spot to try and hook a big kingfish but other parts of Coffin Bay are also becoming better known."

She said sanctuary zones on the eastern side of Kellidie Bay, Mount Dutton Bay, Mount Dutton Creek, Horse Peninsula, Yangie Bay and Eely Point needed to be avoided by anglers.

"Fishers may continue to fish for kingfish in Kellidie Bay and other parts of Coffin Bay, just not within the sanctuary zones.

"This allows the kingfish to go about their breeding activity with less disturbance."

Ms Paull said fishers also needed to be aware that if they hooked a fish outside the sanctuary zone, they were not allowed to follow it into the sanctuary zone to land it.

She said no part of the fishing activity could occur within the zone and fishers were also not allowed to "push or herd" fish out of a zone with boats.

"The Kellidie Bay sanctuary zone not only protects an area where kingfish and snapper are thought to spawn but also protects mudflats and intertidal seagrass beds which are important habitat for an array of fish species including whiting, flathead and flounder," Ms Paull said.

"People are welcome to enter the sanctuary zone in a boat, anchor up and observe and admire the diverse marine life in this area but please leave the fishing to outside the sanctuary zone," she said.

"By protecting the important habitats and ecosystems within Coffin Bay we are ensuring a healthy productive marine environment in the future, and that benefits everyone, including anglers," she said.

Figure 51. Port Lincoln Times marine park compliance media release example

Measure 15.1h

Number of signs installed/replaced/maintained

Assessment 15.1h

As part of DEWNR's efforts to maximise voluntary compliance, 107 signs covering all 19 marine parks were placed at popular locations across the State near marine parks such as beach entry points and boat ramps. These signs aim to educate the community about the zones in marine parks, the species that benefit from protection of marine parks, and the activities permitted (Table 63, Figure 52 and Figure 53).

Figure 52. Marine park compliance sign at Davenport Creek in the Nuyts Archipelago Marine Park

Table 63. Locations of compliance signs in different regions across South Australia

Eastern Eyre Peninsula	South East
Mount Dutton Bay boat ramp	Coorong Sth SZ (south boundary on beach)
Shelley Beach – Mt Dutton Bay creek	Tea Tree Crossing beach access point
Coffin Bay boat ramp	42 Mile Crossing beach access point
Coffin Bay township beach launch	Maria Creek boat ramp
Kellidie Bay Conservation Park Beach	Robe boat ramp
Coffin Bay National Park entrance	Doorway Rock
Gunyah Beach access point	Robe Obelisk
Port Lincoln Marina access point	Southend boat ramp
Billy Lights Point boat ramp	Southend western beach access point
Axel Stenross Boat Ramp	Canunda National Park (nth of SZ)
Redcliff Christian Haven	Canunda National Park (sth of SZ)
Second Creek	Port MacDonnell Boatramp
Tumby Bay marina boat ramp	Piccaninnie Ponds beach access point
Port Gibbon (near boat ramp)	Piccaninnie Ponds western boundary
Cowell boat ramp	Canunda National Park (inland entry track)
Whyalla boat ramp	Tea Tree Crossing - Highway entry
Black Point carpark	Coorong Sth SZ (north boundary on beach)
Fitzgerald Bay boat ramp	
8 Mile Creek Carpark	
Cowleds Landing Shack Site and beach launch	
Western Eyre Peninsula	**Kangaroo Island**
Coombra camping site	Christmas Cove boat ramp
Granites camping site	American River boat ramp
Fowlers Bay jetty/launch	Muston historic jetty carpark
Point Sinclair beach launch	Independence Memorial Cairn carpark
Davenport Creek camping site	Strawbridge Point beach access point
Nadia Landing beach launch	Bay of Shoals boat ramp
Ceduna main boat ramp	Emu Bay boat ramp
Thevenard boat ramp	Stokes Bay entrance (near café)
Smoky Bay boat ramp	Harveys Return beach access point
Yanerbie beach launch	Bales Bay beach access point
Sceale Bay boat ramp	Matthew Flinders landing memorial cairn
Pt Labatt	Hog Bay Rd / Mitchell Drive junction
Baird Bay Town Beach boat ramp	
Venus Bay boat ramp	
Anxious Bay beach launch	
Elliston boat ramp	

Northern and Yorke	Adelaide & Mount Lofty Ranges
Blanche Harbor (nth boundary of SZ)	O'Sullivans Beach boat ramp
Blanche Harbor (end of Shack Rd)	Port Noarlunga jetty
Carpenters Landing boat ramp	Port Noarlunga South, overlook Onka mouth
Port Augusta Yacht Club boat ramp	Aldinga, Esplanade opposite Seaborne Ave
Power Boat Club boat ramp	Aldinga, Esplanade opposite #70
Chinamans Creek boat ramp	Aldinga, Esplanade opposite #90
Miranda community entrance	Aldinga, Esplanade opposite shops
Port Pirie boat ramp	Aldinga, Esplanade opposite café
Port Hughes boat ramp	Aldinga beach access point
Balgowan boat ramp	Silver Sands beach access point
Port Victoria boat ramp	Sellicks beach access point
Pondalowie beach launch	Myponga beach access
Chinamans Hat beach access point carpark	North Carrickalinga walking trail
Chinamans Hat bottom of hill pull out	Normanville beach access point
Marion Bay boat ramp	Wirrina boat ramp
Point Davernport park entrance	Rapid Bay Beach parking area
Edithburgh boat ramp	Cape Jervis boat ramp
Salt Swamp Creek walking trail	Bluff boat ramp (Newland Head)
Ardrossan boat ramp	Kent Reserve boat ramp
Port Clinton boat ramp	Victor Harbor boat ramp
Port Arthur beach access point	
Port Wakefield boat ramp	

Measure 15.1i

Number of DEWNR staff trained for marine parks Compliance

Assessment 15.1i

DEWNR facilitates warden training which introduces DEWNR and partner agency staff (Measure 15.10 below) to the approach for encouraging legislative compliance within the network of marine parks established under the *Marine Parks Act 2007*. For the financial years 2014/15, 2015/16, and 2016/17, 147, 28 and 40 DEWNR staff have completed this training respectively, for a collective total of 215 trained wardens.

Wardens are Authorised officers pursuant to the *Marine Parks Act 2007* Section 32(1) and may exercise the powers prescribed under the *Act* in regards to upholding compliance of the M*arine Park Act 2007* (Section 34).

Measure 15.1j

Number of partner agency staff trained for marine parks Compliance

Assessment 15.1j

DEWNR have engaged South Australian Police (SAPOL) water officers with an information session related to marine park compliance. In addition, authorised officer training was provided for five EPA officers in 2016, however, these staff have not yet been appointed as wardens.

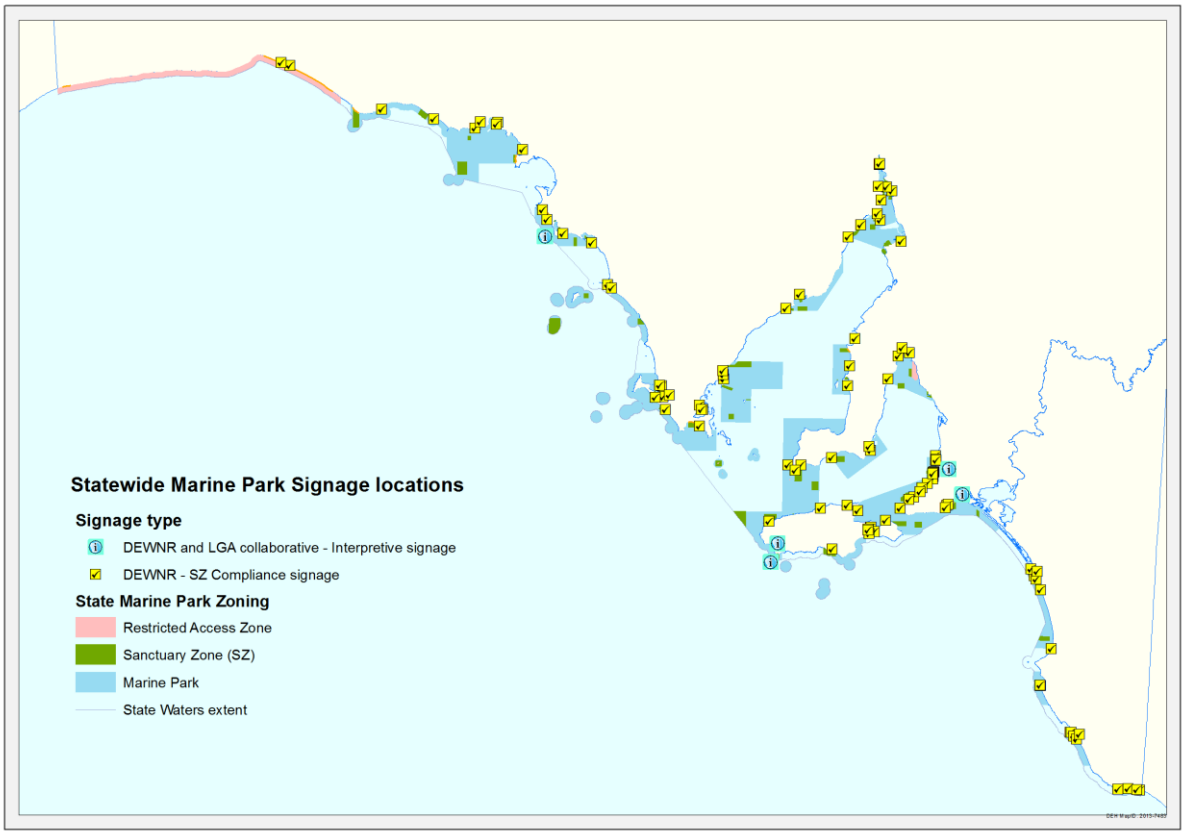


Figure 53. Locations of marine park signage

Measure 15.1k

Number reparation orders issued

Assessment 15.1k

There has been one reparation order issued. In April 2015 a vehicle was abandoned within the Cowleds Landing sanctuary zone in Upper Spencer Gulf. The operation to remove the vehicle was delicate because the vehicle was in an inaccessible area within a fragile mangrove and sand flat area. The removal required special machinery to retrieve the vehicle without causing further damage to the marine park. The owner of the vehicle was informed of his offence under Regulation 6(3)(a)(i) of the *Marine Park (Zoning) Regulations 2012* (which prohibits a person from depositing or leaving any litter, bottle, broken glass, china, pottery, plastic article, refuse or other waste material, except in an area receptacle provided for that purpose) and issued with a reparation order pursuant to section 40(1) of the Marine Parks Act 2007 for the cost incurred to retrieve the vehicle. At present the cost has not been repaid.

Measure 15.1l

Modification to Fishwatch operator's script and management practice, and subsequent number of offences reported to DEWNR that have been received through Fishwatch.

Assessment 15.1l

Public awareness and compliance of marine park zones is necessary to ensure their effectiveness. Citizens with concerns over fishing activities can report potential offences to Fishwatch. In 2015 Fishwatch changed their operator scripts to include a question asking whether or not the offence being reported was taking place within a marine park sanctuary zone:

- On average, Fishwatch receives 567 calls every year from citizens reporting various fishing offences in the marine environment (blue line on Figure 54).
- Between 2014/15 to 2016/17, an average of 43 calls (orange bars on Figure 54) were made annually that directly related to citizens concerned about breaches to marine park sanctuary zones. This is around 8 per cent (green dots Figure 54) of all calls to Fishwatch in this period and indicates that the community have an awareness of marine park sanctuary zones and support the role of marine parks (Figure 54). Data prior to this period is unavailable as sanctuary zones were not implemented until 1 October 2014.

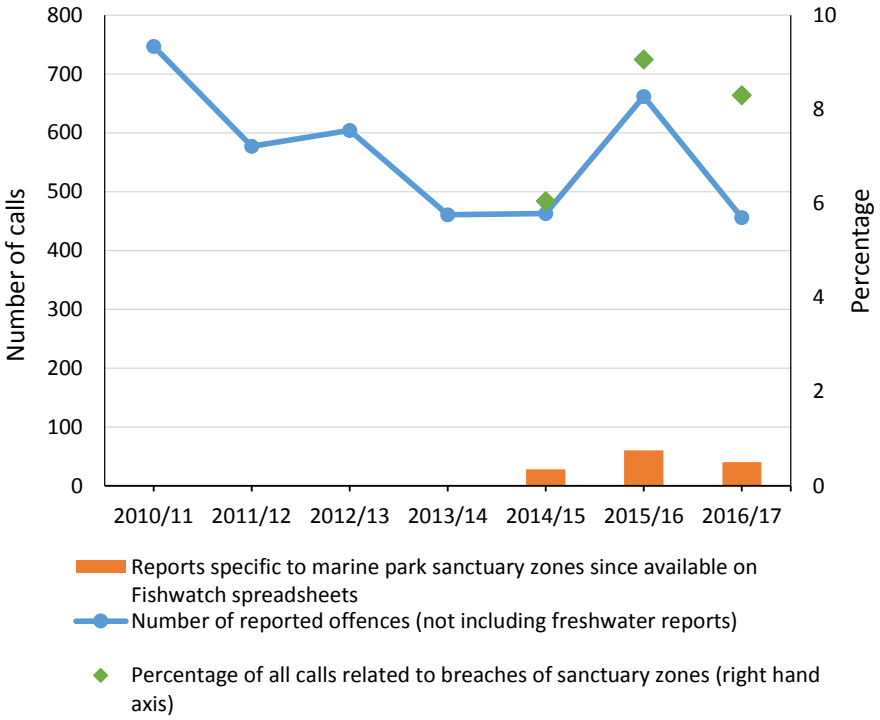


Figure 54. Call to Fishwatch related to breaches to fishery regulations in the marine environment. Blue line represents total calls. Orange bars represent total reports within marine parks. Green dots represent percentage of all calls that are related to offences in marine parks (right axis).

Most calls to Fishwatch regarding sanctuary zones occurred in 2015/16 (about double 2014/15 and two thirds 2016/2017). The sanctuary zones with the most calls are located in Encounter Marine Park with the majority of calls concerning offences in Noarlunga and Aldinga. 10 out of 19 parks have had at least one call since 2014/15 (Table 64). The parks where no offences have been phoned into Fishwatch are: Far West Coast Marine Park; Nuyts Archipelago Marine Park; Investigator Marine Park; Neptune Islands Group Marine Park; Gambier Islands Group Marine Park; Lower Yorke Peninsula Marine Park; Western Kangaroo Island Marine Park; Southern Kangaroo Island Marine Park and Lower South East Marine Park.

A comparison of calls to existing aquatic reserves (Aldinga and Noarlunga) that are now marine park sanctuary zones shows that there was an increase in calls to Noarlunga and Aldinga protected areas post-2012 when the marine parks zones were proclaimed. Prior to the implementation of fishing restrictions in sanctuary zones on 1 October 2014, calls regarding Aldinga and Noarlunga sanctuary zones averaged 6 and 7 per year respectively (1.25 and 1.09 per cent of all offence calls respectively). Between 2014/15 to 2016/17 (i.e. post full implementation of sanctuary zones) calls increased slightly for Noarlunga with an average of 13 calls reporting sanctuary zone breaches (2.38 per cent), while average calls regarding Aldinga were higher between 2014/15 to 2016/17 (9 calls, 1.74 per cent) than 2010/11 to 2013/14, although 2015/16 and 2016/17 are lower than the three years preceding (Figure 55).

Table 64. Annual summary of calls to Fishwatch sorted by marine park

Marine Park	2014/15	2015/16	2016/17	Total
West Coast Bays Marine Park		**1**		**1**
Venus Bay*		1		1
Thorny Passage Marine Park		**7**	**2**	**9**
Coffin Bay		7	1	8
Sleaford Bay			1	1
Sir Joseph Banks Group Marine Park	**1**	**1**	**1**	**3**
Salt Creek	1			1
Second creek		1		1
Not specified*			1	1
Franklin Harbor Marine Park			**1**	**1**
Port Gibbon			1	1
Upper Spencer Gulf Marine Park	**2**	**7**	**4**	**13**
Cuttlefish Coast	1	2	2	5
Head of the Gulf		3		3
Cowleds Landing	1	1	2	4
Blanche Harbour	1	1		2
Eastern Spencer Gulf Marine Park		**1**	**1**	**2**
Goose Island			1	1
Pt Victoria Bay		1		1
Southern Spencer Gulf Marine Park			**1**	**1**
Chinamans Hat			1	1
Upper Gulf St. Vincent Marine Park	**5**	**6**	**1**	**12**
Offshore Ardrossan	4	2		6
Clinton wetlands		3		3
Light River Delta		1	1	2
Encounter Marine Park	**19**	**35**	**29**	**83**
Noarlunga Reef	6	17	16	39
Aldinga reef	10	10	10	30
West Island	3	1	1	5
Rapid Head		3	1	4
Carrickalinga Cliffs		1		1
Encounter Bay		2	1	3
Pelican Lagoon		1		1
Upper South East Marine Park		**2**		**2**
Cape Dombey		1		1
Coorong Beach		1		1
Total	**28**	**60**	**40**	**127**

*Actual Sanctuary zone not identified in fishwatch data.

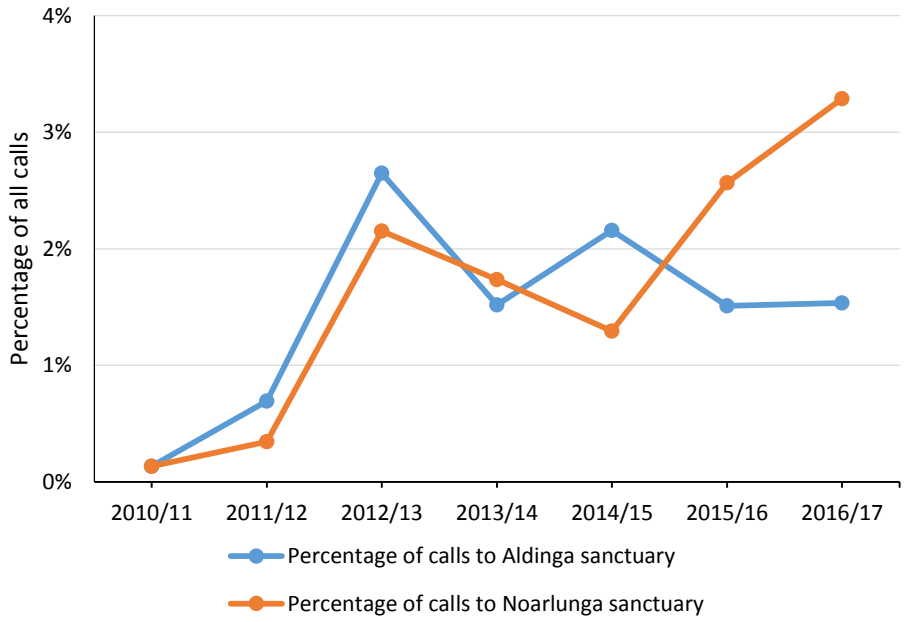


Figure 55. Average calls to Fishwatch regarding offences at Aldinga and Noarlunga Sanctuary Zones

Measure 15.1m

Number, type and location of marine park compliance offences and incidents reported

Assessment 15.1m

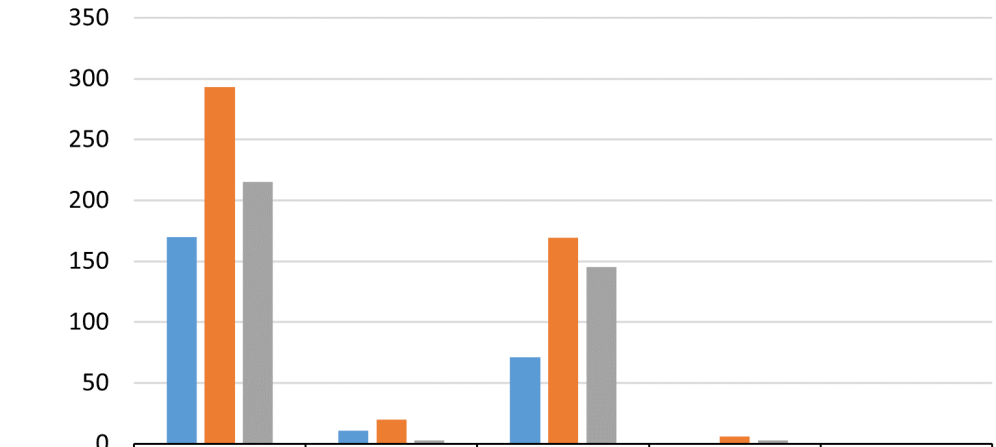
There were 215 compliance incidents reported by or to DEWNR in 2016/2017 (Figure 56). The highest number of these incidences were reported from Noarlunga (45) and Aldinga (38) sanctuary zones in the Encounter Marine Park, and Cape Elizabeth (22) sanctuary zone in the Eastern Spencer Gulf Marine Park. In total, 35 sanctuary zones (42 per cent) had incidents reported. Refer to Figure 56 for incident reports; education letters; warnings etc in previous years.

Measure 15.1n

Number of warnings, expiations and prosecutions

Assessment 15.1n

Over the three years compliance had been in operation, there have been a total of 678 incidents reported, as well as 34 education letters, 385 warnings and 9 expiations issued. To date there have been no prosecutions (Figure 56). There have been 30 prosecutions under the Historic Shipwrecks Act 1981 resulting from marine park patrols of the Offshore Ardrossan sanctuary zone. In 2016/17 there were 145 official warnings (a 16 per cent decrease from the previous year). All but one warning was for recreational fishing offences. A large number of warnings (80 or 55%) were associated with the Encounter Marine Park. Warnings at the Offshore Ardrossan SZ (*Zanoni*) declined from 48 in 2014/15 to 7 in 2015/16 and then to 2 in 2016/17.



	Reports	Education	Warning	Expiation	Prosecution
2014/15	170	11	71	0	0
2015/16	293	20	169	6	0
2016/17	215	3	145	3	0

Figure 56. Marine park Compliance incident reports, education letters; warnings; expiations and prosecutions

9.6 Key findings

Multiple activities have been undertaken against all 15 of the management plan strategies as outlined and planned in the Program Logic (see Scholz et al. 2016). As highlighted in the component framework (Figure 7) by undertaking these activities it is predicted that this will result in changes in ecological and socio-economic values (see next Sections 10 and 11).

A summary of activities in the five years between 2012 and 2017, includes:

- A total of 160 permits have been issued since the marine park management plans were implemented, 94 of these were for research.
- 71 marine park events reaching over 23,000 students at 17 schools have taken place since 2012/13.
- An extensive recreational fishing education program has circulated over 300,000 copies of the Recreational Fishing Guide. Around 10,000 South Australian recreational fishing guide apps are downloaded annually providing access to information on the locations of sanctuary zones.
- Since 2014/15 there has been over 120 marine-park related community events reaching over 77,000 people.
- The Marine Parks team have given almost 130 oral presentations promoting marine parks to over 6000 community members.
- 26 citizen science projects have been undertaken involving approximately 500 community members.
- Implemented the largest ongoing marine biodiversity monitoring program in the state's history.
- Completed the first major marine biodiversity expedition to the states iconic offshore islands since 2008.
- Underwater Visual Census (UVC) monitoring has been undertaken in 11 Sanctuary Zones (SZ) across 7 marine parks with a total of 120 surveys.
- Baited Remote Underwater Video Systems (BRUVS) monitoring commenced in 2014 and has been undertaken in 14 SZs across 10 marine parks with a total of 496 surveys.
- Inventory mapping has been completed for 18 Sanctuary Zones and partially completed for another two.
- Since 2014/2015, $240,300 has been approved to fund 12 research partnership projects with universities.
- Interviewed over 2000 people in annual phone surveys to gauge public support for and perceptions of marine parks in South Australia.
- 107 marine park zoning signs were placed across the state at popular locations such as beach entry points and boat ramps to help maximise voluntary compliance.
- A total of 7299 shore, boat and aerial compliance patrols have been conducted since November 2014 when sanctuary zones were fully implemented. As of 30 June 2017, there have been 678 incidents identified, and 34 education letters, 385 warnings and 9 expiation notices issued.

9.7 Case studies 1–6

Case study 1 Ocean Eyre

Case study 2. Using a remotely piloted aircraft (RPA) to research marine mammals

Case study 3. Recreational fishing and marine parks

Case study 4. Experiencing marine sanctuaries

Case study 5. Encounter Marine Park social perceptions

Case study 6. Zanoni historic shipwreck

Case study 1: Ocean Eyre

Background

Connecting to the environment

Eyre Peninsula, South Australia, is home to nine marine parks including Thorny Passage Marine Park and the Sir Joseph Banks Marine Park. In 2014, a community project began on the Eyre Peninsula titled "Marine Parks: creating a lasting connection with the ocean", referred to as Ocean Eyre. The aim was to connect school students with their coastal environment through teaching them about local threats to the environment and the tools used to provide protection, such as marine parks and sanctuary zones.

This case study highlights the Ocean Eyre project, the links with marine park management plan strategies, and the ecological and socio-economic outcomes as a result of both marine park management plans.

The project

The students from three Eyre Peninsula schools went on expeditions to Wreck Beach near Sleaford Bay Sanctuary Zone in Thorny Passage Marine Park (2014), and Point Bolingbroke Sanctuary Zone in Sir Joseph Banks Group Marine Park (2015), where they were involved in both Aboriginal and western scientific activities. The project aimed to use science, connection and experiences to create advocacy. Students were involved in Barngarla cultural sessions, where they learnt about connection to Country, how Barngarla people used Aboriginal science such as fish traps and astronomy, as well as learning about language, art and making traditional food.

The students were also involved in beach BioBlitzes, which included beach profile surveys, as well as coastal vegetation and bird surveys. The beach profile survey was based on a citizen science program designed to train students in a Rapid Assessment Method to help assess life on beaches. As traditional beach life survey methods are time consuming and most of the animals and plants that live at the beach actually live in the sand, they are difficult to find and monitor. This method provides a way to predict biodiversity levels by measuring such things as the width and slope of the beach, and sand grain size. The Assessment results were then incorporated into the marine parks monitoring, evaluation and reporting program.

Students came away with a sense of pride and empowerment, inspired to help to protect this amazing natural environment. To find out more watch this video at **https://youtu.be/djZM3WM2T7w**

Management plan strategies

Strategies addressed					
5	**7**	**8**	**9**	**11**	**14**
✓	✓	✓	✓	✓	✓

Strategies 5, 7 and 8: Conducting collaborative research and communicating results will aid in increasing public appreciation, and understanding. The project increased the students understanding of plants and animals living in their coastal environment.

Strategies 9 and 14: The project connected students to the local Barngarla people, creating a greater awareness of how this group use and value the plants and animals in the local area. This was achieved by students hearing stories and people speaking in the Barngarla language, and learning about using traditional fish traps and other traditional activities.

Strategy 11: The project also successfully formed a partnership that supports the implementation of the MER Program by involving community members in the management and monitoring of the marine park. It is expected that this program model could be implemented across South Australia in other marine park sanctuary zones.

Students learning from the Barngarla people

Ecological outcomes

Specific evaluation questions addressed:

✓ What biodiversity is included within the marine parks network?

The results from this project made a positive contribution to the marine parks monitoring, evaluation and reporting program by providing baseline information about the coastal flora and fauna within the marine park. Collecting baseline information is important in order to be able to assess changes within marine parks over time.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

The students experienced how people such as scientists, natural resource management officers, and local Aboriginals connected with and protecting the local environment. These experiences ensured that they created their own unique connection with the natural environment. Creating a lasting connection to the environment during childhood is important to ensure they become advocates for the environment as adults. This work gave the students a variety of opportunities to learn about their local coastal environment and the plants and animals that live there. Understanding the environment is an important step in creating positive changes in community attitudes towards the coastal and broader environment.

Students learning how to survey birds and coastal biodiversity

Students monitoring in marine parks

Students learning from the Barngarla people

Case study 2: Using a remotely piloted aircraft (RPA) to research marine mammals

Background

Marine parks were designed to include many species of conservation importance. One of the most iconic is the southern right whale, which migrates to areas of South Australia, the most significant being the Great Australian Bight, for breeding and calving. The Bunda Cliffs, at the Head of the Bight, also include important haul-out and breeding sites for Australian sea lions. Our understanding of marine mammal ecology and behaviours is limited, largely due to difficulties in accessing them. Animals inhabit offshore islands and often remote on-shore locations. Approaching them can result in negative impacts on their behaviours, particularly when young animals are involved. The Head of Bight is world renowned as a habitat for southern right whales (SRW) and Australian sea lions (ASL), but it is difficult to access these animals due to rough waters and inaccessible cliffs. To overcome this, DEWNR has worked collaboratively with university researchers to find ways to use remotely piloted aircraft (RPA) (aka drones) to do this work.

In 2016, Dr Fredrik Christiansen from Murdoch University began a project to use RPAs to gain an understanding of the health of the southern right whale population, especially the relationship between mother and calf body condition Climate-driven indirect effects on the whales' prey is becoming a growing concern. These whales feed mainly in the sub- Antarctic, and the amount of prey available will dictate how much energy a female will have available for reproduction. In addition, work was done to consider the impacts of using RPAs on the whales. The use of RPAs in a Restricted Access Zone for research required a DEWNR Marine Parks permit. The success of this work inspired DEWNR to begin a second project to use RPAs to count Australian sea lions located in breeding colonies and haul out sites in the Bunda Cliffs at the Head of Bight.

This case study highlights the two projects using RPAs, the links with the marine park management plan strategies, and some early socio-economic and ecological outcomes as a result of implementation of the management plans.

Methods

Southern right whale project

During winter, the Head of the Bight is an important breeding and nursing ground for southern right whales, where more

Southern right whale and calf at the Head of the Bight

whales are found here, particularly mothers and calves, than anywhere else in Australia. The whales are observed less than 500 m from the coast so RPAs can be used to photograph them. A small multi-rotor RPA mounted with digital cameras was operated from the cliffs of the Bight up to 2 km offshore, between 5 and 120 m above sea level.

Up to 300 whales of all ages were photographed, but the particular aim was to photograph females with calves, so that the relative body condition of the females could be related to the length and condition of her calf. When possible, repeated measurements were taken of the same whale at various times to investigate changes in body condition.

In addition, while flying the RPA, researchers used a reaction scale to assess whale responses, ranging from no reaction to strong reaction, and modified the use of the RPA accordingly. When a strong reaction was observed, work on that animal was immediately stopped and not resumed for the rest of the day.

Australian sea lion project

Following the success of the whale research, in 2017 as part of long term ASL monitoring, DEWNR in collaboration with SARDI used an RPA to count sea lions along the Bunda cliffs. This enabled the inclusion of previously unobtainable animals, including mothers and pups. RPAs were used on average at 50 m above sea level with little response from the animals observed.

Results

Southern right whale project

More than 90 mother/calf pairs were recorded at the Head of Bight, and a preliminary analysis shows a strong relationship between maternal body condition and calf growth rates.

The aim is to monitor the southern right whale population at the Bight over four years to quantify changes in their body condition, and how this relates to environmental variables in the sub-Antarctic. This will increase Australian and international understanding about the ongoing health of this population.

Australian sea lion project

The early results of the sea lion count show both a significant increase in numbers and previously unknown locations of animals in the Bunda Cliffs, which greatly improves our understanding of the health of this population.

Management plan strategies

Activities associated with the two RPA projects have addressed numerous strategies of the marine park management plans:

Strategies addressed									
2	**4**	**5**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Strategy 2: Understanding the requirements of marine mammals is important for helping to understand and mitigate threats.

Strategy 4: The marine parks program supported this work by providing permits under the Marine Parks Act 2007 which included conditions to ensure impacts on animals and the environment were mitigated.

Strategies 5, 7 and 8: Conducting collaborative research and communicating results will aid in increasing public appreciation and understanding.

Strategy 9: Aboriginal communities were involved with the southern right whale RPA projects.

Strategies 10, 11, 12 and 13: Outcomes from the two projects will inform the MER Program. The projects were collaborations that have informed better decisions on monitoring of southern right whales and Australian sea lions.

Ecological outcomes

Specific evaluation question addressed:

- ✓ What biodiversity is included within the marine parks network?
- ✓ Have sanctuary zones maintained or enhanced biodiversity and habitats?

These projects increase Australian and international understanding about the ongoing health and abundance of southern right whale and Australian sea lion populations. Populations of SRW and ASL are predicted to maintain their current status inside the Restricted Access and Sanctuary Zones and the RPA projects will assist with monitoring these population trends.

Socio-economic outcomes

Specific evaluation question addressed:

- ✓ Have local businesses and communities changed due to marine park management plans?
- ✓ Has tourism changed due to marine parks?

Both projects are providing information about whale and sea lion responses to RPAs which will guide Australian and international researchers in future work. Research into the wellbeing and protection of breeding sites ensures a viable tourism industry into the future. Photographs obtained from both projects may be used for a wide range of community education materials.

References

Christiansen F, Rojano-Doñate L, Madsen PT and Bejder L (2016) Noise Levels of Multi-Rotor Unmanned Aerial Vehicles with Implications for Potential Underwater Impacts on Marine Mammals

Australian sea lions

Head of the Bight is an important calving area

Case study 3: Recreational fishing and marine parks

Background

Fishing is a popular past time for South Australians. About 1 in 5 people (277,000) partake in recreational fishing each year and fish for a total of about 1 million days annually. The estimated annual catch of targeted species like King George whiting, garfish, snapper, Australian herring, Australian salmon, southern calamary and blue swimmer crab accounts for 23–58 per cent of the total annual catch (commercial and recreational, Giri & Hall 2015).

Recreational fishing is encouraged and promoted in marine parks in those zones where fishing is allowed. Within the 19 marine parks, over 86 per cent of the marine parks (or 94 per cent of state waters) is still open to fishing. Sanctuary zones and restricted access zones are closed to fishing, but in some (15) sanctuary zones shore based line fishing is still allowed.

Following full implementation of the sanctuary zones in 2014, a number of election commitments were made and A$3.25 million pledged to promote opportunities for recreational fishing. These initiatives included the formation of a recreational fishing grants program, the opening and stocking of offline freshwater reservoirs, and the creation of an artificial reef. This case study highlights the three initiatives, other promotional and monitoring activities undertaken by DEWNR, links with the marine park management plan strategies, and socio-economic and ecological outcomes as a result of the initiatives and implementation of the management plans.

Grants program and promotional activities

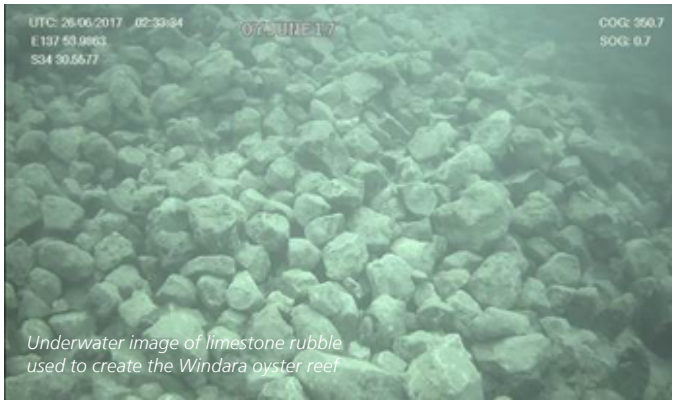
Between 2015 and 2017, DEWNR committed to fund up to $750,000 annually to increase recreational fishing opportunities and facilities across the state. Since 2015, 107 projects have received, or have been approved to receive, $1,994,593 in recreational fishing grants across the state. The funded projects have also attracted a further $1.5 million in co-contributions from councils and other funding bodies. The recreational fishing grants have contributed to upgrading facilities and access to popular fishing areas with projects such as modifying rock walls to improve access, and providing shelters and fish cleaning stations. The grants have also funded social events and fish stocking programs.

DEWNR have also promoted fishing in marine parks by providing over 300,000 recreational fishing guides, and attending numerous shows such as World Environment Day and the Royal Adelaide Show. These activities are aimed at informing the public about what they can do and where they can fish in marine parks.

Reservoirs

To increase fishing opportunities for South Australia's anglers, two reservoirs have been opened for recreational fishing (Williamstown and Bundaleer Reservoirs) and three more reservoirs are proposed to be opened (Tod, Aroona and Beetaloo Reservoirs). The Government of South Australia allocated up to $400,000 to improve access with a further $210,000 from the Australian Government to improve access and amenities at the proposed fishing sites.

Funding for stocking reservoirs was secured through the recreational fishing grants. A total of 209,300 fish at a cost of around $205,100 have been, or are proposed to be, stocked into the five reservoirs from DEWNR grants. The reservoirs will be stocked with a variety of native fish such as Murray cod, silver perch, golden perch and Australian bass. The Bundaleer will also be stocked with rainbow trout. Co-funding provided to RecFish SA means that additional fish will be able to be purchased and stocked into these reservoirs. In addition to this, a further 238,000 Murray cod at a cost of $250,000 are funded to be stocked into the South Australian section of the River Murray Approximately $450,000 will be invested in fish stocking.



Underwater image of limestone rubble used to create the Windara oyster reef

Windara Reef

The government is investing $600,000 towards restoring the native oyster beds in Gulf St Vincent that were prevalent before European settlement. The project is a collaboration between DEWNR, PIRSA, SARDI, DPTI, EPA, SATC,

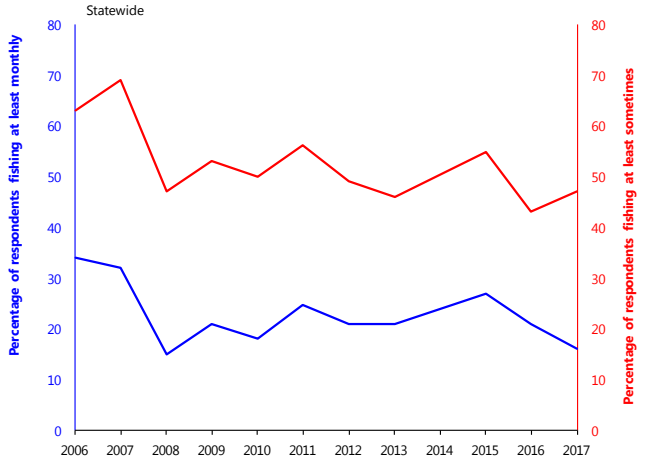
RecFish SA, the University of Adelaide, Yorke Peninsula Council, South Australian Oyster Growers Association, Natural Resources Northern and Yorke, and the Nature Conservancy.

Stage 1 was completed in August 2017 which saw 4 hectares of reef submerged near Rogues Point, south of Ardrossan. The reef is planned to be seeded with native oysters by the end of 2017.

Stage 2 of the project is to expand the reef to 20 hectares and is proposed to be completed by the end of 2018. Government funding has been used to leverage further funding from the Australian government and the Nature Conservancy to a total of $4.2 million to complete Stages 1 and 2.

Participation

Regular phone surveys are conducted to monitor support for marine parks and the level of participation in various marine recreational activities including fishing. The percentage of marine users who go fishing regularly or occasionally has varied annually but has remained stable since 2008, and since 2014 when sanctuary zones were fully implemented (see graph).



Management plan strategies

Activities associated with recreational fishing have addressed several strategies of the marine park management plans:

Strategies addressed			
5	**7**	**10**	**12**
✓	✓	✓	✓

Strategies 5 and 7: During the implementation phase of marine parks, the grants, reservoir and artificial reef initiatives were undertaken to provide positive offsets and promotional activities were undertaken to educate people. Either directly or indirectly these activities should assist in allowing public appreciation, understanding and enjoyment of marine parks to continue and grow.

Strategies 10 and 12: The participation surveys are undertaken as part of the marine parks MER Program as identified in the MER Plan. The results support the predictions of change for the 19 management plans, i.e. that there would be no change from the current (pre-2014) trend in recreation and fishing participation. The outcomes of the study are being made publically available in the current Status Report and will be used to inform whether it is necessary to continue monitoring participation as part of the MER Program beyond 2017.

Ecological outcomes

While the shellfish reef is outside of any sanctuary zone and can be fished, the project aims to increase reef habitat and restore lost native oyster populations. The future increase in habitat will have many benefits for marine species, providing food and shelter and increasing ecosystem resilience.

The reservoirs provide new, alternative locations for fishing outside of the marine environment thereby reducing potential impacts of displaced effort and increased pressure on fish stocks in areas outside of sanctuary zones

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

The successful delivery of the grants program and creation of Windara Reef have increased the recreational fishing opportunities within and around marine parks and thus promoted greater use of the environment. This likely has flow on effects such as increasing understanding and appreciation of the marine environment.

Including co-contributions, over $3 million has been invested into recreational fishing. Improving fishing facilities will allow fishing related tourism to expand and provide a way for families and individuals to enjoy the marine park environment in line with the *Healthy Parks Healthy People SA* policy found at www.environment.sa.gov.au/files/sharedassets/public/park_management/healthy-parks-healthy-people-gen.pdf.

Participation in fishing activities has not changed since the full implementation of sanctuary zones on 1 October 2014 suggesting that sanctuary zones have not had a negative impact on fishing participation.

A large amount of investment has been put into creating new opportunities for recreational fishing, and in minimising impacts through the zoning process, and it is anticipated that these initiatives have offset the relatively small loss of fishing grounds due to sanctuary zones.

References

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

Case study 4: Experiencing Marine Sanctuaries

Background

Providing opportunities for public appreciation, involvement, education, understanding and enjoyment of marine environments is central to the success of South Australia's marine parks network, and is integral to the implementation of marine park management plans. To help achieve this, marine parks supports the non-government organisation known as Experiencing Marine Sanctuaries Inc. (EMS). EMS provides safe and supervised snorkelling experiences in South Australia's marine parks. EMS is an incorporated, not-for-profit, non-government organisation run by a management committee of volunteers with diving, marine biology and community engagement backgrounds. EMS is based on (with permission) the highly successful New Zealand program Experiencing Marine Reserves, which has been running for over 13 years.

EMS is supported by the Department of Environment, Water and Natural Resources, Natural Resources Adelaide and Mount Lofty Ranges and Natural Resources Eyre Peninsula. EMS also receives in-kind and monetary support from other organisations.

EMS provides an experiential program for school students and community members to help achieve better protection of the marine environment through education and advocacy. An important component of this work is to give students and their parents a safe and professionally supervised experience in the marine environment. Whenever possible, this includes experiencing both unprotected marine environments and marine sanctuary zones, with particular emphasis on comparing the diversity and abundance of organisms in each location. Having a ratio of one adult to two students assists with supervision, ensures a strong connection with the community, and also builds intergenerational links.

Snorkelling with cuttlefish in the Cuttlefish Coast Sanctuary Zone

EMS
experiencing
marine sanctuaries

EMS experiences

Snorkelling experiences include:

- Swimming with cuttlefish in Upper Spencer Gulf Marine Park (About 400 participants since 2016)
- Visiting various sites in Encounter Marine Park including Port Noarlunga Reef Sanctuary Zone, Second Valley, Victor Harbor, Port Willunga and Rapid Bay Jetty (Over 1200 participants since 2015)
- Snorkelling at Tumby Bay Jetty in Sir Joseph Banks Group Marine Park (100 participants since 2016) and other sites across Eyre Peninsula including Streaky Bay and Smooth Pool.

Future opportunities

Citizen science - In future, participants may collect fish abundance and diversity data while participating in a snorkel experience using the Reef Watch Fish Survey method. Fish sightings are recorded directly on a waterproof fish slate.

School education - EMS and Natural Resources Management Education will work together to provide professional development opportunities, curriculum links and access to existing marine science resources for teachers.

Fun in the summer - EMS will work closely with summer school holiday programs, NaturePlay SA, DEWNR's Park of the month program and Reef Watch to run community snorkel experiences.

Management plan strategies

Strategies addressed				
5	6	7	8	11
✓	✓	✓	✓	✓

The EMS program addresses a number of management plan strategies. The program provides public education, appreciation, understanding and enjoyment of the marine parks, as well as opportunities for nature based tourism. It achieves this through partnerships with stakeholders and community members in the day to day management and monitoring of the marine parks.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Has coastal recreation changed due to marine park management plans?

✓ Has tourism changed due to marine parks?

The EMS program provides inexperienced snorkelers with a safe and educational outlet to learn and enjoy more about marine parks. There is potential for this type of activity to make positive contributions to local economies. For example about 240 snorkelers joined EMS to see the giant Australian cuttlefish in Upper Spencer Gulf Marine Park, near Whyalla, in July 2017. An economic assessment of the event using the RISE model indicated that the event contributed an estimated A$24,000–$36,000 to gross regional product and supported between 0.19 and 0.28 FTE jobs.

Participants' feedback (from EMS Facebook site)

Thanks to everyone at EMS for a brilliant session snorkelling amongst the giant cuttlefish! A long-dreamed of, truly magical experience that I'm sure I will return for-and want to share with more of my friends. Love your work! 8 July 2017

Very well organised, guides and shore volunteers are all so passionate and knowledgeable about the marine sanctuaries. Equipment provided is good quality too. Excellent! 2 May 2017

Wonderful experience - very friendly professional people running the tours, so happy we were provided with all the gear. We felt very safe and had amazing time. Kids did not want to get out of water. Thank you! 1 February 2017

Well organised. Safety is paramount. Get to appreciate our stunning marine environment with expert guides. Very patient and supportive of those snorkeling for the first time. 11 January 2017.

EMS participants at Port Noarlunga

EMS participants at Port Noarlunga


Cuttlefish aggregate and spawn in the Cuttlefish Coast Sanctuary Zone

Case study 5: Encounter Marine Park social perceptions


Image credit Jason Tyndall

Background

The Marine Parks Research Program is complementary to the MER Program, it aims to both build partnerships with the research community and provide an additional and external source of skills and experience to inform the management of Marine Parks. A Marine Parks research prospectus, 'Forging the Links' was released In 2013 describing marine park research priorities under three themes:

- ecological systems: status and processes
- communities: social, cultural and economic values and assets
- management effectiveness.

A key concept of the research prospectus is creating strong inter-disciplinary links between the themes, particularly the communities and ecological systems themes. Understanding the connections between people and the natural world is important for the success of all of our marine parks. Community stewardship is a central object within the South Australian *Marine Parks Act 2007,* and in 2012 the South Australian Marine Parks Council endorsed community stewardship as both a method and the goal for ensuring that South Australia's marine parks will be effective and successful.

In 2016 a social research project was commissioned to investigate the socio-cultural dimensions of determining marine park effectiveness in the Encounter Marine Park. This research is the first in South Australia to investigate the social dimension of stewardship creation for marine parks. It provides some understanding and reasons behind whether and how community ownership is developing for the Encounter Marine Park.

This case study highlights the social research project, the links with the marine park management plan strategies, and the socio-economic outcomes as a result of implementation of the marine park management plans.

The Research

Methods

The research project "An investigation into the socio-cultural dimension of determining MPA effectiveness" was conducted by Flinders University and lead by Associate Professor Beverley Clarke. The research set out to explore perceptions of success held by communities adjacent to the Encounter Marine Park, and stakeholder groups engaged in the implementation and ongoing management of the park. It was also an aim of the study to investigate whether different groups have different perceptions about success and dimensions of success. This research involved collaborative funding from the Wildlife Conservation Fund and the DEWNR marine parks program.

Forty-one individuals and four focus groups (consisting of 32 individuals) were interviewed to gain a greater understanding of how the community 'perceive success' of the Encounter Marine Park and how they would measure it. Of the four focus groups, two consisted of participants with either commercial or recreational fishing interest, and two consisted of participants with conservation interest. The 41 individuals were interviewed between April and November 2015, and the four focus groups took place between September and October 2015.

Results

The research identified the following:

- In broad terms the Encounter Marine Park meets fundamental conditions needed for success. The park is generally perceived to already be successful and to have a range of potential, as well as already realised benefits.
- Increased tourism was the most commonly expressed socio-economic benefit perceived.

Stewardship and community involvement in the marine park's ongoing management was of importance to respondents across the stakeholder groups. Groups indicated the need for more signage at marine parks, and more communication of marine park events, news, monitoring outcomes and education programs. It was also observed that while study participants understood potential economic benefits of the marine park, more needs to be done to promote the social benefits of the marine park.

Community support was considered to be integral to the park's success. It is expected that the existence and promotion of the marine park will lead to enhanced community understanding, and realisation of the parks ecological and social benefits. However, success of the park will be dependent upon engagement by DEWNR with the local community, which will to some extent, be dependent on ongoing resourcing for community engagement, communication, management, monitoring and enforcement.

To capture aspects of success that matter to the wider community, there is a need for indicators canvassing a wide range of parameters, however datasets for indicators of success, specific to a local marine park, may not be readily available.

Management plan strategies

Strategies addressed				
5	**6**	**11**	**12**	**13**
✓	✓	✓	✓	✓

Strategies 5 and 6: Through stakeholder engagement, this research helps the marine parks program understand how to cater for and promote nature based activities in marine parks to the public.

Strategies 11, 12 and 13: Outcomes from the research informed the MER Program, assisting in social research techniques and informing adaptive management.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

✓ Has coastal recreation changed due to marine park management plans?

This research will help the marine parks program to develop products and stewardship activities to assist in increasing public appreciation and understanding. This will ultimately lead to greater awareness and enjoyment of the marine park by the public, and potentially increase recreation and local tourism.

Community enjoying marine parks

References

Clarke B., Thurstan R., Yates K. L., (2016) An investigation into the socio-cultural dimension of determining MPA effectiveness. Report prepared for Department of Environment, Water and Natural Resources, Adelaide.

Case study 6: Zanoni Historic shipwreck

Background

The Zanoni was a 44m, 338t, 1865-built barque that sank in a freak storm while travelling from Ardrossan to Port Adelaide inb South Australia in 1867. The Zanoni wreck was discovered in 1983 and is now recognised as the most complete wreck of a 19th century trading vessel in South Australian waters. The wreck is protected under the *Historic Shipwrecks Act 1981* and all activities including taking a vessel into the protected zone are prohibited. In addition, since October 2012, the site of the Zanoni has been included within the Offshore Ardrossan Sanctuary Zone as part of the Upper Gulf St Vincent Marine Park (UGSVMP) management plan. Despite being protected by two legislative Acts, the wreck has sustained damage as a result of vessels anchoring and fishing at the site. In March 2015, there was an increase in community concern regarding offences at the wreck site.

This case study highlights compliance and protection activities at Zanoni, the links with the UGSVMP management plan strategies, and the socio-economic and ecological outcomes as a result of implementation of the management plan.

Improving compliance at the Zanoni

In response to community concern, DEWNR and PIRSA increased patrols to the area and witnessed up to 13 boats at the wreck site on a single visit. Targeted education of boat owners was undertaken with a total of 130 vessels engaged. This included 11 commercial vessels (marine scale fishers) and included vessels leaving from ramps in Ardrossan, as well as from the other side of Gulf St Vincent at North Haven and St Kilda. Through aerial and boat patrols, vessels breaching sanctuary zones are able to be identified and prosecuted. To date, there have been 30 prosecutions for breaches at the Zanoni site.

Since the targeted patrolling and education efforts in 2015, subsequent patrols through busy periods such as Christmas and New Year by DEWNR, PIRSA and SAPOL usually result in just a single vessel on the wreck at any time. Patrols during Easter 2017 reported no offenders at the wreck site, suggesting that education efforts are having a positive impact. Commercial fishing at the site continues to be reported but as yet no commercial offenders have been intercepted.

The Zanoni is also an attractive site for divers who may enter the 550m exclusion zone under a permit issued by DEWNR. Since marine parks were introduced in 2012 the number of vessel permits has averaged about 5 per year. Permitting allows divers to enjoy diving on the Zanoni wreck but in a manner that does not damage the wreck.

Targeted boat ramp Zanoni education	
Location	**No. of boat owners**
Ardrossan	45
North Haven	62
St Kilda	23

Management plan strategies

Activities associated with Zanoni have addressed multiple strategies of the UGSVMP management plan:

Strategies addressed								
1	**2**	**4**	**5**	**6**	**7**	**8**	**10**	**15**
✓	✓	✓	✓	✓	✓	✓	✓	✓

Strategies 1 and 2: Through targeted compliance activities the incidence of illegal fishing and boating activity at the Zanoni has decreased, thus mitigating threats to the biodiversity and habitats of the Offshore Ardrossan SZ.

Diving at the Zanoni wreck

Strategies 4, 5 and 6: A permitting system is in place to allow boats to enter the zone for research or sustainable tourism activities such as scuba diving.

Strategies 5 and 7: Education on marine parks and the Zanoni wreck has been implemented through educational signs, boat ramp outreaches and regular patrols to the area.

Strategy 8: Local community members have taken ownership for the Zanoni and voiced concern about non-compliance which lead to "Operation Open Season" being implemented.

Strategy 10: Baited Remote Underwater Video Systems (BRUVS) monitoring as part of the MER plan is conducted at the site.

Strategy 15: The compliance strategy is being implemented to ensure voluntary compliance and prosecution of offenders.

Ecological outcomes

Specific evaluation questions addressed:

✓ What biodiversity is included within the marine parks network?

The wreck is a haven for recreationally and commercially important fish species such as snapper. Recent studies on snapper movement have shown that in winter, snapper show strong site attachment around the Zanoni wreck before moving off in spring. The study provided good evidence of the effectiveness of well-placed sanctuary zones (Fowler et al. 2017). The ongoing marine parks MER Program is using BRUVS to monitor for changes in fish populations, including snapper that may be due to the UGSVMP management plan.

Enforcing compliance around the wreck is important to protect the artificial reef habitat that houses a range of species, as anchor chains and fishing activity can damage the habitat. It is envisaged that this protection will have a positive ecological outcome.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have European heritage values changed due to marine park management plans?

The UGSVMP management plan (through the Offshore Ardrossan Sanctuary Zone) helps to protect the structural integrity of the Zanoni wreck by ensuring boating activity does not damage the site. Since implementation of the management plan the number of illegal boating incidences has declined and the plan has therefore had a positive effect on the Zanoni wreck.

References

Fowler, A.J., Huveneers, C. and Lloyd, M.T. (2017). Insights into movement behaviour of snapper (*Chrysophrys auratus*, Sparidae) from a large acoustic array. Marine and Freshwater Research, 68, 1438-1453.

Fishing gear and anchor damage on the Zanoni wreck

A moonlighter fish at the Zanoni wreck

10 Ecological monitoring and ongoing trends

10.1 Overview

Understanding the ecological dimension of implementing South Australia's 19 marine park management plans, including what biodiversity occurs within the network and how it interacts with external drivers and human pressures, is essential for long-term planning, and for evaluating the outcomes of management decisions. Information on ecological change is therefore required for the evaluation of the implementation of the plans and contributes to Step 2 of the evaluation; to determine if the predicted changes in ecological values were observed (see Section 2.2, Figure 57).

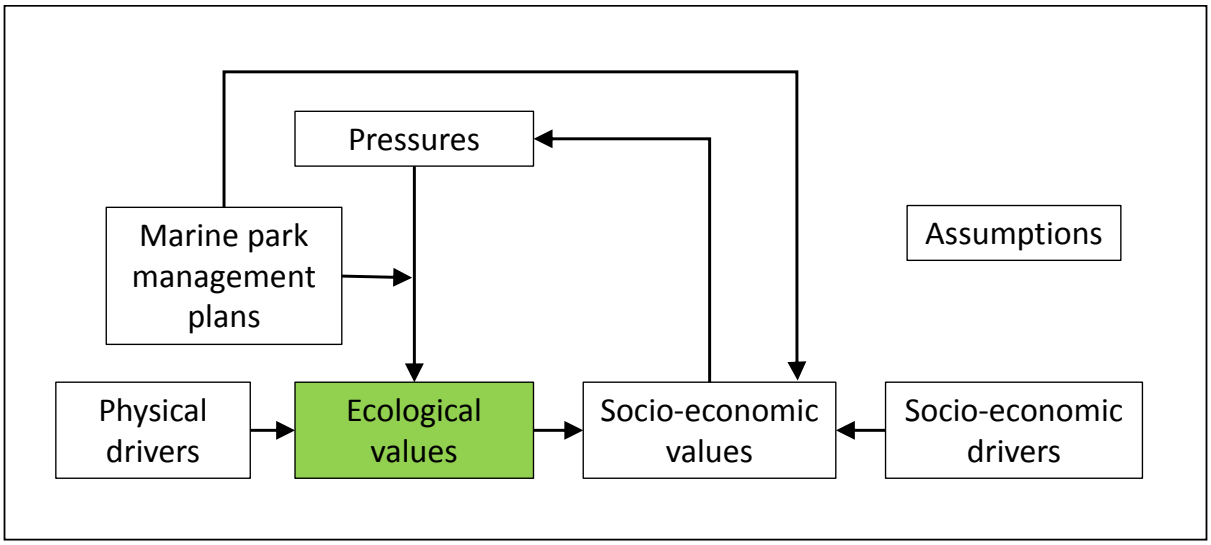


Figure 57. Framework for the seven components of the marine parks monitoring, evaluation and reporting program highlighting the ecological values component which is addressed in this section. See Section 2.2 for further details of the framework

This chapter documents information collected from monitoring of ecological indicators against each of the specific evaluation questions outlined in Section 5 (Table 65). These SEQs guide the ecological monitoring that is undertaken and the type of data that is collected. Ecological indicators that were identified in the Monitoring, Evaluation and Reporting Plan (MER Plan, Bryars et al. 2017a) provide the framework and structure for how the data is presented. The specific evaluation questions contribute to answering the higher level key evaluation questions 1, 2 and 3 (see Section 5). The activities undertaken for each of the management plan strategies (as documented in Section 9) have potential causal links with the ecological and socio-economic values that are being monitored for change. In each of the sections below these potential links are documented against each specific evaluation question to demonstrate the multi-faceted nature of the management plan strategies.

The data displayed in this section has been collected by the **core monitoring** methods, namely dive surveys or Underwater Visual Census (UVC), Baited Remote Underwater Video Systems (BRUVS) surveys and benthic mapping surveys. Most of the data comes from sites located inside Sanctuary Zones (SZs) and associated 'outside' comparison sites which are usually located within Habitat Protection Zones (HPZs). As outlined in the Marine Parks MER Plan (Bryars et al. 2017a) ecological monitoring has initially been focused on SZs, however, it is anticipated that the program will be expanded to include questions regarding the performance HPZs as well.

Table 65. Specific Evaluation Questions being used to assess for change in ecological values

Specific Evaluation Question
16. What biodiversity and habitats are included within the marine parks network?
17. Have SZs maintained or enhanced biodiversity and habitats?
18. Have HPZs maintained biodiversity and habitats?
19. Have SZs maintained or enhanced ecological processes?
20. Have SZs enhanced ecosystem resilience?

One of the overarching goals of the marine parks network is to protect and conserve marine biodiversity and habitats. To effectively do this a knowledge of the biodiversity and habitats contained within marine parks is critical. While our knowledge of marine ecosystems is relatively poor compared to terrestrial ecosystems (Carr et al. 2003), a significant amount of effort has been directed at gaining at greater understanding of our coast and marine assets. This information is summarised in the baseline reports for the 19 marine parks (Bryars et al. 2016a-s)

There are still many areas of our marine parks where there is no available knowledge of benthic habitats, and limited knowledge of the plants and animals that live there. The ecological monitoring program, while collecting data to assess the effectiveness of the marine parks network, is also building on previous work, and generating new knowledge and understanding of the biodiversity and habitats within the marine parks network. In many cases this will be the first time data has been collected for some of these ecosystems.

An independent review of the marine park sampling program was undertaken by the University of Adelaide (Delean 2017). The objective of the review was to assess the power and precision of the current ecological sampling design to detect biologically meaningful change in the selected indicators. The study concluded that for community and focal group indicators a 20% change will be possible to be detected, with ten years of sampling with a power of >80%. Changes in individual fish species will take slightly longer for some species, while abundances of other species are so low that power to detect change is unknown at this stage. In general, the sensitivity of the current monitoring program to detect change is suitable for answering the SEQs.

In addition to core monitoring, a number of complementary monitoring programs have also been established to support the core monitoring program (see Bryars et al. 2017a). At this stage only the survey of rock lobster numbers using pot sampling inside and outside the Cape du Couedic SZ has been completed, with data available for presentation in this report (see Case study 8). Other examples include:

- Citizen science monitoring of pipis (*Donax plebideltoides*) in the Piccaninnie Ponds SZ
- BRUVS monitoring at the Encounter Bay SZ by Flinders University third-year Marine Biology students

Data for these studies will be presented on completion of the respective monitoring programs.

The information presented in the following sections demonstrates the breadth of ecological monitoring work being undertaken by the DEWNR core monitoring program, and displays the current trends in the main ecological indicators. Predictions of change in ecological values due to marine parks are complex and dependent on a variety of factors including the type of ecosystem, habitat and species, specific indicator being measured, and time since protection (see Bryars et al. 2017a, b for further details). Nonetheless, some generalised predictions based upon Bryars et al. (2017a, b) include:

- Biodiversity and habitats will be maintained or enhanced inside SZs
- Biodiversity and habitats will be maintained or degraded inside HPZs
- Ecological processes will be maintained or enhanced inside SZs

- Ecosystem resilience will be maintained or enhanced inside SZs.

Ecological responses associated with implementation of Marine Parks generally occur over many years, however, some early results indicate responses within the first five years, (see Rock Lobster Case study 8). The ecological data collected to date only contains at most three years of records since Marine Parks were fully implemented on 1 October 2014 and often less. Given the inherent variability in marine ecosystems and the short time frame since Marine Parks were fully implemented, ecological changes are not expected to be evident at the time of publishing this report. Quantitative analysis and evaluation of these trends is beyond the scope of this status report and will be undertaken as part of the final evaluation for input to the 10-year review by 2022 when a longer time series of data is available.

10.2 Indicators used to answer SEQs

Marine ecosystems are extremely complex and it is not possible nor pragmatic to measure every component of them (e.g. species, processes, services etc.). Indicators are used as surrogates for various aspects of marine ecosystems. They provide a mechanism for change to be measured, understood and inform management decisions.

To answer the ecological SEQs the indicators identified in the MER Plan were size, composition and abundance of mobile organisms (fish and macro-invertebrates) or percent cover and extent for habitat forming species (macroalgae and seagrass). From this information a number of measures can be derived that focus on different aspects of the ecosystem. The measures used in the ecological monitoring program are divided into community level, focal group and focal species levels to ensure that different components of the marine ecosystems are assessed. The measures and the SEQs they inform are outlined in Table 66, Table 67, and Table 68.

10.2.1 Community level indicators and measures

A community is a collection of different and interacting populations living together in a defined geographical area. Community level indicators (Table 66) measure the integrity of an ecosystem which in turn is related to its health, functioning and resilience. Knowledge and measurement of community structure and composition allows managers to evaluate whether management efforts are working and also helps understand the types of communities that are found in the marine parks network and identify which ones may require higher levels of management (e.g. areas of high biodiversity).

Table 66. Community level indicators and measures and the SEQs they inform

Community Indicators	SEQ 16	SEQ 17	SEQ 18	SEQ 19	SEQ 20
Species richness	✓	✓	✓	✓	✓
Trophic structure		✓	✓	✓	✓
Community structure	✓	✓	✓	✓	✓
Recovery from disturbance				✓	✓
Community temperature index				✓	✓

Species richness

Species richness is the total number of species and is a measure of an ecosystems biodiversity. Higher species richness is an indicator of higher biodiversity. Maintaining biodiversity is one of the Objects of the *Marine Parks Act 2007* and is important for a number of reasons, as loss of biodiversity reduces ecosystem resilience and function and can compromise ecosystem services (Duffy et al. 2013).

Trophic structure

Trophic structure describes what role organisms play in an ecosystem, i.e. are they primary producers (seagrass) or carnivores (predatory fish). Trophic structure is also a function of energy flow from primary producer's through the food chain to top level predators. Extensive removal of, or damage to, a particular trophic level or levels can compromise ecosystem health and functioning, as described by the concept of trophic cascades (Estes & Palmisano 1974, Casini et al 2009). Trophic structure is monitored using the approach adopted in Soler et al (2015) which compares the relationship between the biomass for the following trophic groups; omnivore, planktivore, benthic invertivore, browsing herbivore, higher carnivore, scraping herbivore. Tracking the relative amount of biomass at each trophic level can identify changes in trophic structure.

Community structure

Community structure here is defined as the patterns in the distribution and abundance of species across monitoring sites. Examination of community structure is a powerful tool for examining changes through time; including recovery from disturbance and change in trophic status. Research has shown that protected marine communities can revert to a state quite different from unprotected ones (Edgar et al 2009). Community structure is assessed using multivariate statistical techniques to display species assemblages across sites in multidimensional space (Clarke 1993).

Recovery from disturbance

Ecological theory states that healthy, intact ecosystems are more resilient to disturbance (Hughes et al. 2005). The protection provided by marine parks is predicted in some cases to improve the condition of marine ecosystems and therefore their resilience. A measure of this resilience will be their recovery from disturbance. In the event of disturbance, benthic habitats and associated biota will be monitored to measure their recovery relative to pre-disturbance levels.

Community temperature index

Community temperature index (CTI) is a measure of the average thermal affinity of communities (Bates et al. 2014, Stuart-Smith et al 2015). Most communities are comprised of species with a broad range of thermal distributions. One of the potential outcomes of global warming is the replacement of cooler-affinity species with warmer ones. Protection afforded by marine parks is predicted to improve resilience in some cases and therefore buffer ecosystems to some extent, from the impacts of external drivers such as climate change. A recent study has shown that diverse communities are less affected by rising temperature than less diverse ones (Duffy et al. 2015). CTI can be used to measure community responses to climate change. The calculation of CTI follows the method outlined in Stuart-Smith et al. 2015.

10.2.2 Focal group indicators and measures

A focal group is a collection of species that is ecologically or socio-economically valuable or sensitive to threats. They may be critical-habitat forming species such as seagrass, or species targeted by resource extraction such as popular recreational and commercial fish species. Assessment of focal group indicators provides important insight and understanding of trophic relationships, food web integrity and energy flows (Table 67).

Table 67. Focal group level indicators and measures and the SEQs they inform

Focal Group Indicators	SEQ 16	SEQ 17	SEQ 18	SEQ 19	SEQ 20
Size and abundance of fished species	✓	✓	✓	✓	✓
Size and abundance of large fish	✓	✓		✓	✓
Size and abundance of site attached fish	✓	✓		✓	✓
Presence of marine pests	✓	✓	✓	✓	✓
Percentage cover of macroalgae	✓		✓		✓
Percentage cover and extent of seagrass	✓		✓		✓

Size and abundance of fished species

One of the main protections provided by SZs is from extractive use. Fished species often come from higher trophic levels (e.g. snapper, kingfish, harlequin fish) and these fish can be extremely important in regulating ecosystems as they can exert top down control by reducing prey numbers (Baum & Worm 2009, Boyce et al. 2015). Measuring the size and abundance of fished species by commercial and recreational fishers will potentially provide one of the clearest signals about whether SZs are working. For the purposes of this report fished species are considered to be those species susceptible to being caught by net or line (see Appendix G for full list).

Size and abundance of large fish

Large fish are prized by both commercial and recreational fishers and are often caught in disproportionally high numbers. Larger fish play an important role in structuring communities as they consume larger prey and have much higher fecundity than smaller fish resulting in the production of disproportionately higher numbers of recruits than smaller fish (Berkeley et al. 2004, 2004, Sato & Suzuki 2010). A reduction in the number of large fish can contribute to reduced ecosystem function and resilience. The abundance of large fish is predicted to be maintained or increased inside SZs. Large fish are defined here as fish >200 mm and this measure has been demonstrated to be a robust indicator or fishing pressure (Stuart-Smith et al. 2017).

Size and abundance of site attached fish

Many site-attached fish generally have small home ranges and slow growth rates, with some also having low fecundity (Bryars 2015). These life history traits make them particularly vulnerable to localised threats. These species (e.g. blue devils and blue groper) are often iconic and highly valued by recreational users such as snorkelers and divers. The protection afforded by marine parks is highly likely to benefit these species.

Presence of marine pests

Marine pests can devastate marine communities by out competing and overtaking native species leaving degraded marine ecosystems (Grosholz 2002, Perrings 2002). Healthy marine systems help to reduce the opportunity for marine pests to settle and thrive by colonising available surfaces and assimilating available nutrients. It is expected that the protection provided by marine parks will enhance the resilience of marine ecosystems and reduce the likelihood of marine pest incursions.

Percent cover of macroalgae/percent cover and extent of seagrass

Macroalgae and seagrass species form some of the most important benthic habitats in the marine environments of Australia (Connell & Gillanders 2007). Macroalgae relies on rocky substrates while seagrass generally occurs on soft sediments. The percent cover and extent of both of these groups is indicative of overall ecosystem health and predicted to be maintained or enhanced inside SZs and HPZs.

10.2.3 Focal species indicators and measures

Individual species can be important for a range of reasons. They may be keystone species, critical to ecosystem functioning (e.g. rock lobsters, the seagrass *Posidonia australis*), iconic species valued by divers or just in general (e.g. blue groper, leafy sea dragons), highly sought after recreational species (King George whiting, snapper), or vulnerable species less resilient to environmental change. Focal species' size and abundance are relatively easy to measure, and assessing them can provide a good indicator of Marine Park performance (Table 68). Increases in their abundances can also be used as an effective communication tool to demonstrate whether marine parks are working.

Table 68. Focal species indicators and measures and the SEQs they inform

Focal Species Indicators	SEQ 16	SEQ 17	SEQ 18	SEQ 19	SEQ 20
Size and abundance key invertebrates (e.g. rock lobster, urchins)	✓	✓		✓	✓
Size and abundance key fished species (e.g. snapper, sweep)	✓	✓		✓	✓
Size and abundance site attached fish (e.g. groper, blue devils)	✓	✓		✓	✓
Percentage cover key macroalgae (e.g. *Ecklonia*)	✓		✓		✓
Cover and extent of seagrass species (e.g. *Posidonia*)	✓		✓		✓

The indicators outlined in this section have been selected to align with and provide information relevant to answering the ecological SEQs. In some cases data will not be presented for an indicator. There are several reasons for this, including:

- data was collected in a research collaboration and cannot be released yet
- data has not been processed (e.g. some habitat video, aerial imagery and photo quadrat data has been collected and is still to be processed)
- data not yet available for reporting (e.g. recovery from disturbance)
- In addition to 'core' monitoring, a number of complimentary monitoring programs have also been established to support the core monitoring program. At this stage only the survey of rock lobster numbers inside and outside the Cape Du Couedic SZ have been completed with data available for presentation in this report (see Case Study: Rock lobsters in Cape du Couedic Sanctuary Zone). Other examples include:
    - Citizen science monitoring of pipis (*Plebidonax deltoides*) in the Piccaninnie Ponds SZ
    - BRUVS monitoring at the Encounter Bay SZ by Flinders University third-year Marine Biology students

  Data for these studies will be presented on completion of the respective monitoring programs.
- The survey design to assess the effectiveness of Marine Park SZs is based on comparing sites inside SZs (impact) with sites outside SZs (controls) (see Bryars et al. 2017a). Marine parks were declared in 2012, prior to this the location of zoning boundaries was unknown, however data began being collected in 2005 (Edgar 2015) and hence some monitoring prior to 2012 is not balanced in that some SZ may only have control sites and no corresponding 'impact' sites and vice versa. In cases where there are no corresponding inside or outside sites for comparison, this is recorded in the relevant figure caption to distinguish between cases where there was no occurrence of a particular organism.
- As mentioned earlier, interpretation regarding whether implementation of marine parks are achieving the *Objects of the Marine Parks* Act *2017*, as represented by the SEQs is beyond the scope of this document.
- Focal species may be different for each Marine Park
- Aldinga SZ (Encounter MP) was not surveyed in 2017 and the 2016/17 Pages SZ BRUVS data has not been processed at the time of this documents release.
- BRUVS data for 2016/17 is presented in this report, however while 2016/17 dive monitoring was completed for 2016/17 the data was not processed in time for this report.
- The absence of standard errors in graphs denotes locations with only one survey.

10.2.4 SEQ 16 – What biodiversity and habitats are included within the marine parks network?

The following section provides a snapshot of some of the biodiversity and habitats that make up the South Australian marine parks network.

Total number of species recorded

A total of 382 species of fish and invertebrates have been recorded by the monitoring program (BRUVS and dive surveys) (Figure 58). Fish[1] were the most diverse group comprising 205 species which accounted for over 50% of the total number of species. Molluscs (snails, abalone, squid) were the second most diverse groups comprising 82 species, which accounted for 21% of the total number of species, followed by Echinoderms comprising 61 species which accounted for 16% of the total species. Crustaceans comprised 24 species which accounted for 6% of the total number of species and "other" species comprised 10 species, which accounted for 3% of the total number of species (Figure 58).

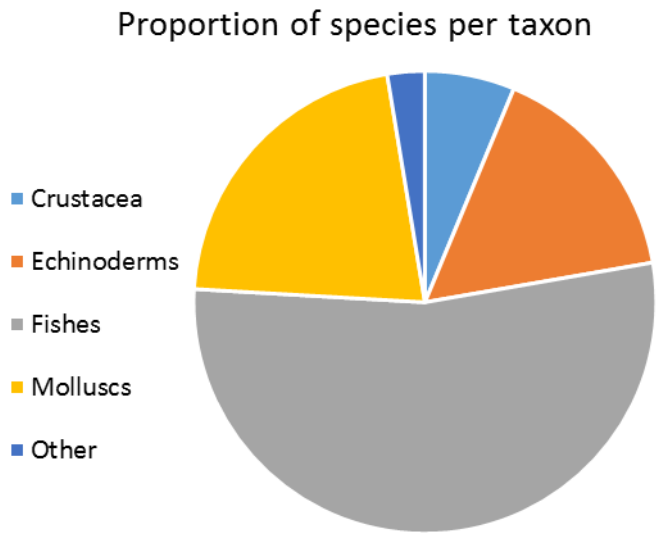


Figure 58. Proportion of species recorded for each taxa recorded during BRUVS and dive surveys

[1] Fishes includes species from Class Agnatha (jawless fish); Class Chondrichthyes (sharks, rays and chimaeras) and Class Cephalopoda (squids, cuttlefish and octopus)

Fish communities (Baited remote underwater video surveys)

Most common fish families

There were at least 126 species of fish captured by BRUVS comprising 63 families. Monacanthidae (leatherjackets) 16 species, Labridae (wrasse) 10 species and Carangidae (trevally, scad) 4 species were the most common fish families recorded during BRUVS (Figure 59, Figure 60). Atherinidae (hardyheads) 1 species and Odacidae (cale, weed whiting) 8 species were also common fish families recorded on BRUVS (Figure 59).

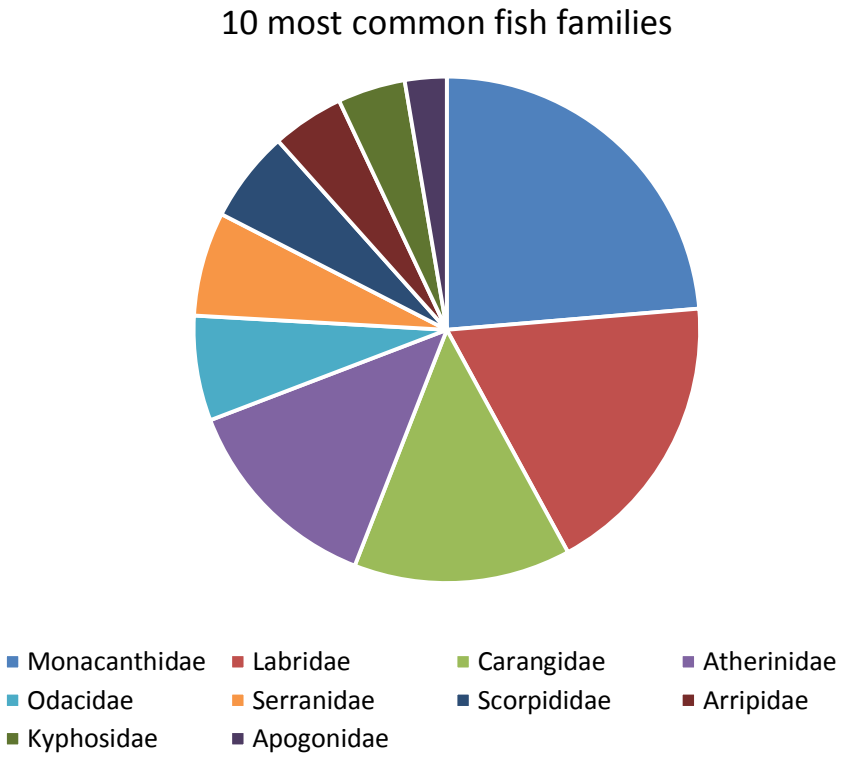


Figure 59. Top ten fish families recorded at all sites during BRUVS surveys

Figure 60. Common fish families captured by BRUVS; horseshoe leatherjacket (*Meuschenia hippocrepis,* Monacanthidae), western blue groper (*Achoerdus gouldii,* Labridae) and trevally (*Pseudocaranx sp,* Carangidae)

Most common fish species

Bluethroat wrasse (*Notolabrus tetricus*) was the most common fish species captured on BRUVS, being recorded at over 75% of sites (Figure 61, Figure 62). Two other species of wrasse, brownspotted (*Notolabrus parilus*) and senator (*Pictilabrus laticlavius*), and red mullet (*Upeneichthys vlamingii*) were also common occurring at more than 65% of sites. King George whiting (Sillaginodes punctatus), several leatherjacket species, western blue groper (*Achoerodus gouldi*i) and sea sweep (*Scorpis aequipinnis*) were also relatively common across sites (Figure 61).

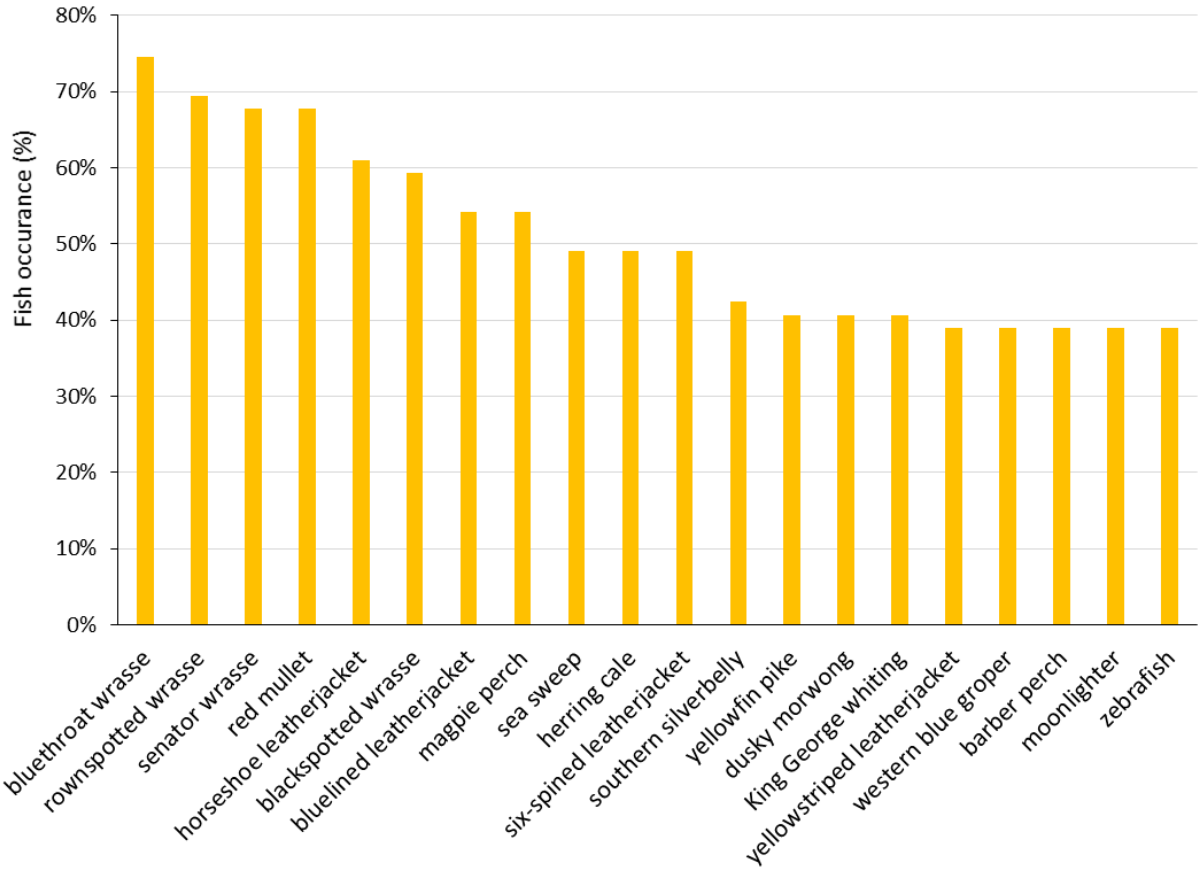


Figure 61. Most common fish species recorded on BRUVS based on percent occurrence at all sampling sites

Figure 62. Common fish species captured by BRUVS; bluethroat wrasse (*Notolabrus tetricus*), brown spot wrasse (*Notolabrus parilus*) and magpie perch (*Cheilodactylus nigripes*)

Largest fish recorded

Sharks and rays were the largest fish recorded on BRUVS with seven species being within the overall top 20 largest fish (Figure 63). A 3.2 m white shark (*Carcharodon carcharias*) was the largest fish recorded while a 1.3 m smooth ray (*Dasyatis brevicaudata*) was the largest ray recorded (Figure 63, Figure 64). The largest bony fish recorded was a 1.1 m kingfish (*Seriola lalandi*) and a 1 m western blue groper (*Achoerdus gouldii*) (Figure 63).

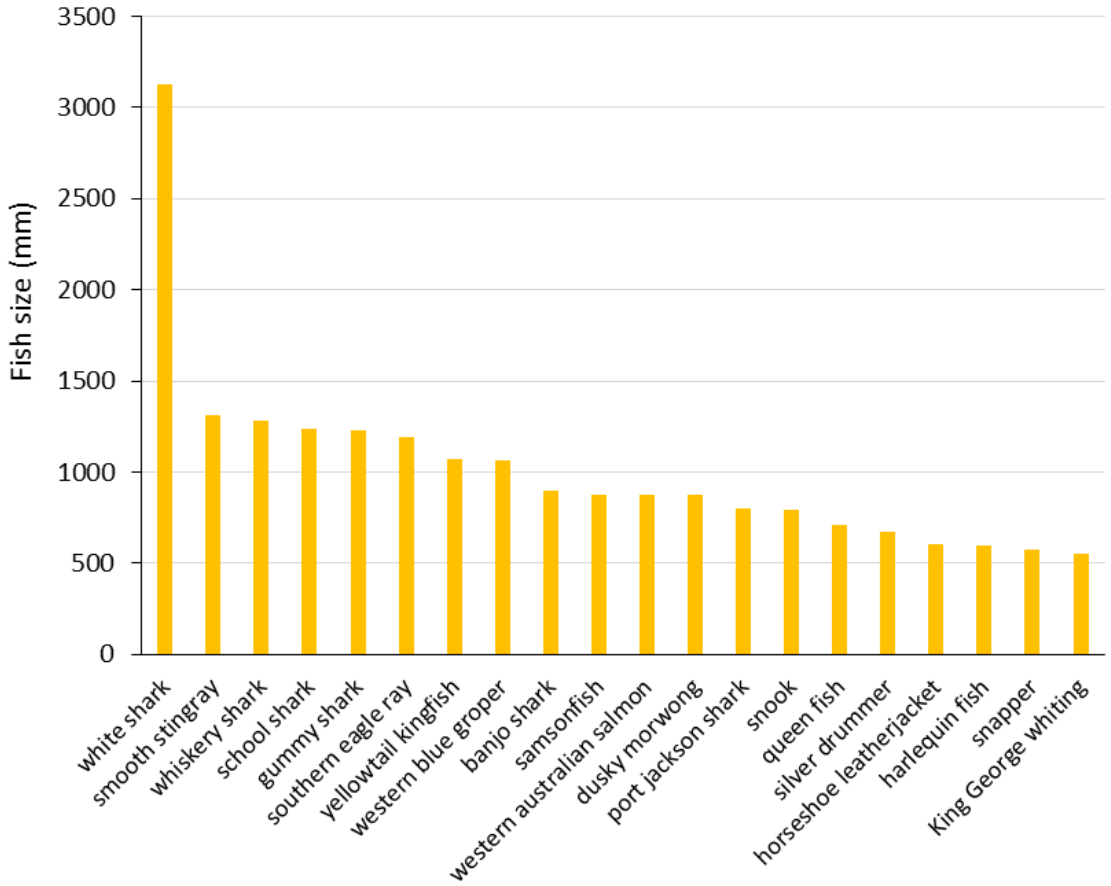


Figure 63. Top twenty largest fish species (>200mm) recorded at all sites during BRUVS surveys

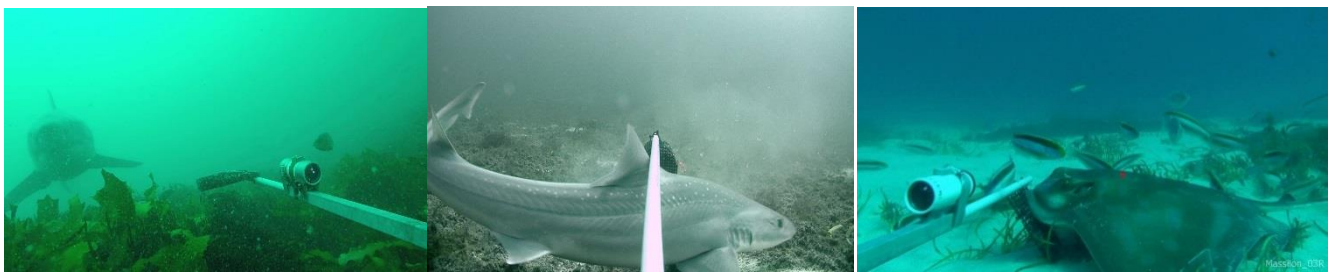


Figure 64. Largest fish recorded on BRUVS in order, white shark (*Carcharadon carcharias*), gummy shark (*Mustelus antartica*) and smooth ray (*Dasyatis brevicaudata*)

Fish species richness by sanctuary zone

The remote offshore Island SZ, Pearson Isles had the highest number of fish species with an average of 19 species recorded per BRUVS drop, followed by the Sponge Gardens SZ with an average of 18 species per BRUVS drop (Figure 65, Figure 66). Isles of St Francis SZ had the third highest species richness with an average of 14 species per BRUVS drop (Figure 65). Cuttlefish Coast SZ had the lowest species richness with less than five fish species recorded per BRUVS drop (Figure 65).

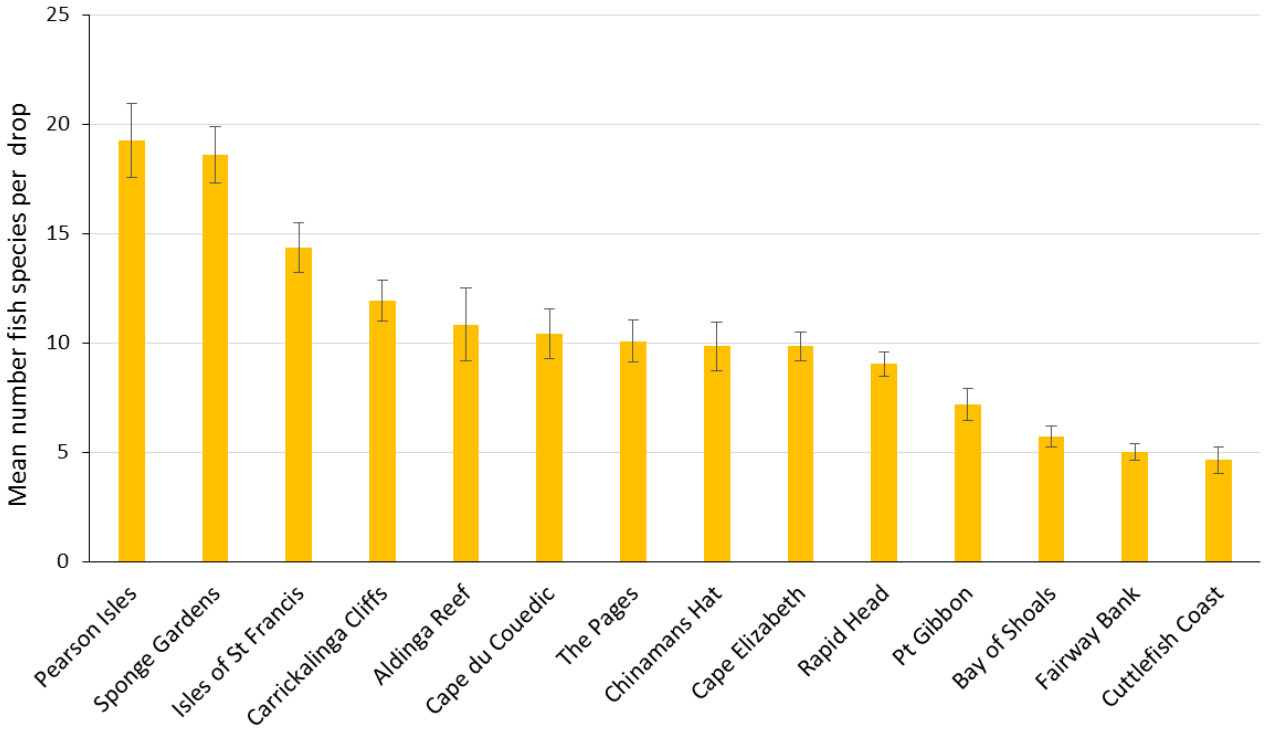


Figure 65. Mean number of fish species recorded per BRUVS drop by SZ

Figure 66. Examples of fish communities from left to right: Pearson Isles SZ , Isles of St Francis SZ and Bay of Shoals SZ

Large fish (>200 mm) abundance by Sanctuary Zone

Similar to species richness the highest abundance of large fish (>200 mm) were recorded at the remote offshore SZs, Pearson Island, Isles of St Francis (see case study 7) and the Sponge Gardens SZ (Figure 67). Abundance of large fish are at similar levels for other SZs excluding the Bay of Shoals SZs which has the lowest average number of large fish (>200 mm) (Figure 67).

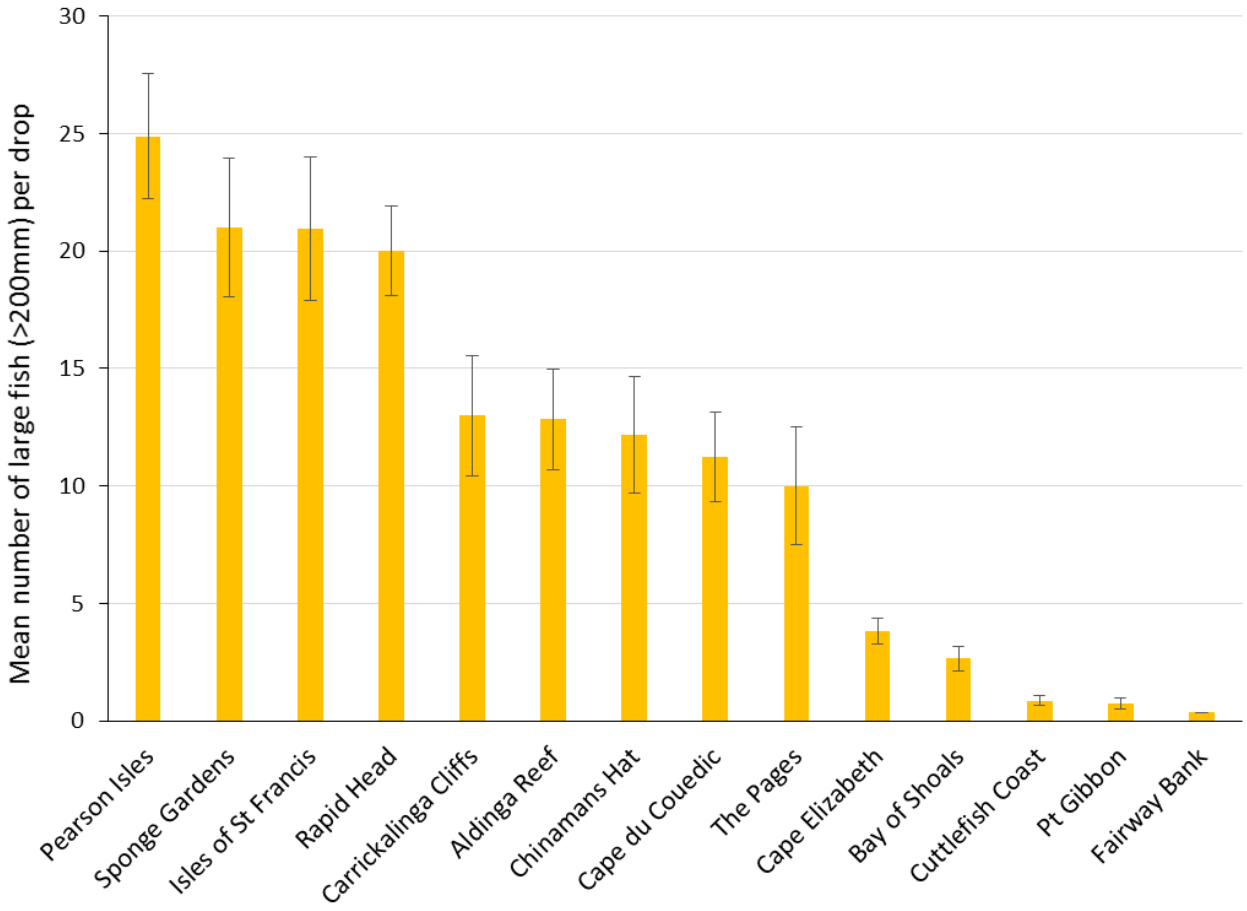


Figure 67. Mean number of large fish species (>200 mm) per BRUVS drop by Sanctuary Zone

Fish communities (Dive surveys)

Most common fish families

A total of 154 species from 57 families were recorded during dive surveys within SZs. Families representing the most species included the Monacanthidae (leatherjackets), Labridae (wrasse) and Odacidae (cales and weed whiting) (Figure 68). Other common families included the Kyphosidae (drummers), Tripterygiidae (threefins, triplefins) and Carangidae (trevally) (Figure 68).

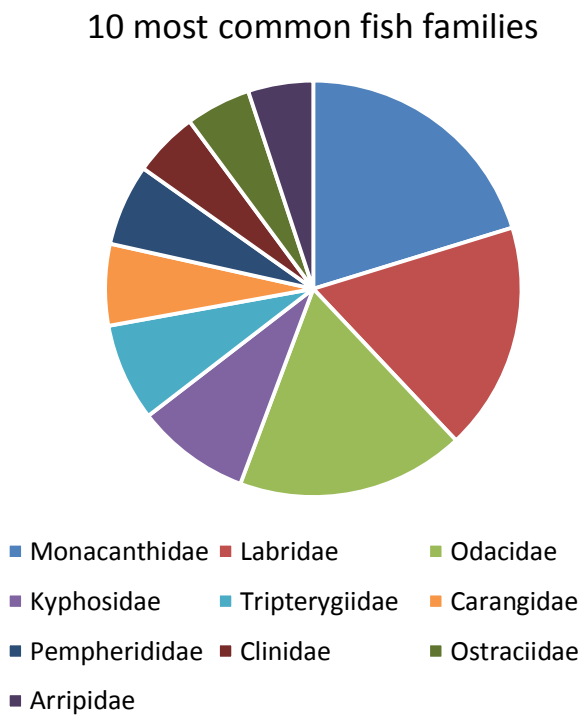


Figure 68. Top ten fish species within families recorded within SZs during dive surveys

Most common fish species

Of 154 species observed during dive surveys, only 19 species were recorded at 50% or more of the dive survey sites. Magpie perch (*Chelmonops curiosus*) and bluethroat wrasse (*Notolabrus tetricus*) were the most common fish species recorded on dive surveys occurring at 93% of all sites (Figure 69, Figure 70). Victorian scaleyfin (*Parma victorae*); sea sweep (*Scorpis aequipinnis*) and senator wrasse (*Pictilabrus laticlavius*) followed closely occurring at over 82% of all sites.

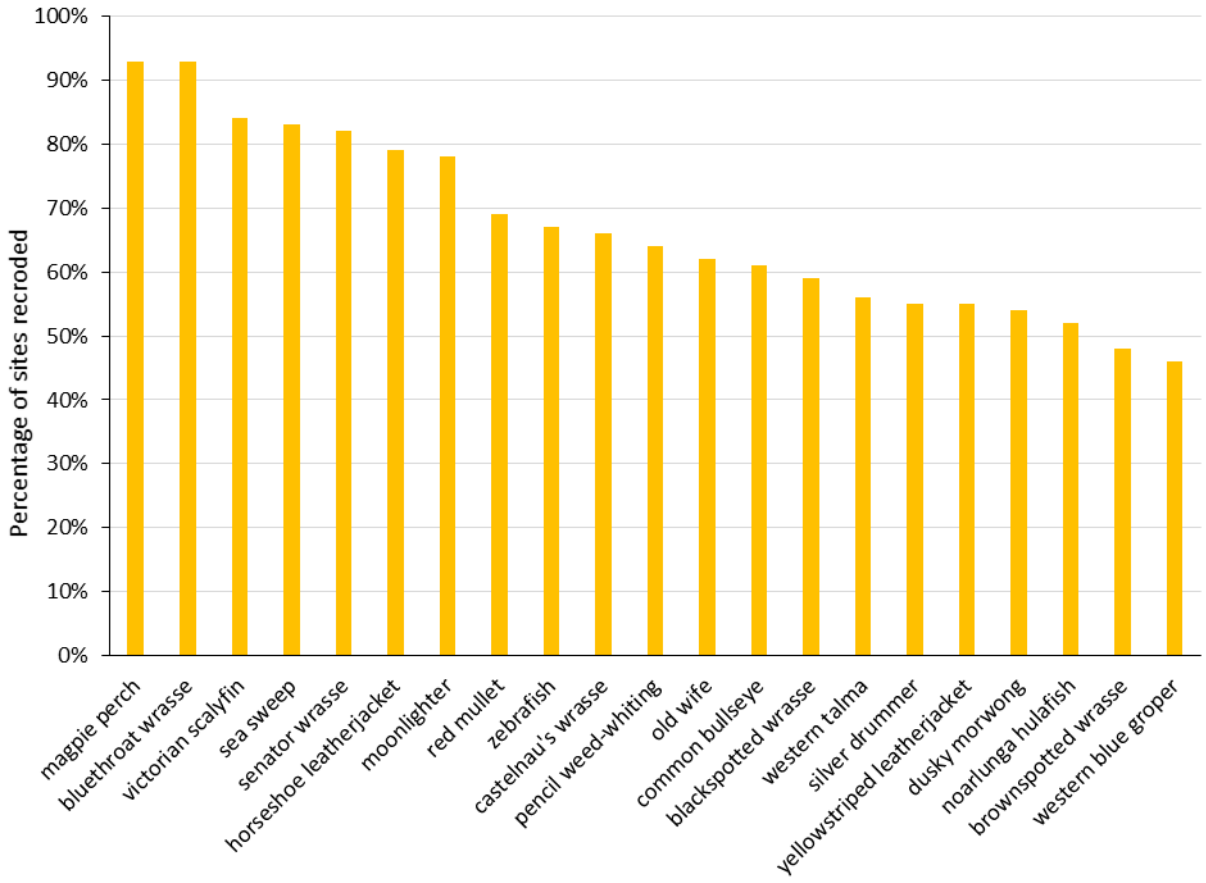


Figure 69. Top twenty most common fish species based on percent occurrence recorded during dive surveys at all sampling sites

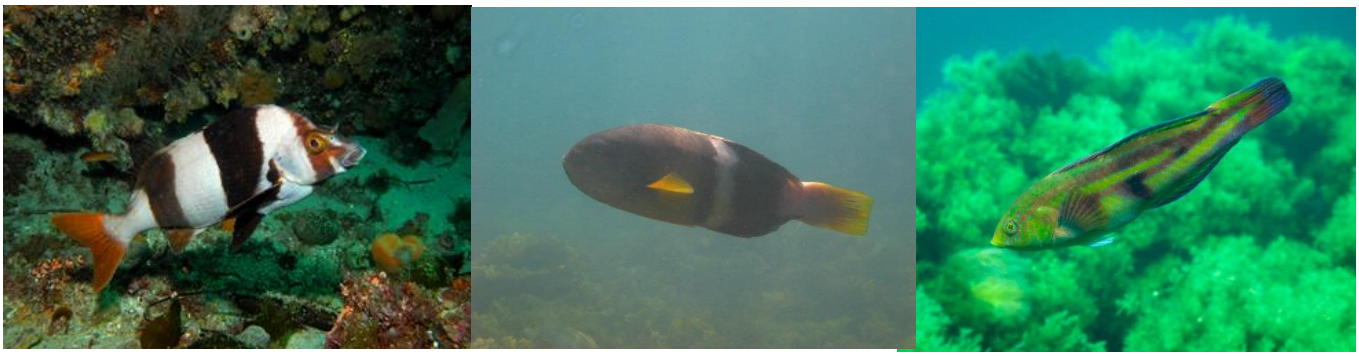


Figure 70. Common fish species recorded on dive surveys from left to right: Magpie perch (*Chelmonops curiosus*); bluethroat wrasse (*Notolabrus tetricus*) and senator wrasse (*Pictilabrus laticlavius)*

Largest fish recorded

Sharks and rays were the largest fish recorded on dive surveys (Figure 71). The largest ray recorded was a 1.75 m southern eagle ray (*Myliobatis tenuicaudatus*), the largest shark was a 1.6 m gulf wobbegong (*Orectolobus halei*). Port Jackson shark (*Heterodontus portusjacksoni)* and banded wobbegong (*Orectolobus ornatus*) were the next largest sharks recorded at 1.22m and 90 cm respectively. The largest bony fish recorded on dive survey was a 1.5 m western blue groper (*Achoerodus gouldii*), followed by dusky morwong (*Dactylophora nigricans*) at 1.22m and silver drummer (*Kyphosus sydneyanus*) at 75 cm (Figure 71, Figure 72).

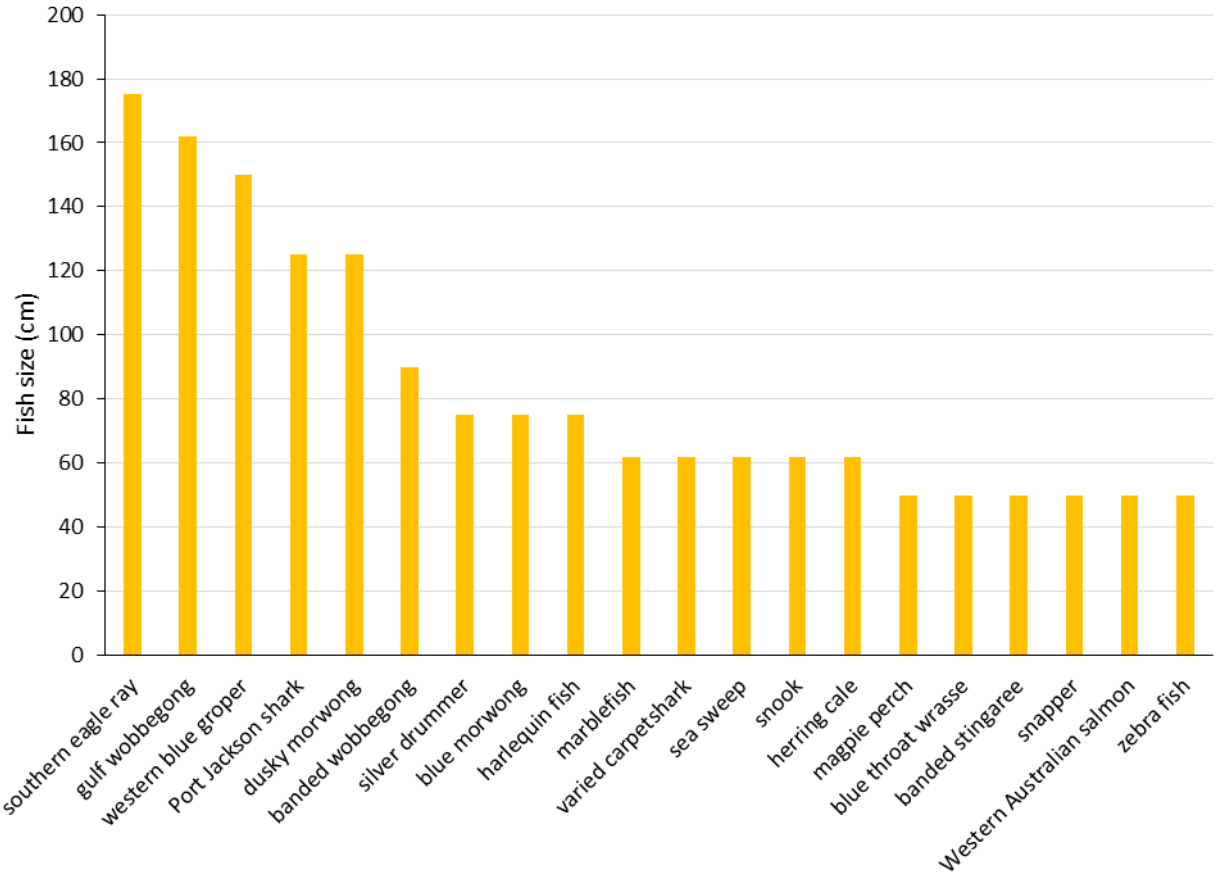


Figure 71. Top twenty largest fish species recorded during dive surveys inside SZs

Figure 72. Common large fish species recorded on dive surveys from left to right: southern eagle ray (*Myliobatis tenuicaudatus*); western blue groper (*Achoerodus gouldii*) and dusky morwong (*Dactylophora nigricans*)

Fish species richness

Isles of St Francis had the highest number of fish species of any SZ, with around 30 species of fish recorded on dive surveys (Figure 73). Several other SZ including Pearson Isles, Aldinga Reef, Sponge Gardens and Rapid Head had similar numbers of fish species. Encounter Bay SZ and two sites in the south-east Lacepede Bay and Cape Dombey had the lowest number of species with <12 fish species recorded during dive surveys (Figure 73).

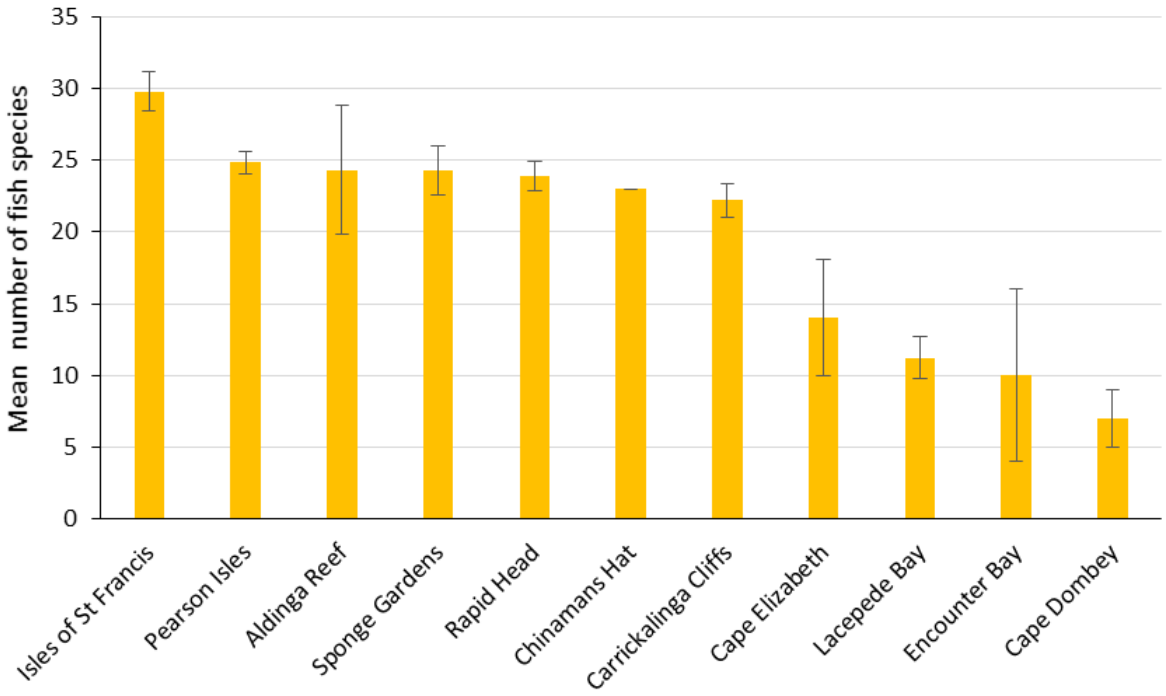


Figure 73. Mean (±SE) number of fish species recorded per dive survey by individual SZs

Large fish (>200 mm) abundance

Pearson Island SZ has the highest abundance of large fish species (>200 mm) with over 500 fish recorded per dive survey (Figure 74). Isles of St Francis, Cape Borda and Sponge Gardens SZs have the next highest number of large fish species with 250–300 large fish species recorded per dive survey (Figure 74). The SZ with the least number of large fish species is Encounter Bay and Cape Dombey SZ, with less than 10 large fish species recorded per dive survey (Figure 74).

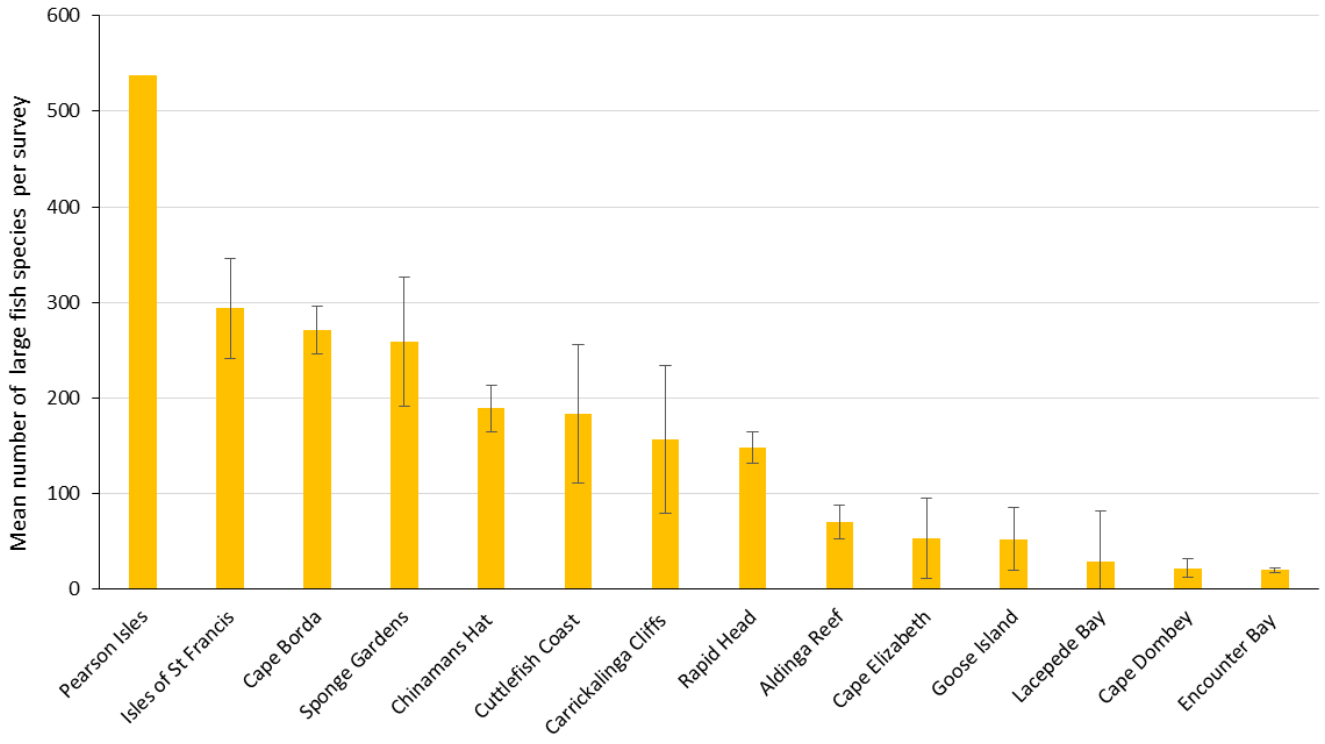


Figure 74. Mean (±SE) number of large fish species (>200 mm) recorded per dive survey by individual SZs

Invertebrates communities (Dive surveys)

Total number of macroinvertebrate species

A total of 166 macro-invertebrate species from 69 families were recorded from dive surveys within SZs. The families representing the most species included the Asterinidae (cushion seastars) 8 species, Trochidae (top shells) 7 species, Oreasteridae (granular sea stars) 7 species and Ranellidae (triton shells) 7 species (Figure 75). Other common families included the Chromodorididae (sea slugs, nudibranchs) 6 species, Turbinidae (turbo shells) 6 species and Temnopleuridae (sea urchins) 6 species (Figure 75).

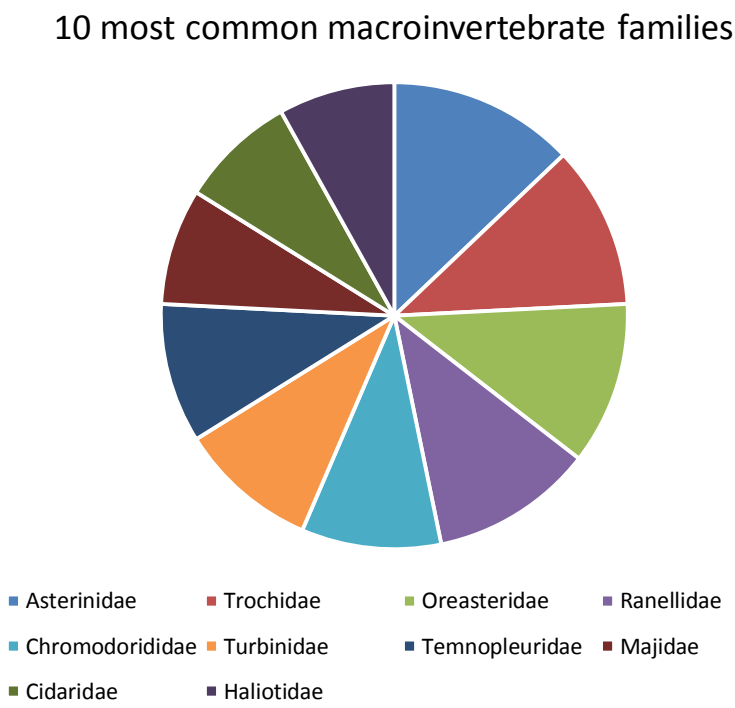


Figure 75. Top ten macroinvertebrate families with the most species recorded inside SZs during dive surveys

Most common macroinvertebrate species

Velvet star (*Petricia vernicina*) and tulip shell (*Pleuroploca australasia*) were the most common macroinvertebrates recorded in SZs during dive surveys occurring at 75% and 72% of all sites (Figure 76, Figure 77). Biscuit star (*Tosia australis*) were also commonly recorded during dive surveys occurring at 67% of all sites and Purple Urchin (*Heliocidaris erythrogramma)* occurred at about 64% of all sites (Figure 76).

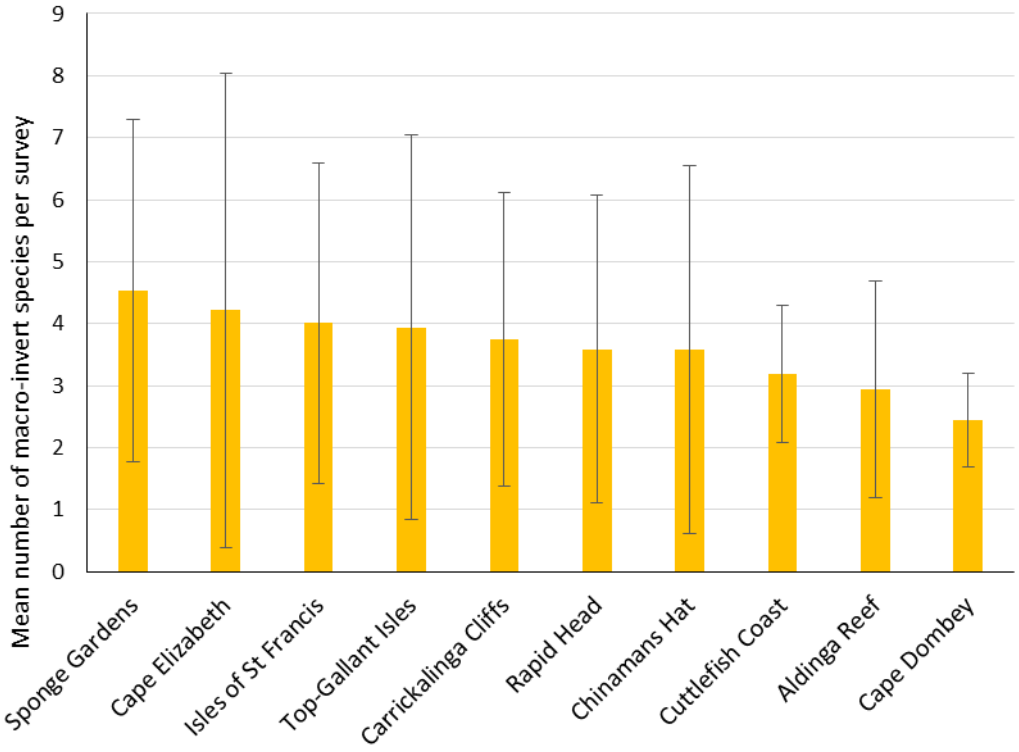


Figure 76. Most common macroinvertebrate species recorded during dive surveys

Figure 77. Most common macro-invertebrate species recorded during dive surveys from left to right: velvet star (*Petricia vernicina);* tulip shell *(Pleuroploca australasia)* and biscuit star *(Tosia australis)*

Macroinvertebrate species diversity

Sponge Gardens SZ had the highest macroinvertebrate species diversity with an average of 4.5 species recorded per dive survey (Figure 78). Cape Elizabeth SZ has the second highest macro-invertebrate diversity with an average of 4.2 species recorded per dive survey, followed by Isles of St Francis SZ which has an average of 4 species recorded per dive survey. Cape Dombey SZ has the least macro-invertebrate species diversity with an average of 0.75 species recorded per dive survey (Figure 78).

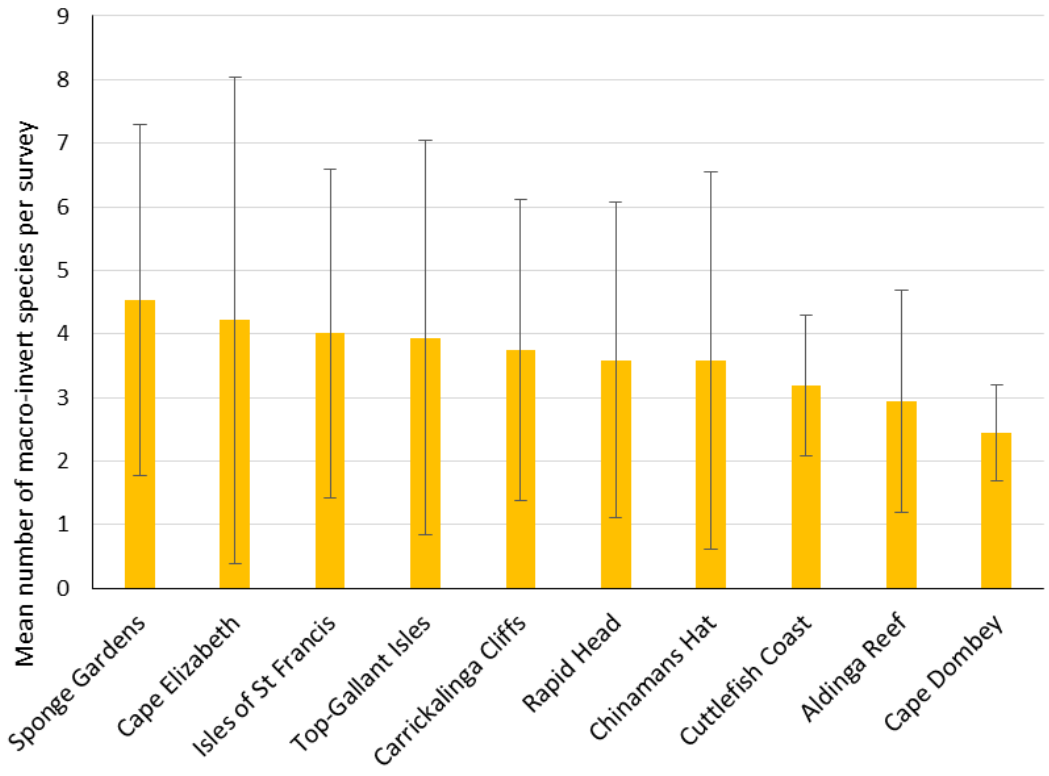


Figure 78. Mean number of macroinvertebrate species recorded per dive survey within individual SZs

Habitats

Benthic mapping overview

The long term goal of the marine park benthic mapping program is to provide full cover mapping of the state's entire marine parks network benthic habitats. Realistically this is a process that will take decades and more significant resourcing than is currently allocated. As outlined in the Marine Parks Monitoring, evaluation and reporting plan 2017 the priorities for the mapping program from 2012–22 are to:

- Complete rapid assessment mapping of sanctuary zones
- Undertake full cover swath sonar mapping at potential and existing BRUVS and dive monitoring sites

In addition the mapping program will explore in the future the potential to remap selected areas to determine changes in cover and extent of ecological values, sand, seagrass and reef.

Benthic mapping methods

The marine parks program currently collects two different types of benthic habitat mapping data (over and above the various mapping products that have informed the program at various stages, Bryars et al 2017b), namely Inventory mapping data and swath sonar data. Inventory mapping data is derived from short video transects of the seafloor and consists of a variety of classifications based on the physical substrate and habitat forming biota (such as seagrass). For simplicity, this information is displayed in maps, grouped into three (and occasionally four) simple habitat categories, Sand, Seagrass and Reef (and "Invertebrates" where relevant). These categories align with "ecological values" identified in the Baseline Reports for each of the marine parks. However, each of these categories can represent a range of benthic habitat or seafloor types. For example, Reef habitat may differ considerably from one area to another, both in structure (elevation, slope, rugosity) and biota (presence and absence and dominant species). The "Seagrass" category can represent a number of species and differing structure (density and patchiness). Similarly, Sand equates to any unconsolidated seafloor and could range from fine sediment to course shell rubble. Figure 79 demonstrates the more complex information underlying the simple categories of reef, seagrass and sand and Table 69 details the full range of habitats that can be represented under these categories based on National intertidal/subtidal benthic (NISB) habitat classification scheme v1.0 (Newton et al. 2007).

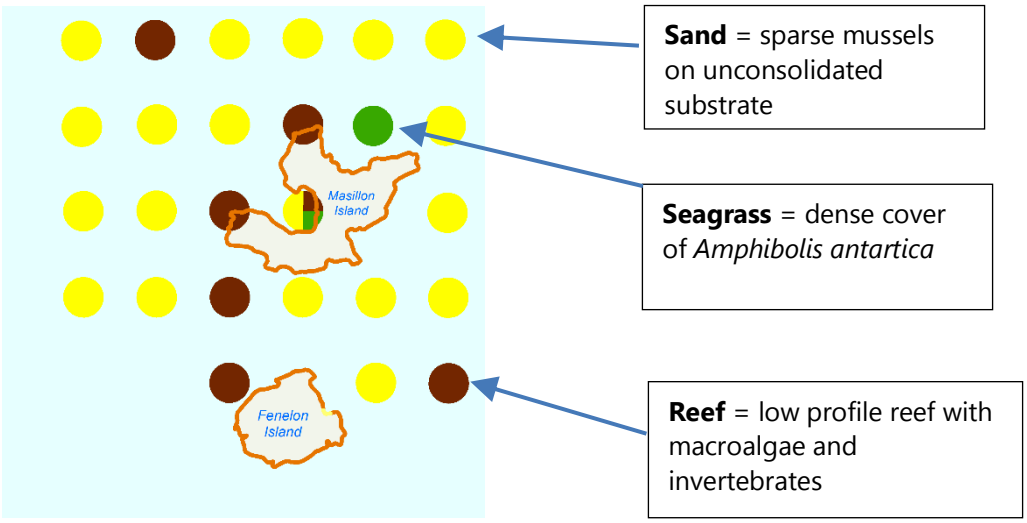


Figure 79. Example map demonstrating the additional information that underlies the overarching categories of sand, seagrass and reef

Table 69. Breakdown of the broad habitat categories used in inventory maps showing example breakdowns of more detailed classification levels (Newton et al 2007)

Broad habitat class	Substrate	Habitat	Video classification	Description (example)
Reef	Consolidated	Algae dense	Algae; Dense	*Caulerpa* spp. dense on profile reef
Reef	Consolidated	Algae medium	Algae; Medium	*Hormisira* algae
Reef	Consolidated	Algae sparse	Algae; Sparse	Turfing algae on Boulders; sparse
Reef	Consolidated	Consolidated bare substrate	Reef; Low profile	Unvegetated hard organic flat reef with urchins (*Centrostephanus* sp)
Reef	Consolidated	Invertebrates dense	Reef; Invertebrates	Sponges and bryozoans on low profile reef
Reef	Consolidated	Invertebrates medium	Invertebrates; Medium	Invertebrate reef (mussels, sponge and urchins)
Reef	Consolidated	Invertebrates sparse	Reef; Invertebrates	Sponge
Reef	Consolidated	Reef low profile	Boulders	Boulders
Reef	Consolidated	Reef low profile	Cobble	Cobble
Reef	Consolidated	Reef low profile	Invertebrates; Dense	Reef; Invertebrate; Dense; Flat
Reef	Consolidated	Reef low profile	Reef; Macroalgae and invertebrates	Algae and invertebrate reef
Reef	Consolidated	Reef low profile	Reef; Macroalgae; Low profile	Broken bottom
Reef	Consolidated	Reef low profile	Stony coral	Coral bombie
Reef	Consolidated	Reef medium profile	Invertebrate; Medium	Invertebrates on medium profile reef
Reef	Consolidated	Reef medium profile	Invertebrates; Dense	Mixed Invertebrate on Reef
Reef	Consolidated	Reef medium profile	Reef; Macroalgae; Medium/high profile	Reef; Mixed *Ecklonia* and Seirococceae; Profile
Sand	Unconsolidated	Algae dense	Algae and invertebrates; Dense	Algae red ball and invertebrates dense
Sand	Unconsolidated	Algae dense	Algae filamentous; Dense	Cobble with filamentous algae
Sand	Unconsolidated	Algae dense	Algae; Dense	Algae ball dense
Sand	Unconsolidated	Algae medium	Algae and invertebrates; Medium	Algae and sponges on sand

Broad habitat class	Substrate	Habitat	Video classification	Description (example)
Sand	Unconsolidated	Algae medium	Algae and seagrass; Medium	*Caulerpa* spp and *Halophila* medium
Sand	Unconsolidated	Algae medium	Algae; Medium	Rhodolith
Sand	Unconsolidated	Algae sparse	Algae and invertebrates; Sparse	Invertebrates and algae on sand
Sand	Unconsolidated	Algae sparse	Algae: Sparse	Algae shell rubble
Sand	Unconsolidated	Invertebrates dense	Invertebrates and algae; Dense	Invertebrates and algae; Sand; dense
Sand	Unconsolidated	Invertebrates dense	Invertebrates; Dense	Mussels; dense
Sand	Unconsolidated	Invertebrates medium	Invertebrates and algae; Medium	Invertebrates and algae on sand
Sand	Unconsolidated	Invertebrates medium	Invertebrates; Medium	Pinna with sponges medium
Sand	Unconsolidated	Invertebrates sparse	Invertebrates; Sparse	Mussels; sparse
Sand	Unconsolidated	Soft coral; medium	Soft coral; Medium	Soft coral; medium
Sand	Unconsolidated	Soft coral; sparse	Soft coral; Sparse	Soft coral; sparse
Sand	Unconsolidated	Unconsolidated bare substrate	Unconsolidated bare substrate	Shale
Seagrass	Unconsolidated	Seagrass dense	Seagrass and algae; Dense	*Posidonia* and *Ulva* dense
Seagrass	Unconsolidated	Seagrass dense	Seagrass and invertebrates; Dense	*Zostera* and invertebrates dense
Seagrass	Unconsolidated	Seagrass dense	Seagrass; Dense	*Amphibolis* dense
Seagrass	Unconsolidated	Seagrass dense	Seagrass; Sparse	*Halophila* and *Posidonia* sparse
Seagrass	Unconsolidated	Seagrass medium	Seagrass and algae; Medium	*Zostera* and algae medium
Seagrass	Unconsolidated	Seagrass medium	Seagrass and invertebrates; Medium	*Posidonia* and invertebrates medium
Seagrass	Unconsolidated	Seagrass medium	Seagrass; Medium	*Zostera* and *Halophil*a
Seagrass	Unconsolidated	Seagrass sparse	Seagrass and algae; Sparse	*Zostera* and *Hormisira* algae
Seagrass	Unconsolidated	Seagrass sparse	Seagrass and invertebrates; Sparse	*Halophila*, *Zostera* and invertebrates
Seagrass	Unconsolidated	Seagrass sparse	Seagrass, algae and invertebrates	*Halophila, Zostera, Colpmenia* and sponge
Seagrass	Unconsolidated	Seagrass sparse	Seagrass; Sparse	*Posidonia* sparse

In addition to Inventory mapping, in some sanctuary zones targeted high resolution swath mapping has been conducted. Swath sonar provides detailed bathymetric (depth) and backscatter (texture) information from the seafloor from which digital elevation models (DEMs) and texture (sidescan sonar) maps can be produced. This information can be used to produce more detailed habitat maps and can be particularly useful in complex habitat areas, for example reef areas where secondary information such as slope, aspect and complexity can be mapped and correlated with other monitoring data (such as species preferences). In this report, some example DEMs are presented for reef habitats in selected sanctuary zones.

The Port Noarlunga Reef sanctuary zone is characterized by nearshore high profile reefs (previously mapped, see DEH 2009) and offshore sand substrate with scattered patches of seagrass (Figure 80). The seafloor for all of the previously unmapped third of the zone was bare sand habitat. Closer inshore small amounts of seagrass and reef were present.

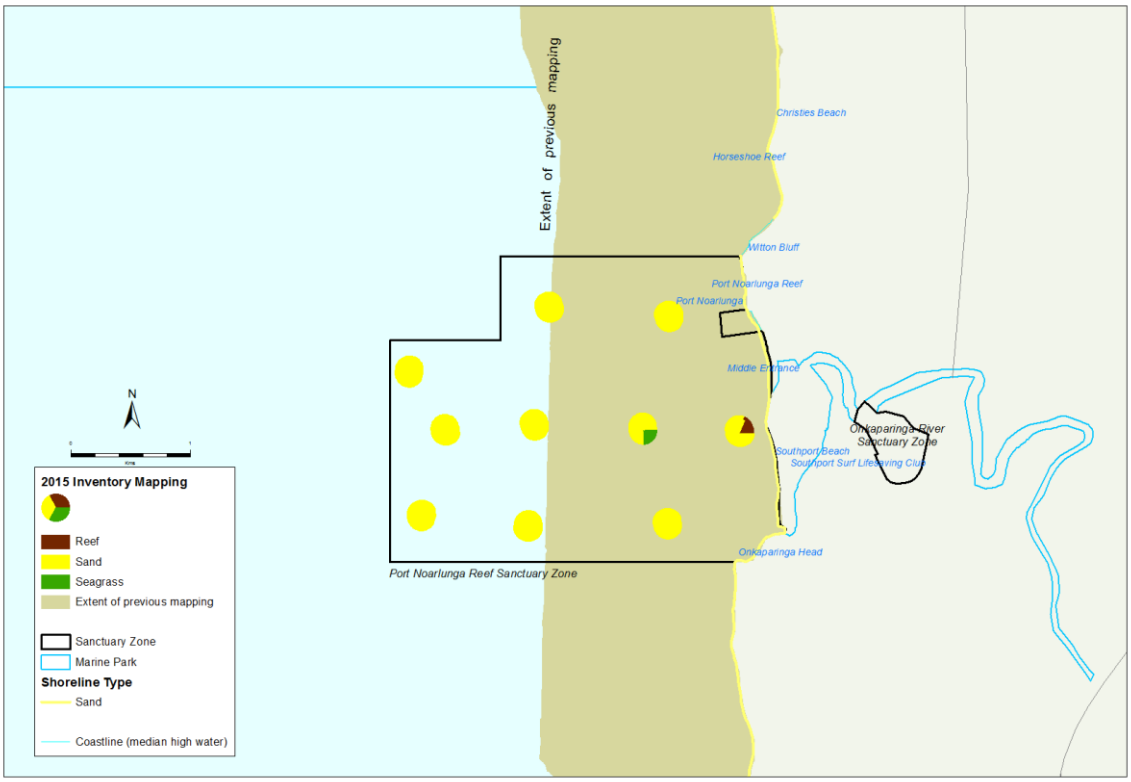


Figure 80. Benthic habitat classes for previously unmapped and mapped parts of the Port Noarlunga SZ

Aldinga Reef SZ consists of significant nearshore high profile reef (previously mapped, see DEH 2009) covering the majority of the zone out to 18 m depth. Previously unmapped deeper habitat is entirely soft sediment (Figure 81). Swath mapping of the inshore reef (the droppoff) has been carried out but is yet to be compiled.

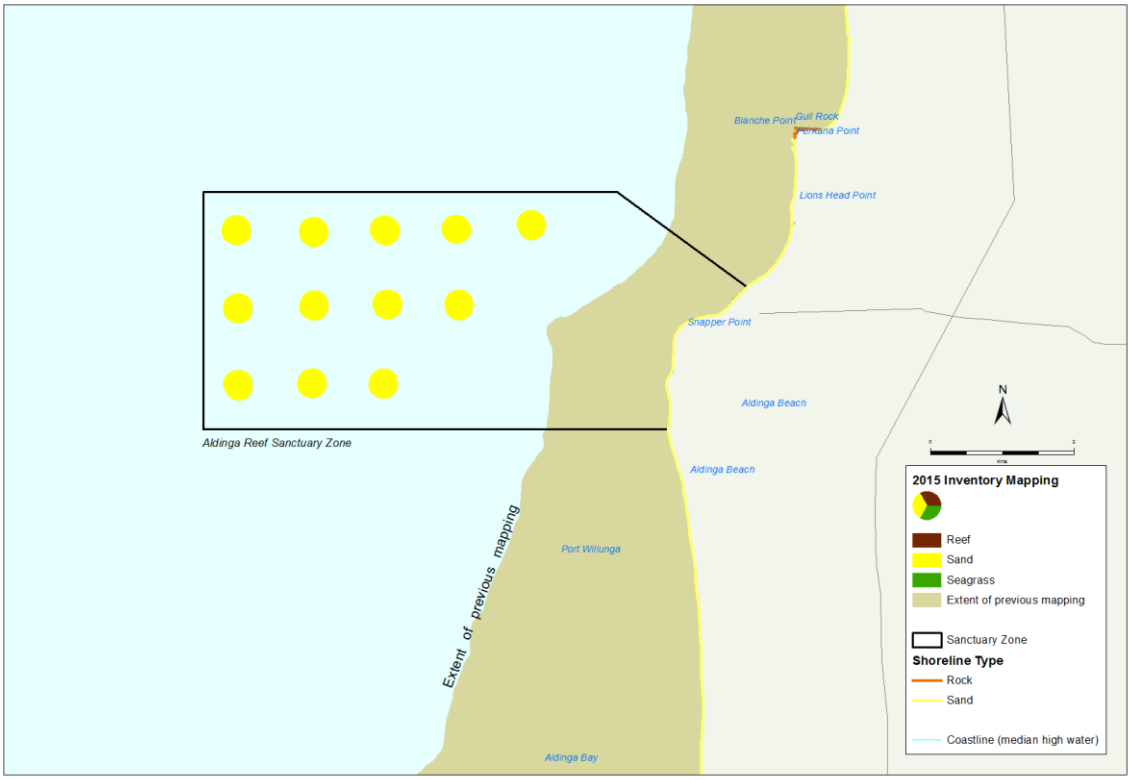


Figure 81. Benthic habitat classes for previously unmapped parts of the Aldinga Reef SZ

Carrickalinga Cliffs SZ (Figure 82) has a band of nearshore fringing reef (Figure 83) dropping quickly onto sandy seafloor (previously mapped, see DEH 2009). Very little of this zone was unmapped at the time of declaration of sanctuary zones, and through the inventory mapping approach the unmapped portion was found to be soft sediment (Figure 82). Swath mapping of the fringing reef is shown in (Figure 83).

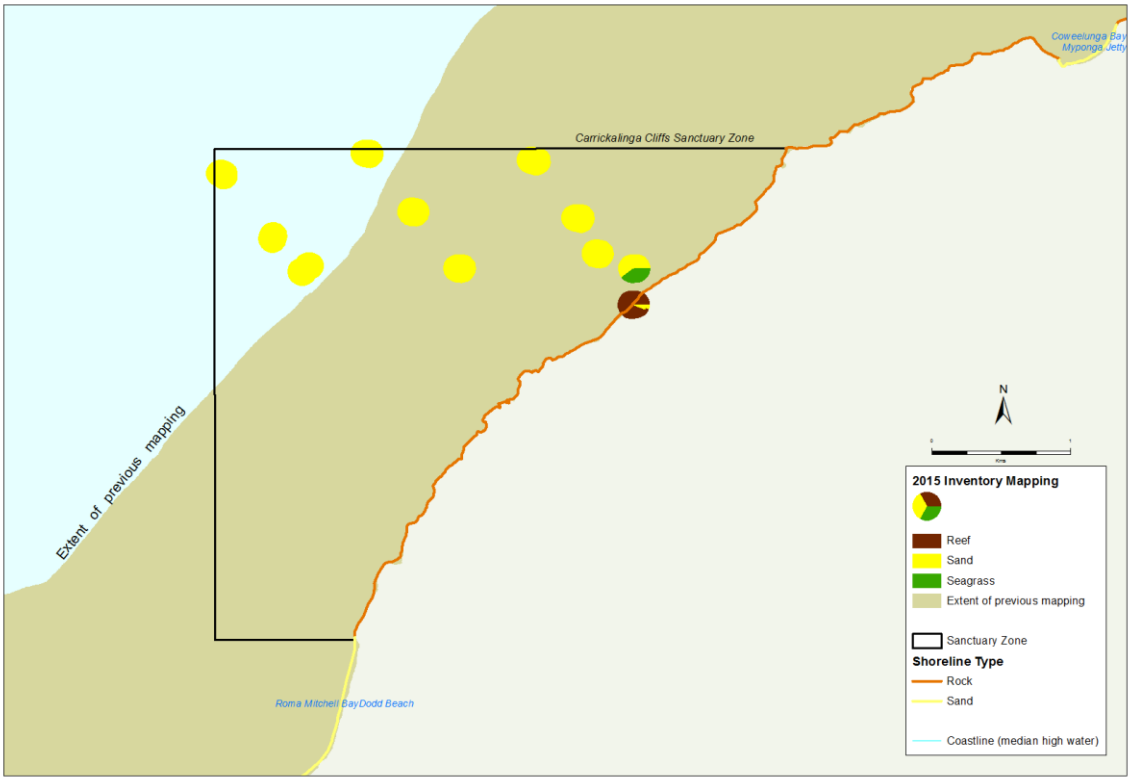


Figure 82. Benthic habitat classes for previously unmapped and mapped parts of the Carrickalinga Cliffs SZ

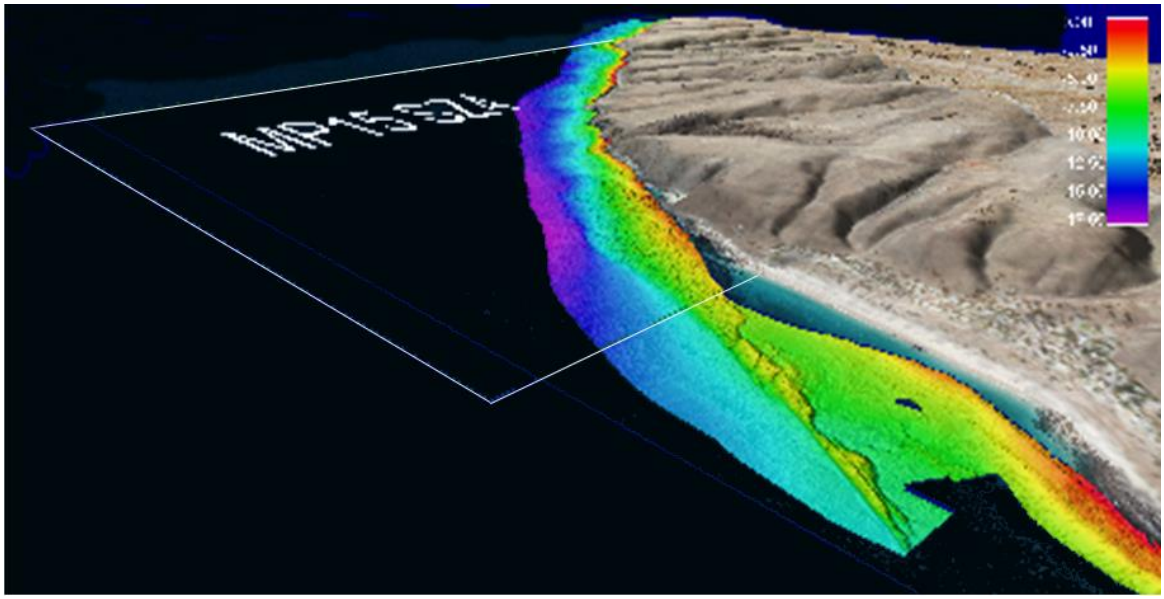


Figure 83. Swath sonar bathymetry map of the Carrickalinga Cliffs SZ, showing fringing reef structure between shoreline and soft sediment habitats in deeper water (10–15 m)

Rapid Head SZ (Figure 84) has a band of nearshore fringing reef comprising algal and patchy seagrass (*Amphibolis* sp) habitats (previously mapped, see DEH 2009). The area is subject to high current and as a consequence, soft sediment habitat that extends to the western margin of the zone (Figure 84) consists of coarse grain and shell rubble habitat. Swath mapping of the inshore reef has been carried out but is yet to be compiled.

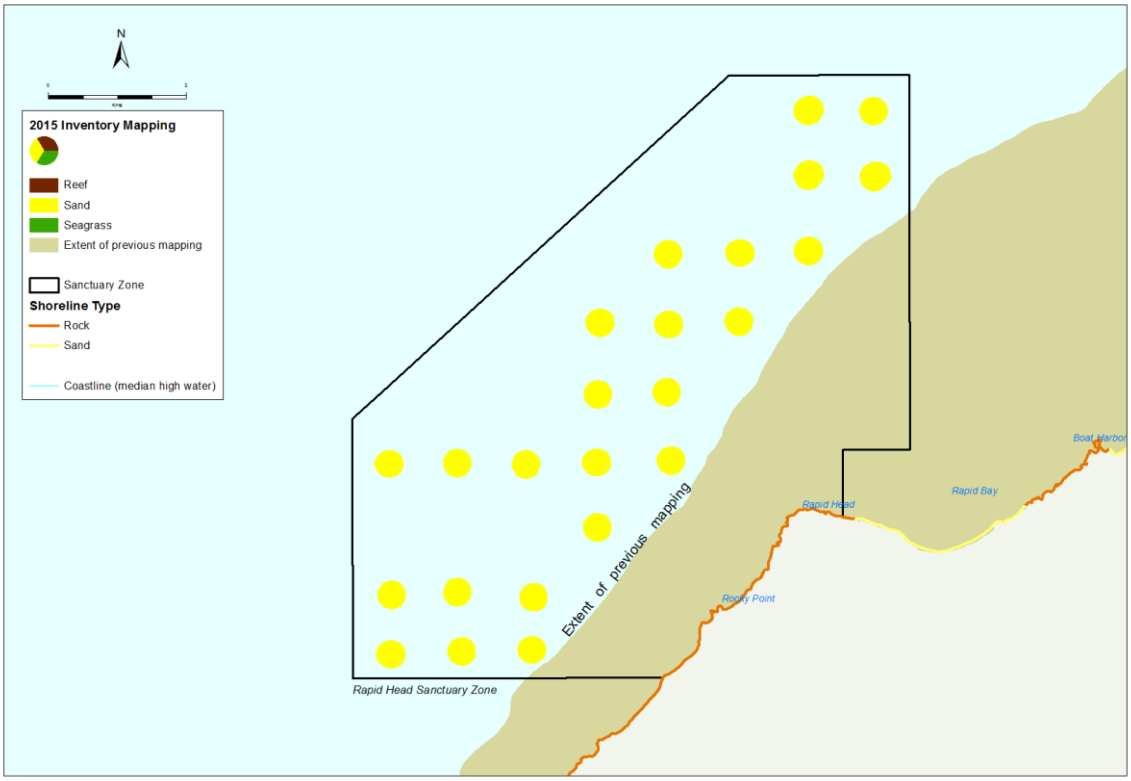


Figure 84. Benthic habitat classes for previously unmapped parts of the Rapid Head SZ

The **Bay of Shoals SZ** is a shallow and very sheltered soft sediment environment which is ideal for seagrass habitats. Inventory mapping found seagrass to be the dominant habitat forming biota at all of the survey drops (Figure 85). However, it should be noted that frequently algal species are found mixed among the seagrass beds.

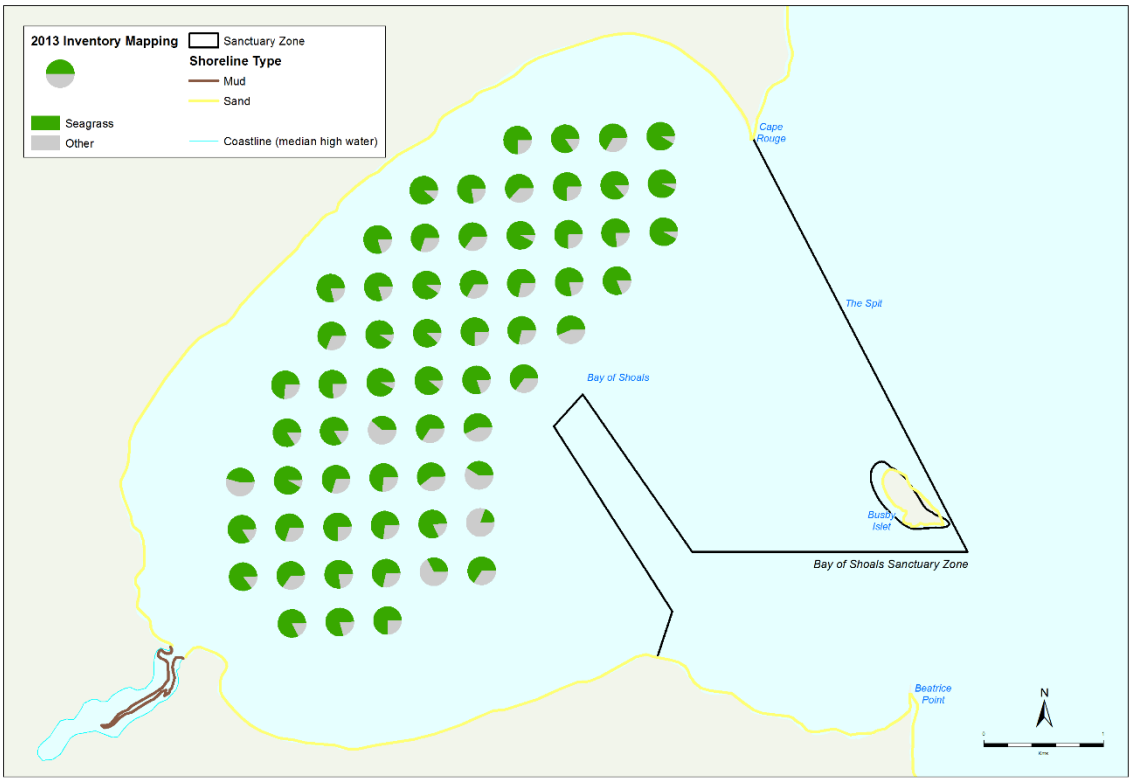


Figure 85. Benthic habitat classes for previously unmapped parts of the Bay of Shoals SZ

The **Sponge Gardens SZ** extends offshore from the cliffs west of Antechamber Bay and is characterized by diverse physical and geographic influences, including steep 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 86). Almost 60% of samples were invertebrate communities with the remainder being mostly soft sediment and reef habitat (approx. 20% each).

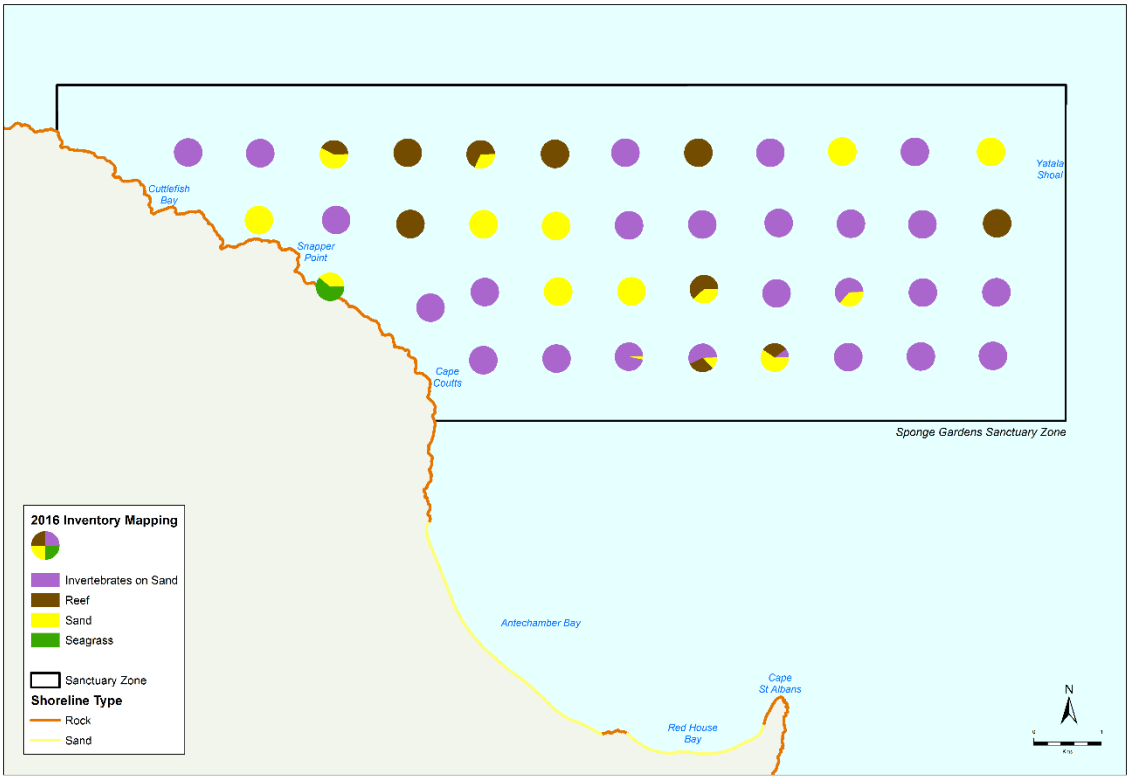


Figure 86. Benthic habitat classes for previously unmapped parts of the Sponge Gardens SZ

Swath bathymetry of the coastal margin of the zone (see Figure 87 for an example section) shows high profile steeply sloping reef on the headlands which drop quickly to approximately 20 m depth. More gently sloping sand dominated seafloor can be seen in the bays. The deeper margin (20–40 m) of the swath bathymetry map show moderately sloped seafloor dominated by sand with occasional reef structure.

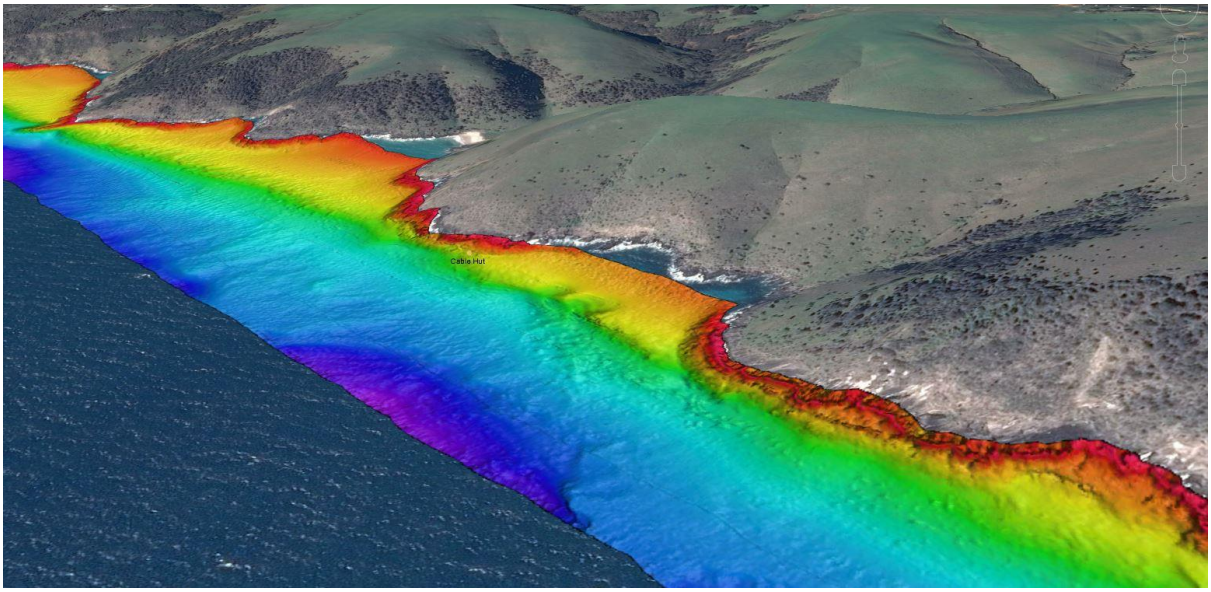


Figure 87. An example Swath sonar digital elevation model (DEM) of fringing reef on the coastal section of the Sponge Gardens SZ in the cable hut area. Steep reef slopes dropping to approximately 20 m depth can be seen on the headlands with more gentle sand dominated slopes in the bays.

The Pages SZ contains the only offshore island habitats in the Encounter Marine Park. Beyond the island and its fringing reefs the sanctuary zone contains a mix of deep water (30 – 50m) soft sediment and reef habitat (Figure 88)

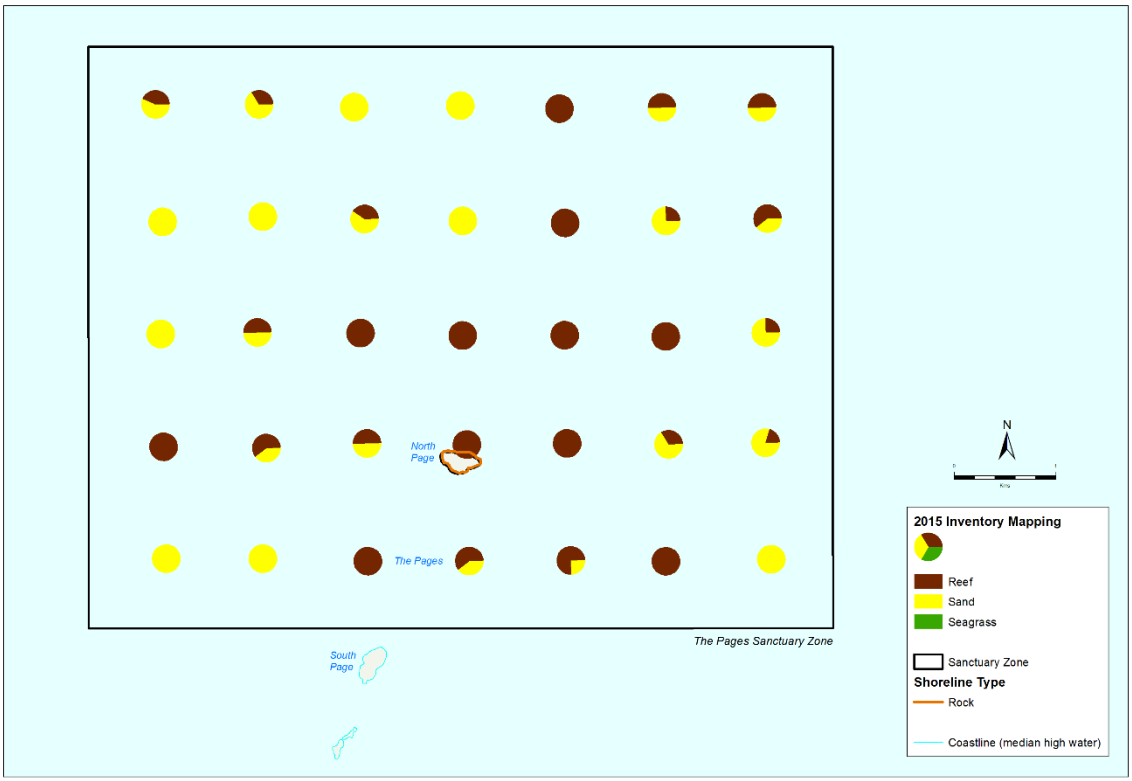


Figure 88. Benthic habitat classes for previously unmapped The Pages SZ

The **Encounter Bay SZ** spans an area of habitat transition between the more reef-dominated environment to the west and sand-dominated areas influenced by the mouth of the River Murray to the east. Previous mapping (DEH 2009) covered approximately 2/3 of the sanctuary zone (although the inshore area had not been ground truthed), and was dominated by patchy low profile reef with some areas of bare substrate. Subsequent inventory mapping of the unmapped remainder plus an inshore area (not previously ground truthed) found a similar mix of habitats (Figure 89) although more sand/sediment bottom was evident particularly on the eastern margin of the zone. Among drop locations on the eastern margin, several video drops were in areas shrouded in thick fine sediment and visibility was zero and are not presented in (Figure 89). These locations are likely dominated by silt seafloor but patch reef may also be present.

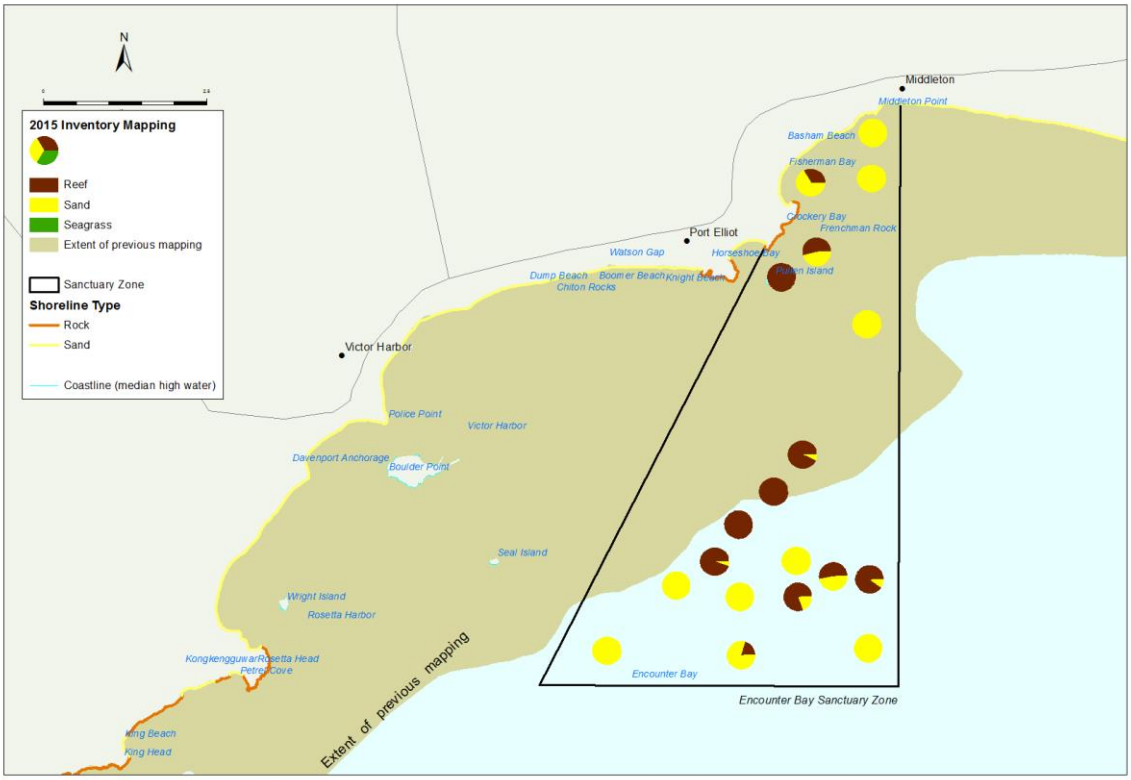


Figure 89. Benthic habitat classes for previously unmapped parts of the Encounter Bay SZ

Nuyts Archipelago Marine Park

The **Isles of St Francis SZ** is a large off-shore zone with a variety of physical/geographic influences and consequently a broad range of benthic habitat and biota. Deep open water areas seem to be dominated largely by sandy seafloor habitat although a significant number of drops found reef (Figure 90). Reef habitat was found to be more prevalent close to the islands particularly on the side more exposed to wave energy. Seagrass habitats can be found in sheltered areas in the lee of Islands.

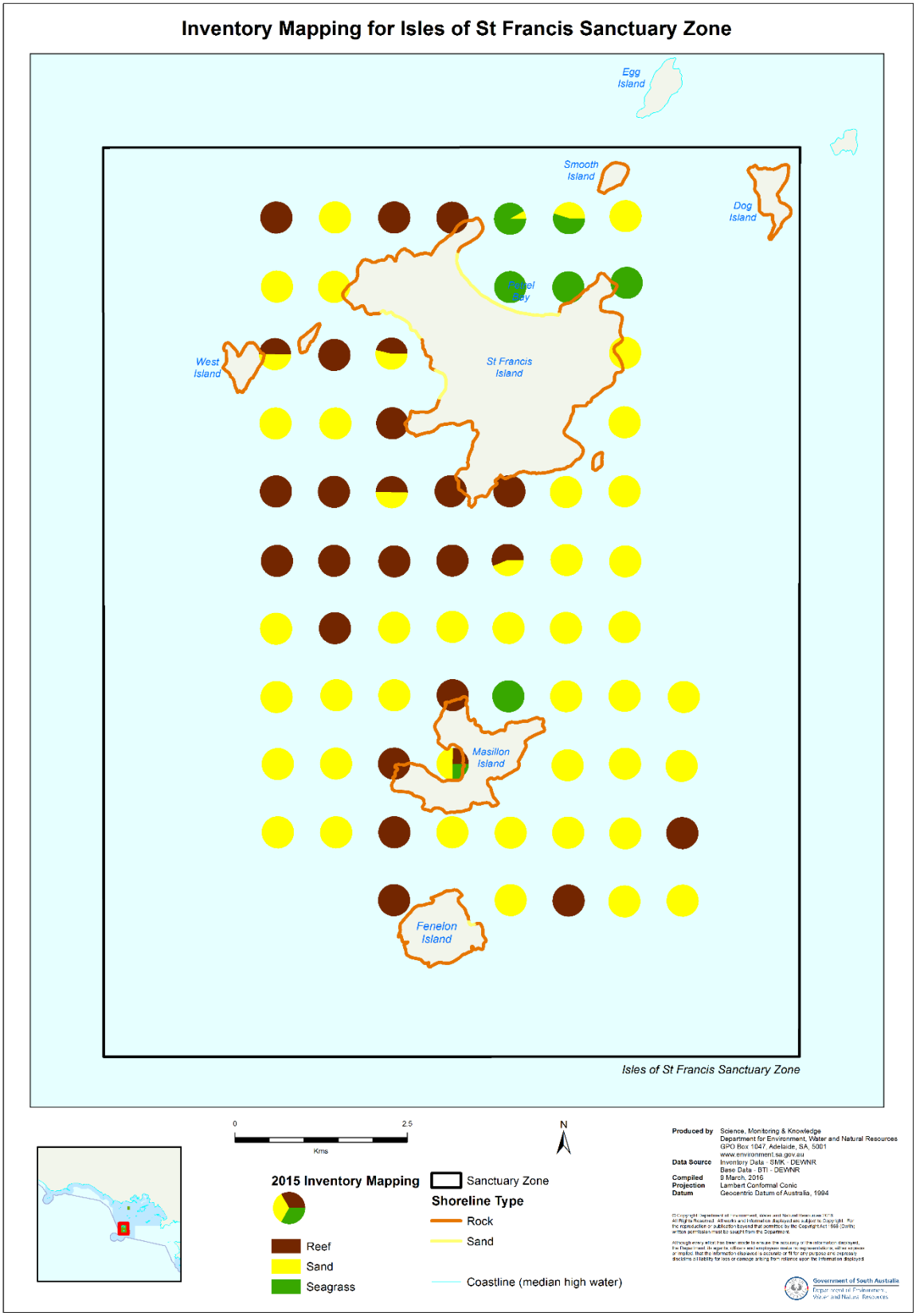


Figure 90. Benthic habitat classes for the Isles of St Francis SZ

Deep water sandy habitat was found to dominate the majority of the **Lound Island SZ** with reef habitats found close the island itself (Figure 91).

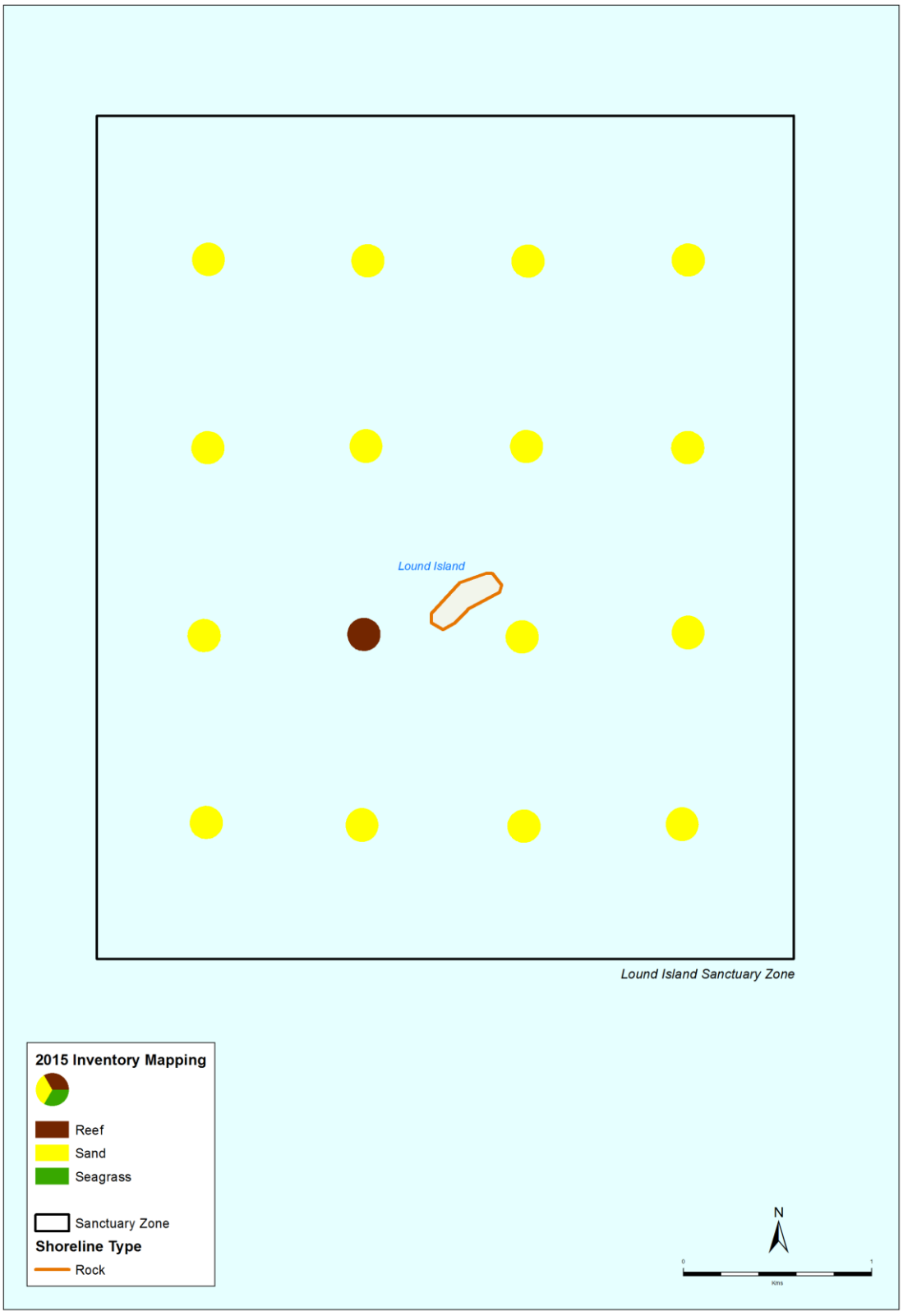


Figure 91. Benthic habitat classes for the previously unmapped Lound Island SZ

Franklin Harbour Marine Park

Of the four sanctuary zones within the Franklin Harbour Marine Park the two within the bay/inlet and more than half of the Offshore Franklin Harbour zone have been mapped previously. Inventory mapping video transects have been collected for the remainder of the two outer zones (Offshore Franklin and Pt Gibbon sanctuary zones) but remains to be processed and maps produced.

Upper Spencer Gulf Marine Park

Only the **Fairway Bank SZ** within the Upper Spencer Gulf Marine Park remained unmapped at the time of declaration (2012). Inventory mapping video transects have been collected for this zone but to date remain unprocessed.

Eastern Spencer Gulf Marine Park

The Goose Island and **Port Victoria SZ** have previously been completely mapped. The nearshore half of the **Cape Elizabeth SZ** has also been mapped, however the remaining offshore half of the zone remains unmapped.

Southern Spencer Gulf Marine Park

Previous mapping of the **Chinamans Hat SZ** covered the nearshore third of the zone contained a mix of reef and seagrass seafloor habitat. Subsequent inventory mapping of the remainder of the zone which is in deeper waters found that sand/soft sediment habitats dominated (Figure 92).

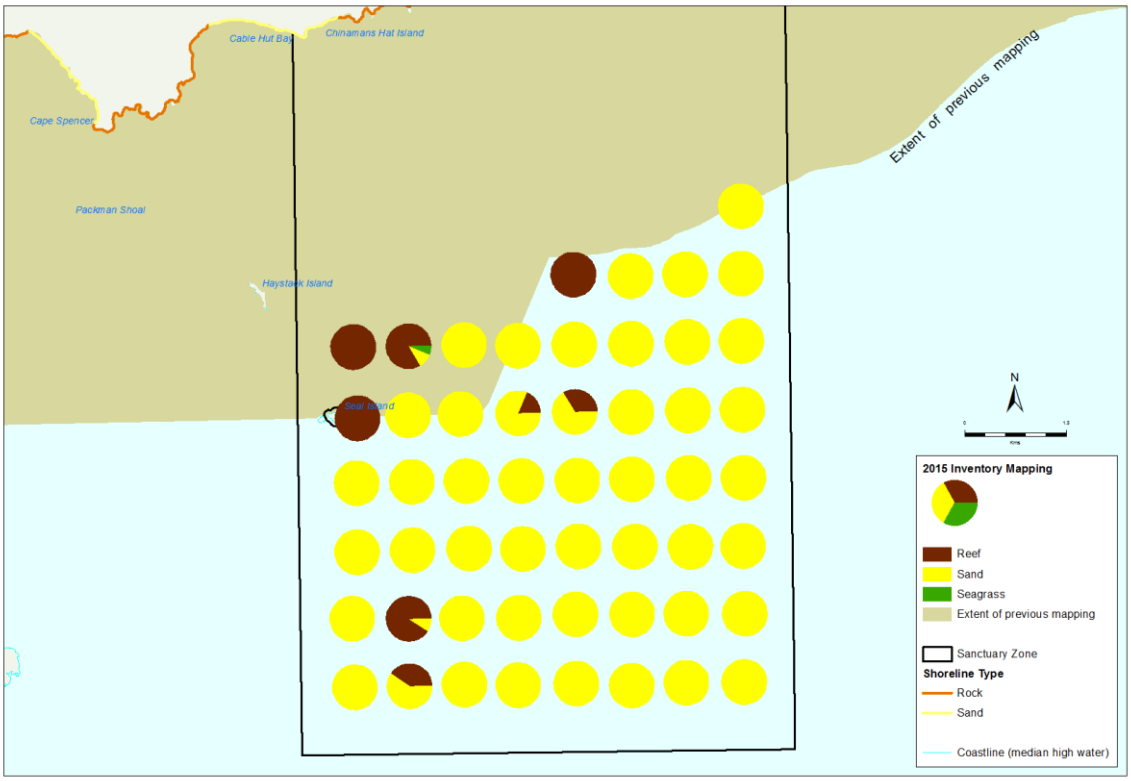


Figure 92. Inventory mapping data for the previously unmapped portion of the Chinamans Hat SZ

The entire **Orcades Bank SZ** is in deep water, the seafloor is largely sand habitat broken up by significant amounts of low profile reef (mostly ledges; Figure 93). A high profile (10 m high) reef (after which the zone is named) is found in the north western corner of the zone.

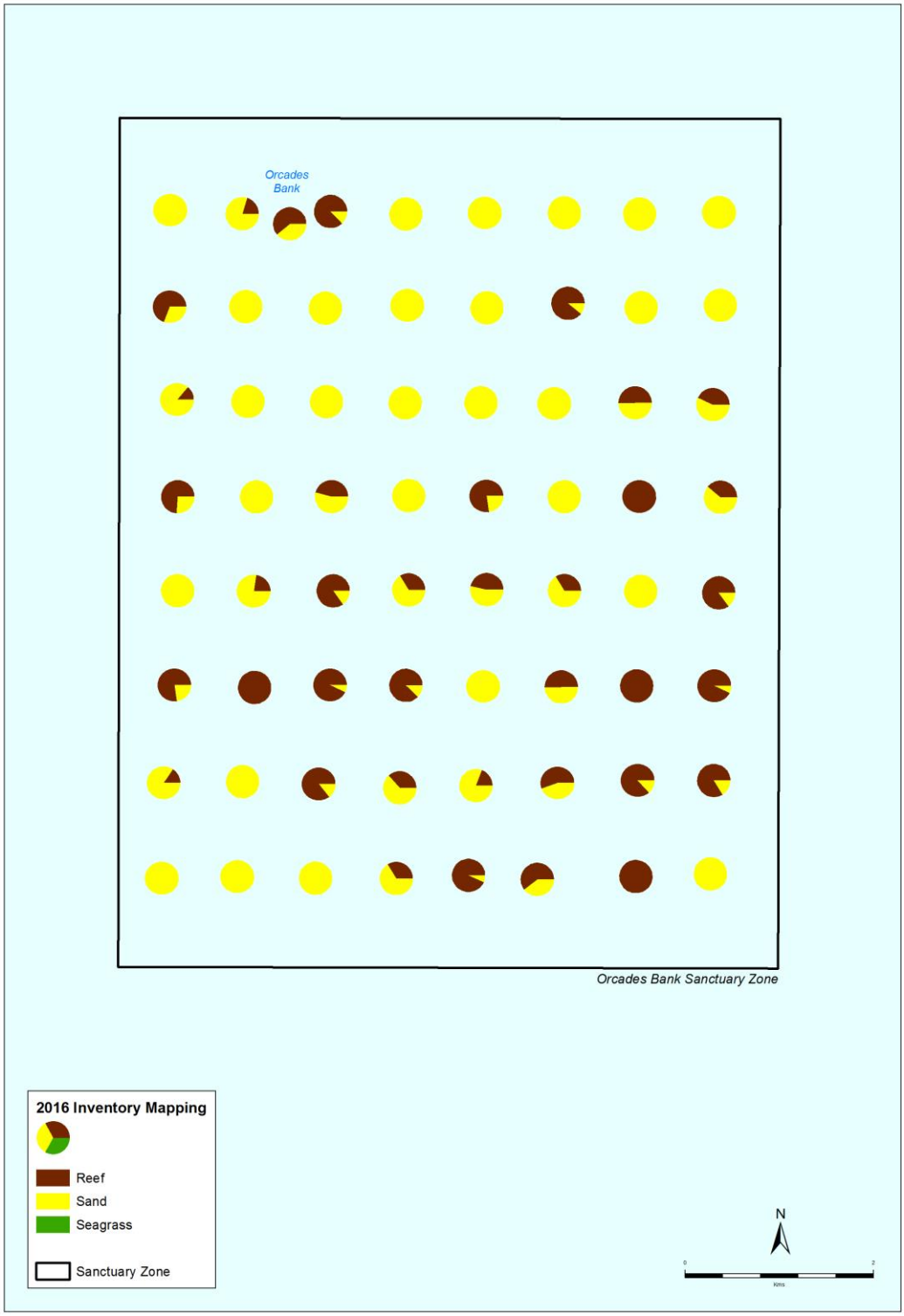


Figure 93 Benthic habitat classes for the previously unmapped Orcades Bank SZ

Lower Yorke Peninsula Marine Park

Approximately two-thirds of the **Point Davenport SZ** was mapped prior to declaration and was mostly dominated by seagrass habitats. Subsequent inventory mapping of the remaining third of the zone was completed in 2016. Similarly to the inshore area, the previously unmapped area was dominated by seagrass habitat (Figure 94). The Salt Swamp Creek sanctuary zone was completely mapped in the 1990s therefore no further mapping has been carried out.

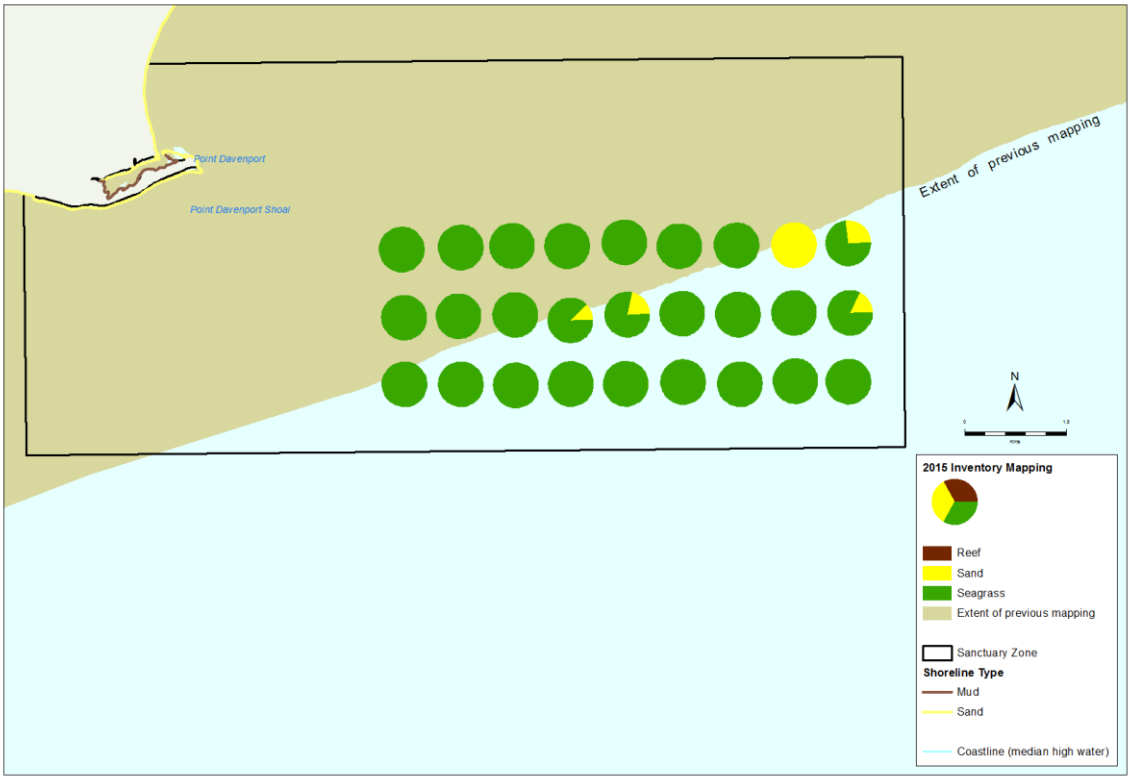


Figure 94. Benthic habitat classes for the Point Davenport SZ

Upper Gulf St Vincent Marine Park

The majority of the Upper Gulf St Vincent Marine Park was mapped prior to 2012 and is dominated by shallow seagrass communities. Although the Clinton Wetlands and Middle Spit sanctuary zones have previously been mapped, ground truthing only covered the inshore areas and missed the southern half of Clinton and most of Middle Spit. As a consequence, inventory mapping was carried out to confirm the previous mapping. Inventory mapping for Clinton confirmed previous mapping with the area almost totally dominated by seagrass (Figure 95). Similarly, Inventory mapping of the **Middle Spit SZ** confirmed previous mapping and showed the area to be dominated entirely by seagrass habitat (Figure 96).

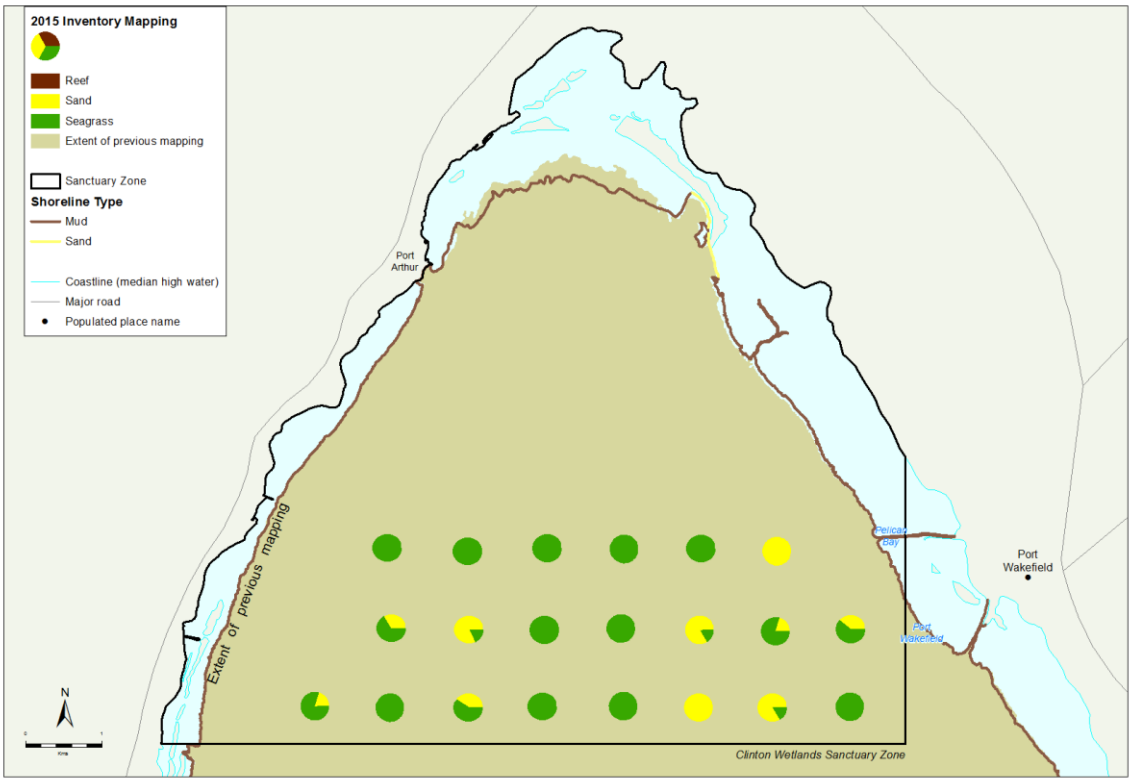


Figure 95. Benthic habitat classes for the Clinton Wetlands SZ

The **Offshore Ardrossan SZ** in the middle of the gulf on the southern border of the park, is in deeper waters, and was found to contain less seagrass with some video transects dominated by unvegetated soft sediment, while transects with seagrass tended to be patchier and sparser than the shallower zones (Figure 97).

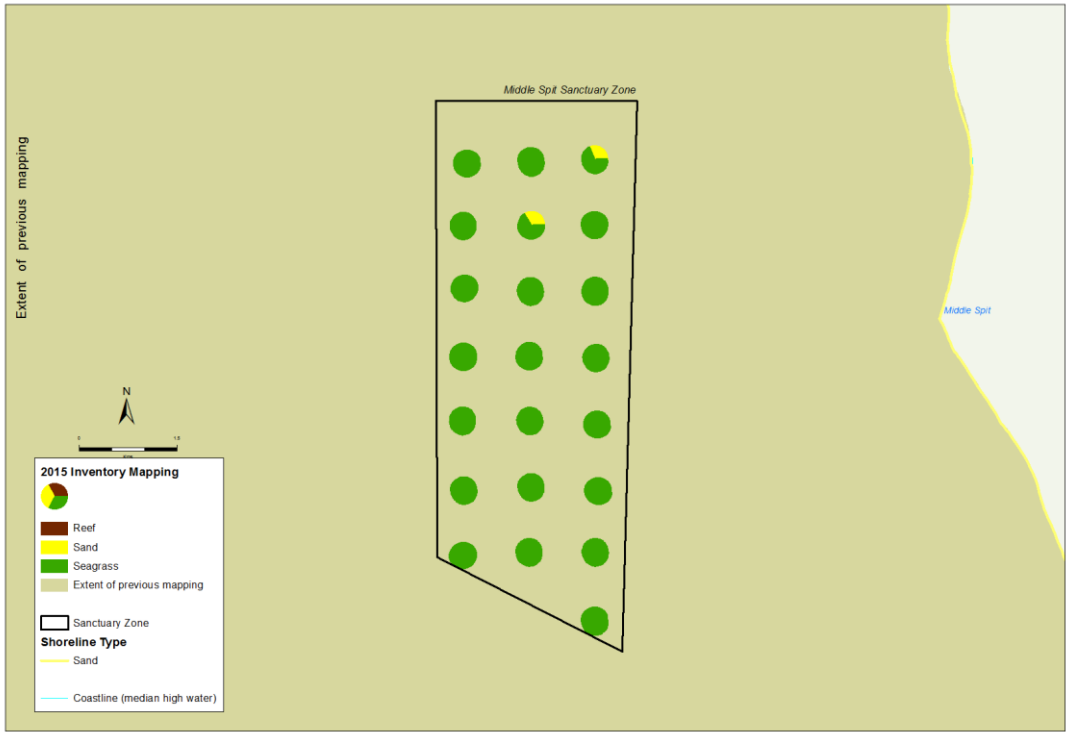


Figure 96. Benthic habitat classes for the Middle Spit SZ

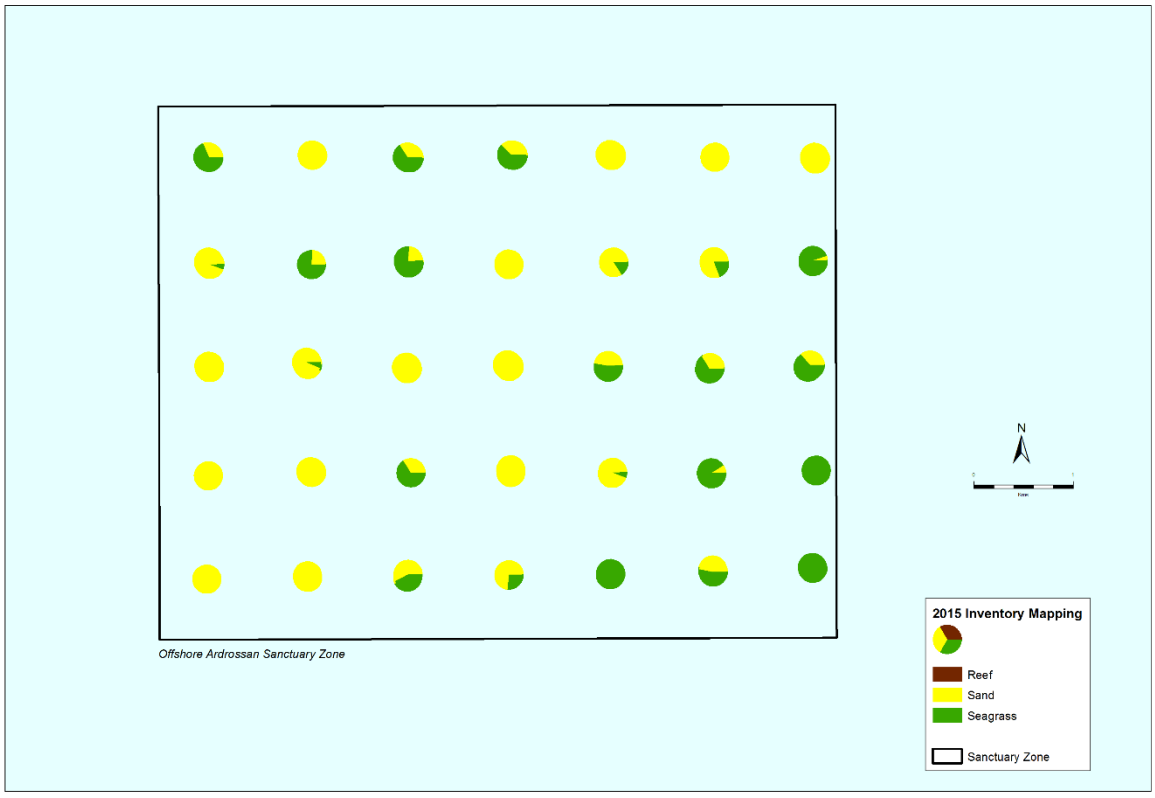


Figure 97. Benthic habitat classes for the Offshore Ardrossan SZ

Western KI Marine Park

None of the three sanctuary zones had reliable benthic mapping prior to declaration of the Western KI Marine Park. To date the Cape Borda and Kangaroo Island Upwelling remain unmapped due to difficulty accessing these remote locations. An expedition to the **Cape du Couedic SZ** in 2015 provided the opportunity to inventory map the entire zone and swath map almost half. Reef is the dominant habitat in this zone (Figure 98). Swath mapping of the western third of this zone has been carried out but is yet to be compiled.

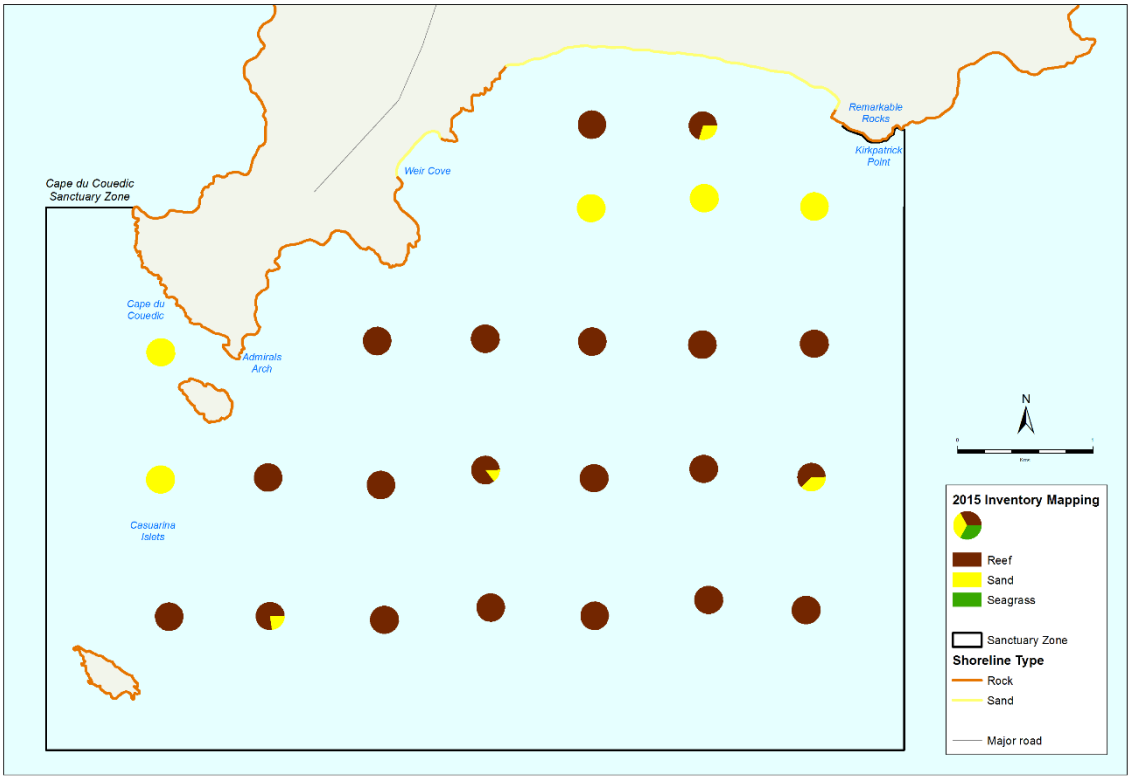


Figure 98. Inventory habitat map for the Cape du Couedic SZ

Southern KI Marine Park

The Southern KI Marine Park has one sanctuary zone and no previous habitat mapping exists for the area. Due to difficulties in accessing this park, no inventory mapping has yet been conducted.

Upper South East Marine Park

The Upper South East Marine Park has one sanctuary zone, Lacepede Bay, which was fully mapped prior to declaration. Subsequently a small amount of swath sonar mapping has been carried out in and around the sanctuary zone to assist in locating appropriate sites for dive and BRUVS monitoring sites. To date this data has not been used for mapping products.

Previous mapping also entirely covered the Cape Dombey SZ so no Inventory mapping has been conducted. In 2014 the entire zone and its surrounds was mapped with swath sonar however bathymetry and backscatter maps are yet to be compiled.

Lower South East Marine Park

The Lower South East Marine Park has two sanctuary zones, Canunda and Piccaninnie Ponds. Both zones have previously been mapped, however they lack ground truthing. To date there has been no opportunity to inventory map these zones to confirm previous mapping.

10.2.5 SEQs 17–20 Encounter Marine Park

Potential causal links between management plan strategies and observed changes in biodiversity, habitats, ecosystem processes, and ecosystem resilience: Strategies 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15

Notes on data presented in this section

The indicators outlined in this section have been selected to align with and provide information relevant to answering the ecological SEQs. In some cases data will not be presented for an indicator, sampling event or SZ. There are several reasons for this including:

- data was collected in a research collaboration and cannot be released yet
- data has not been processed (e.g. some habitat video, aerial imagery and photo quadrat data has been collected and is still to be processed).
- data not yet available for reporting (e.g. recovery from disturbance event)
- The survey design to assess the effectiveness of Marine Park SZs is based on comparing sites inside SZs (impact) with sites outside SZs (controls). Marine parks were declared in 2012, prior to this the location of zoning boundaries was unknown, however data began being collected in 2005 (Edgar 2006) and hence some monitoring prior to 2012 is not balanced in that some SZ may only have control sites and no corresponding impact sites and vice versa.
- Focal species may be different for each marine park
- Aldinga SZ (Encounter MP) was not surveyed in 2017 and the 2016/17 Pages SZ BRUVS data has not been processed at the time of this documents release.
- BRUVS data for 2016/17 is presented in this report, however while 2016/17 dive monitoring was completed for 2016/17 the data was not processed in time for this report.
- The absence of standard errors in graphs denotes locations with only one survey.

Community indicators (Baited remote underwater video surveys)

Fish species richness

The number of fish species recorded by BRUVS in the Encounter Marine Park was higher inside SZs compared to outside in 2015/16 but was similar between the two zones in 2016/17 (Figure 99). Overall the number of species recorded in 2016/17 was lower than in 2015/16 (Figure 99).

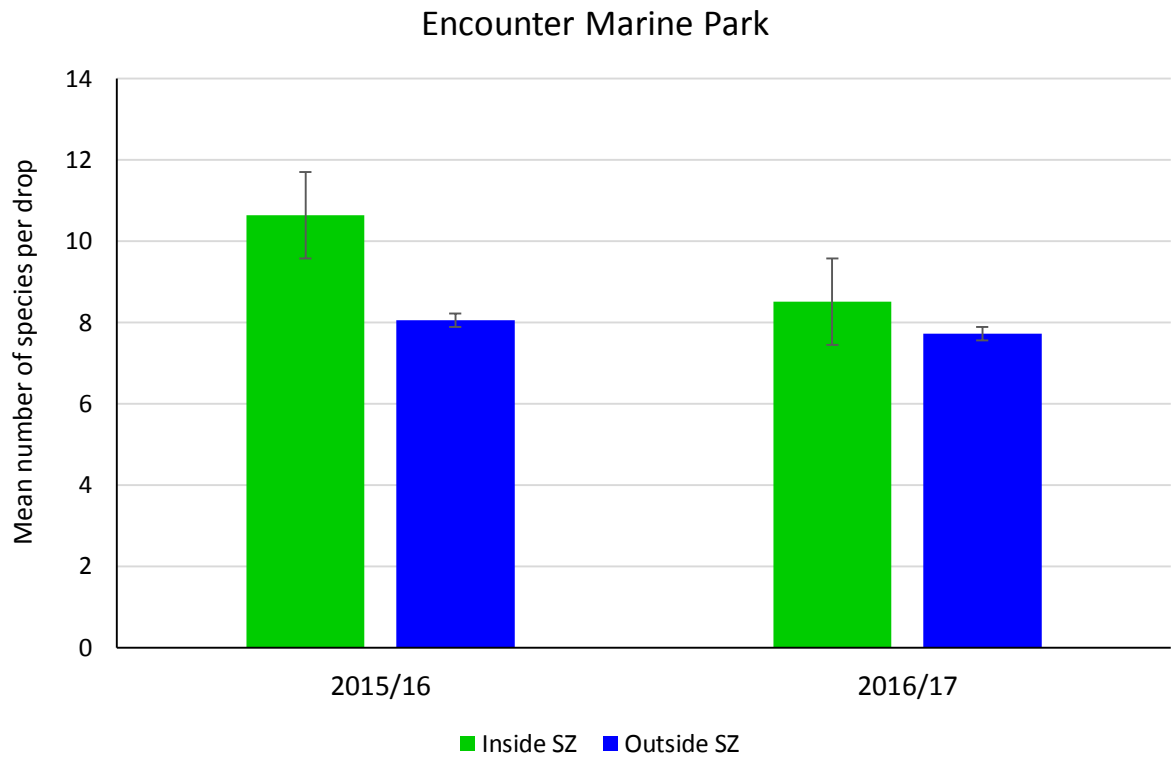


Figure 99. Mean (±SE) number of fish species per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

Carrickalinga, Aldinga and Sponge Gardens SZs had highest numbers of fish species recorded inside the SZ compared to outside, whilst Rapid Head, Bay of Shoals and the Pages SZs all had relatively similar numbers of fish species both inside and outside of the SZs (Figure 100).

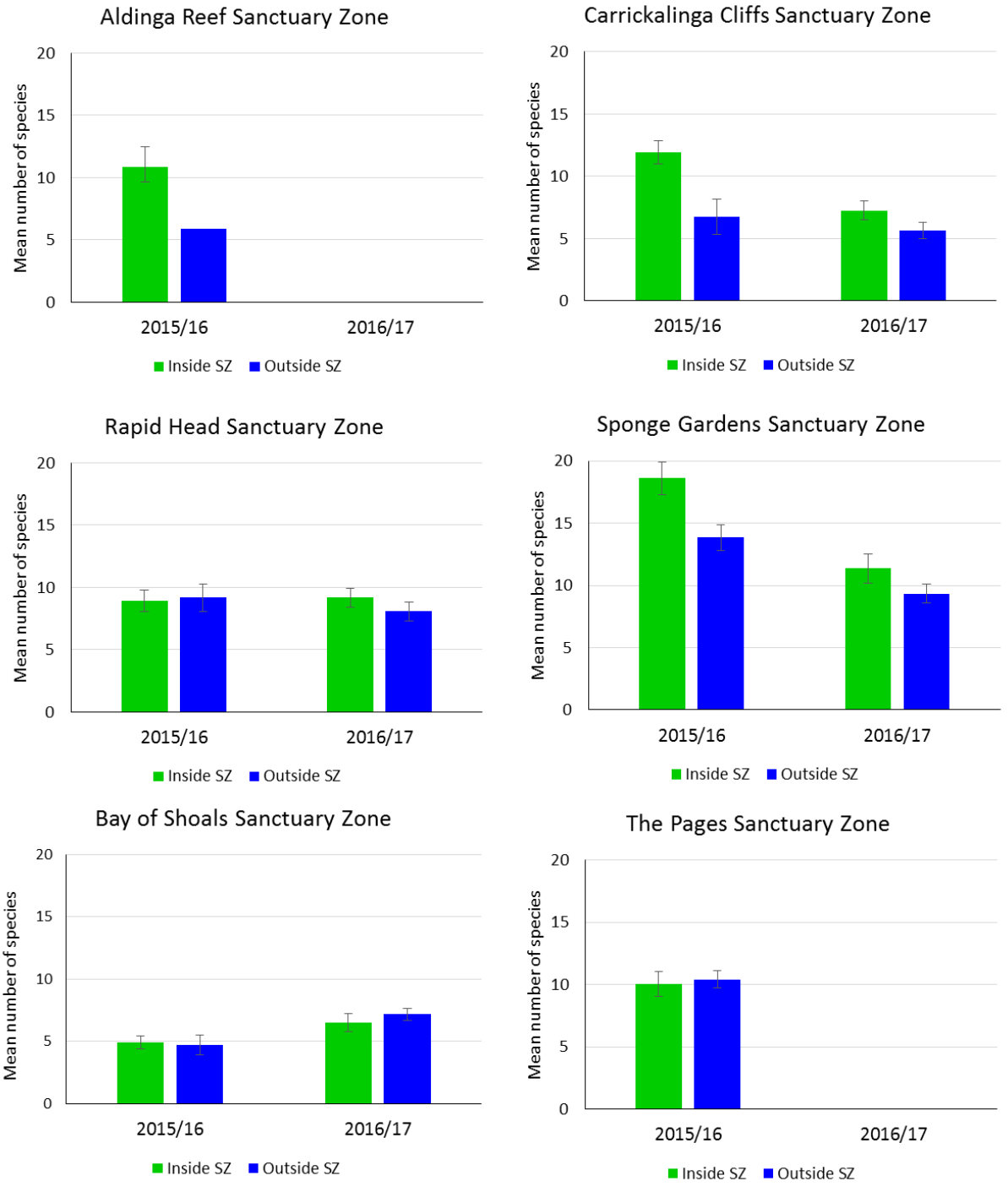


Figure 100. Mean (±SE) number of species per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Community temperature index fish

The mean community temperature index for fish in Encounter Marine Park was similar (within 0.2 °C) between inside and outside of the SZ at approximately 18 °C in both 2015/16 and 2016/17 (Figure 101).

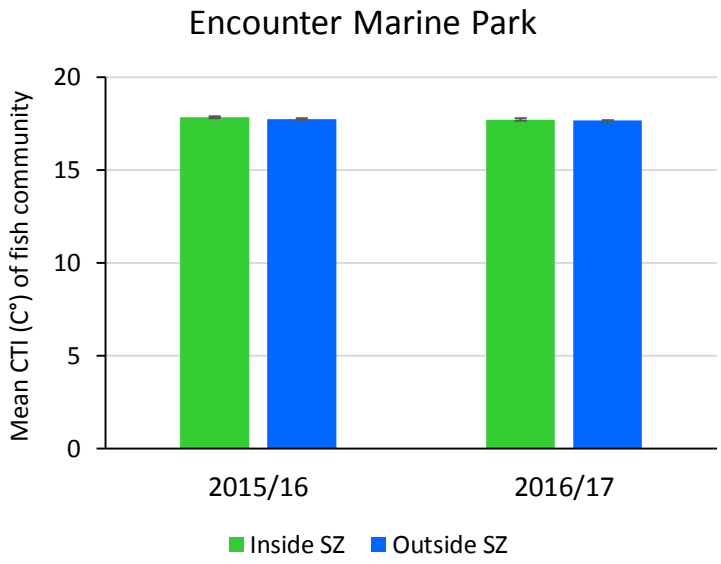


Figure 101. Mean (±SE) community temperature index (CTI, °C) for fish communities at sites inside vs outside SZs in Encounter Marine Park

The mean community temperature index (CTI, Stuart-Smith et al. 2015) for fish communities inside and outside SZs was similar for all individual SZs, with the exception of Aldinga SZ where outside the SZ had a slightly higher CTI outside by 0.5 °C in 2015/2016 (Figure 102). The CTI has remained relatively similar across all SZs between 2015/16 and 2016/17 with the exception of Aldinga and the Pages SZ.

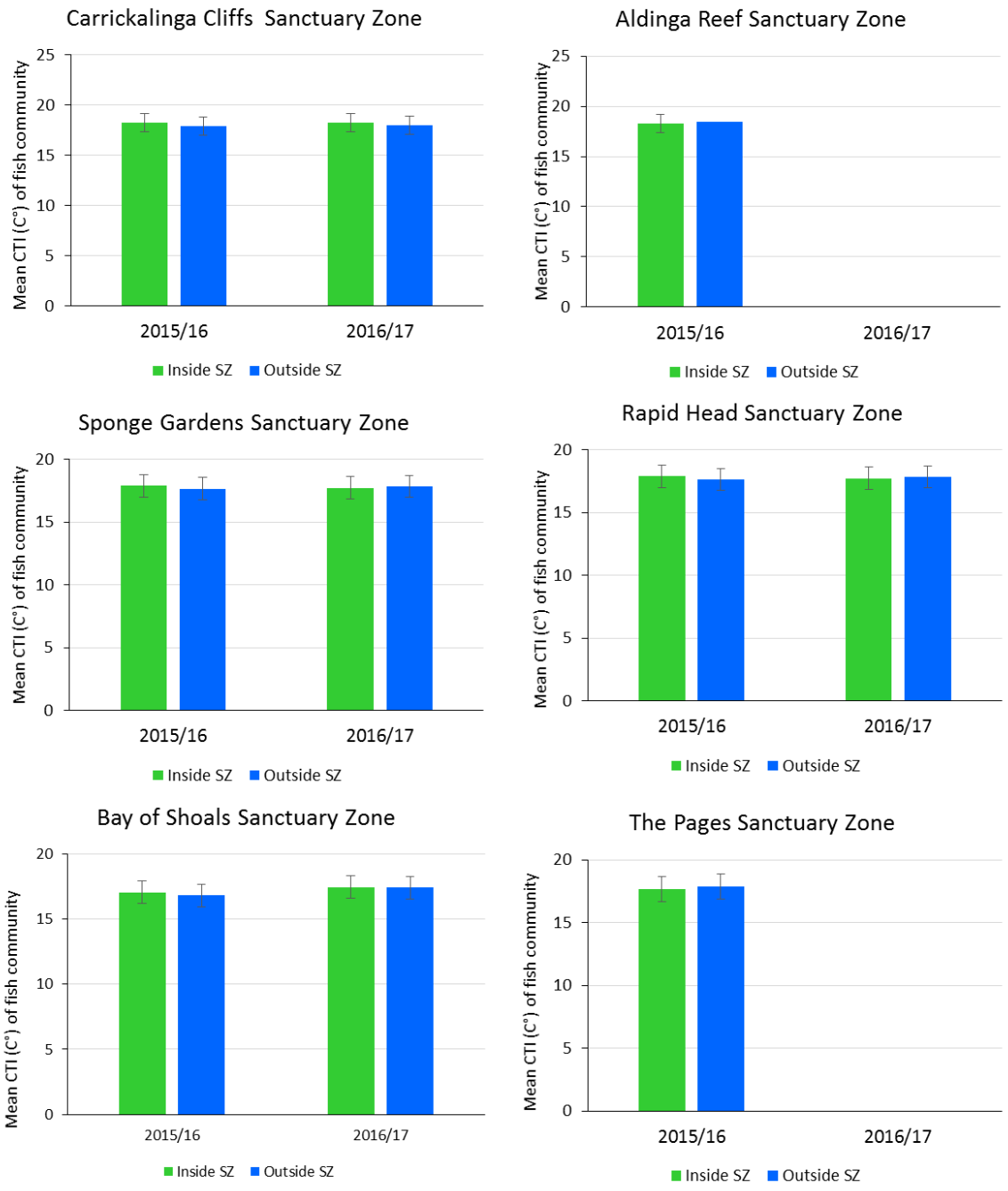


Figure 102. Mean community temperature index (°C) for fish communities at sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Trophic structure

The trophic structure for Encounter Marine Park was relatively similar between inside and outside of SZs in 2015/2016, where there were similar proportions of mean biomass of the respective groups. Browsing herbivores, benthic invertivores, omnivores and higher carnivores were relatively even and higher than plankitvores (Figure 103). The relative groupings were more variable in 2016/17 with inside SZ sites having less omnivores and greater proportion of browsing herbivores. The outside sites in 2016/17 were comparable with 2015/16 with slightly higher proportions of benthic invertivores and less higher carnivores (Figure 103).

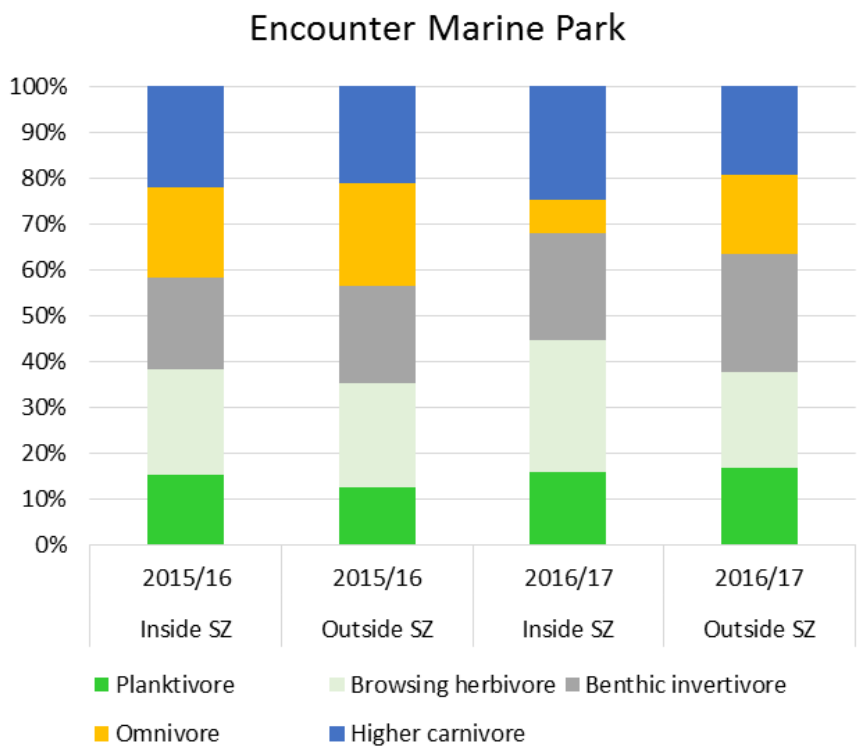


Figure 103. Proportion of mean biomass per fish trophic group recorded on BRUVS inside vs outside SZs in Encounter Marine Park

The mean biomass of fish species per trophic group was generally inconsistent between SZs with slight changes between each year within the individual SZs (Figure 104), for example Carrickalinga Cliffs SZ had relatively similar proportions of trophic groups inside SZ compared to outside in 2015/2016, however in the following year there were no omnivores detected. The Sponge Gardens SZ displayed the most consistency overall for both years across both zones, with only a slight decrease in the proportion of higher predators detected outside the SZ in 2016/17 (Figure 104). Bay of Shoals SZ had no planktivores recorded on BRUVS for any of the sites both years and also had a decrease in the amount of browsing herbivores detected in 2016/17. Rapid Head and Carrickalinga Cliffs SZ both had very similar proportions of trophic groups across both years both inside and outside SZs (Figure 104).

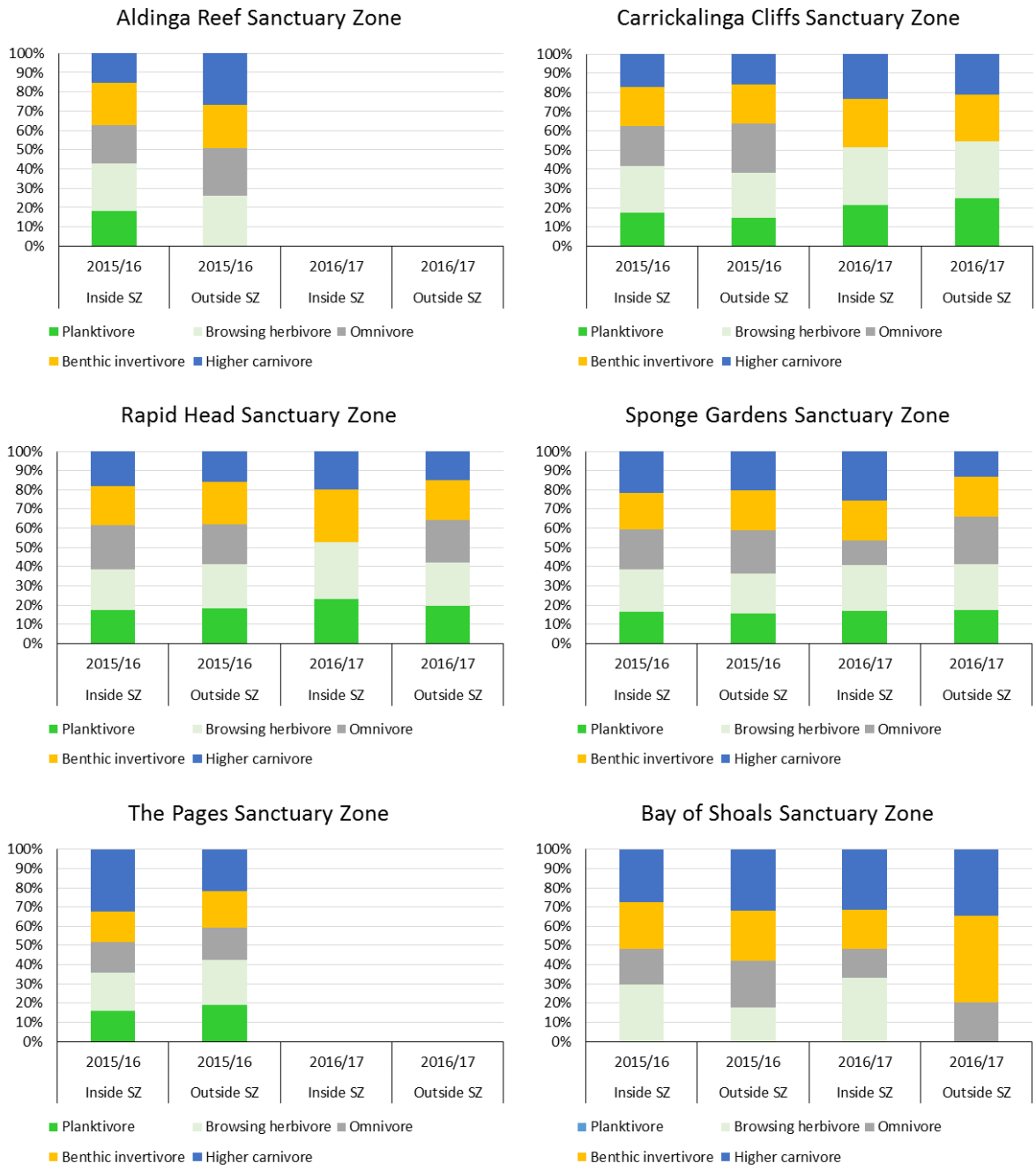


Figure 104. Mean biomass per fish trophic group recorded on BRUVS inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Recovery from disturbance

No data yet

Focal group indicators (baited remote underwater video surveys)

Abundance of fished species

The mean number of fished species recorded by BRUVS in the Encounter Marine Park was higher outside SZ compared to inside in 2015/16 but was relatively similar between inside and outside SZ in 2016/17 (Figure 105). Overall the mean abundance of fished species recorded in 2016/17 was lower than in 2015/16 (Figure 105).

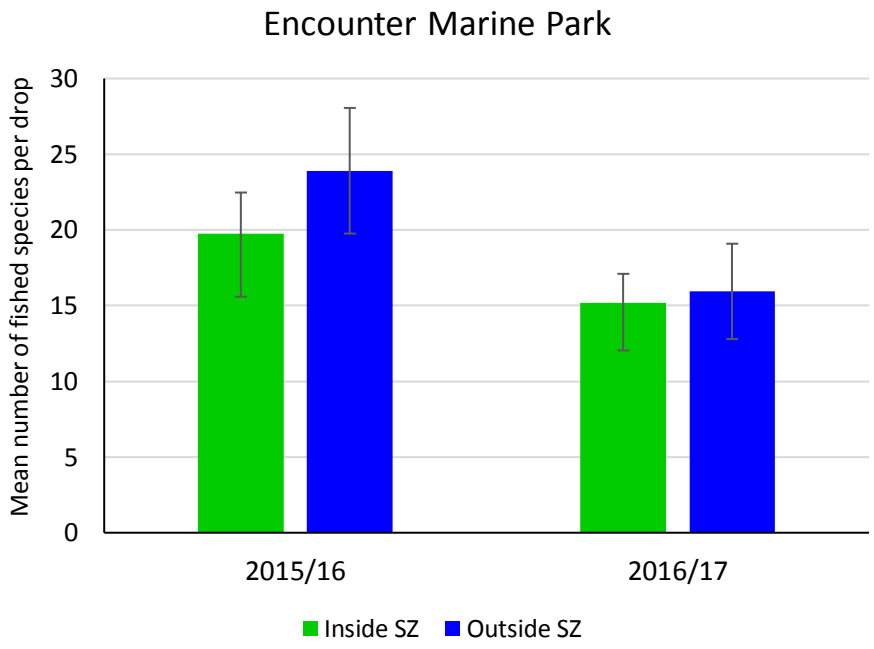


Figure 105. Mean (±SE) number of fished species per BRUVS drop for sites inside vs outside SZ in Encounter Marine Park

The mean number of fished species recorded by BRUVS was highest in Aldinga Reef and Sponge Gardens SZs (Figure 106). In general the abundance of fished species was consistent between inside vs outside for each SZ. For example an SZ with higher abundance inside for 2015/16 was likely to have the same result the following year in 2016/17 (Figure 106).

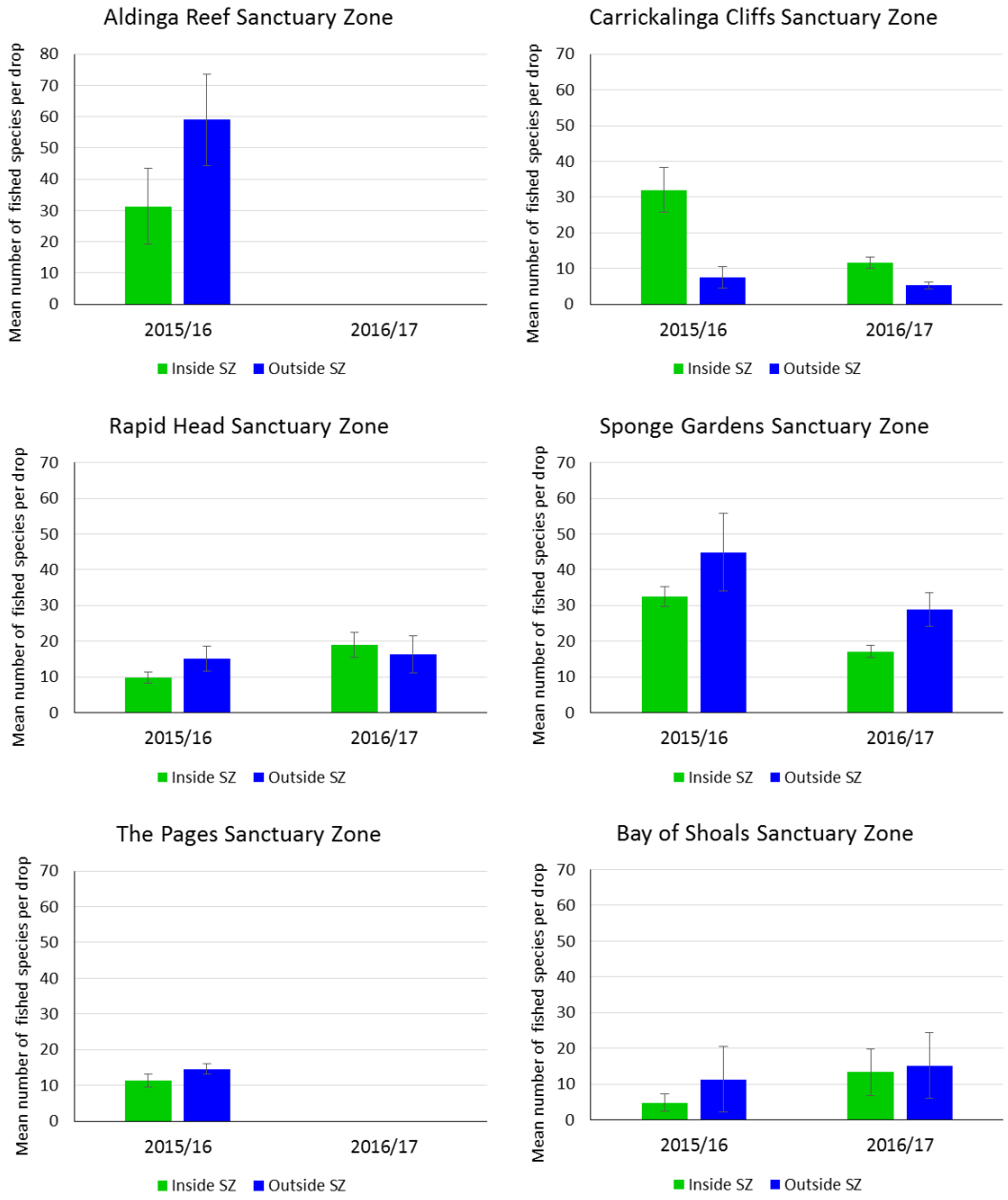


Figure 106. Mean (±SE) number of fished species per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Biomass of fished species

The mean biomass of fished species was higher inside SZs compared to outside for both 2015/16 and 2016/17 in the Encounter Marine Park (Figure 107). The biomass of fished species has remained relatively similar for 2016/17 (Figure 107).

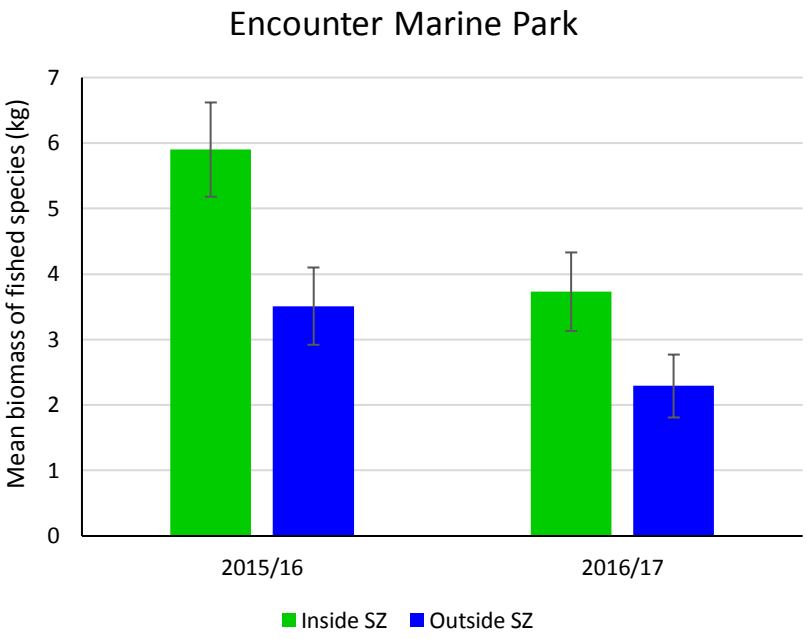


Figure 107. Mean (±SE) biomass of fished species per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean biomass of fished species was not consistent between different SZs but was more consistent between years for individual SZs (Figure 108). Aldinga Reef, Carrickalinga Cliffs and Sponge Gardens SZs had a higher mean biomass of fished species inside SZ vs outside for both 2015/16 and 2016/17, while Bay of Shoals had lower average biomass of fished species inside vs outside for 2016/17. Rapid Head SZ had a relatively similar biomass recorded for inside vs outside the SZ across both years (Figure 108).

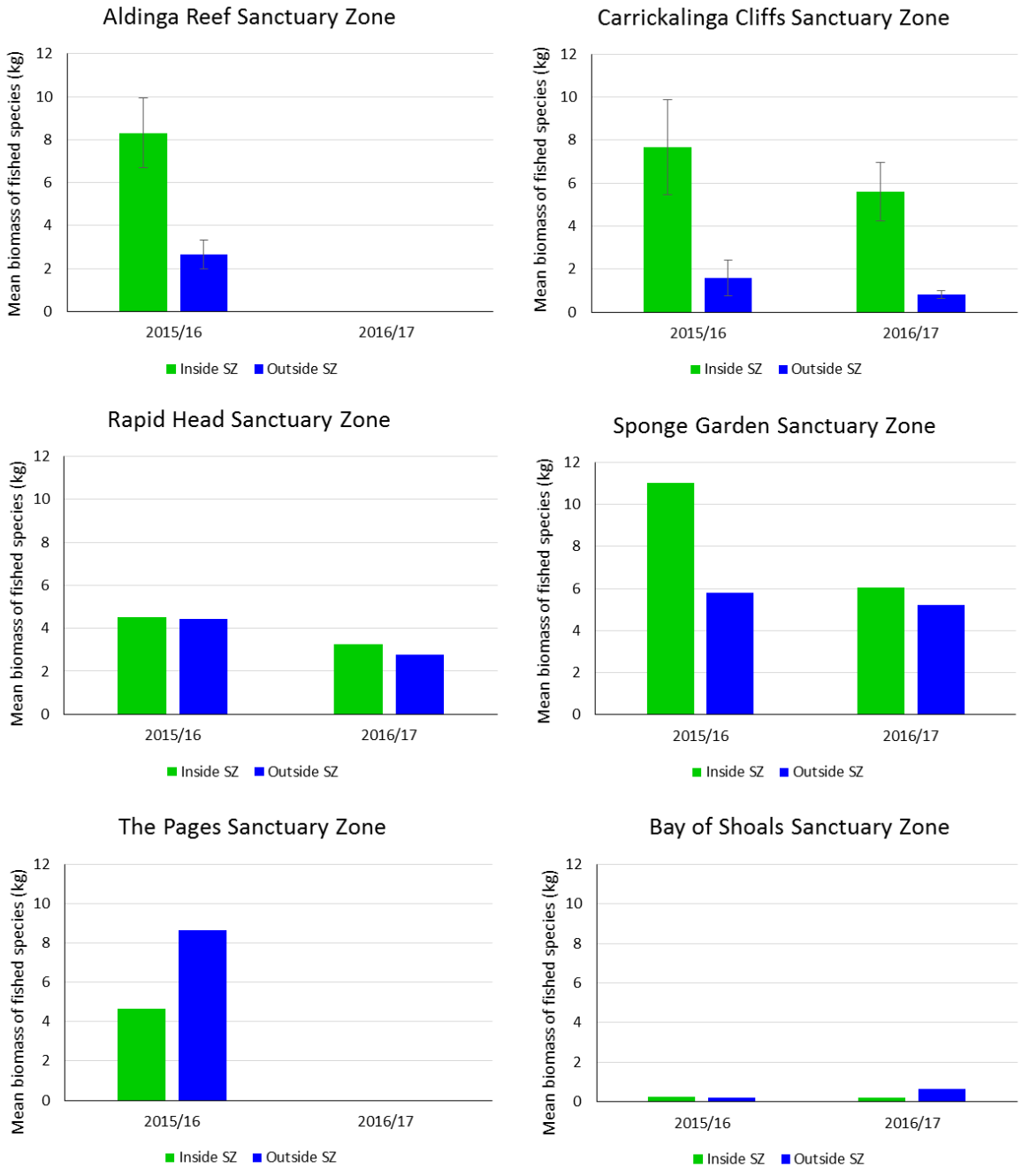


Figure 108. Mean (±SE) biomass of fished species per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of large fish species

The mean number of large fish (>200 mm) recorded on BRUVS was higher inside SZs compared to outside for both 2015/16 and 2016/17 in the Encounter Marine Park (Figure 109). The highest mean number of large fish recorded on BRUVS was about 11 per drop (Figure 109).

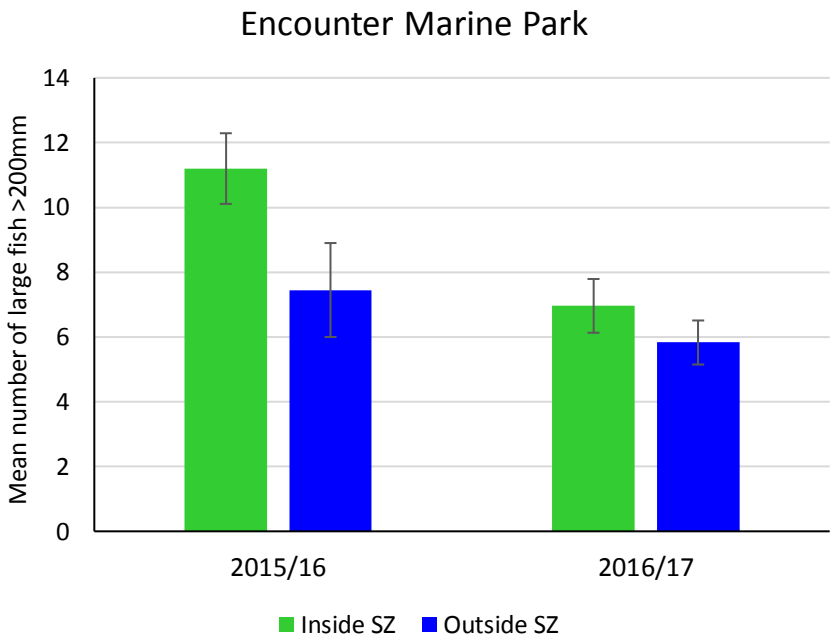


Figure 109. Mean (±SE) number of large fish species (>200 mm) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean number of large fish species recorded on BRUVS was not consistent between SZs and associated comparison sites or within individual SZs (Figure 110). Aldinga Reef, Carrickalinga Cliffs and Sponge Gardens SZs generally had a higher abundance of large fish species inside vs outside SZs for both 2015/16 and 2016/17, while Bay of Shoals, Rapid Head and the Pages SZs had a higher abundance of large fish species outside vs inside SZ which varied between 2015/16 and 2016/17. Sites inside the Sponge Gardens SZ had the highest number of large fish at just over 20 fish per drop (Figure 110).

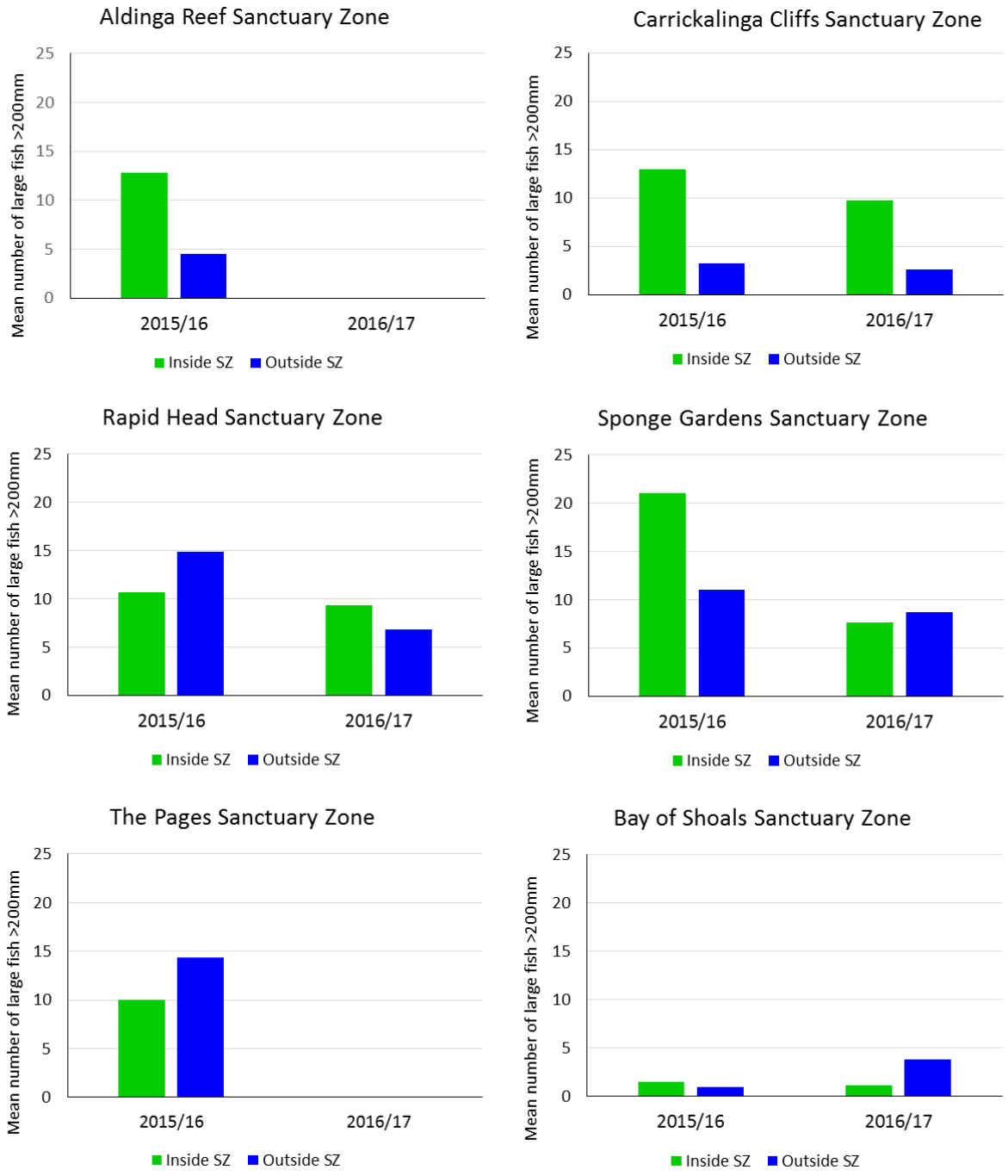


Figure 110. Mean (±SE) number of large fish species recorded per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Biomass of large fish

The mean biomass of large fish species recorded on BRUVS was higher inside SZs compared to outside SZs for both 2015/16 and 2016/17 in the Encounter Marine Park (Figure 111). The highest biomass of large fish species was just over 14 kg per drop in 2015/2016 (Figure 111).

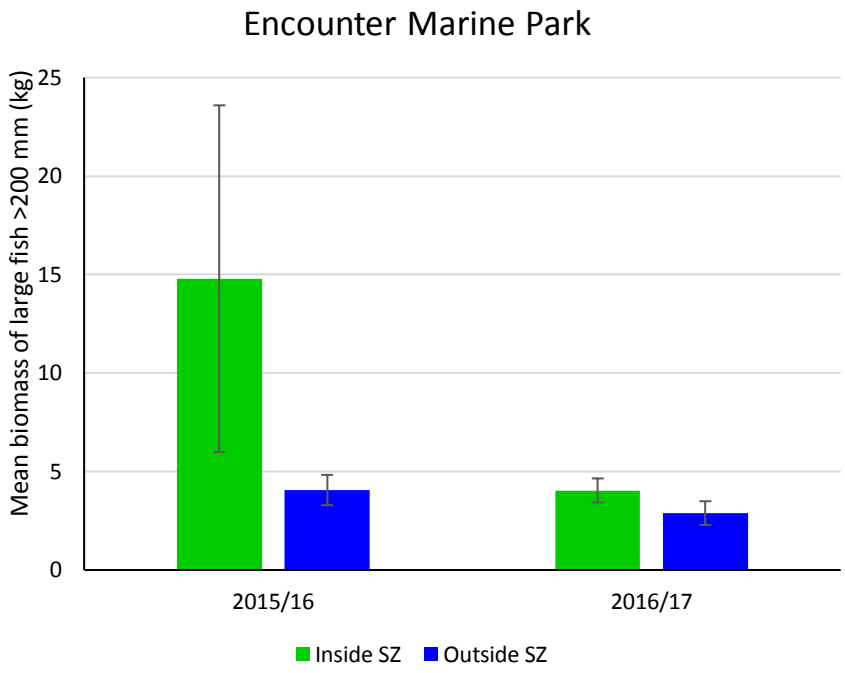


Figure 111. Mean (±SE) biomass of large fish species (>200 mm) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean biomass of large fish species recorded on BRUVS was generally higher inside SZs compared to outside (Figure 112). Aldinga Reef, Carrickalinga Cliffs, The Pages and Sponge Gardens SZs all had higher mean biomass of large fish inside SZ for both years while Bay of Shoals SZ had a higher biomass of larger species outside the SZ for both years. Rapid Head SZ had a higher biomass of larger fish species outside SZ for 2015/16, however in 2016/17 the inside SZ sites had a higher biomass of large species. Sites inside the the Pages SZ had the highest overall biomass of large fish species recorded on BRUVS at about 54 kg per drop (Figure 112).

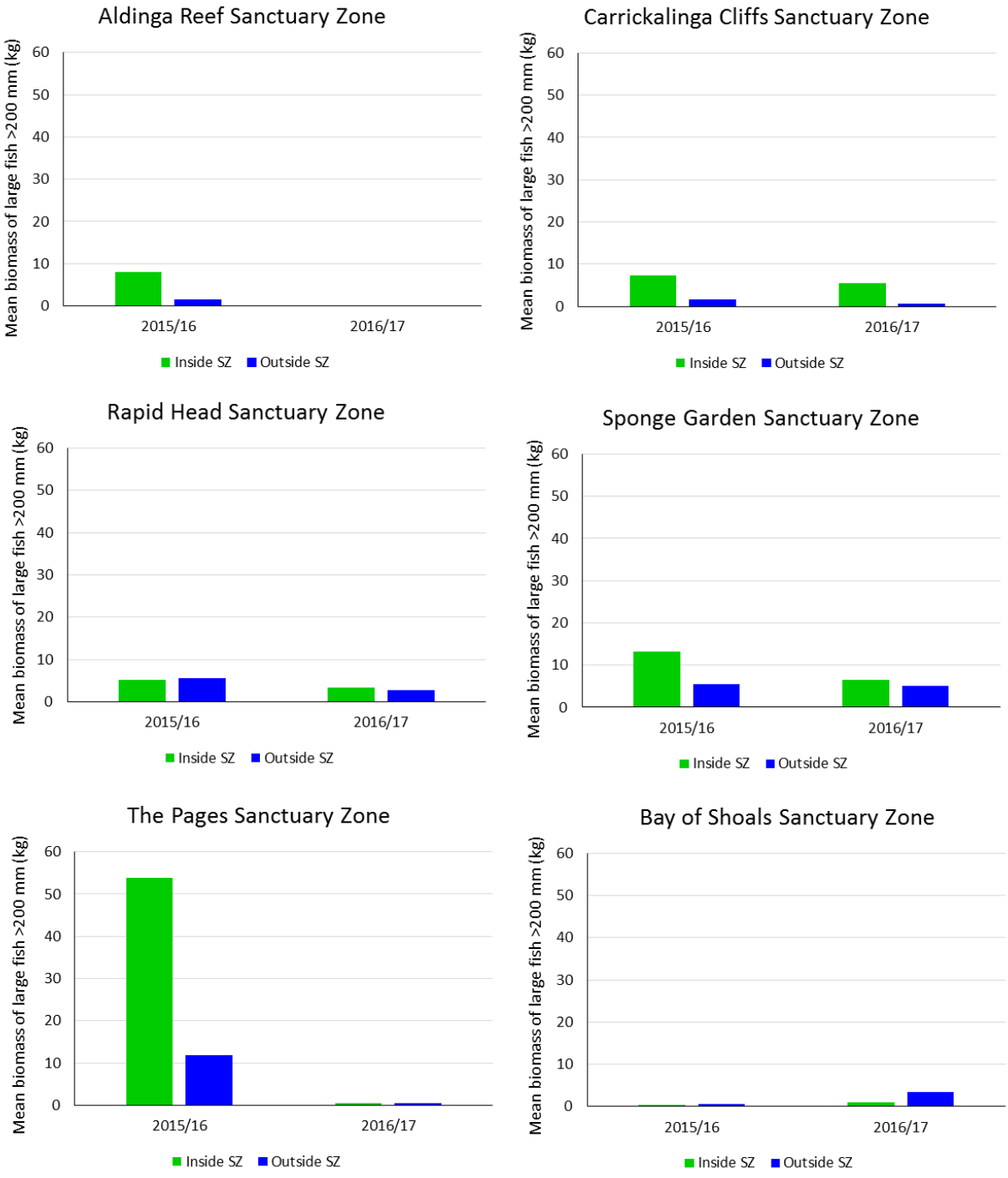


Figure 112. Mean (±SE) biomass of large fish species (>200 mm) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of site attached fish species

The mean number of site attached fish species recorded on BRUVS was higher inside SZs compared to outside for 2015/16 in Encounter Marine Park. In 2016/17 the inside SZ sites compared to outside abundance of site attached fish was relatively similar (Figure 113).

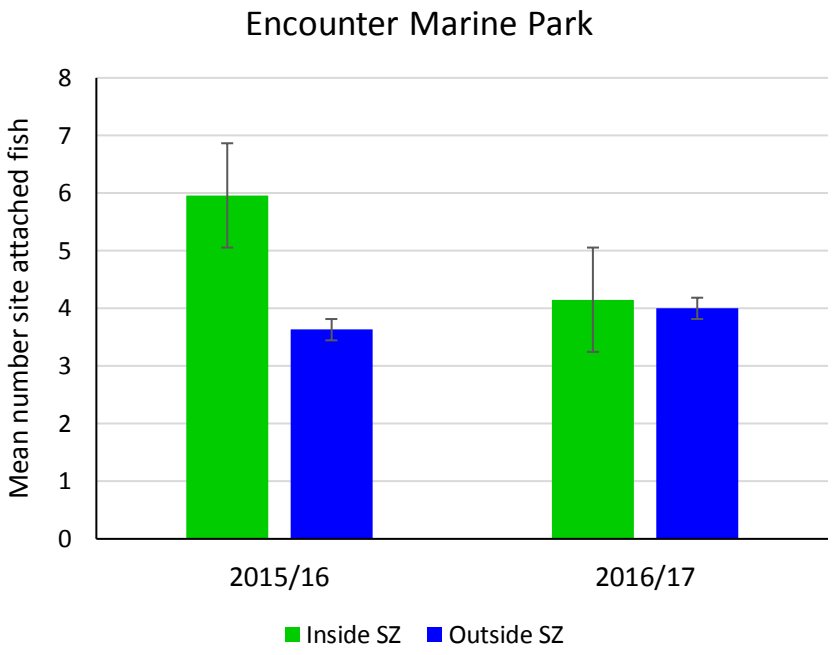


Figure 113. Mean (±SE) number of site attached fish species per BRUVS drop for sites inside vs outside SZs Encounter Marine Park

The biomass of site attached fish species was not consistent between SZs and asscoaited comparison sites or within individual SZs (Figure 114). Carrickalinga Cliffs SZ had higher mean abundance of site attached fish inside SZ vs outside for both years. Rapid Head and Aldinga Reef SZs had slightly higher abundance inside SZ vs outside for both years, while Bay of Shoals and Sponge Gardens SZs had lower abundance inside SZ vs outside. The Pages SZ had a relatively similar abundance recorded for inside vs outside the SZ, however overall the mean abundance was low (Figure 114).

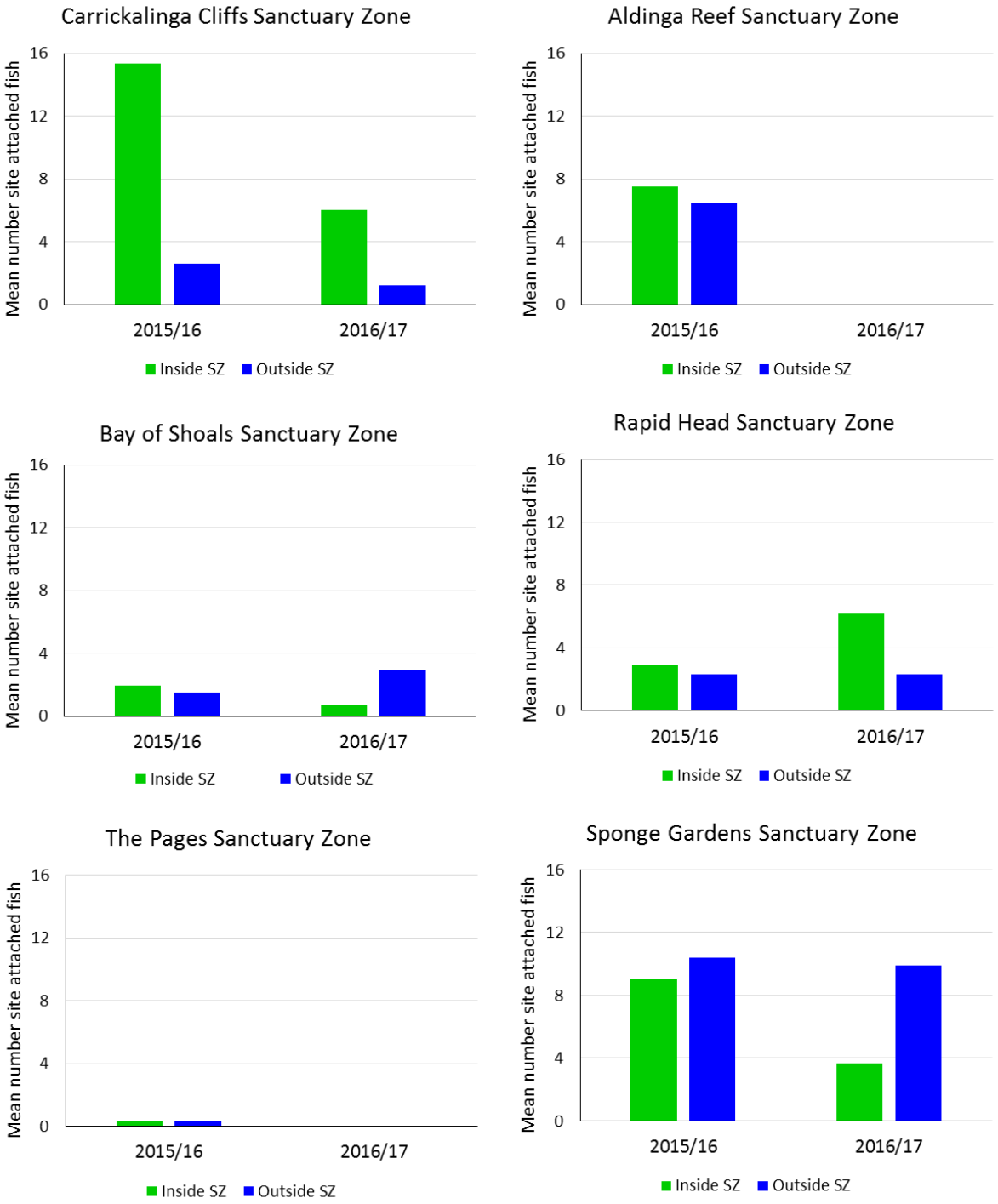


Figure 114. Mean (±SE) abundance of site attached fish species for sites inside vs outside SZs for Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of sharks and rays

The mean abundance of sharks and rays recorded on BRUVS in the Encounter Marine Park was higher inside SZs compared to outside in both 2015/16 and 2016/17 (Figure 115). The abundance of sharks and rays was higher inside SZs in 2016/17 compared to 2015/16. The abundance of sharks and rays recorded was lower outside the SZs in 2016/17 than 2015/16 (Figure 115).

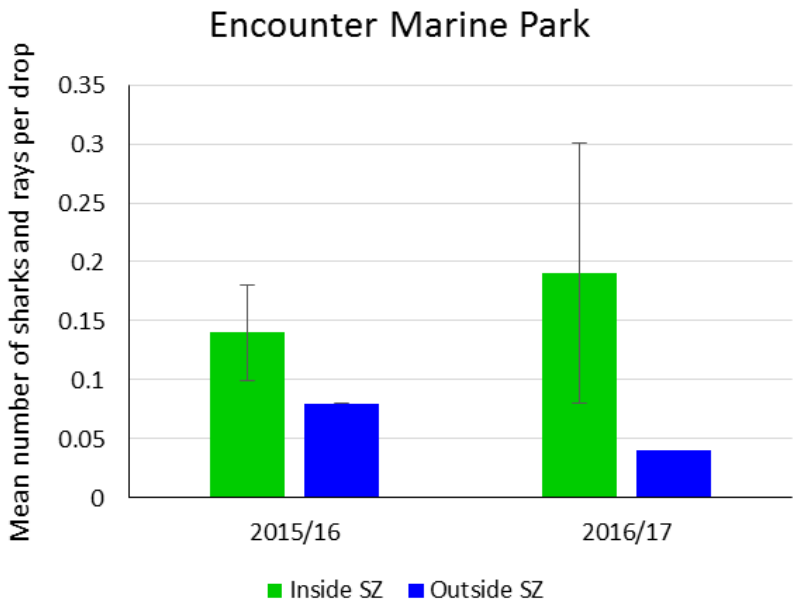


Figure 115. Mean (±SE) number of sharks and rays per drop for sites inside vs outside for Encounter Marine Park

The mean number of sharks and rays recorded on BRUVS was highest at sites inside the Pages Island SZ at approximately 0.7 per drop. Overall the abundance of sharks and rays was not consistent between SZs or within individual SZs and associated comparison sites (Figure 116).

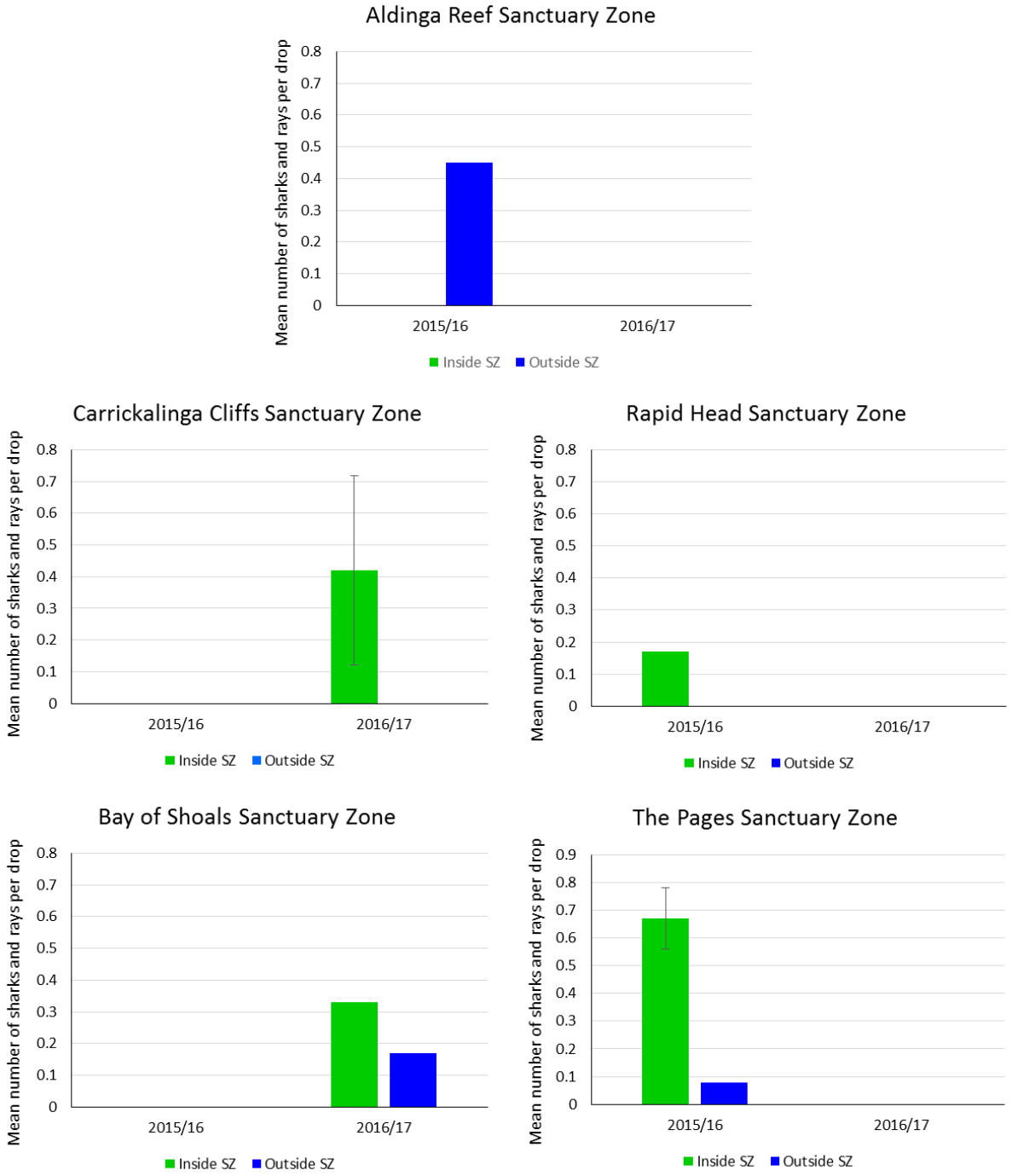


Figure 116. Mean (±SE) abundance of sharks and rays per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Focal species indicators (Baited remote underwater video surveys)

Abundance of snapper (Pagrus auratus)

The mean number of snapper (*Pagrus auratus*) recorded on BRUVS in the Encounter Marine Park was higher inside SZ compared to outside for both 2015/16 and 2016/17 (Figure 117). Overall the mean abundance of snapper recorded in 2016/17 was lower than in 2015/16 (Figure 117).

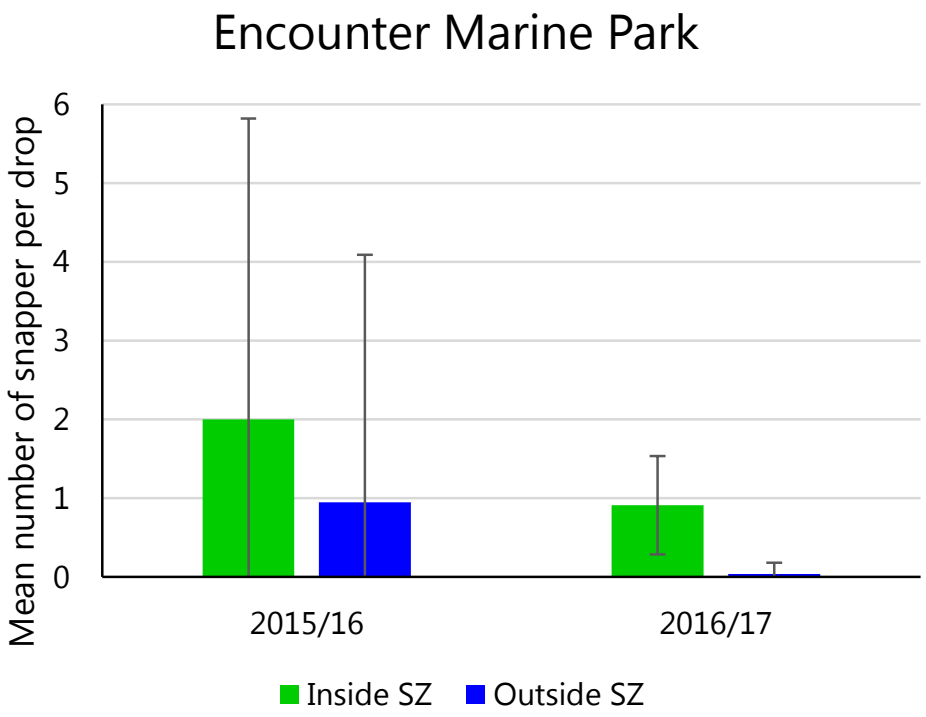


Figure 117. Mean (±SE) number of snapper (*Pagrus auratus*) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean number of snapper (*Pagrus auratus*) recorded on BRUVS was highest inside Carrickalinga Cliffs SZ and outside Aldinga Reef SZ at approximately six fish per drop (Figure 118). All SZs displayed a higher abundance of snapper inside the SZ vs outside across both years, with the exception of Aldinga Reef as it was not resampled in 2016/17 (Figure 118).

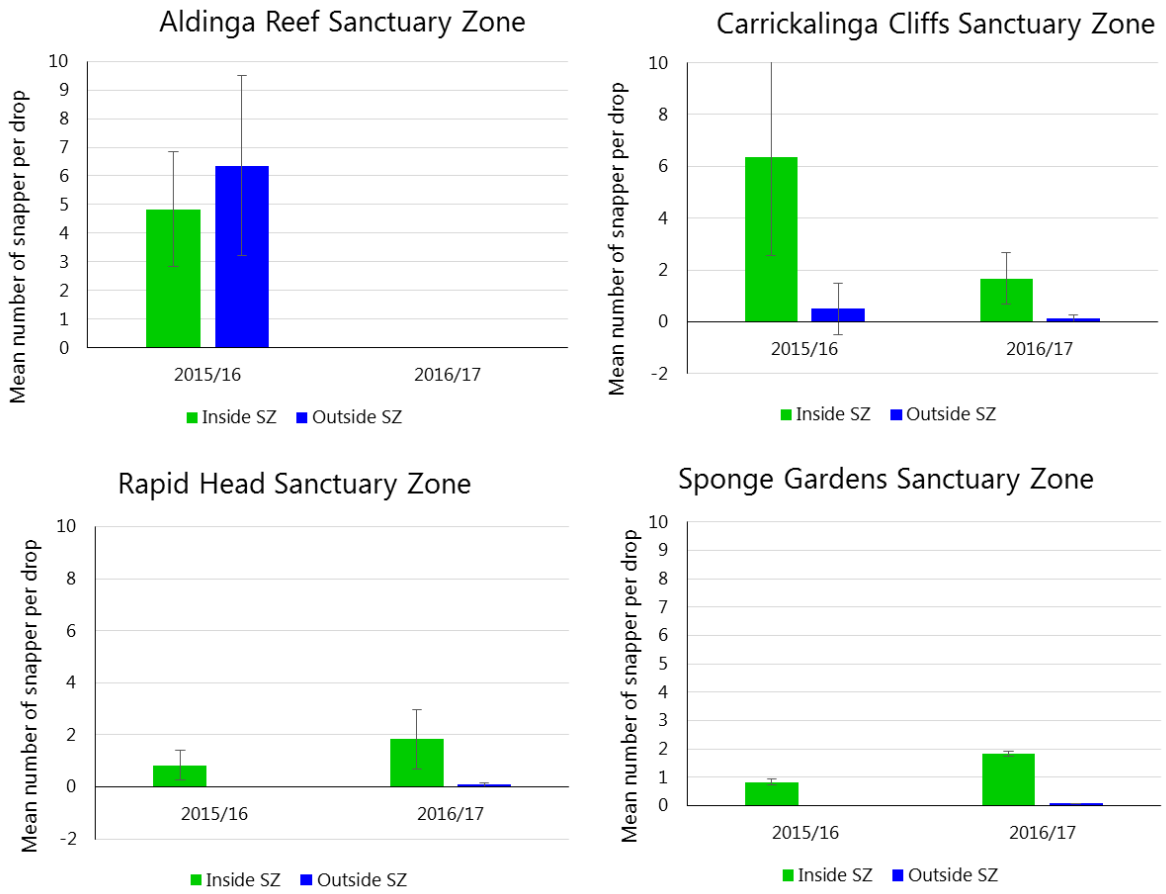


Figure 118. Mean (±SE) number of snapper (*Pagrus auratus*) per BRUVS drop for sites inside vs outside SZ in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of King George whiting (Sillaginodes punctatus)

The average number of King George whiting (*Sillaginodes punctatus*) recorded by BRUVS in the Encounter Marine Park was higher outside SZ compared to inside in 2016/17 but was reasonably similar between sites inside and outside in 2015/16 (Figure 119). Overall the average abundance of King George whiting recorded in 2016/17 was higher than in 2015/16 (Figure 119).

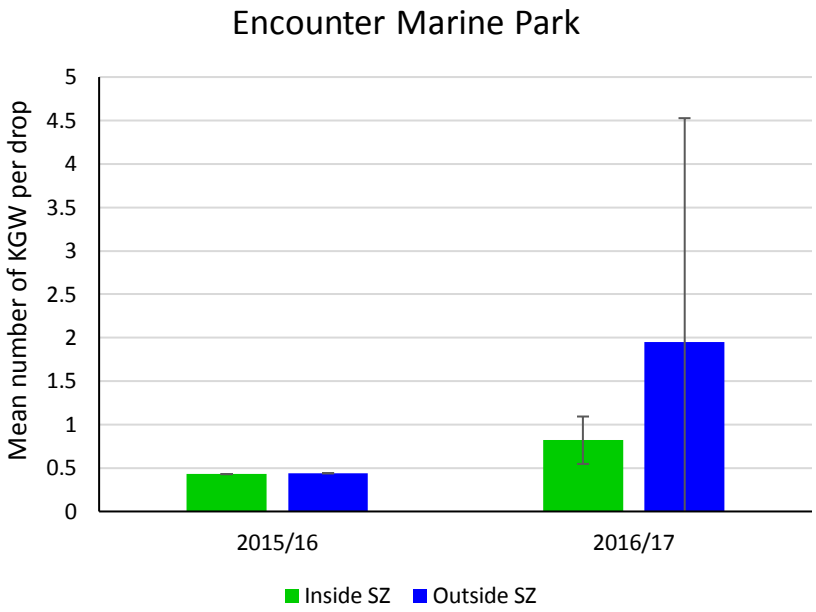


Figure 119. Mean (±SE) number of King George whiting *(Sillaginodes punctatus)* per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean number of King George whiting (*Sillaginodes punctatus*) recorded on BRUVS was not consistent between SZs and associated comparison sites or within individual SZs (Figure 120). Carrickalinga Cliffs SZ had higher abundance inside SZ vs outside for both years. Bay of Shoals SZ had higher abundance inside SZ vs outside in 2015/16, whereas in 2016/17 the outside sites had higher abundance compared to inside SZ. The peak in abundance outside of Bay of Shoals was the overall highest abundance of King George whiting at any site with a mean of 2.5 fish recorded per drop. Sponge Gardens SZ had higher abundance outside the SZ vs inside in 2015/16 and in 2016/17 there was a higher abundance inside the SZ vs outside. Rapid Head SZ had no King George Whiting in 2015/16 recorded on BRUVS, whereas in 2016/17 there was an overall higher abundance of fish with more recorded outside SZ vs inside. In 2015/16 Aldinga Reef SZ had a higher abundance inside SZ with no King George whiting being recorded outside (Figure 120).

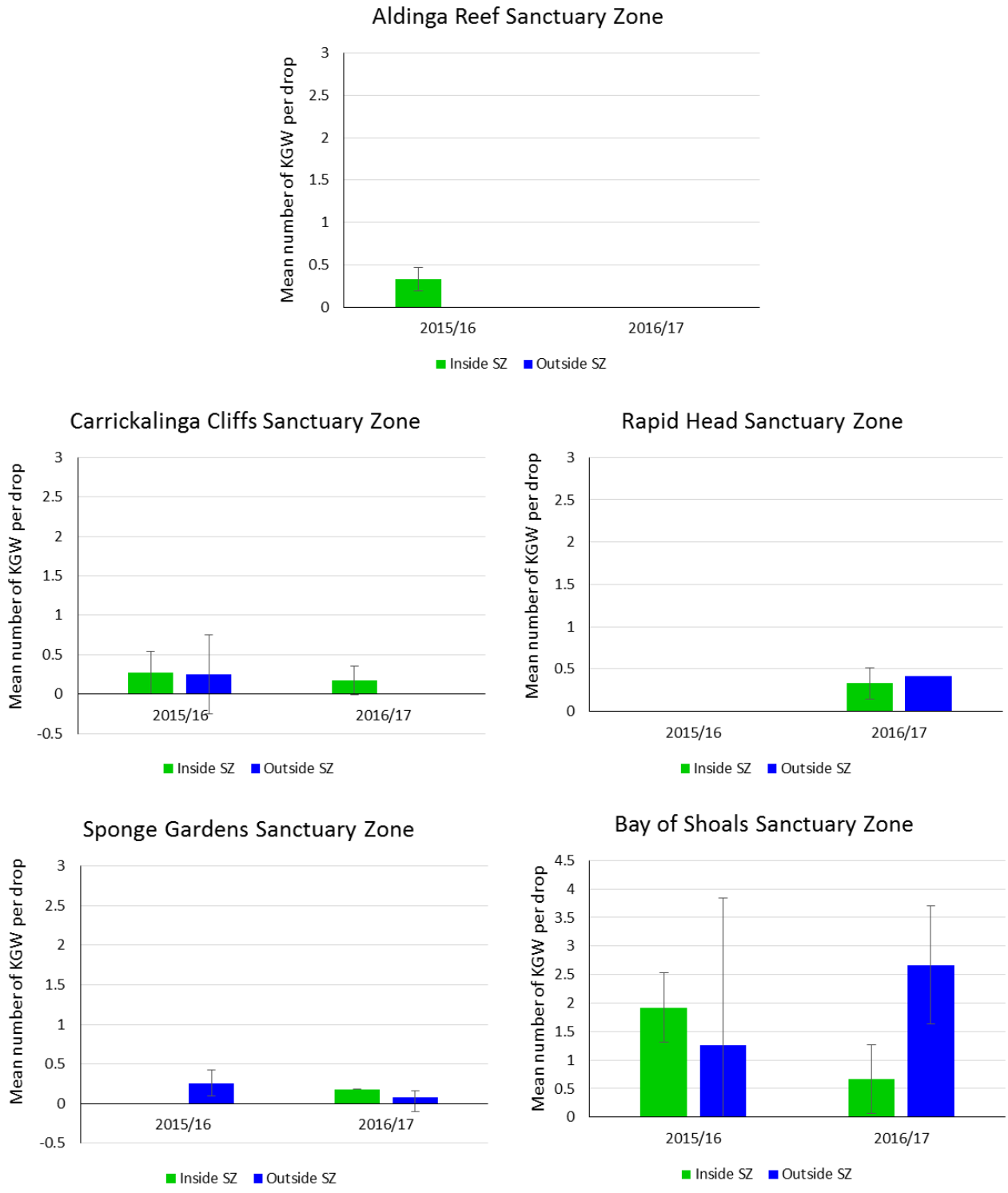


Figure 120. Mean (±SE) number of King George whiting (*Sillaginodes punctatus*) per BRUVS drop for sites inside vs outside SZ in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17).

Abundance of bluethroat wrasse (Notolabrus tetricus)

The mean abundance of bluethroat wrasse (*Notolabrus tetricus*) recorded on BRUVS in the Encounter Marine Park was higher inside SZs compared to outside for both 2015/16 and 2016/17 (Figure 121). Overall the abundance of bluethroat wrasse recorded in 2016/17 was higher than in 2015/16 (Figure 121).

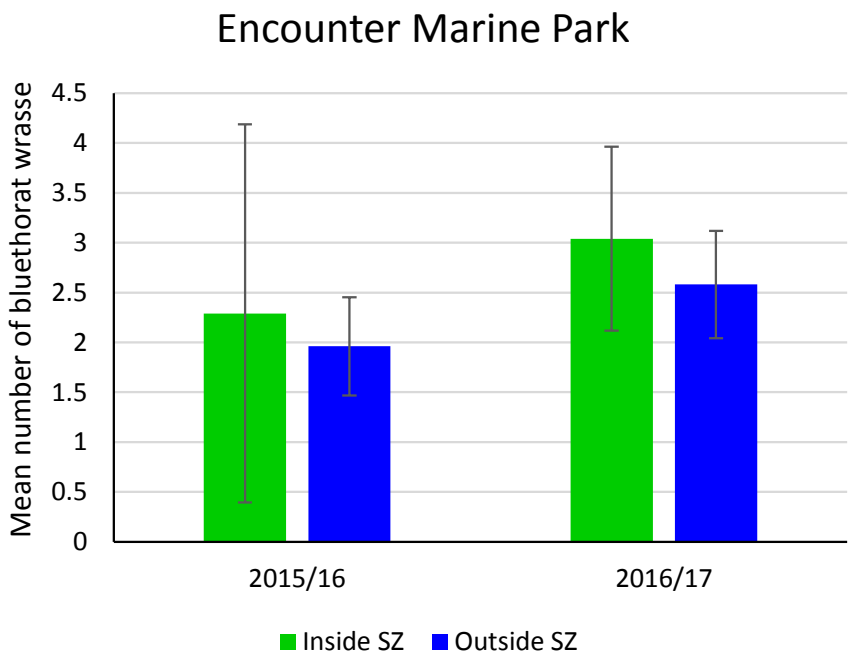


Figure 121. Mean (±SE) number of bluethroat wrasse *(Notolabrus tetricus)* per BRUVS drop for sites inside vs outside SZ for Encounter Marine Park

The mean abundance of bluethroat wrasse *(Notolabrus tetricus)* recorded on BRUVS was highest overall in 2015/16 at sites inside the Sponge Gardens SZ with about 8 fish per drop (Figure 122). Generally, the abundance of bluethroat wrasse was not consistent between SZs and associated comparison sites or within individual SZ. Carrickalinga Cliffs SZ had higher abundance of bluethroat wrasse inside SZ compared to outside for both 2015/16 and 2016/17. The Sponge Gardens SZ had higher abundance inside the SZ compared to outside for 2015/16 but a higher abundance outside compared to inside for 2016/17. Rapid Head SZ had higher abundance of bluethroat wrasse outside of the SZ compared to inside in 2015/16 and higher abundance inside compared to outside for 2016/17 (Figure 122).

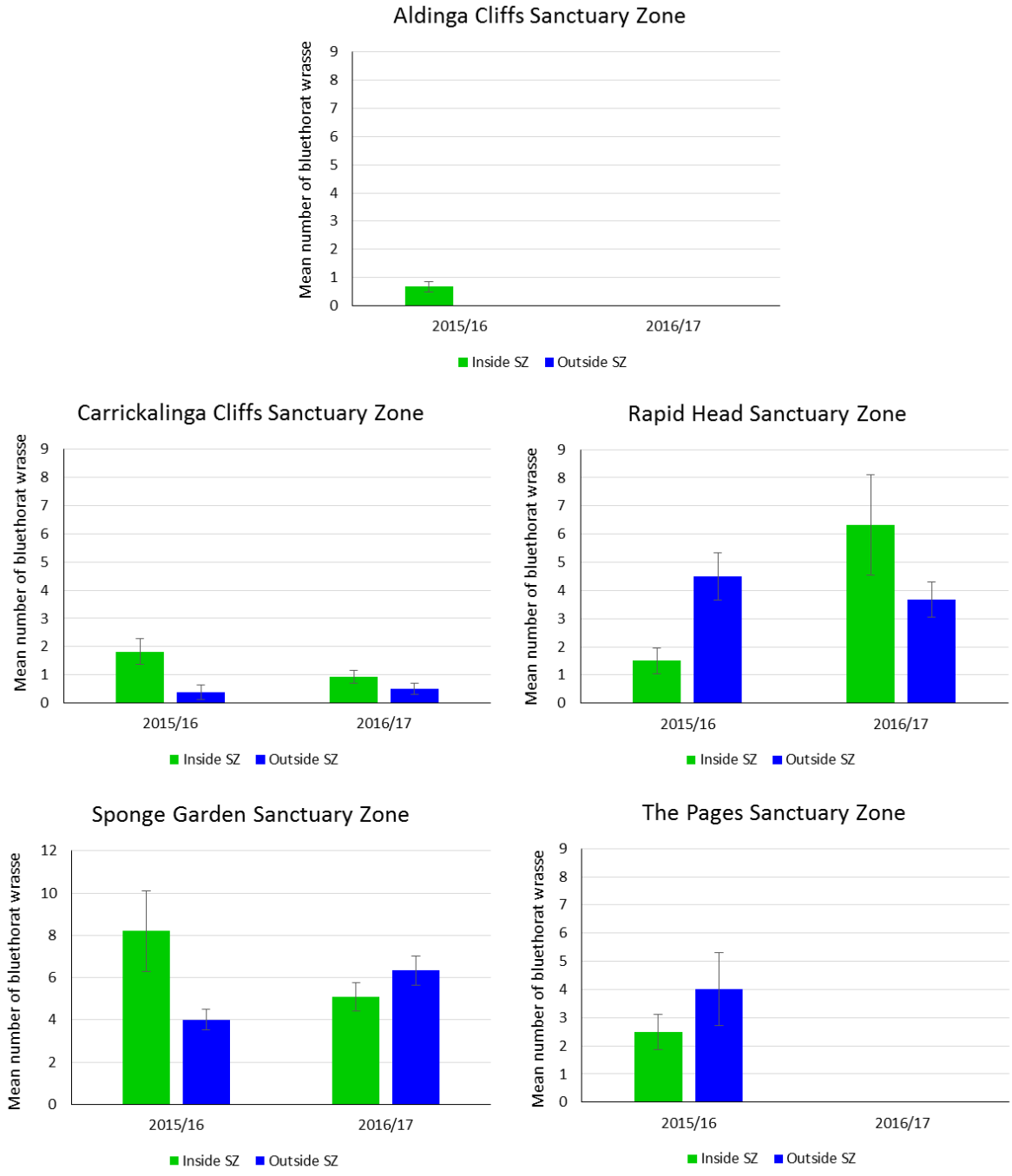


Figure 122. Mean (±SE) number of bluethroat wrasse *(Notolabrus tetricus)* per BRUVS dropfor sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of sea sweep (Scorpis aequipinnis)

The mean number of sea sweep (*Scorpis aequipinnis)* per BRUVS drop in Encounter Marine Park was higher inside SZ compared to outside for both 2015/16 and 2016/17 (Figure 123). The biomass for sea sweep increased outside SZ in 2016/17 (Figure 123).

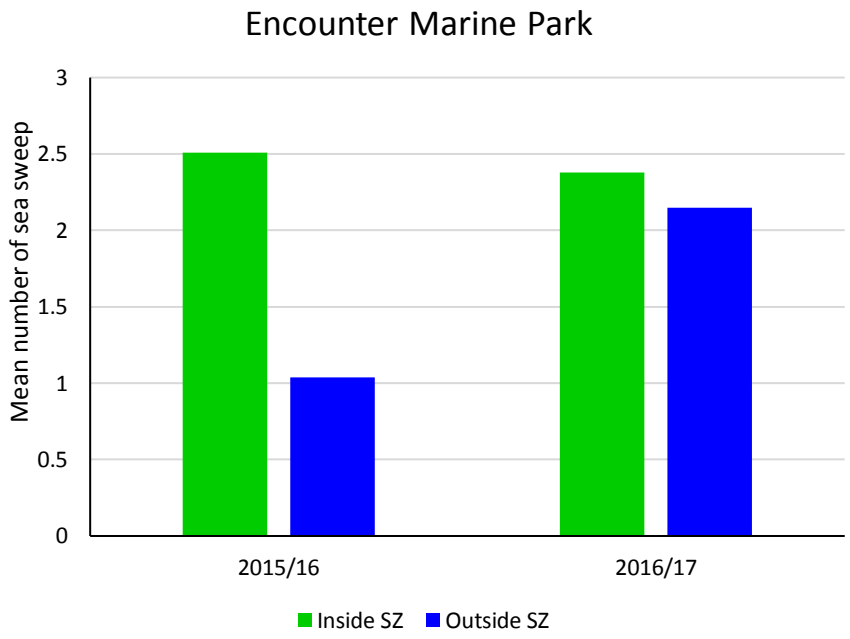


Figure 123. Mean (±SE) number of sea sweep (*Scorpis aequipinnis*) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean number of sea sweep *(Scorpis aequipinnis)* recorded on BRUVS was highest at Sponge Gardens SZ at inside sites in 2015/16 and outside sites in 2016/17 at approximately 7 fish recorded per drop (Figure 124). Aldinga, Carrickalinga Cliffs, Sponge Gardens and the Pages SZ had a higher mean number of sea sweep inside SZ than outside for 2015/2016. In 2016/2017 Carrickalinga Cliffs and Rapid Head SZs had a higher abundance inside SZ than outside, however Sponge Gardens has a higher abundance of sea sweep outside SZ in 2016/17. Aldinga SZ was not surveyed in 2016/17 and the Pages SZ data is still being processed at the time of this publication hence no data is available for those sites during that year (Figure 124).

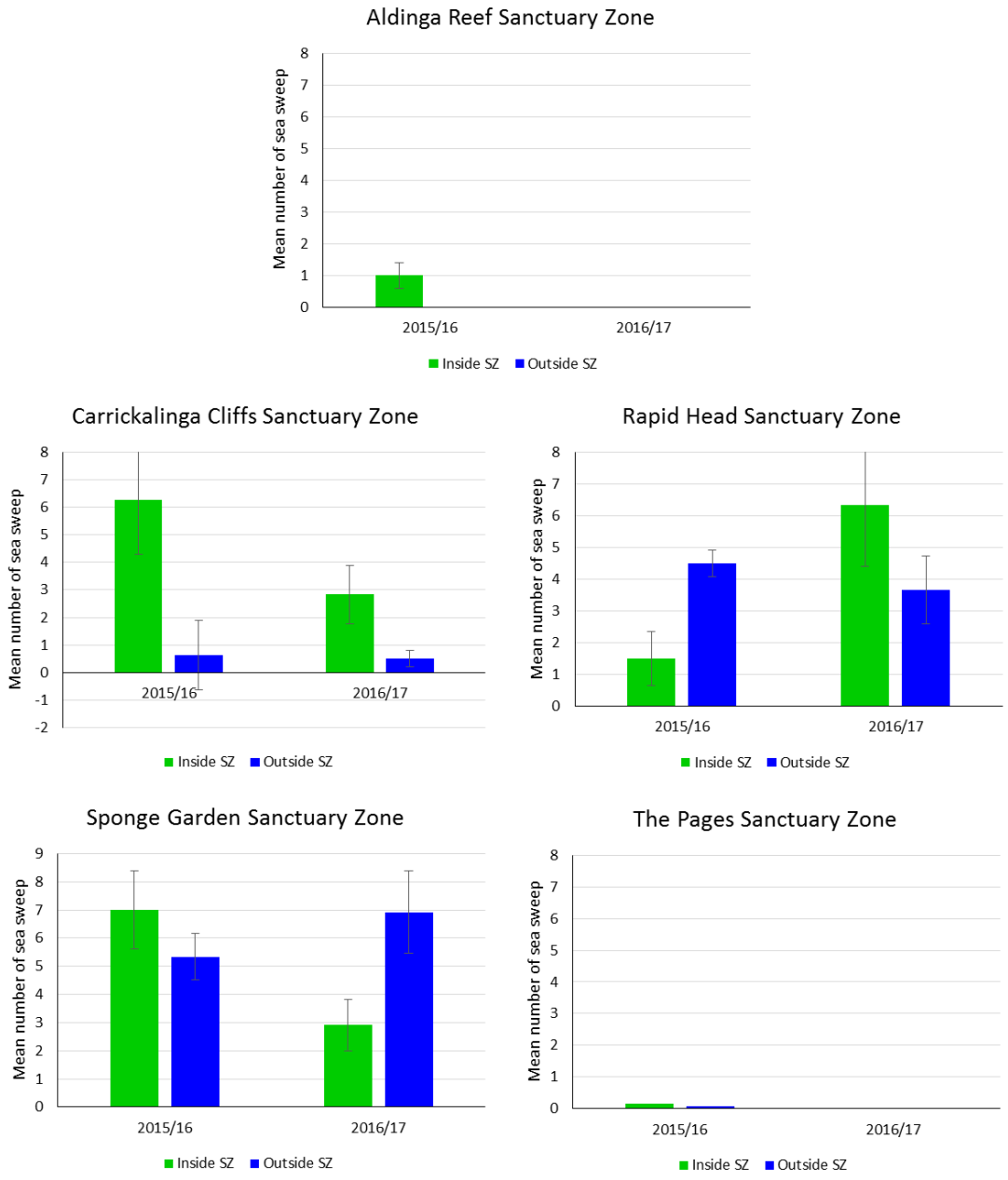


Figure 124. Mean (±SE) number of sea sweep (*Scorpis aequipinnis*) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Abundance of trevally (Pseudocaranx sp)

The mean number of trevally (*Pseudocaranx sp*) recorded on BRUVS drops was higher inside SZs than outside sites in Encounter Marine Park for both 2015/16 and 2016/17 (Figure 125). The highest mean number of trevally recorded inside the SZs was just over six fish per BRUVS drop (Figure 125).

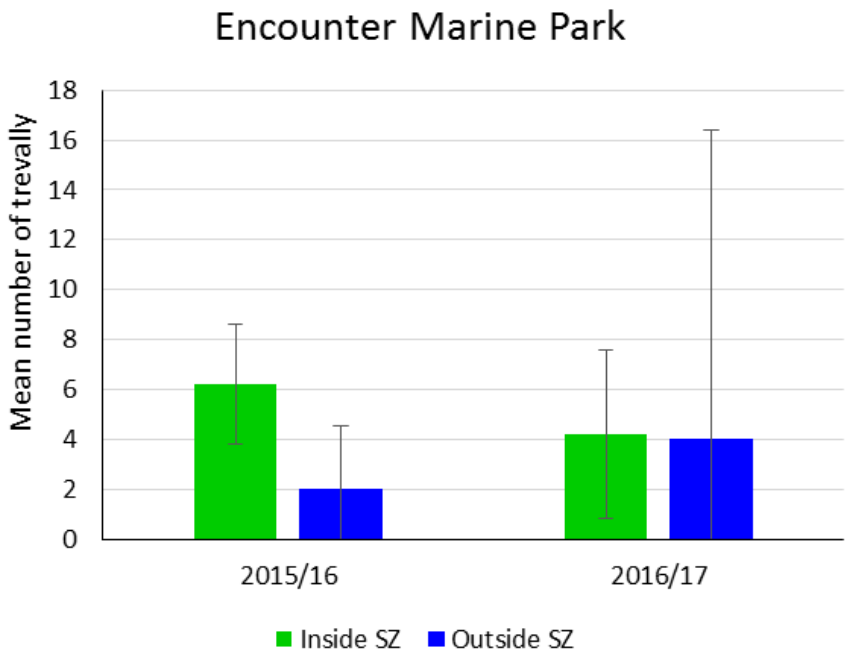


Figure 125. Mean (±SE) number of trevally (*Pseudocaranx sp*) per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park

The mean number of trevally *(Pseudocaranx sp)* per BRUVS drop was generally higher inside SZs than outside sites, where Aldinga Reef, Carrickalinga Cliffs, Rapid Head and The Pages SZs all had higher abundance of trevally for each year sampled (Figure 126). The highest abundance of trevally overall was inside Aldinga Reef SZ in 2015/16 at almost 25 fish recorded per drop. The Bay of Shoals SZ had a higher abundance of trevally outside of SZ sites in 2016/2017, and Sponge Gardens SZ had very low abundance of trevally at across all sites for both years (Figure 126).

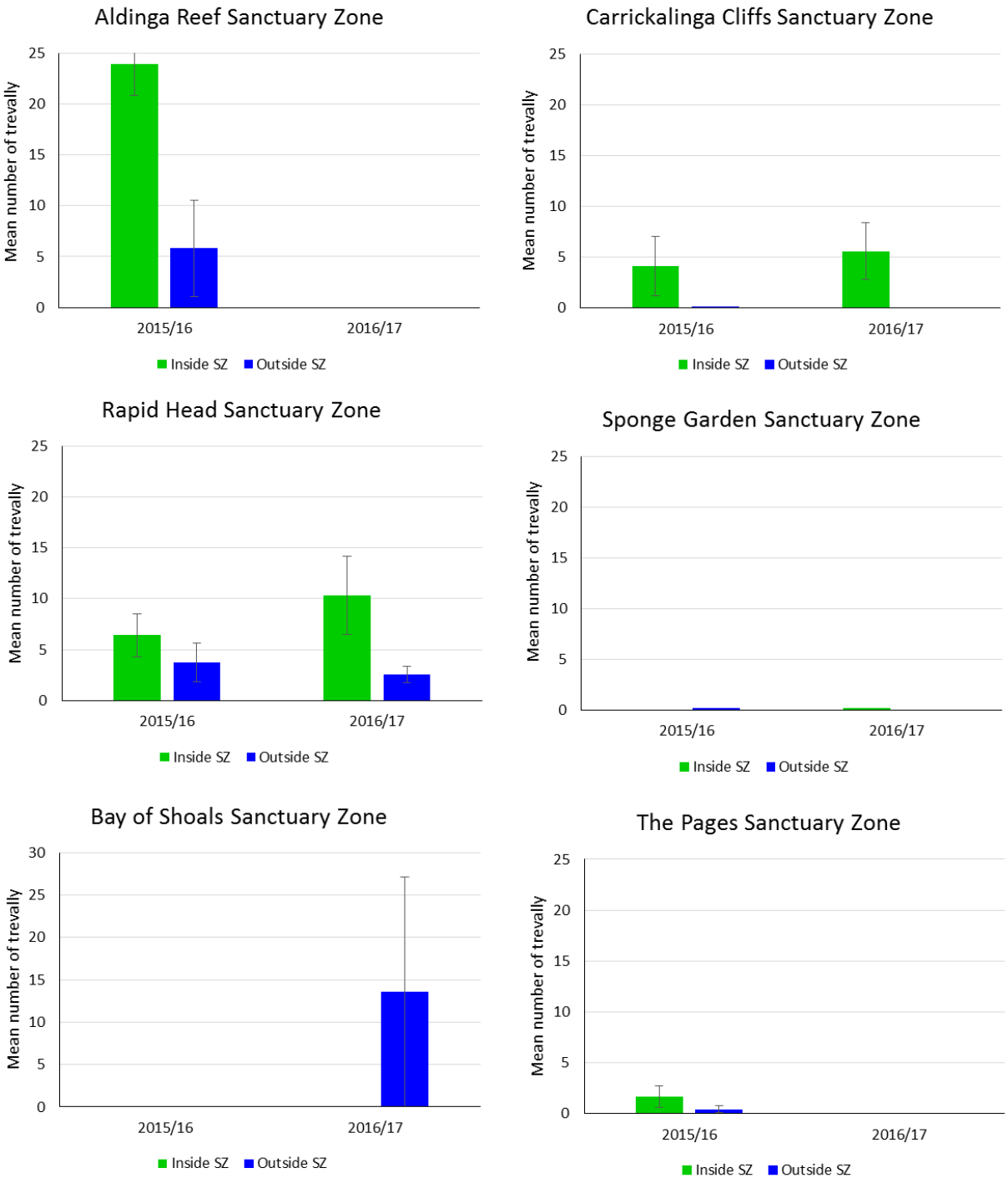


Figure 126. Mean (±SE) number of trevally *(Pseudocaranx sp)* per BRUVS drop for sites inside vs outside SZs in Encounter Marine Park. (Note: Aldinga Reef SZ not sampled in 2016/17 and the Pages SZ data still to be processed for 2016/17).

Community Indicators (Dive surveys)

Fish species richness

The species richness for fish was generally consistent between inside and outside SZs with an average of about 26 fish species recorded per dive survey (Figure 127). In 2008 and 2011 there was a markedly higher species richness inside SZ sites, however this is likely to be attributed to the low number of dive surveys completed inside SZs for those years (Figure 127).

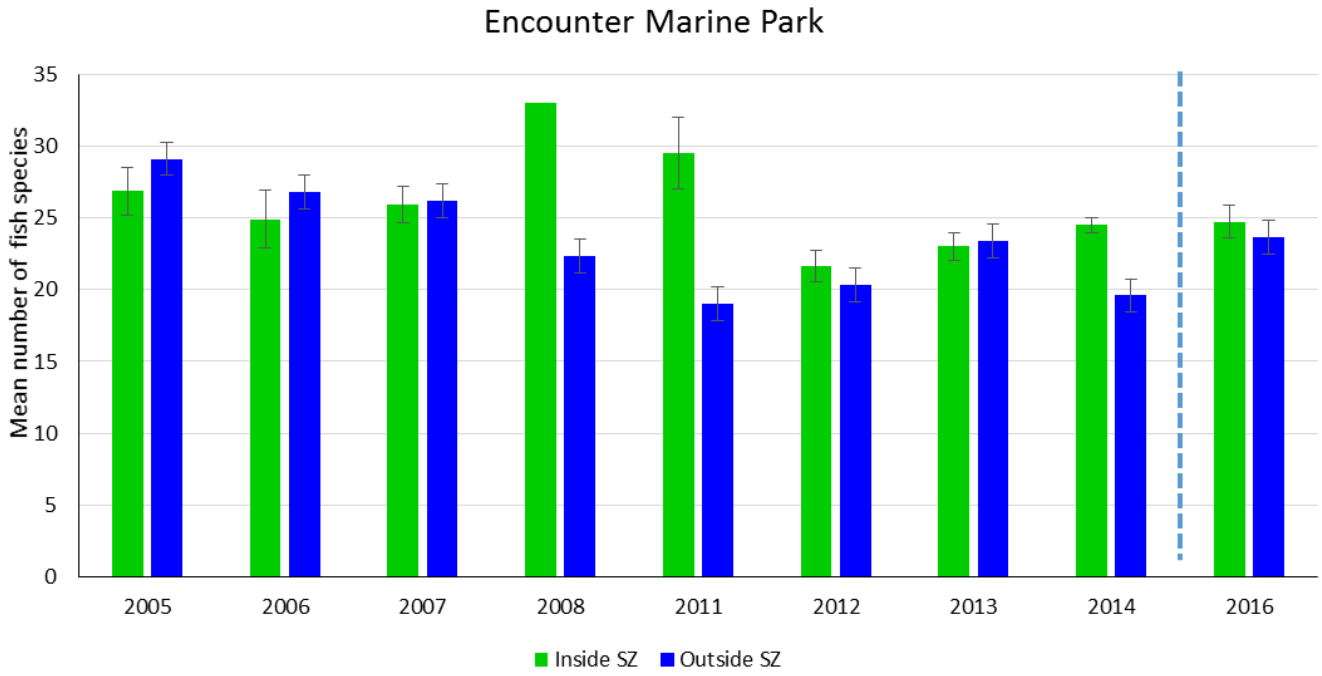


Figure 127. Mean (±SE) number of fish species per dive survey for sites inside vs outside SZs in Encounter Marine Park (Note: Blue line denotes when parks became operational in October 2014)

The mean number of fish species recorded per dive survey was typically between 20–30 fish species, with the exception of Rapid Head SZ and associated comparison sites in 2008 and Carrickalinga SZs and associated comparison sites in 2011 where >30 fish species were counted inside SZs. There were no consistent trends of species richness between inside compared to outside sites for any of the SZs (Figure 128).

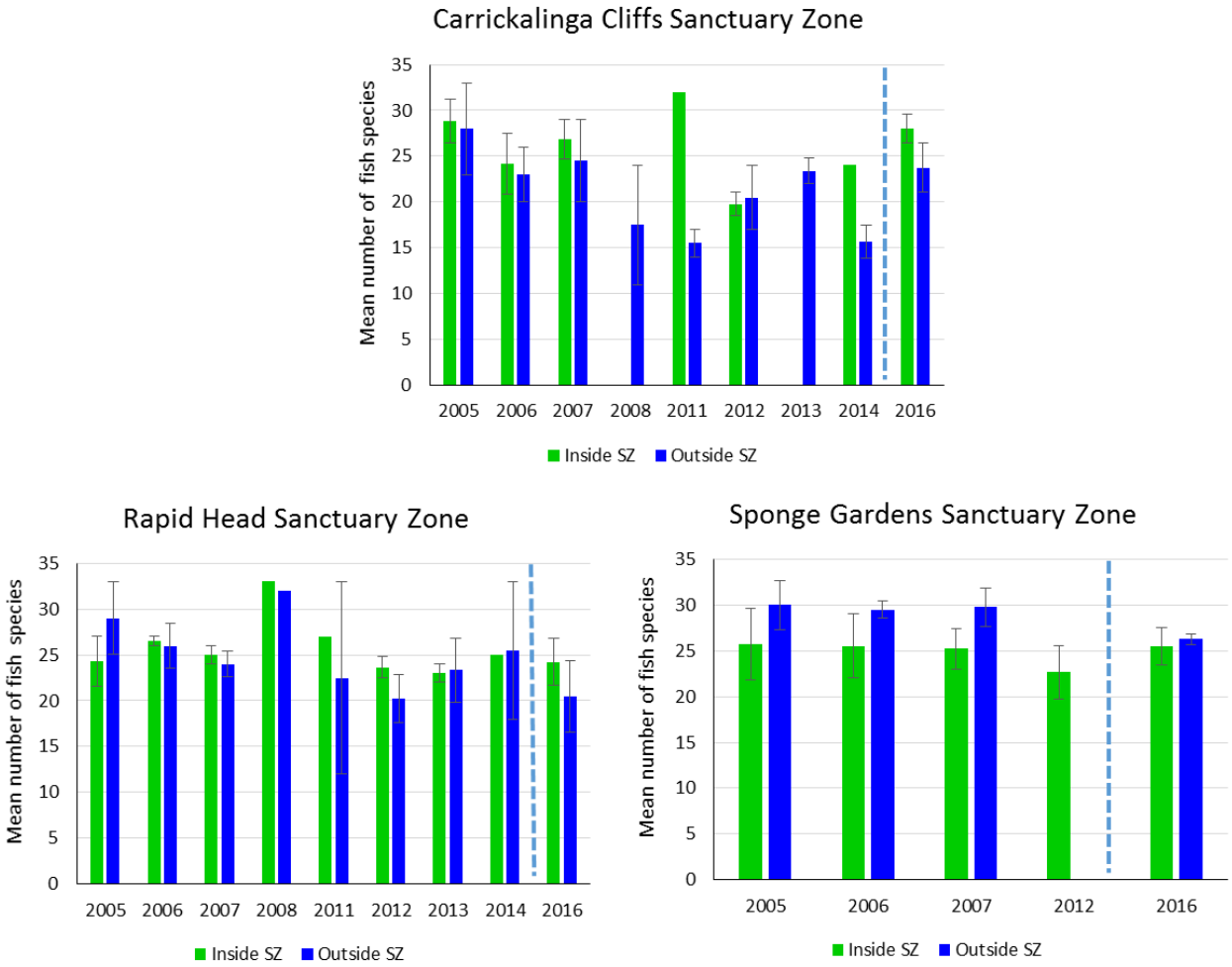


Figure 128. Mean (±SE) number of fish species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Macroinvertebrate species Richness

The species richness of macroinvertebrates in Encounter Marine Park was generally consistent between inside and outside SZs across all years between 2005 and 2016, with the average number of macroinvertebrate species recorded per dive survey between 2–6 (Figure 129). 2006 and 2014 were the only years where the number of macroinvertebrate species was less inside SZ sites than the outside sites, every other year (2005, 2007, 2008, 2011, 2012, 2013, 2016) the inside SZ sites had a higher number of species inside the SZs (Figure 129).

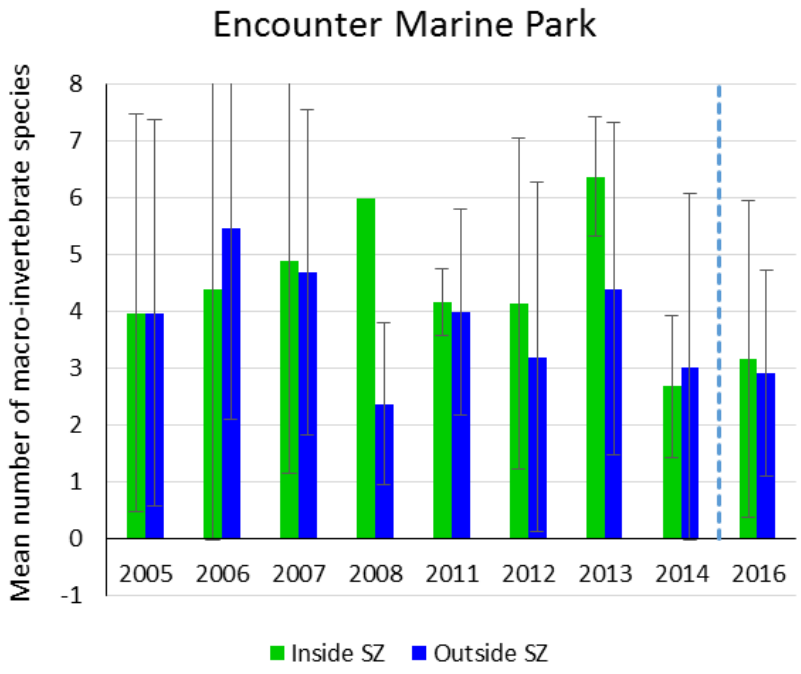


Figure 129. Mean (±SE) number of macroinvertebrate species per dive survey for sites inside vs outside SZs in Encounter Marine Park (Note: Blue line denotes when parks became operational in October 2014)

The species richness of macroinvertebrate species were not consistent across all years from 2005–16 at Carrickalinga Cliffs and Rapid Head SZs and associated comparison sites with the mean number of species recorded per dive survey ranging between 1–6 (Figure 130). The Sponge Gardens SZ had a higher species richness of macroinvertebrate species for inside SZ sites compared to outside. In 2006, inside the Sponge Gardens SZ had the highest overall count of macro invertebrate species at almost 10 recorded per dive survey. There were no dive surveys undertaken inside Rapid Head in 2008 or Carrickalinga Cliffs SZs in 2013, hence there is no data displayed for inside SZs for those years (Figure 130).

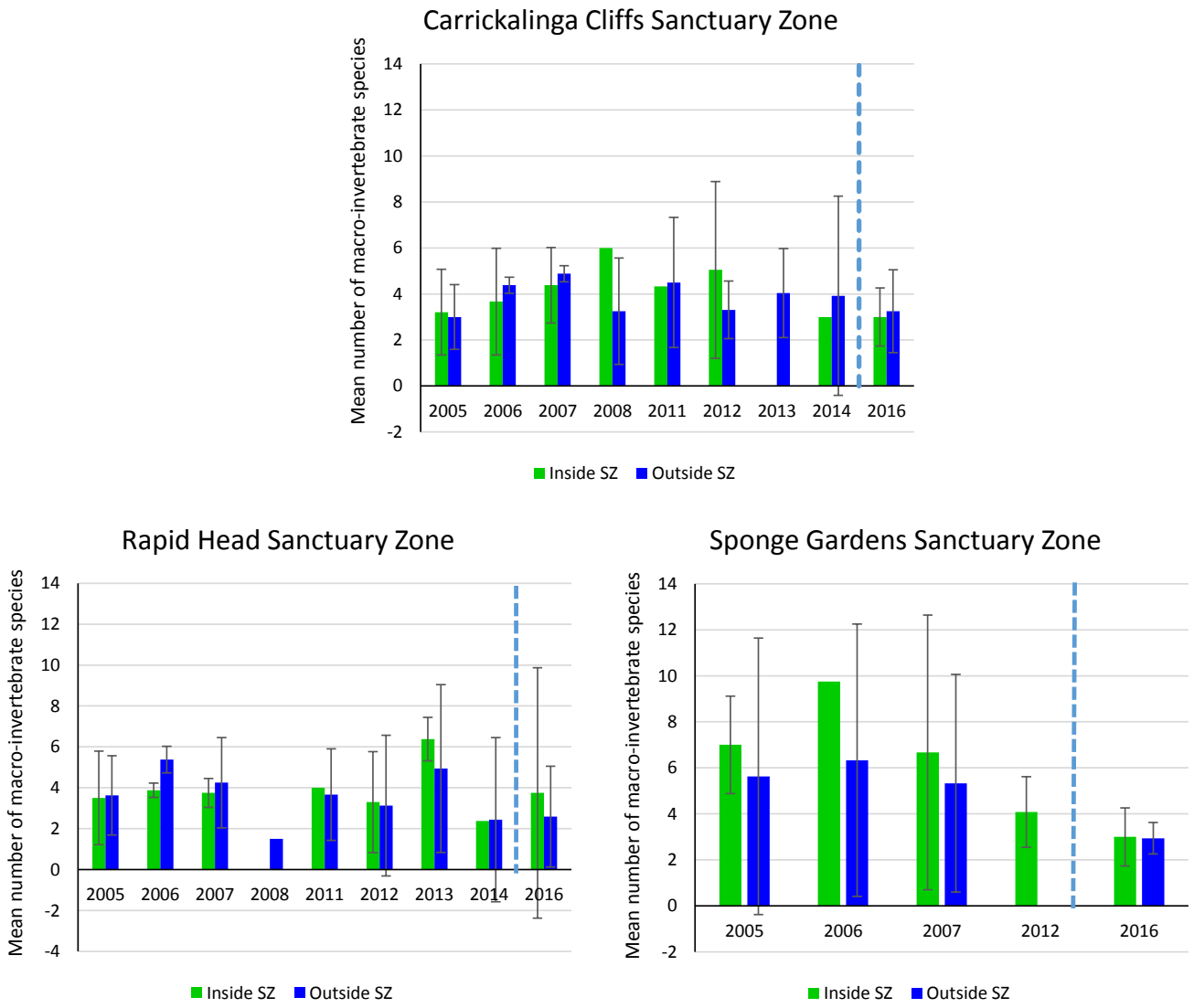


Figure 130. Mean (±SE) number of macroinvertebrate species per dive survey for inside vs outside SZ sites for Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Macroalgae species richness

Data still to be processed

Trophic structure

There appears to be no consistent trend in the relative biomass proportions of the trophic groups from 2005 to 2016 (Figure 131). In general the proportion of biomass in each trophic group is relatively evenly distributed, except for the planktivore and browsing herbivore groups which are slightly higher proportions (Figure 131).

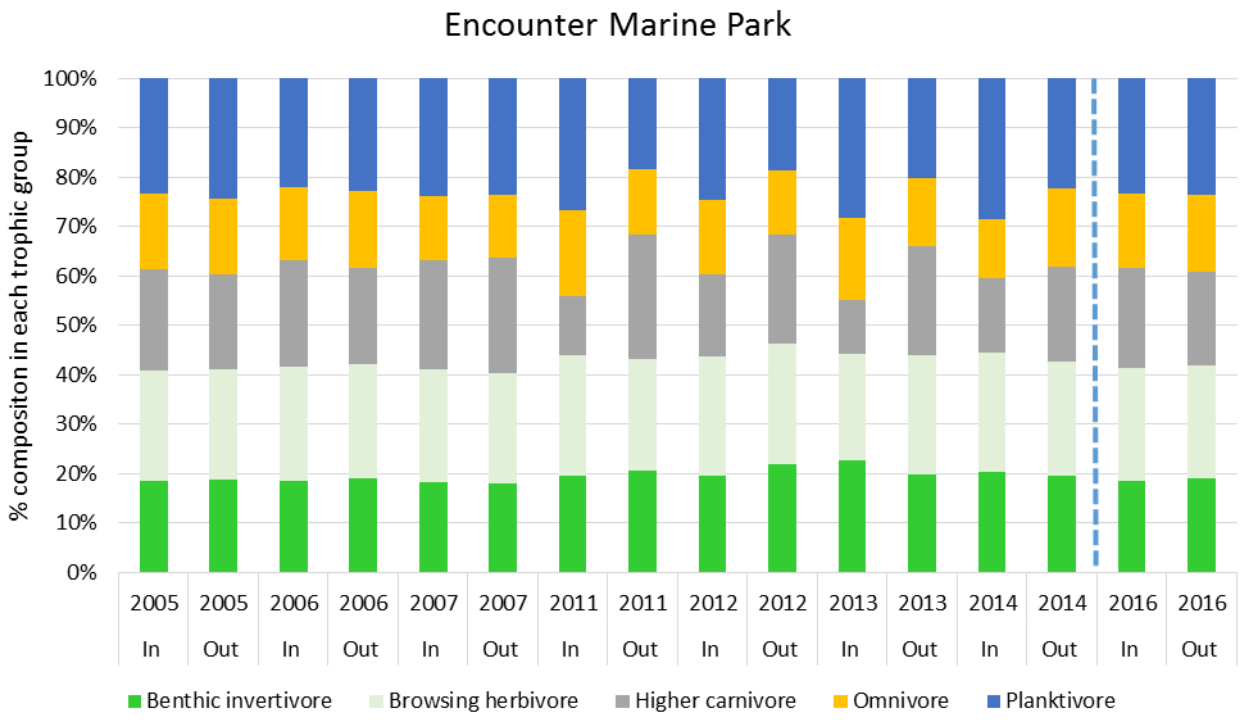


Figure 131. Relative proportion of biomass in the difference trophic groups for per survey for inside SZ sites vs outside SZ sites in the Encounter Marine Park

Recovery from disturbance

No data available yet

Community temperature index

The mean CTI for SZs and comparison sites in the Encounter Marine Park are fairly similar to each with a slight gradient in CTI from just above 18 °C at Aldinga Reef SZ and comparison sites down to just below 18 °C at the Sponge Gardens SZ and comparison sites (Figure 132). Mean CTI is similar at sites inside vs outside for all SZs.

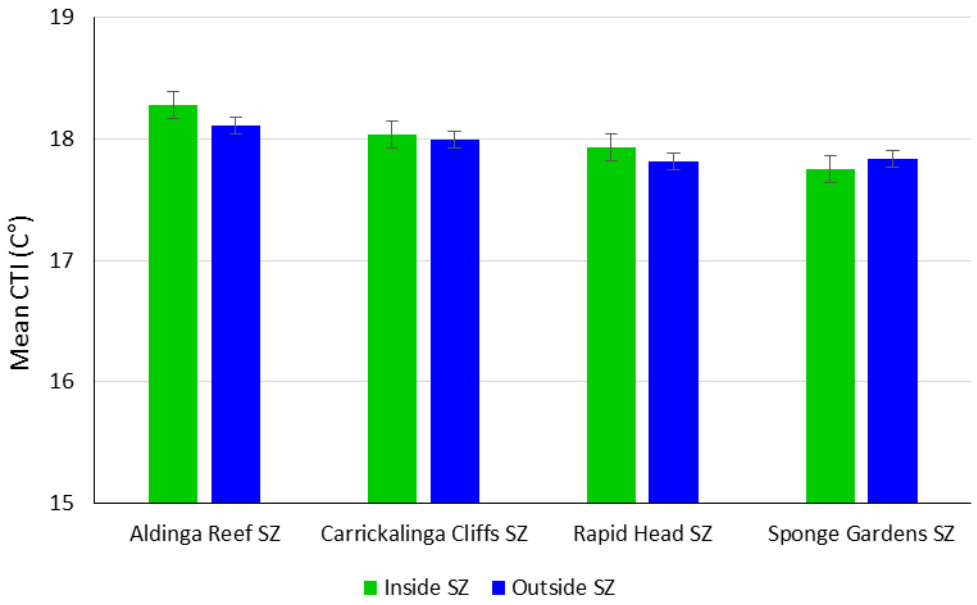


Figure 132. Mean community temperature index (°C) for fish communities inside vs outside SZs in Encounter Marine Park

Focal group indicators (Dive surveys)

Mean abundance of fished species

The mean number of fished species recorded on dive surveys in Encounter Marine Park ranged between 90 and 360 individuals across all sites with an average of 231 species inside and 200 species outside (Figure 133). The mean abundance of fished species was higher inside all SZ sites for every year with the exception of 2007 and 2008, where the outside SZ sites had a higher abundance of fished species (Figure 133).

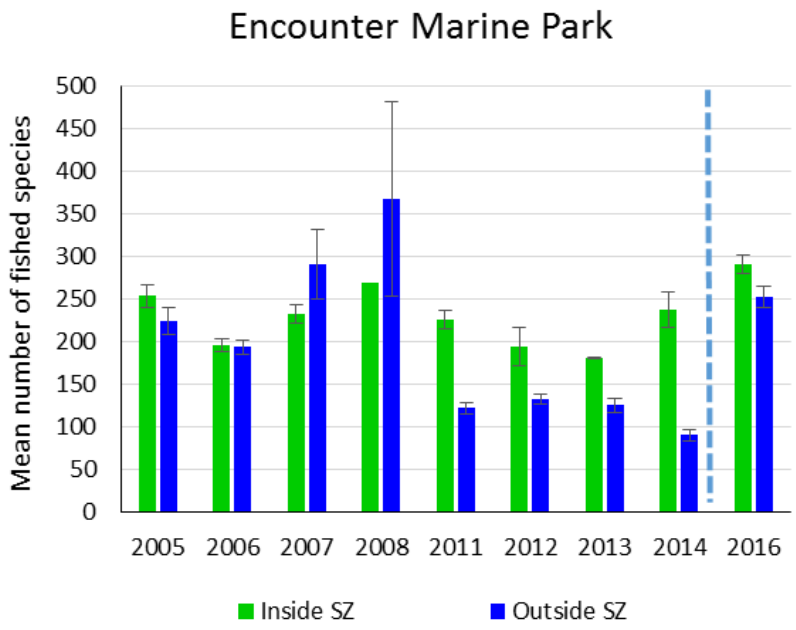


Figure 133. Mean (±SE) number of fished species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of fished species recorded on dive surveys was generally higher inside SZs compared to outside sites at Carrickalinga and Rapid Head SZ, with the exception of 2008 where there were no surveys conducted inside the Carrickalinga SZ (Figure 134). The Sponge Gardens SZ consistently has a higher abundance of fished species outside the SZ compared to inside sites with the highest overall abundance of all SZs recorded in 2016 which was over 600 individuals (Figure 134).

A large school of fish (Australian salmon - *Arripis truttaceus*) entered a dive survey in 2008 at a site outside Rapid Head SZ, which has led to the high numbers observed in that year (Figure 134).

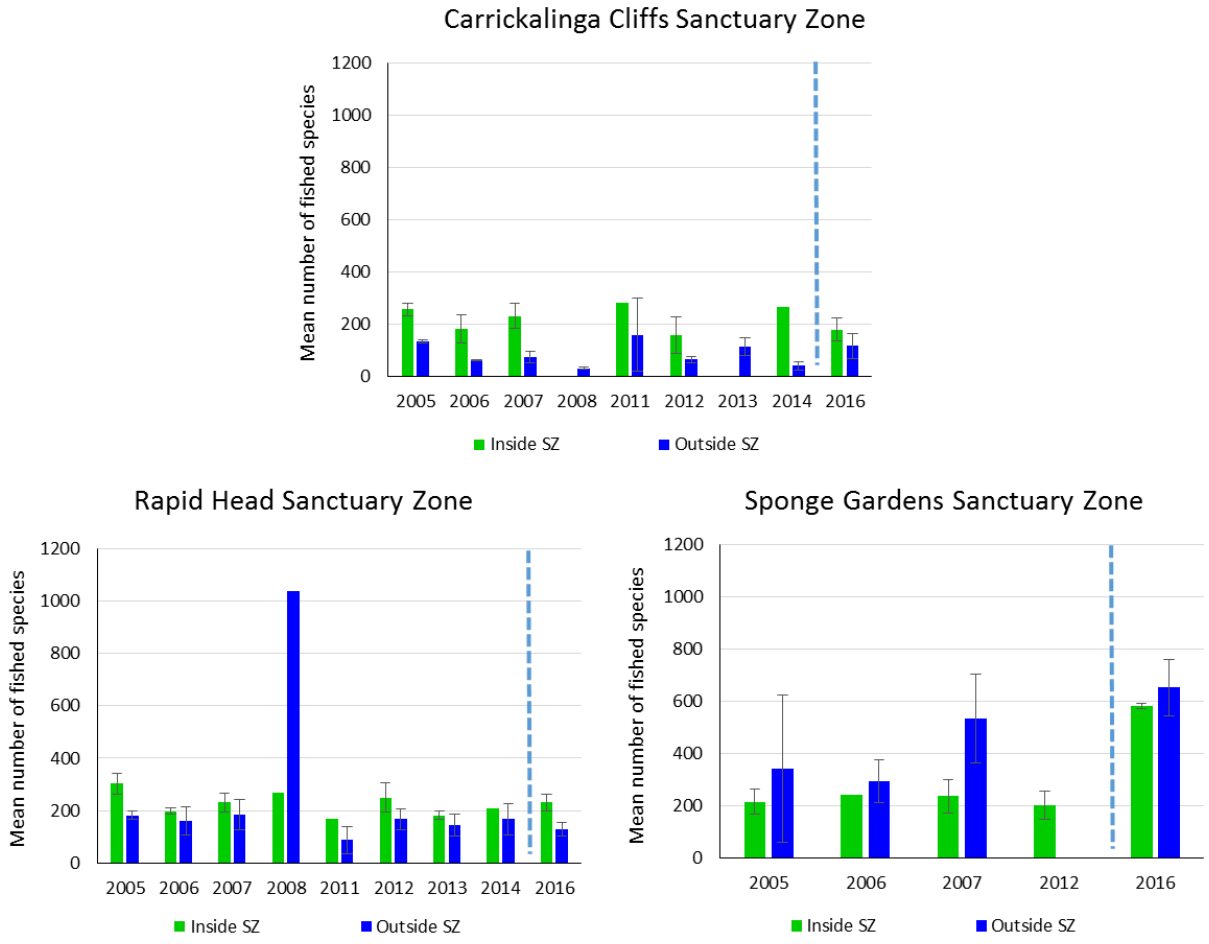


Figure 134. Mean (±SE) number of fished species per dive survey for inside vs outside SZ sites for Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Mean biomass of fished species

The mean biomass of fished species in Encounter Marine Park ranged between 10–120 kg across all sites from 2005–16, with the average biomass for inside SZ and outside sites both being around 52 species (Figure 135). The average biomass of fished species was higher inside SZ sites for every year except 2007, 2008 and 2013 where the outside sites had a higher biomass of fished species. The highest overall biomass of fished species recorded on dive survey was in 2008 at sites outside of the SZ at about 120 kg (Figure 135).

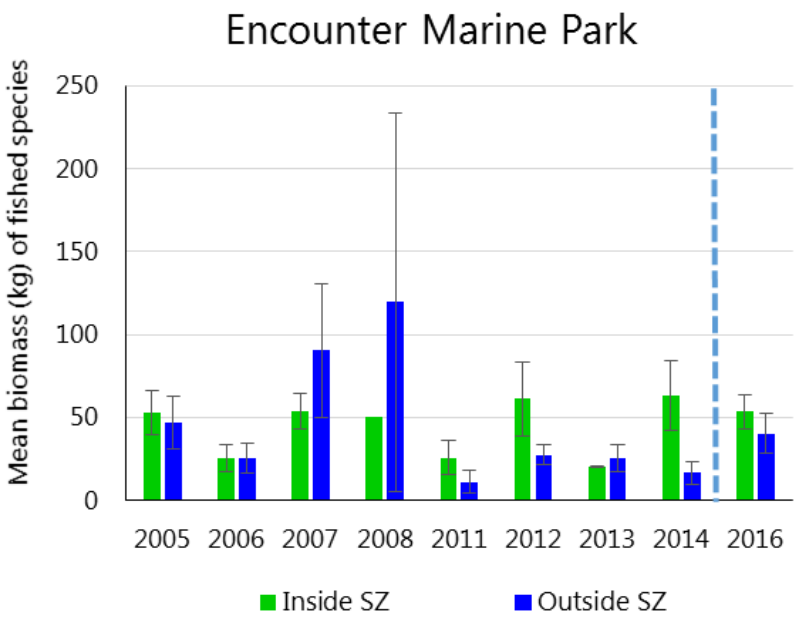


Figure 135. Mean (±SE) biomass of fished species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

With the exception of outside sites at Carrickalinga Cliffs SZ in 2008 the mean biomass of fished species recorded on a dive survey was higher outside the Sponge Gardens SZ, compared to Carrickalinga and Rapid Head across all years reaching a maximum of 180kg in 2008 at outside SZ sites (Figure 136). The fished species biomass was generally higher inside SZ compared to outside in both Rapid Head and Carrickalinga Cliffs SZ, whereas Sponge Gardens SZ had a higher biomass for sites outside SZs every year except 2012 where no surveys were undertaken outside of the SZ (Figure 136).

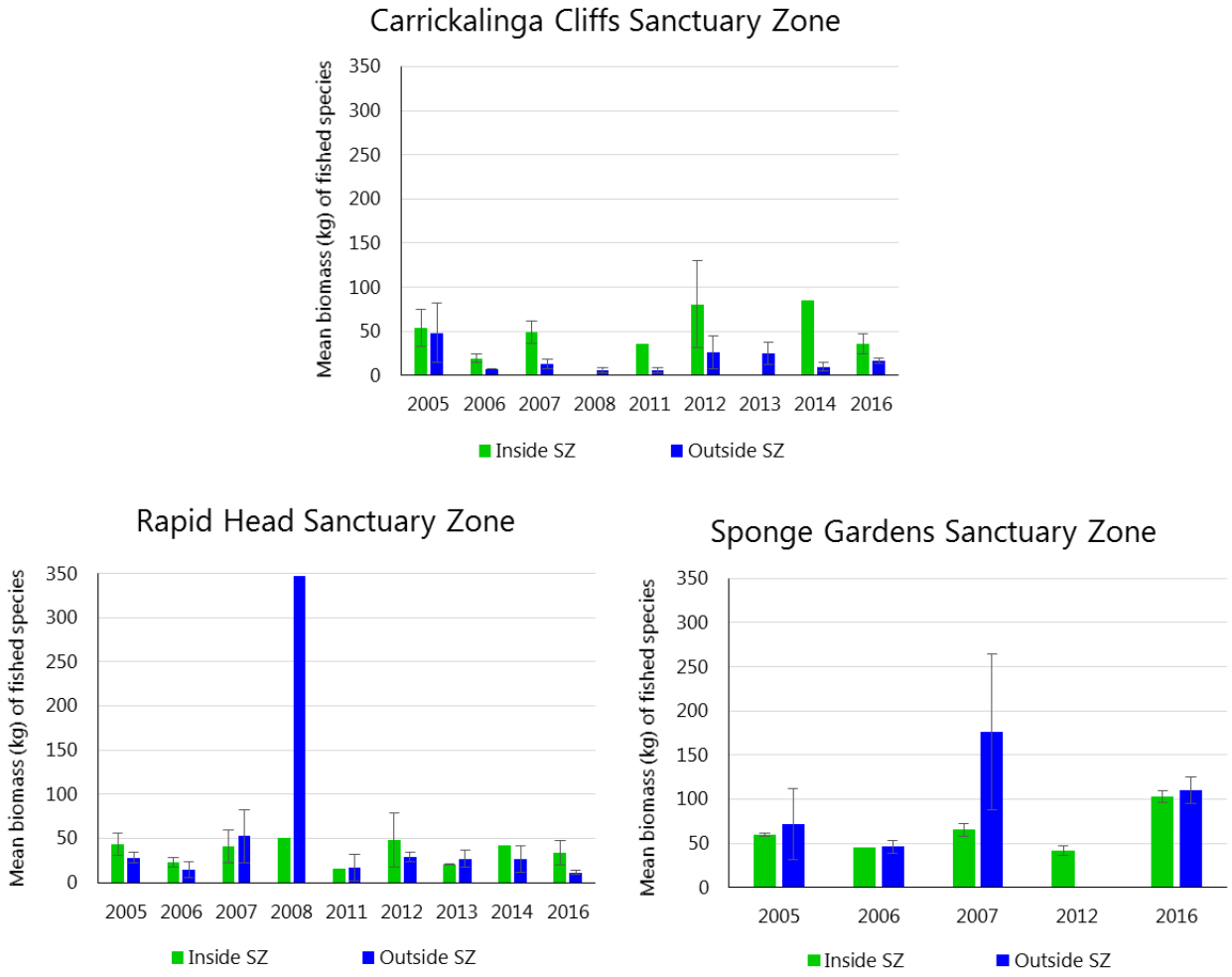


Figure 136. Mean (±SE) biomass of fished species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Mean abundance of large fish species

The mean abundance of large fish (200 mm) recorded on dive surveys in Encounter Marine Park was generally consistent across all years, with a higher abundance of large fish inside SZ sites compared to outside with the exception of 2007, 2008 and 2011 (Figure 137). The average abundance of fish over 200 mm since 2005 has been 172 inside and 169 outside SZ (Figure 137).

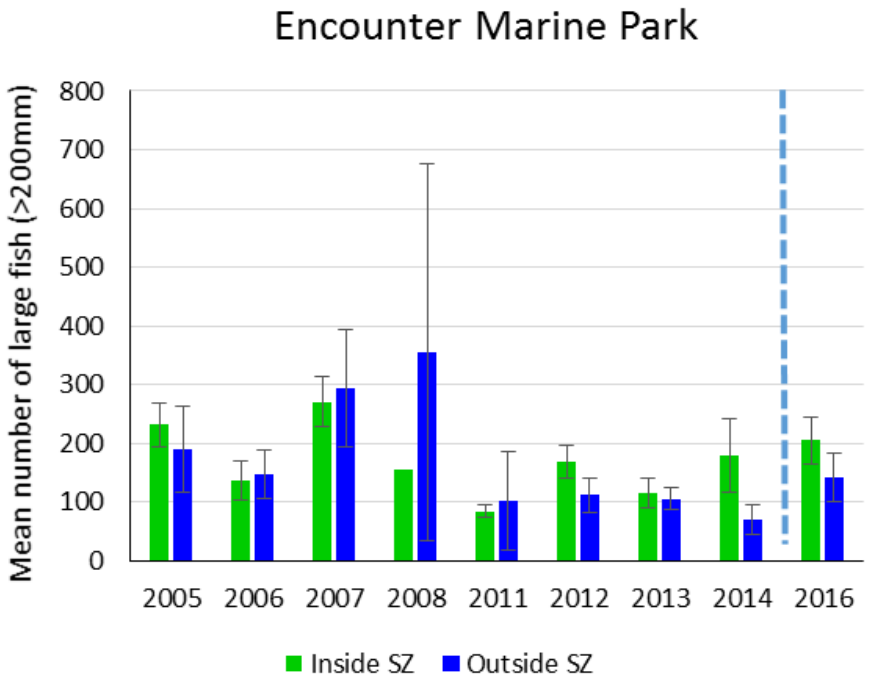


Figure 137. Mean (±SE) number of large fish (>200 mm) species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of large fish (>200 mm) species recorded during dive surveys was variable between different SZs and sites inside and outside SZ (Figure 138). In Carrickalinga Cliffs SZ the abundance of large fish species is more common inside SZ sites compared to outside. The large fish species are also generally more frequent inside the SZ at Rapid Head with 2005, 2006, 2007, 2012 and 2014 all having higher abundance inside compared to outside. The abundance of large species was very high in 2008 at Rapid Head outside the SZ due a large school (>1000) of Australian salmon (*Arripis truttaceus*) passing through the survey site. The Sponge Gardens SZ varies more frequently with large fish species abundance between years with 2005 and 2016 showing fairly similar abundances, where 2006 was higher inside and 2007 was higher outside the SZ (Figure 138).

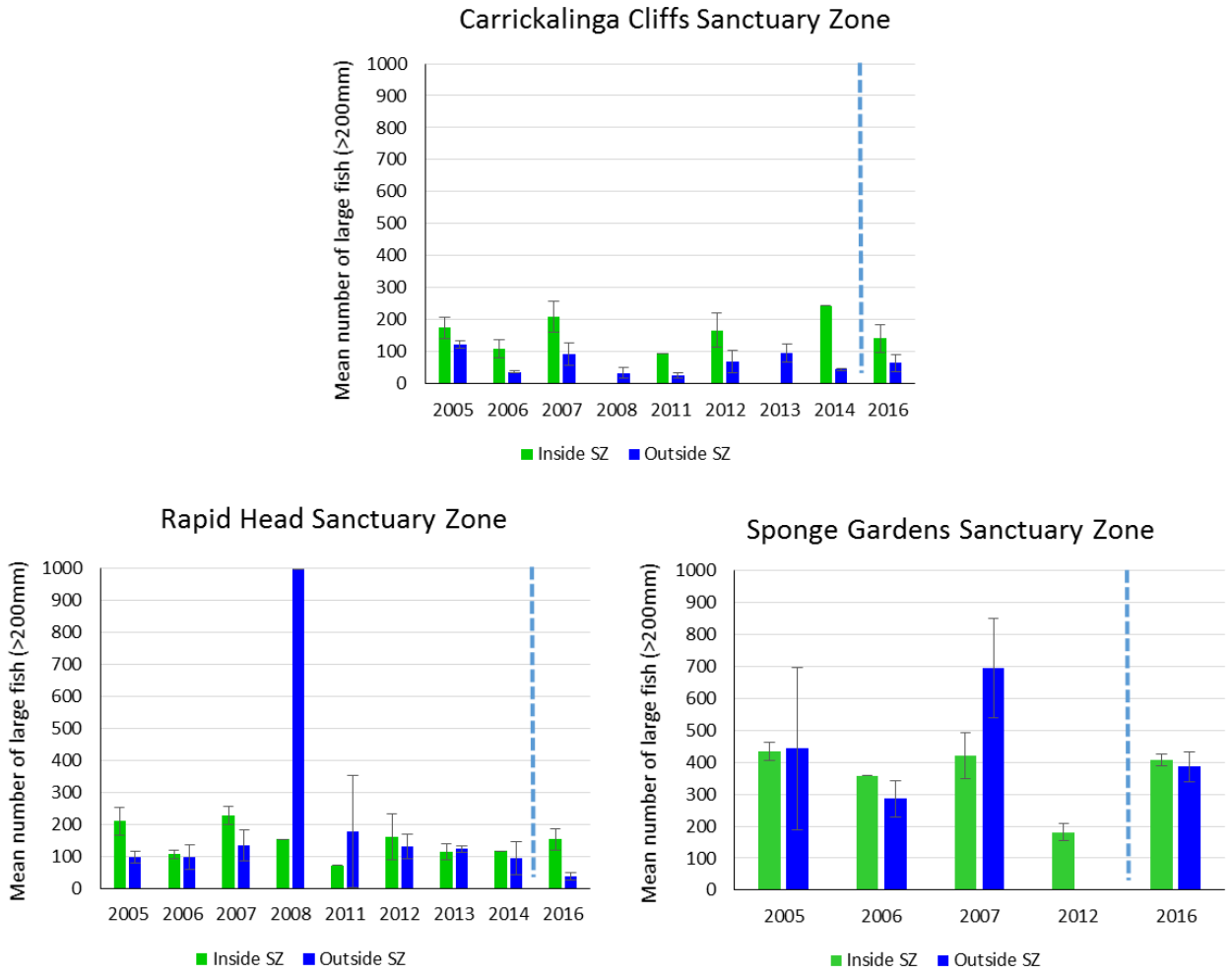


Figure 138. Mean (±SE) number of large fish (>200 mm) species per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Mean biomass of large fish species

The mean biomass of large fish (200 mm) recorded on dive surveys in Encounter Marine Park was variable over time and between sites inside and outside of SZs (Figure 139). The mean biomass of large fish was highest in outside sites in 2007 and 2008 compared to all other sites and years. In recent sampling years the biomass of large fish has been higher inside the SZ compared to outside (Figure 139).

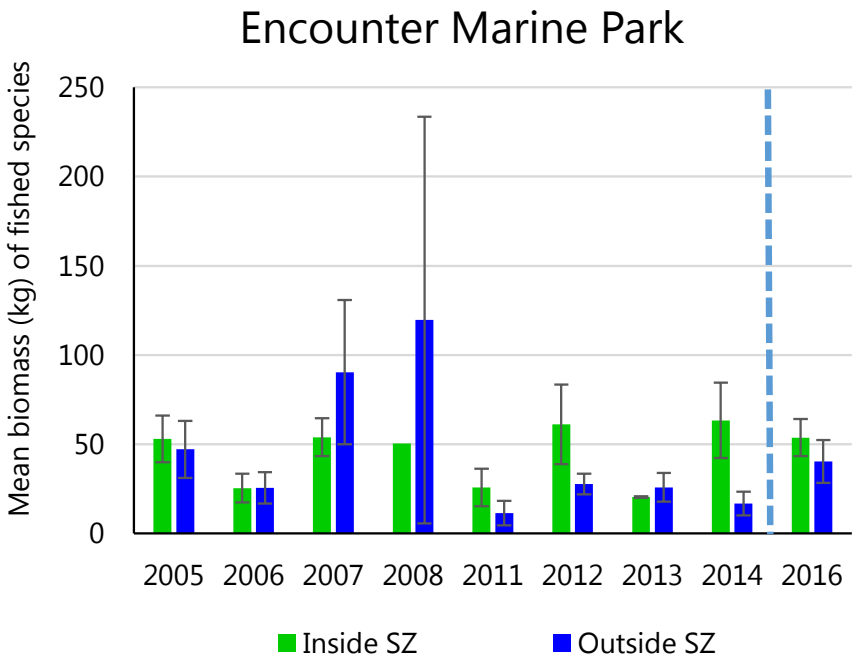


Figure 139. Mean (±SE) biomass of large fish (>200 mm) species per survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean biomass of large fish recorded on dive surveys was highest outside the Sponge Gardens SZ at about 250 kg compared to Carrickalinga Cliffs and Rapid Head SZs and associated comparison sites (with the exception of 2008 where, as discussed a large school of Australian salmon (*Arripis truttaceus*) was recorded) (Figure 140). The mean biomass of large fish was generally higher inside SZs than outside for the Carrickalinga SZ while the pattern was variable for Rapid Head and Sponge Gardens SZs (Figure 140).

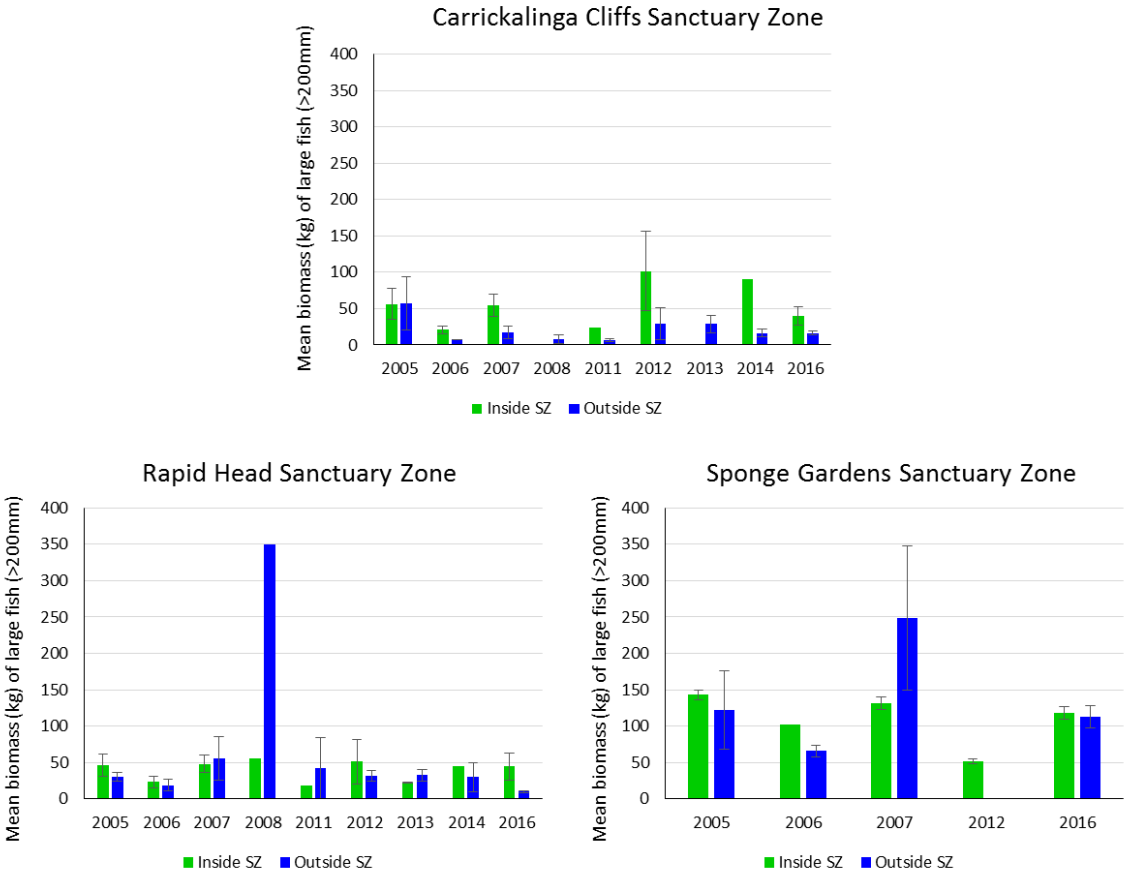


Figure 140. Mean (±SE) biomass of large fish (>200 mm) species per survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Mean abundance of site attached fish species

The mean number of site attached fish species recorded on dive surveys varied each year in Encounter Marine Park, however it was generally a higher number of site attached fish species outside the SZ compared to inside sites (Figure 141). In 2005 and 2012 there was a much higher number of site attached fish species outside the SZ compared to inside at about 1800 fish recorded per survey. In 2008 there was an increase of site attached fish species inside the SZ compared to outside, along with 2016 (Figure 141).

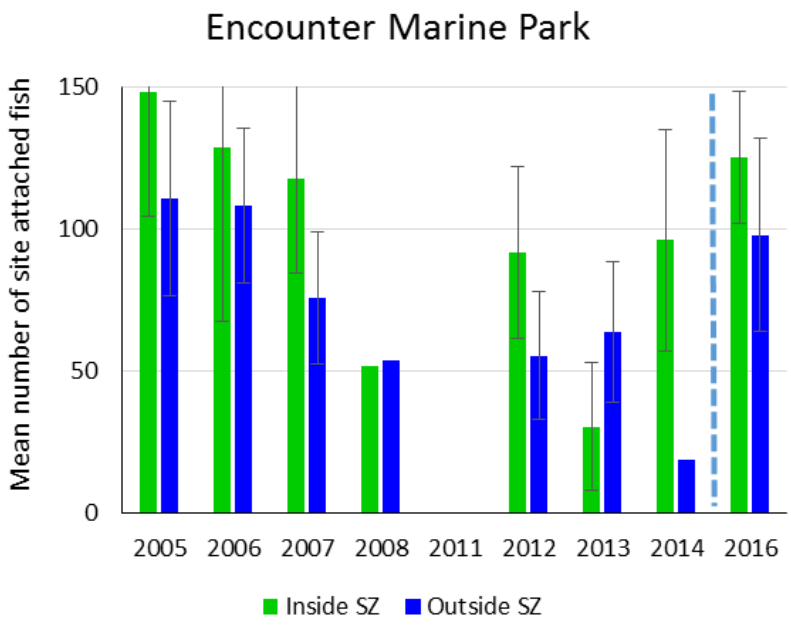


Figure 141. Mean (±SE) number of site attached fish species per survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of site attached fish species recorded during dive surveys varied within each of the SZs and associated comparsion sites in Encounter Marine Park (Figure 142). Carrickalinga Cliffs and Sponge Gardens SZ tended to have higher site attached fish species inside the SZ compared to outside sites and Rapid Head SZ varied between having a higher abundance of fish inside or higher outside depending in the year. The Sponge Gardens SZ outside sites had the overall highest number of site attached fish species with almost 300 fish per survey (Figure 142).

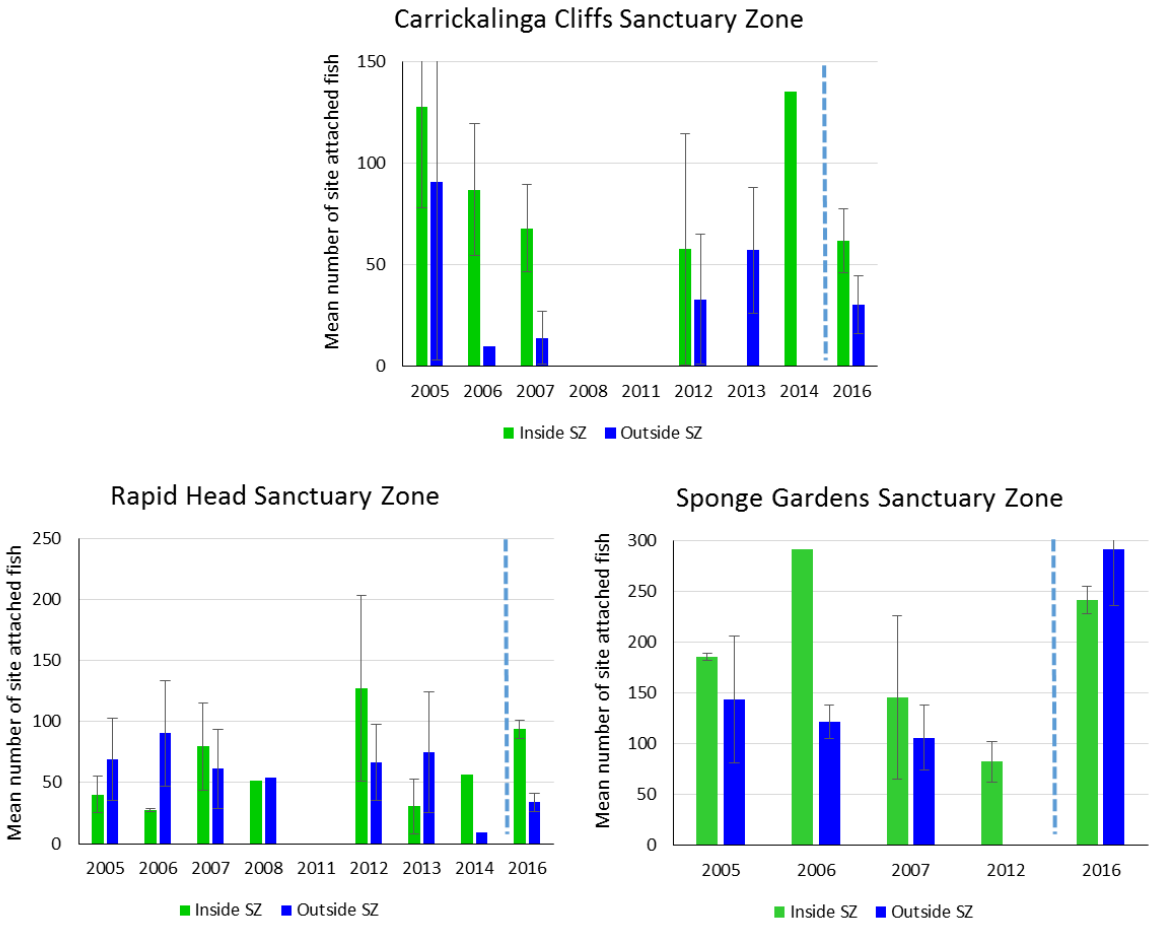


Figure 142. Mean (±SE) number of site attached fish species per dive survey for sites inside vs outside SZs in the Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Mean biomass of site attached fish species

The mean biomass of site attached fish recorded on dive surveys in Encounter Marine Park varied each year between sites, but generally was higher inside SZ compared to outside (Figure 143). The biomass of site attached fish was higher inside the SZ in 2005, 2008, 2012, 2014 and 2016, whereas in 2006, 2007 and 2013 the biomass was higher at outside SZ sites. The highest biomass recorded was in 2014 inside SZ sites at about 38 kg per survey (Figure 143).

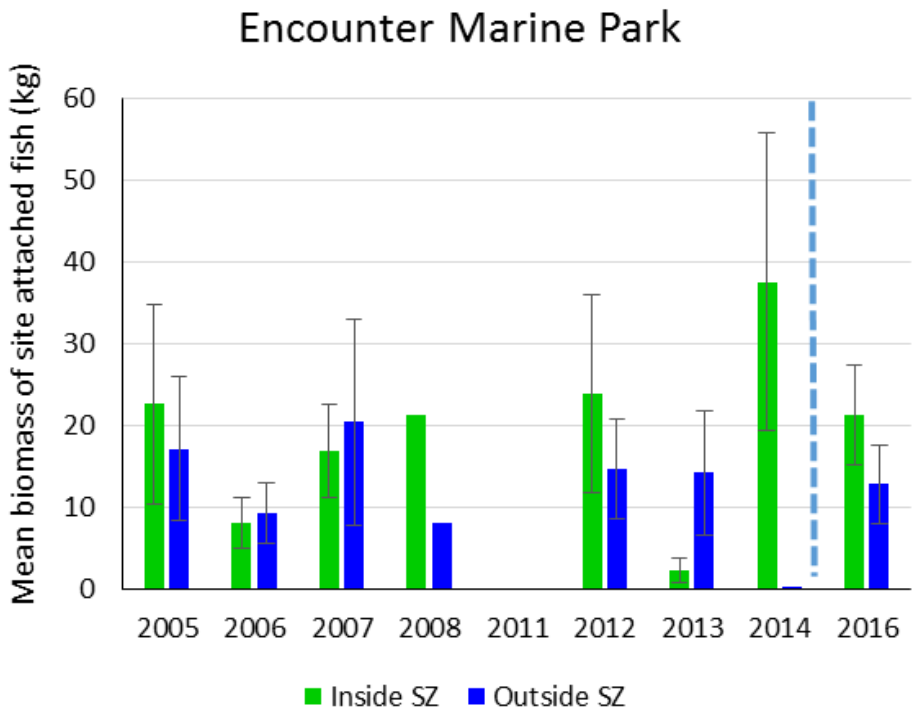


Figure 143. Mean (±SE) biomass of site attached fish species per dive survey for sites inside vs outside SZs in the Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

Presence of marine pests

Marine pests were not observed by dive monitoring surveys of marine park sanctuary zones. Although surveys have the potential to detect marine pests, they are primarily designed to focus on and assess the biodiversity of native species. Larger and obvious marine pest species such as European fan worm (*Sabella spallanzanii*) or European shore crab (*Carcinus maenas*) are recorded during surveys if present, but many marine pest species are also cryptic (camouflaged) and remain unseen. The area used to conduct marine park surveys is also relatively small and the presence of a marine pest can be easily missed. There are a range of other sampling methods more appropriate and effective for monitoring marine pests.

Macro algae % cover

Data collected but not yet processed.

The mean biomass of site attached fish species recorded on dive surveys varied between individual SZs and associated comparison sites in Encounter Marine Park with no consistency across the sites (Figure 144). Carrickalinga Cliffs had a higher biomass of site attached fish inside SZs in 2006, 2007, 2014 and 2016, with the largest biomass recorded inside SZ n 2014 at about 58 kg per survey. Rapid Head SZ generally had a higher biomass of site attached fish outside of the SZ sites from 2005–11, then from 2012 generally had a higher biomass inside SZs with the exception of 2013. The Sponge Gardens shows an overall increase in biomass from 2005 at about 10 kg to 2016 at about 40 kg, which was the highest biomass for any SZ site (Figure 144).

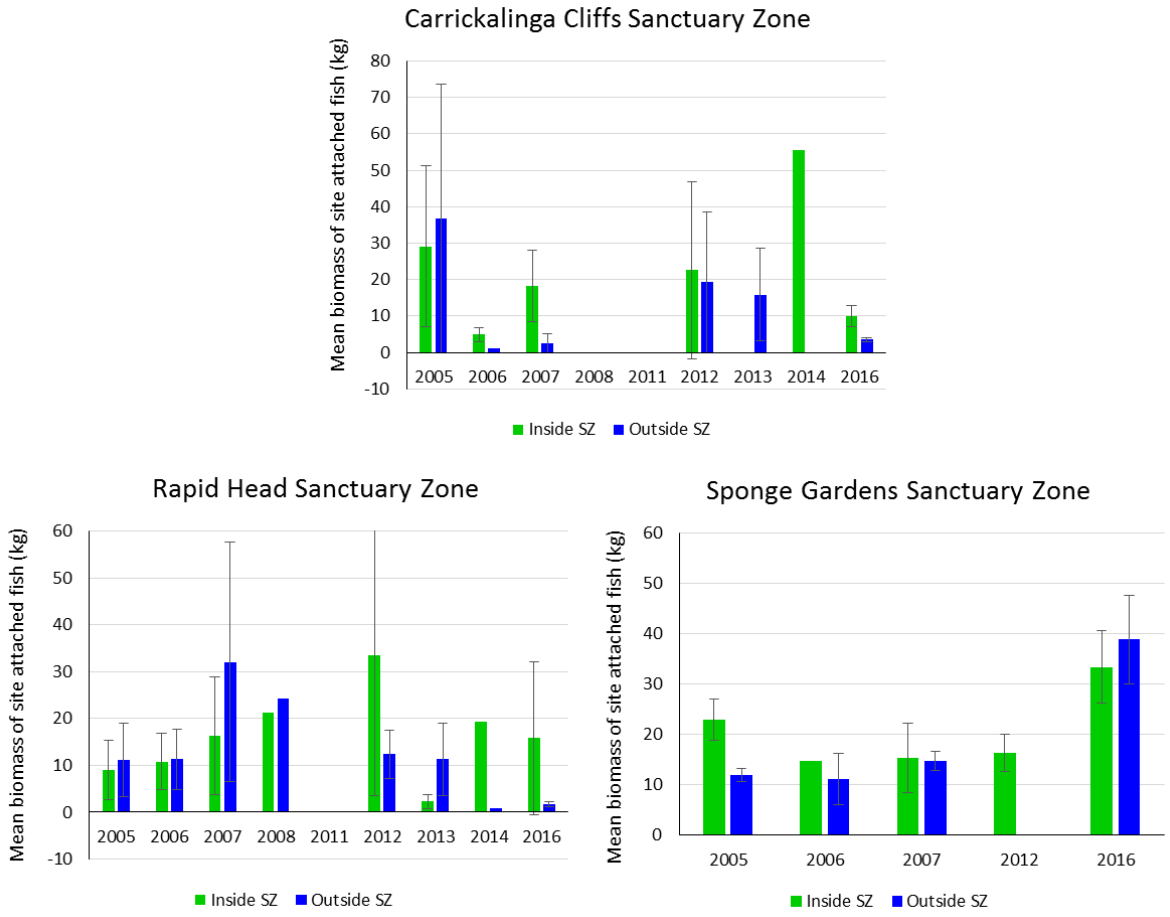


Figure 144. Mean (±SE) biomass of site attached fish species per dive survey for sites inside vs outside SZs in the Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Focal species indicators (Dive surveys)

Abundance of bluethroat wrasse (Notolabrus tetricus)

The abundance of bluethroat wrasse *(Notolabrus tetricus)* recorded on dive survey in Encounter Marine Park was higher inside SZs compared to outside sites for every year from 2005 -2016 (Figure 145). The highest number of bluethroat wrasse recorded inside SZs was around 115 in 2008 (Figure 145).

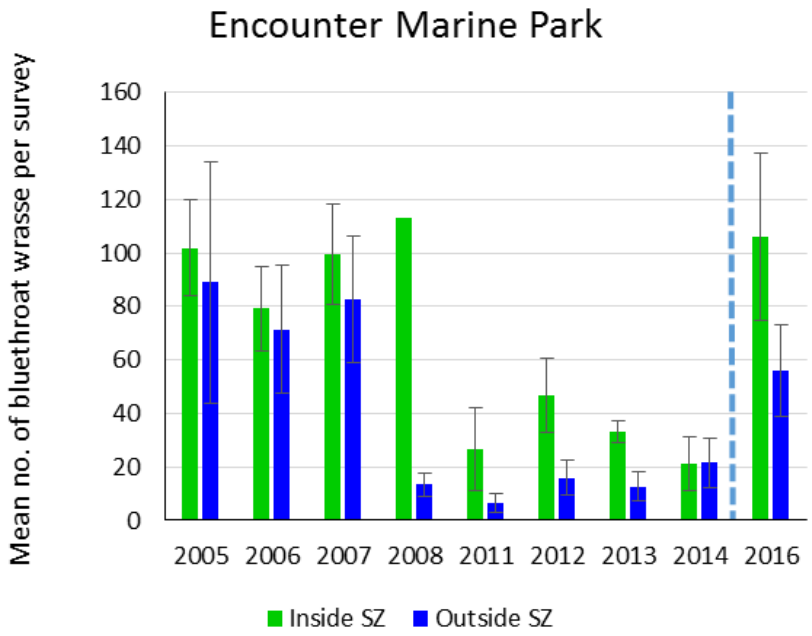


Figure 145. Mean (±SE) number of bluethroat wrasse (*Notolabrus tetricus*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of blue throat wrasse *(Notolabrus tetricus)* recorded on dive surveys varies between the different SZs associated comparison sites, with sites inside the Sponge Gardens SZ having the highest number of fish at about 260 per survey, followed by sites inside Rapid Head SZ in 2005 at about 130 fish per dive. Carrickalinga Cliffs SZ associated comparison sites were considerably lower than other SZs with less than 20 fish recorded per dive since 2008 (Figure 146). The abundance of bluethroat wrasse was typically higher outside of the SZ sites at Sponge Garden from 2005 – 2007, however from 2012 the abundance inside the SZ increased and became higher than outside sites. Rapid Head SZ generally has a higher abundance of bluethroat wrasse inside the SZ compared to outside with every year 2014 having a higher abundance. Carrickalinga Cliffs SZ also follows this pattern where almost every year with the exception of 2013 had a higher abundance of bluethroat wrasse inside the SZ compared to outside sites (Figure 146).

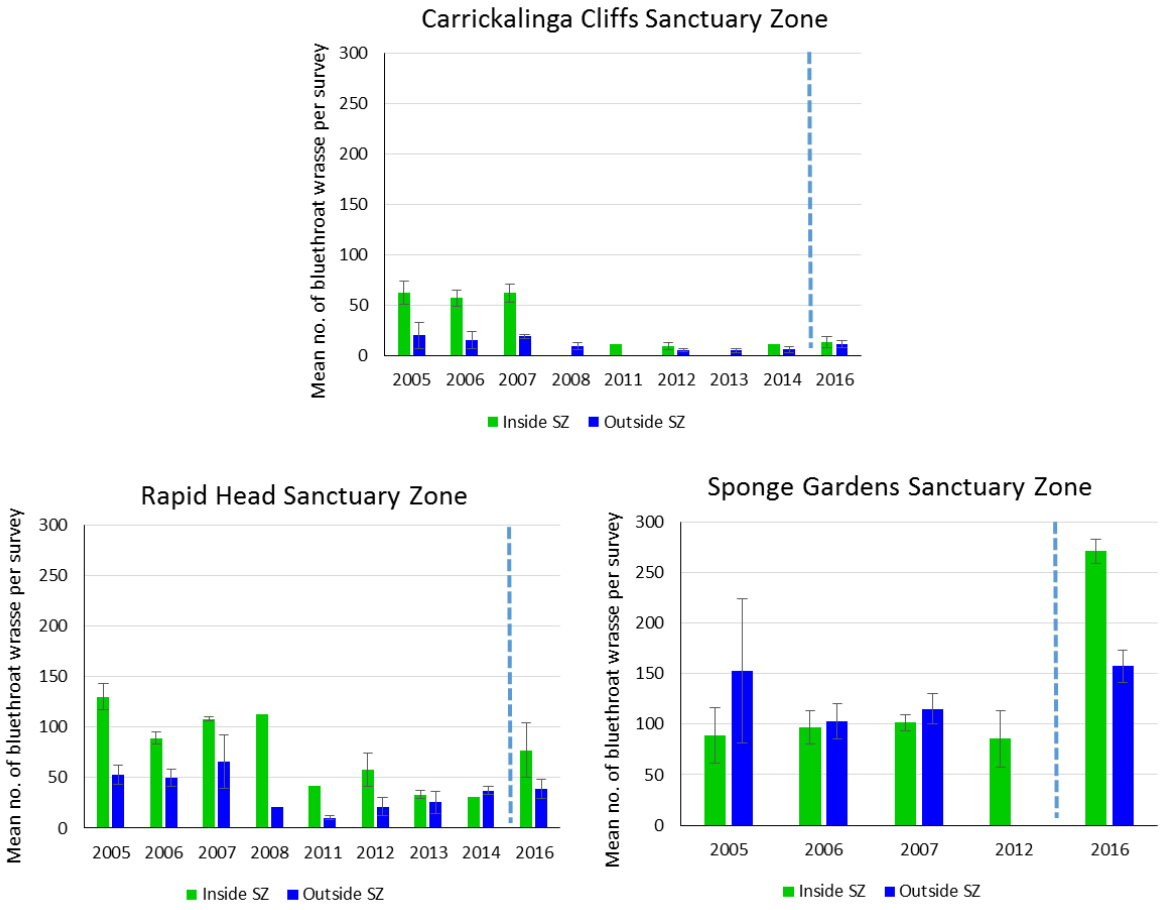


Figure 146. Mean (±SE) number of bluethroat wrasse (*Notolabrus tetricus*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of sea sweep (Scorpis aequipinnis)

The mean number of sea sweep (*Scorpis aequipinnis*) recorded during dive surveys was higher inside SZs compared to outside sites for Encounter Marine Park (Figure 147). 2016 was the only year where the outside SZ sites had a slightly higher abundance of sea sweep compared to inside sites. Overall there has been an increase in the mean number of sea sweep from 2005, where just over 40 per survey were recorded inside the SZ and 20 outside, to 2016 where around 60 were recorded inside and almost 70 for outside sites (Figure 147).

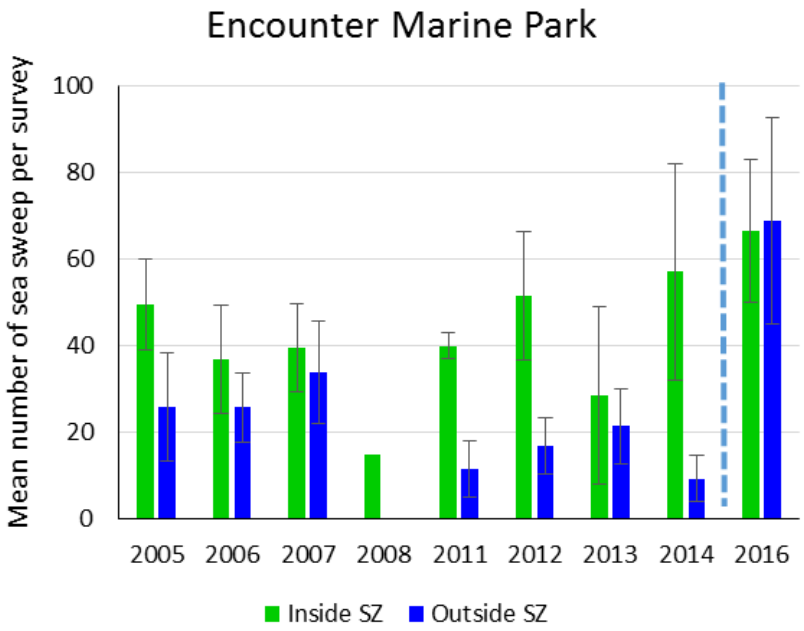


Figure 147. Mean (±SE) number of sea sweep *(Scorpis aequipinnis*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The Sponge Gardens SZ had the overall highest mean number of sea sweep *(Scorpis aequipinnis)* recorded on dive survey at just over 200 fish in 2016 at outside SZ sites, which has increased from 2005 where it was less than 50 fish per survey (Figure 148). Rapid Head and Carricaklinga Cliffs SZ associated comparison sites has relatively similar numbers of sea sweep since 2005, fluctuating below 50 fish per survey for both zones. Rapid Head SZ and Carrickalinga Cliffs generally have a higher abundance of sea sweep inside SZs with the exception of a few years where the outside sites had more sea sweep. Sponge Gardens SZ typically has more sea sweep outside of the SZ then inside sites with the exception of 2006 (Figure 148).

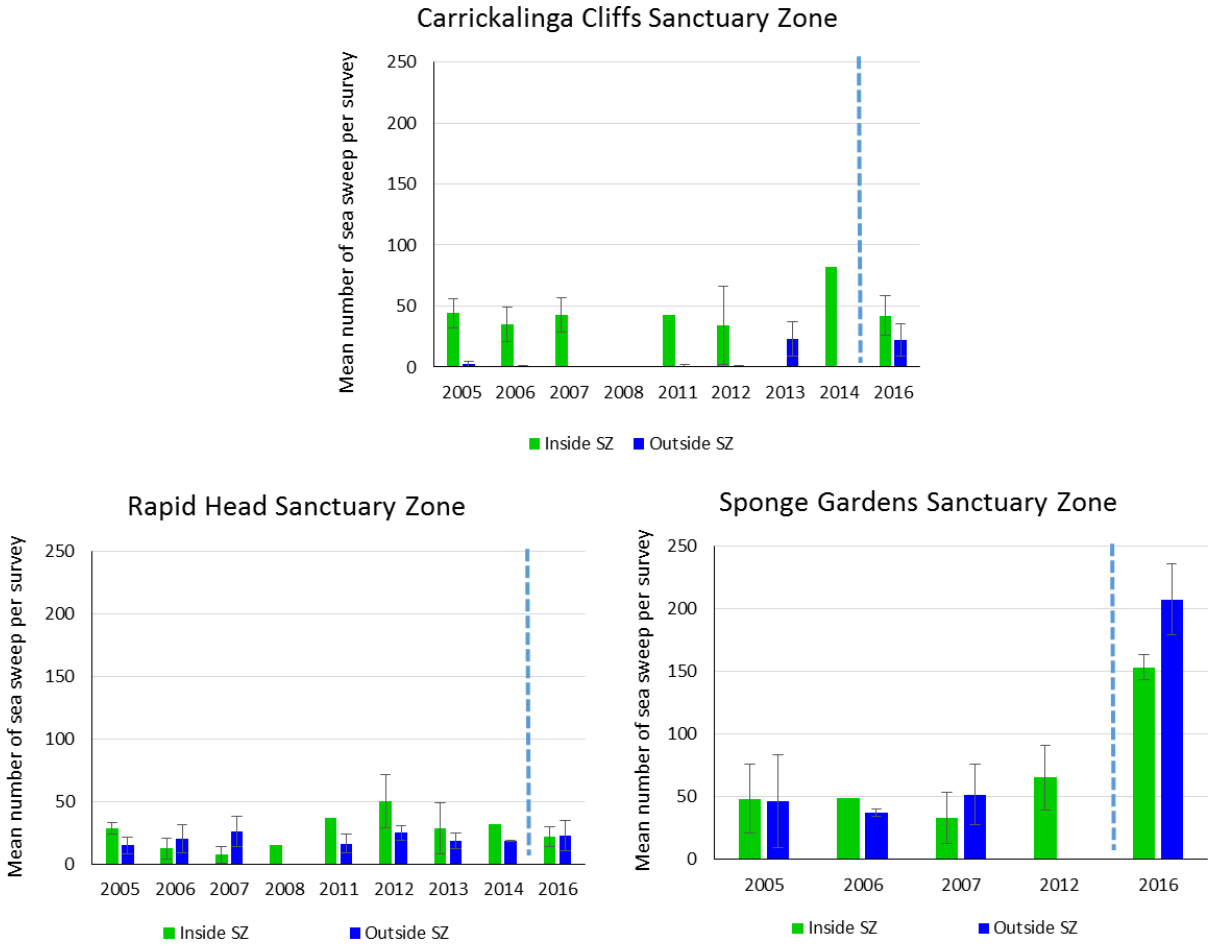


Figure 148. Mean (±SE) number of sea sweep *(Scorpis aequipinnis*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of western blue groper (Achoerodus gouldii)

The mean number of Western blue groper (*Achoerodus gouldii)* recorded on dive surveys in Encounter Marine Park ranged from 1-8 fish per survey (Figure 149). Overall the mean number of Western blue gropers has increased from 2005 – 2016, where just over 7 fish were recorded per dive survey. From 2005 – 2007 the outside SZ sites generally had a higher abundance of Western blue groper outside of the SZ sites compared to inside, where 2008, 2012 and 2014 all had higher abundance inside SZ sites while in 2016 the trend was reversed again (Figure 149).

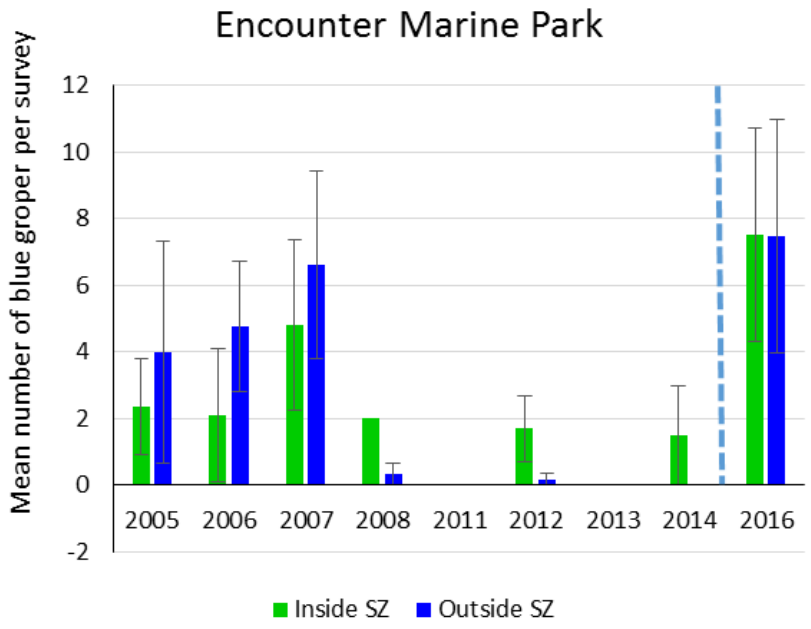


Figure 149. Mean (±SE) number of blue groper (*Achoerodus gouldii*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

Western blue groper (*Achoerodus gouldii)* are not commonly sighted at Carrickalinga Cliffs or Rapid Head SZs associated comparison sites, hence there was a lower abundance of fish recorded at these SZs (Figure 150). The Sponge Gardens SZ and associated comparison sites has the highest abundance of Western blue gropers which has been increasing since 2005 from around 5 fish per survey to 2016 about 27 fish per survey and has higher numbers outside the SZ in all years (Figure 150).

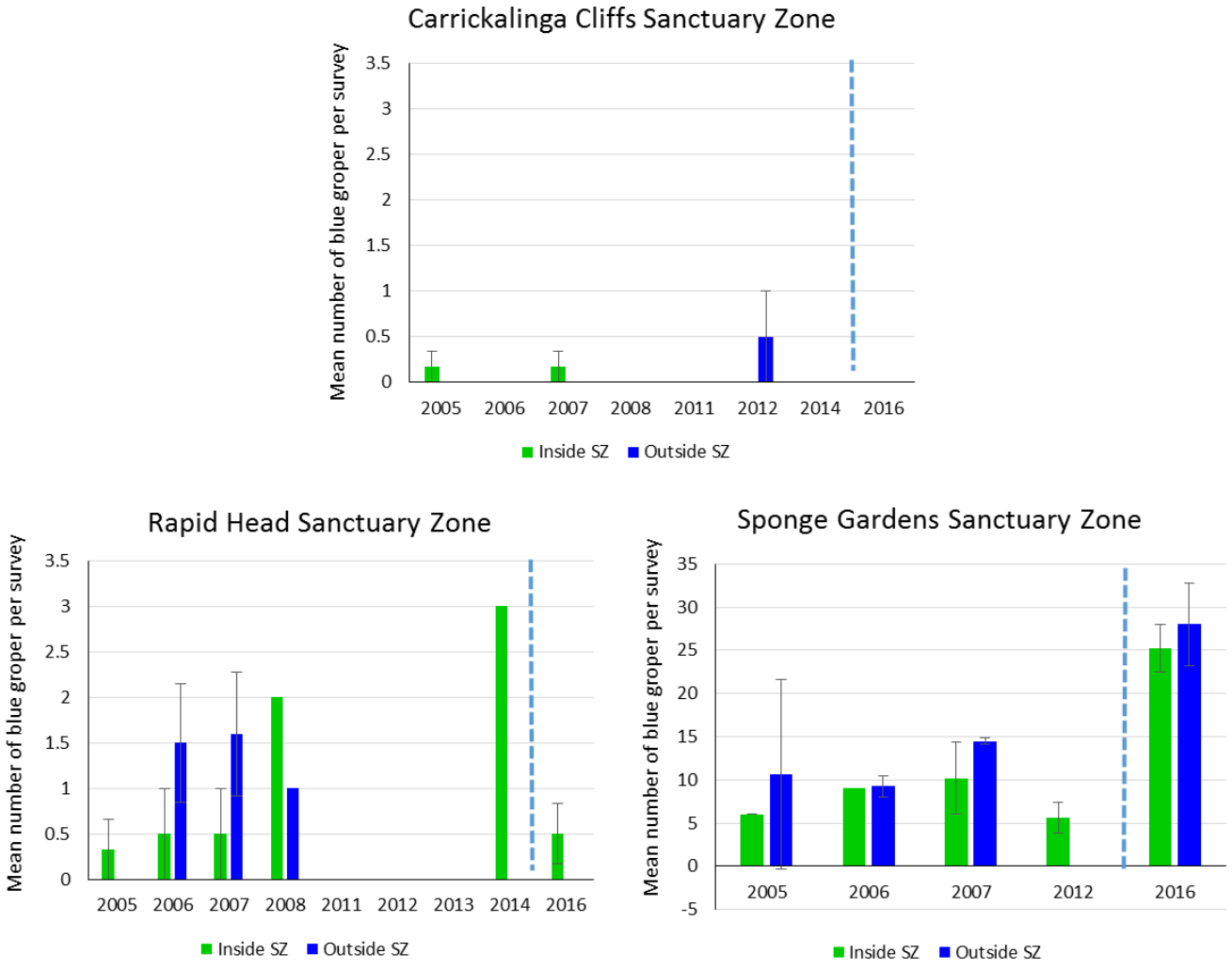


Figure 150. Mean (±SE) number of western blue groper (*Achoerodus gouldii*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of harlequin fish (Othos dentex)

The mean number of harlequin fish *(Othos dentex)* recorded on dive surveys in Encounter Marine Park was generally low, with a slightly higher abundance recorded inside the SZ compared to outside (Figure 151).

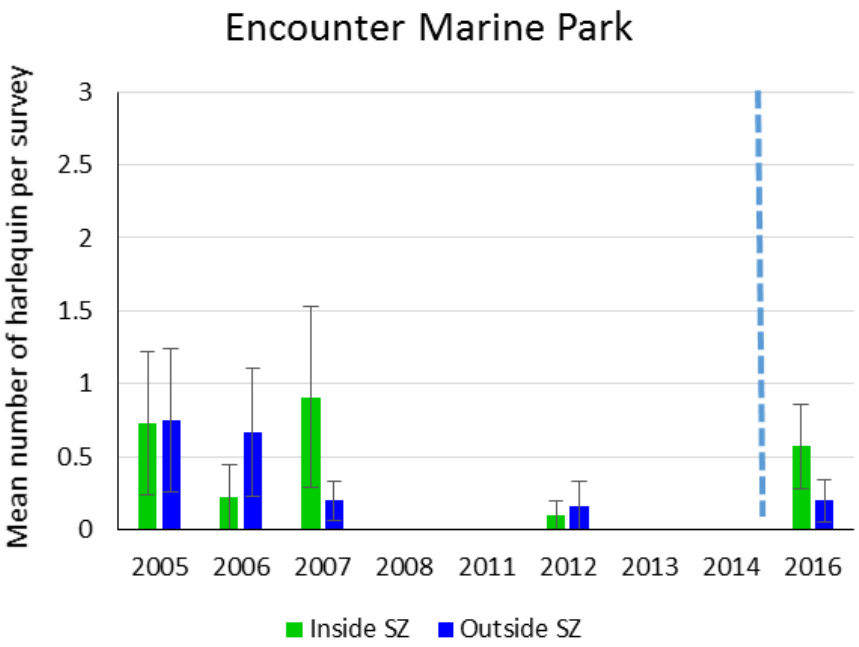


Figure 151. Mean (±SE) number of harlequin fish (*Othos dentex*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

Harlequin fish are not commonly sighted at Carrickalinga Cliffs or Rapid Head SZs and associated comparison sites, hence there was a lower abundance of fish recorded at these SZs (Figure 152). The Sponge Gardens SZ and associated comparison sites has the highest abundance of harlequin fish which has remained fairly similar since 2005, with a mean of about 2 fish seen per dive inside the SZs. The Sponge Gardens SZ generally has a higher abundance of harlequin fish inside the SZ compared to the outside sites with the exception of 2006 where the outside sites had a higher abundance (Figure 152).

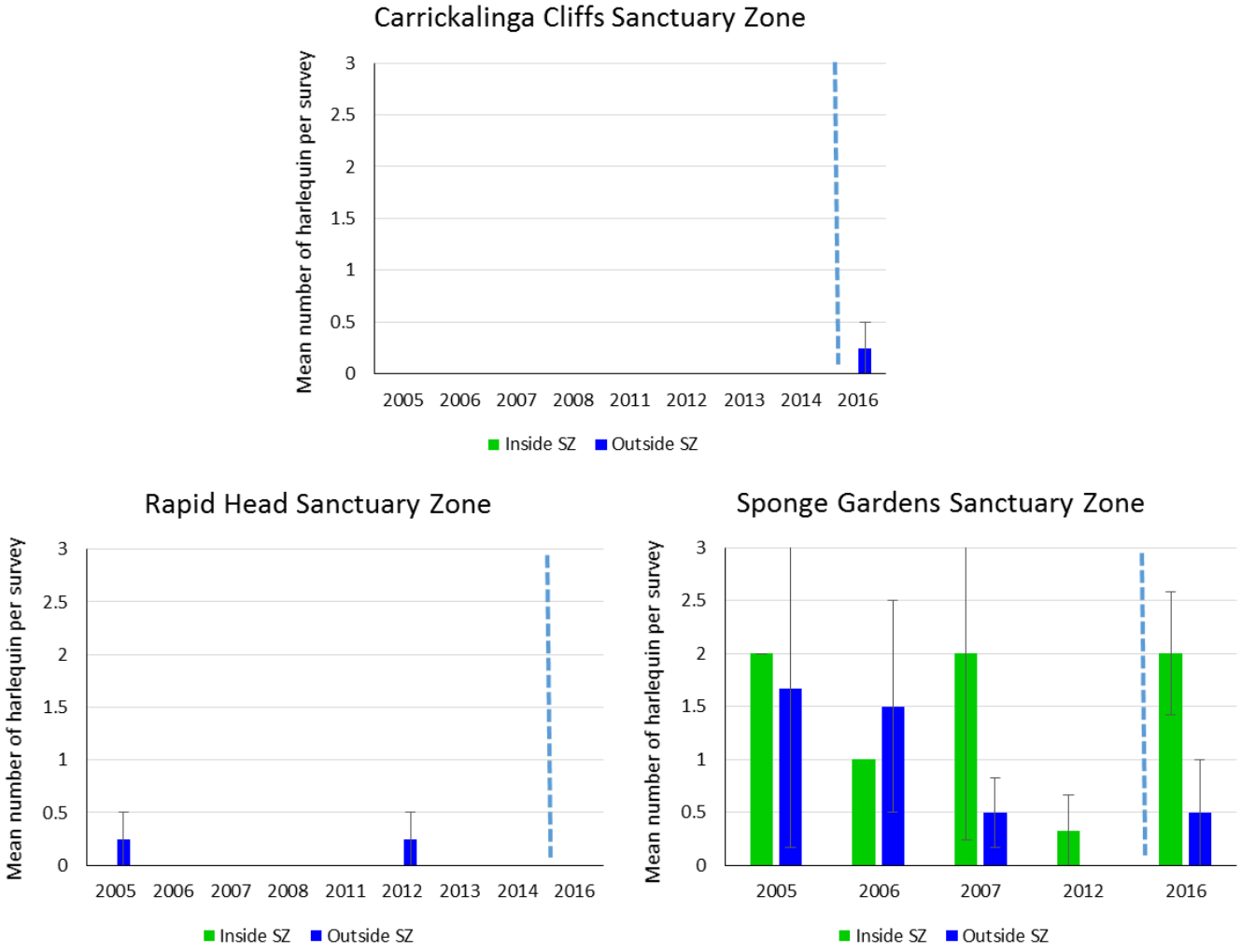


Figure 152. Mean (±SE) number of harlequin fish (*Othos dentex*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of southern blue devil (Paraplesiops meleagris)

The mean number of southern blue devils *(Paraplesiops meleagris)* recorded on dive surveys in Encounter Marine Park is higher inside SZs compared to outside sites (Figure 153). The numbers have remained relatively similar inside SZs from 2005–13 with around 1–2 fish recorded per survey, whereas 2014 had an increase to around 8 fish per survey before declining back to 1–2 fish in 2016 (Figure 153).

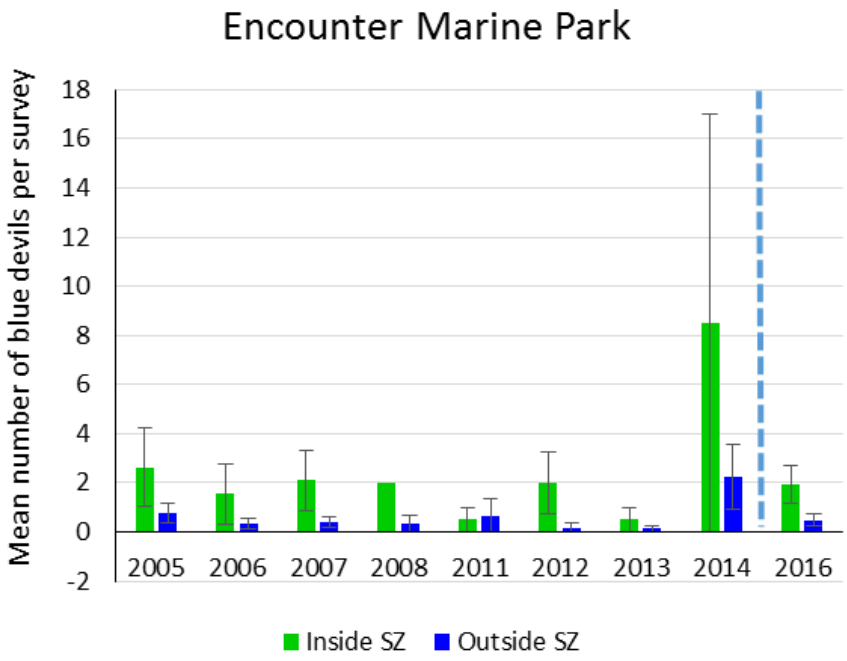


Figure 153. Mean (±SE) number of southern blue devils (*Paraplesiops meleagris*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

Blue devils (*Paraplesiops meleagris*) are not commonly seen at Carrickalinga Cliffs SZ and associated comparison sites, where Sponge Gardens and Rapid Head SZ and associated comparison sites have higher abundance recorded during dive surveys (Figure 154). Rapid Head and Sponge Gardens SZs both had a higher mean number of blue devils recorded during dive surveys inside SZ sites compared to outside, with Rapid Head having the highest abundance recorded in 2016 at about 17 fish per dive recorded inside the SZ (Figure 154).

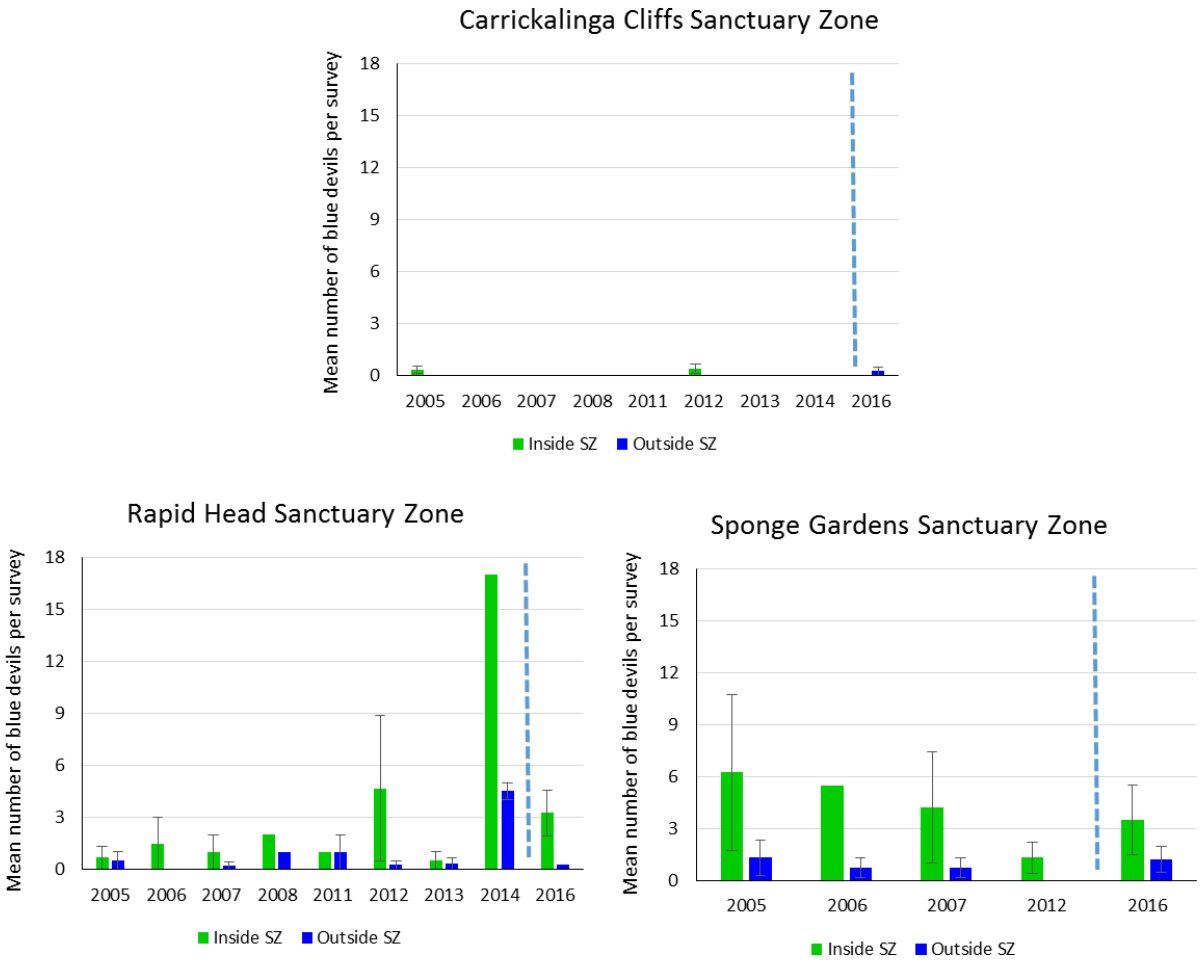


Figure 154. Mean (±SE) number of southern blue devil (*Paraplesiops meleagris*) per dive survey for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of southern rock lobster (Jasus edwardsii)

The mean number of southern rock lobster (*Jasus edwardsii*) recorded on dive survey in Encounter Marine Park is higher inside SZs compared to outside sites with the highest abundance recorded in 2011 at about 0.5 per 50 m^2 (Figure 155).

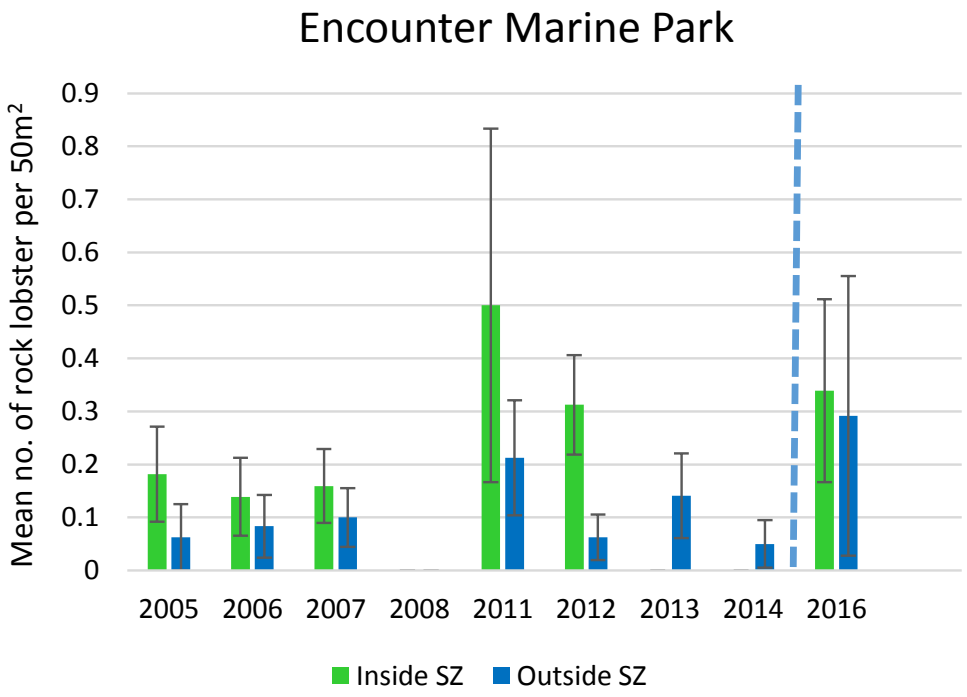


Figure 155. Mean (±SE) number of southern rock lobster (*Jasus edwardsii*) per 50 m^2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of southern rock lobster *(Jasus edwardsii)* recorded on dive survey was generally higher inside SZs compared to outside sites, with the highest abundance at Sponge Gardens outside SZ followed by Rapid Head and Carrickalinga Cliffs SZs and associated comparison sites (Figure 156). The Sponge Gardens SZ had the most consistency in abundance of southern rock lobster with each year being between 0.4–0.7 rock lobsters recorded every 50 m^2 per dive survey (Figure 156).

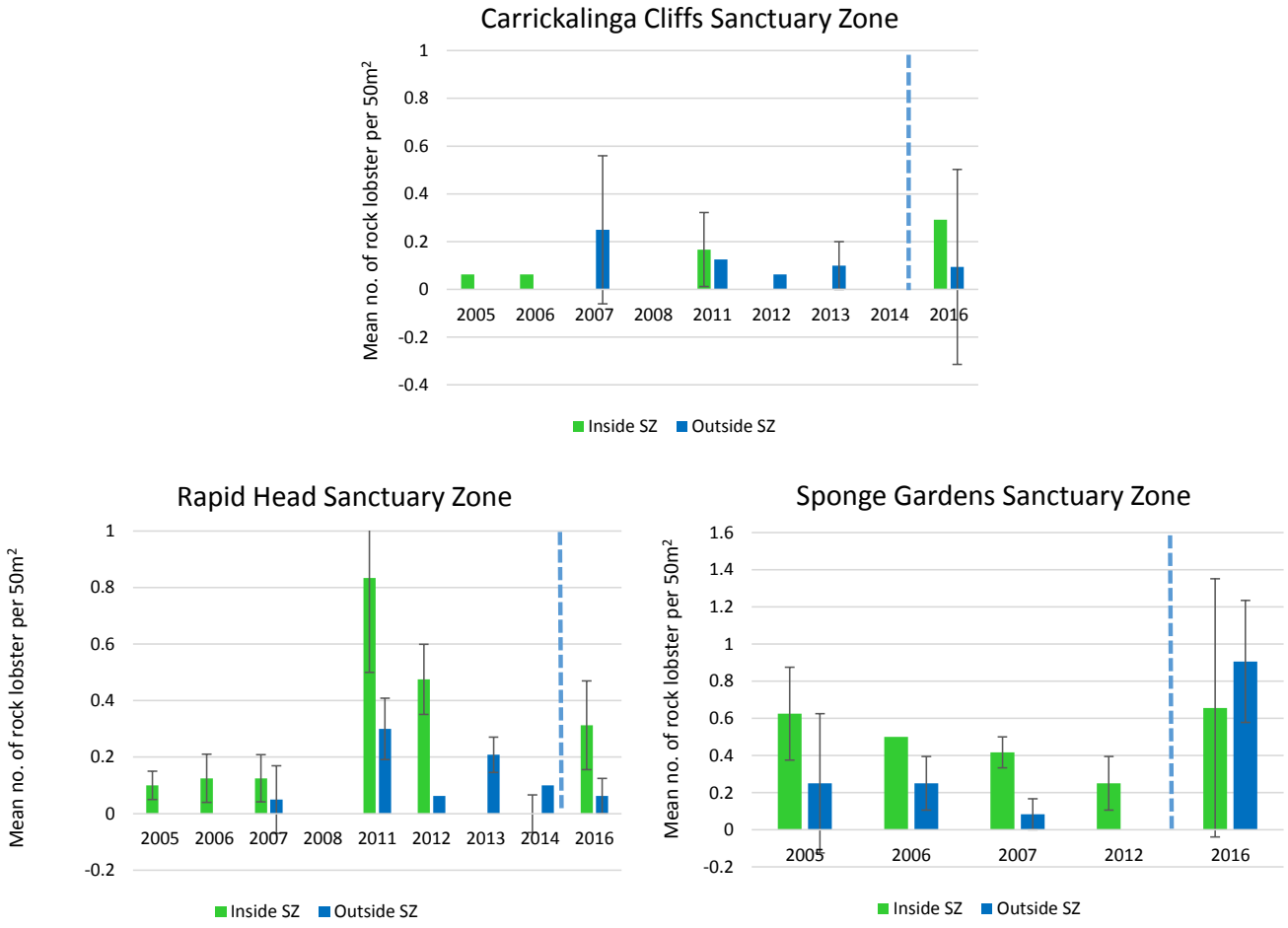


Figure 156. Mean (±SE) number of rock lobster (*Jasus edwardsii*) per 50 m^2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of blacklip abalone (Haliotis rubra)

The mean number of blacklip abalone *(Haliotis rubra)* recorded during dive surveys in Encounter Marine Park was generally higher at outside SZ sites compared to inside sites where 2005, 2006, 2007, 2013 and 2016 all had higher abundances outside (Figure 157). The highest recorded number of blacklip abalone per 50 m^2 was at 0.9 in 2007 outside SZ sites, however since then the abundance of blacklip abalone has been decreasing to about 0.1 (Figure 157).

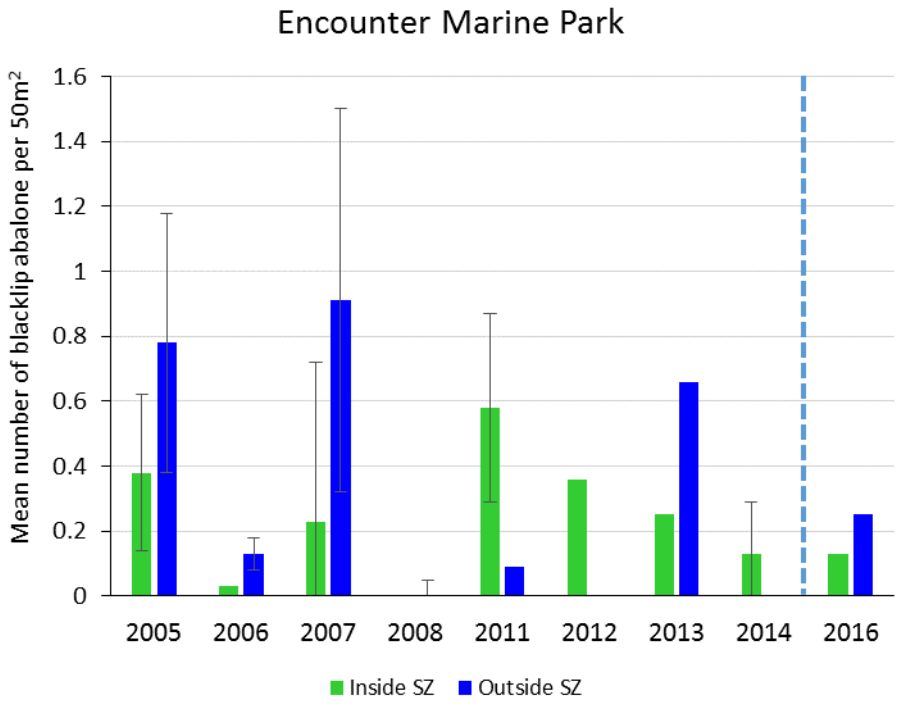


Figure 157. Mean (±SE) number of blacklip abalone (*Haliotis rubra*) per 50 m^2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

There was no consistency of the mean number of blacklip abalone recorded on dive surveys between individual SZs and associated comparison sites in Encounter Marine Park, where abundance varied between each year and each zone across all SZs (Figure 158). The Sponge Gardens and Rapid Head SZs generally had a higher abundance of blacklip abalone *(Haliotis rubra)* at outside SZ sites compared to inside. Rapid Head SZ had the highest mean abundance of blacklip abalone of all SZs with just over 5 recorded per drop every 50 m^2 in 2013 at outside SZ sites (Figure 158).

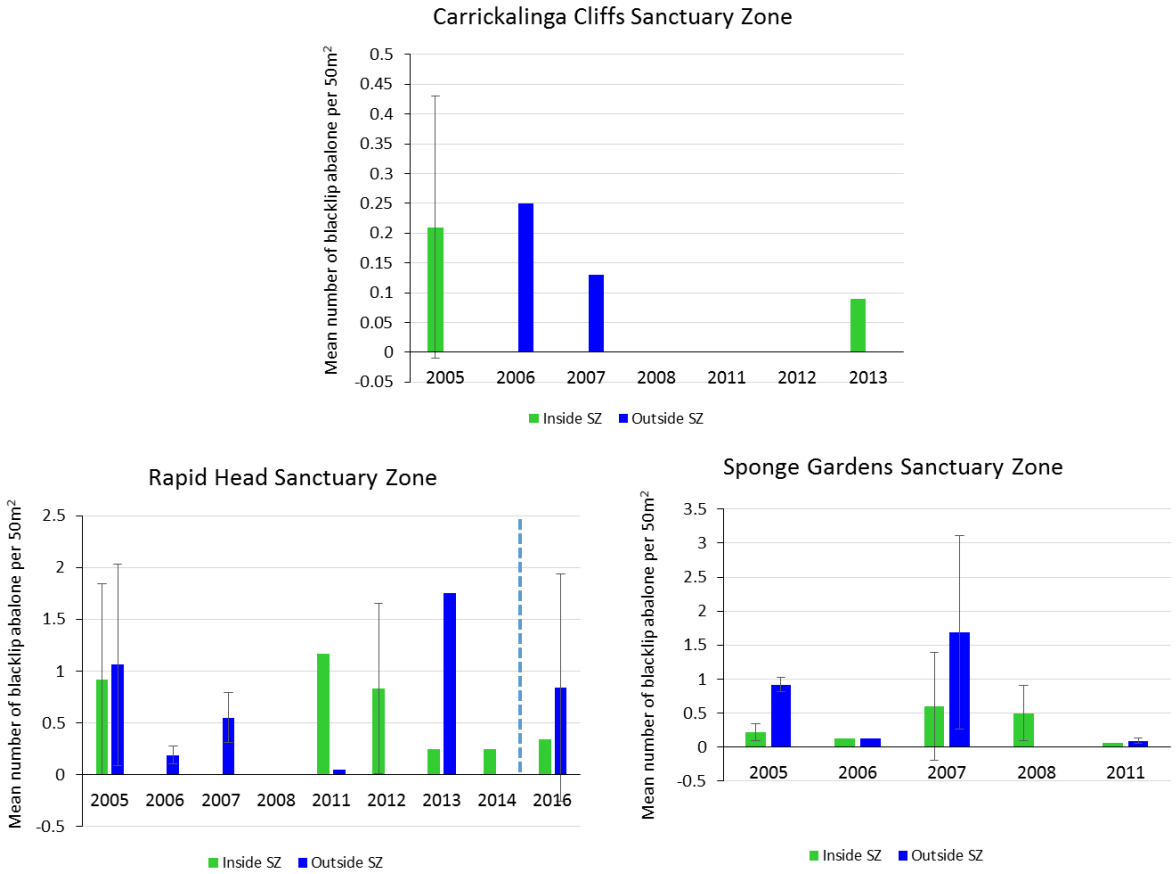


Figure 158. Mean (±SE) number of blacklip abalone (*Haliotis rubra*) per 50 m^2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

Abundance of greenlip abalone (Haliotis laevigata)

The mean number of greenlip abalone *(Haliotis laevigata)* recorded on dive surveys in Encounter Marine Park was generally higher inside SZ sites compared to outside, where in 2013 there was 0.12 recorded per 50 m^2 at inside SZ sites (Figure 159). Generally the overall abundance of greenlip abalone has been variabld since 2005 ranging from 0.03 in 2007 to 0.12 recorded on dive survey per 50 m^2 2013 (Figure 159).

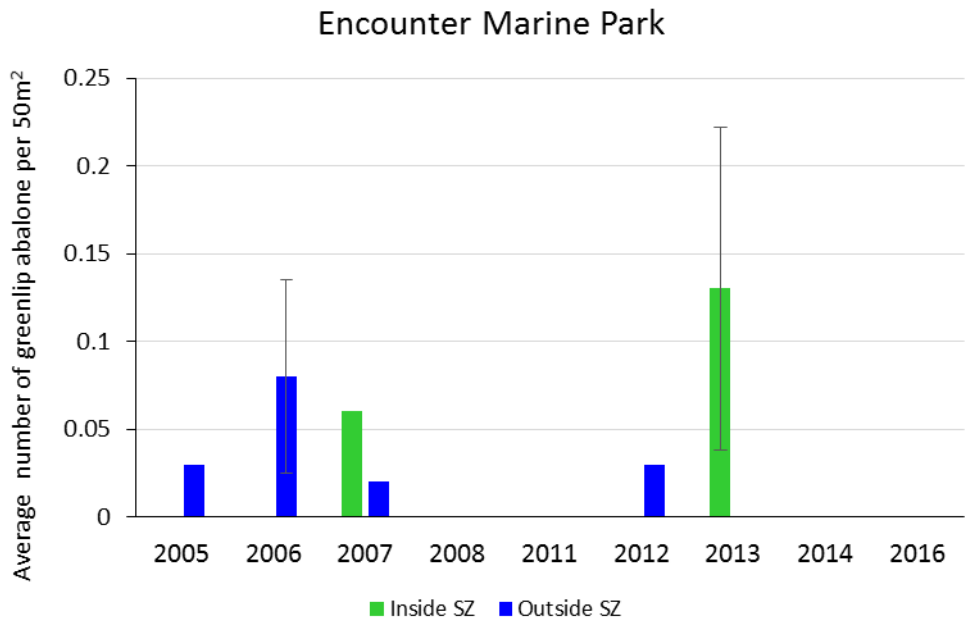


Figure 159. Mean (±SE) number of greenlip abalone (*Haliotis laevigata*) per 50 m^2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014).

The mean number of greenlip abalone (*Haliotis laevigata*) recorded on dive surveys was variable and showed very low abundance at individual SZs, hence there are no patterns described here (Figure 160).

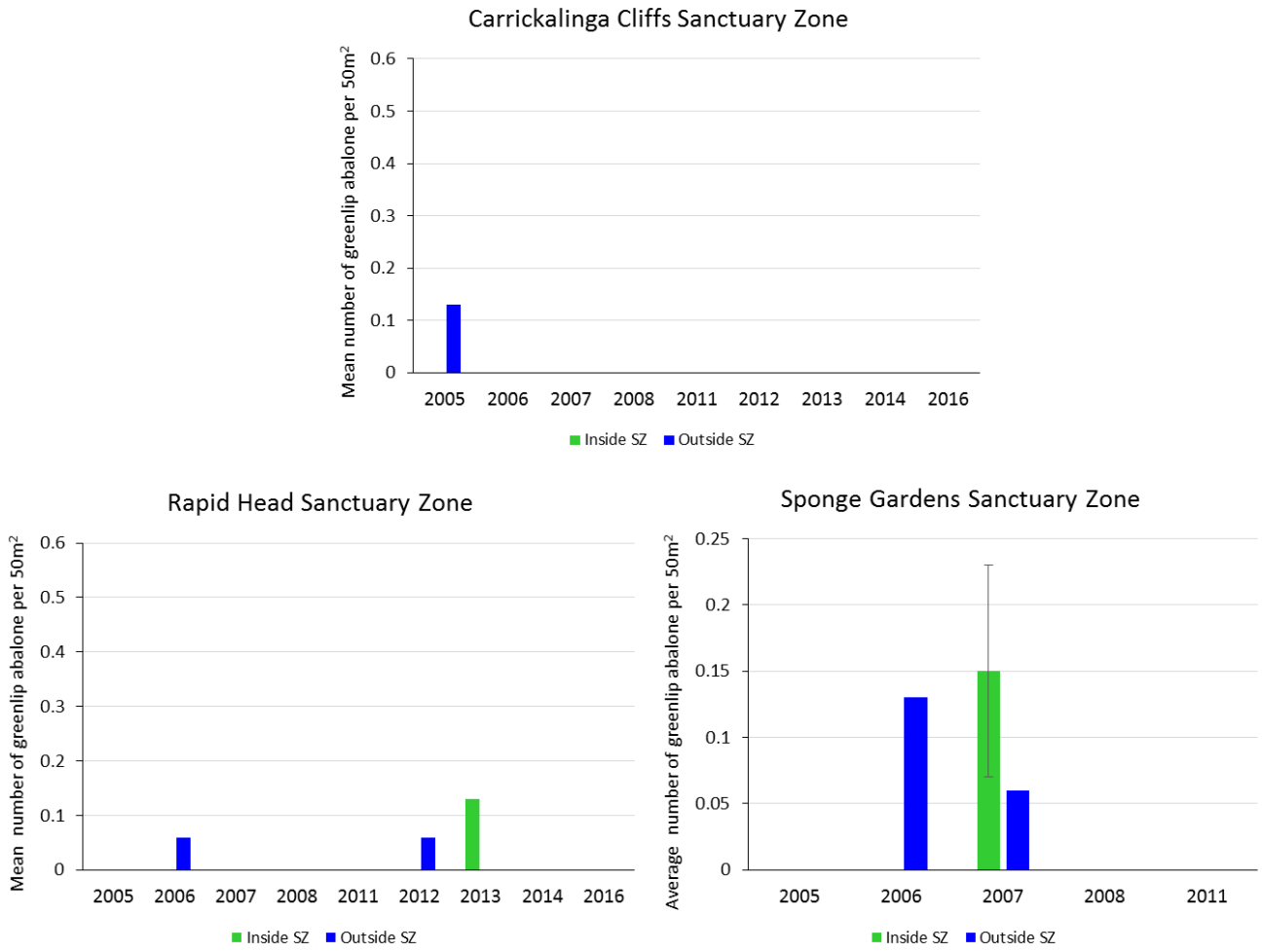


Figure 160. Mean (±SE) number of greenlip abalone (Haliotis laevigata) per 50 m2 recorded on dive surveys for sites inside vs outside SZs in Encounter Marine Park. (Note: Blue line denotes when parks became operational in October 2014, no sites were surveyed inside Carrickalinga Cliffs SZ in 2008 and 2013, no sites were surveyed outside Sponge Gardens SZ in 2012).

10.2.6 SEQs 17–20 Marine Parks 2, 4, 9, 10, 11, 12 and 18

Potential causal links between management plan strategies and observed changes in biodiversity, habitats, ecosystem processes, and ecosystem resilience: Strategies 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15

This section presents data for multiple marine parks and associated sanctuary zones together. In general the sampling resolution in other marine parks compared to the Encounter Marine Park is much lower. In most instances only one SZ is monitored for each Marine Park. For this reason and ease of interpreting graphs and tables, the data for the following marine parks (where there is monitoring data) Nuyts Archipelago, Investigator, Franklin Harbor, Upper Spencer Gulf, Eastern Spencer Gulf, Southern Spencer Gulf and Upper South East are presented together, first for the data collected by BRUVS followed by the data collected by Dive monitoring (Table 70).

Table 70. Summary of where BRUVS and Dive monitoring has been undertaken to date

Marne Park No.	Marine Park	Sanctuary Zone	BRUVS monitoring	Dive monitoring
2	Nuyts	Isles of St Francis	yes	yes
4	Investigator	Pearson Island		yes
4	Investigator	Top-Gallant Isles		yes
9	Franklin Harbour	Port Gibbon	yes	no
10	Upper Spencer Gulf	Cuttlefish Coast	yes	yes
10	Upper Spencer Gulf	Fairway Bank	yes	no
11	Eastern Spencer Gulf	Cape Elizabeth	yes	yes
12	Southern Spencer Gulf	Chinamans Hat	yes	yes
18	Upper South East	Cape Dombey		yes
18	Upper South East	Lacepede Bay		yes

Community indicators (Baited remote underwater video surveys)

Fish species richness

The mean number of fish species was highest at the Isles of St Francis SZ and comparison sites and lowest at SZs and comparison sites in the Upper Spencer Gulf MP (Cuttlefish Coast and Fairway Bank SZ) (Figure 161). In general the mean number of fish species was similar between sites inside SZs compared to sites outside for all SZs.

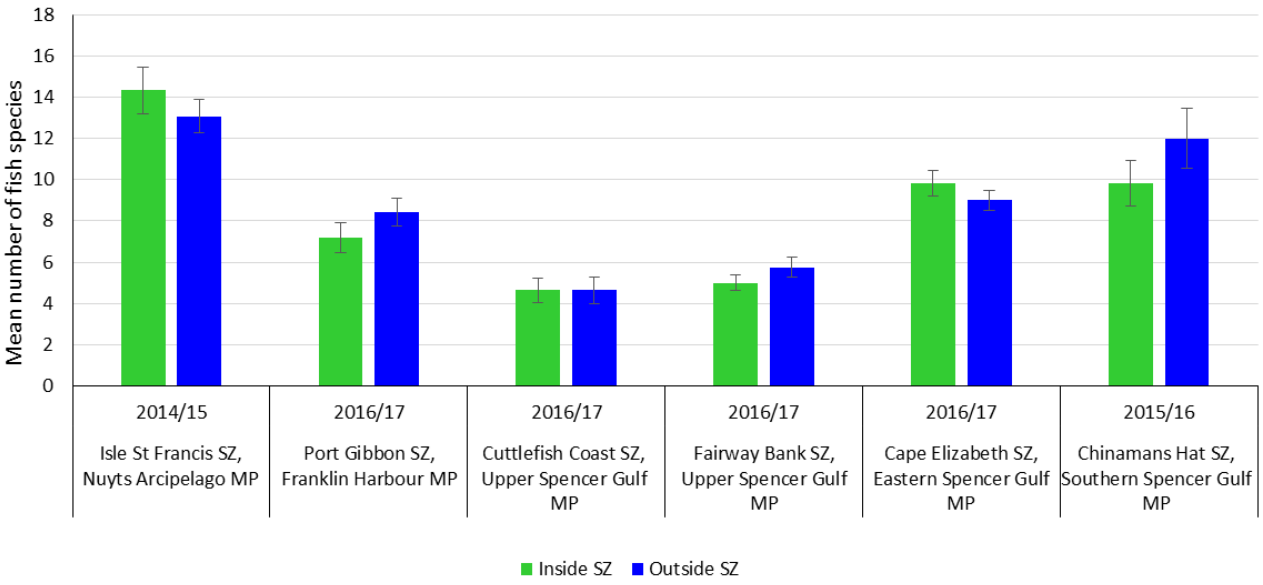


Figure 161. Mean (±SE) number of fish species per BRUVS drop for sites inside vs outside SZs at selected SZs and associated marine park

Community temperature index

The mean community temperature index (CTI) varied between SZs and associated marine parks (Figure 162). Fish communities from Upper Spencer Gulf Marine Park (Cuttlefish Coast and Fairway Bank SZs) had the highest mean CTI of around 19.5 °C while fish communities at Chinamans Hat SZ, Southern Spencer Gulf MP had the lowest CTI of around 17.5 °C.

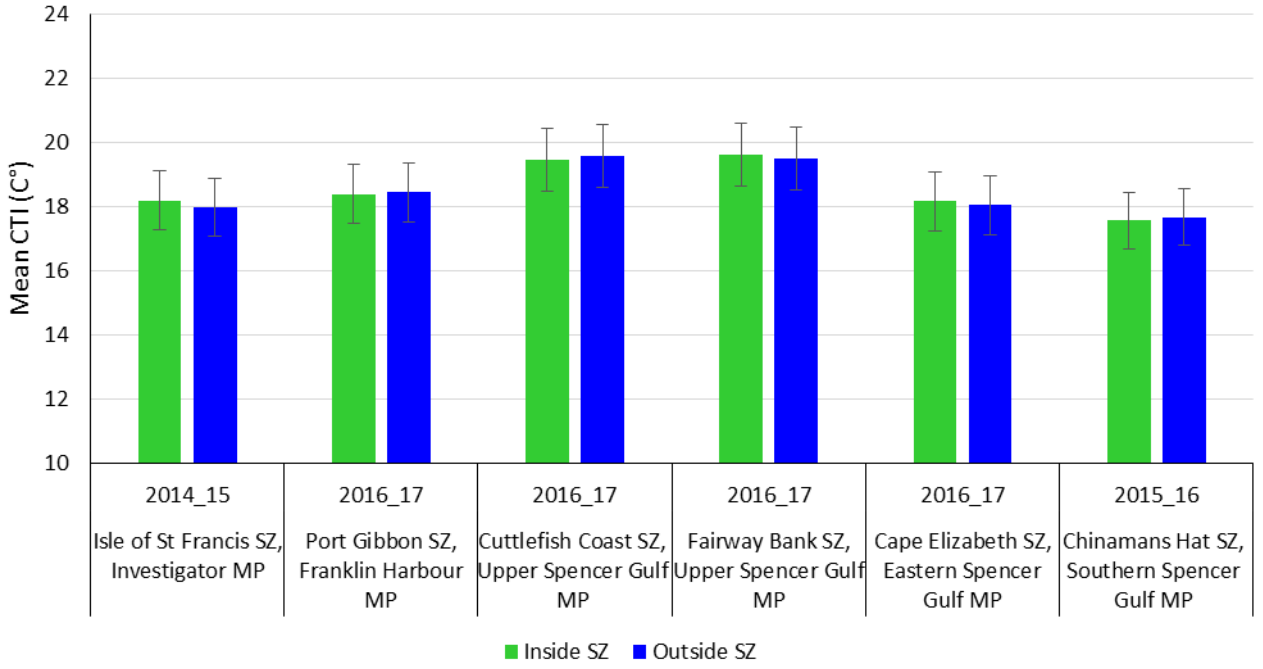


Figure 162. Mean community temperature index (°C) for sites inside vs outside SZs at selected SZs and associated marine park

Trophic structure

The relative biomass of fish in the different trophic groups was variable between the different SZs and their respective marine parks (Figure 163). Isles St Francis SZ and Chinamans Hat SZ and associated comparison sites were the only two SZ that had representation in all trophic groups at sites inside and outside the SZ. At Cuttlefish Coast and Fairway Bank SZs and comparison sites fish had the simplest communities with fish from only two trophic groups present, benthic invertivores and higher carnivores. Port Gibbon SZ, lacked the planktivore trophic group from sites inside the SZ and the planktivore and omnivore trophic groups from sites outside the SZ.

Figure 163. Relative proportion of biomass in the difference trophic groups for per BRUVS drop for sites inside vs outside SZ at selected SZs and associated marine park

Focal group indicators (Baited remote underwater video surveys)

Abundance of fished species

Overall the mean number of fished species was similar at sites inside vs outside across the SZs and their respective marine parks (Figure 164). Mean number of fished species was and order of magnitude higher in Upper Spencer Gulf MP with a mean of between 80–120 fished species per drop, this was mainly a result of the presence of extremely large schools of striped trumpeters (*Pelates octolineatus*) at these sites). Isles St Francis SZ and associated comparison sites had the next highest mean numbers of fished species with slightly higher numbers inside the SZ compared to outside.

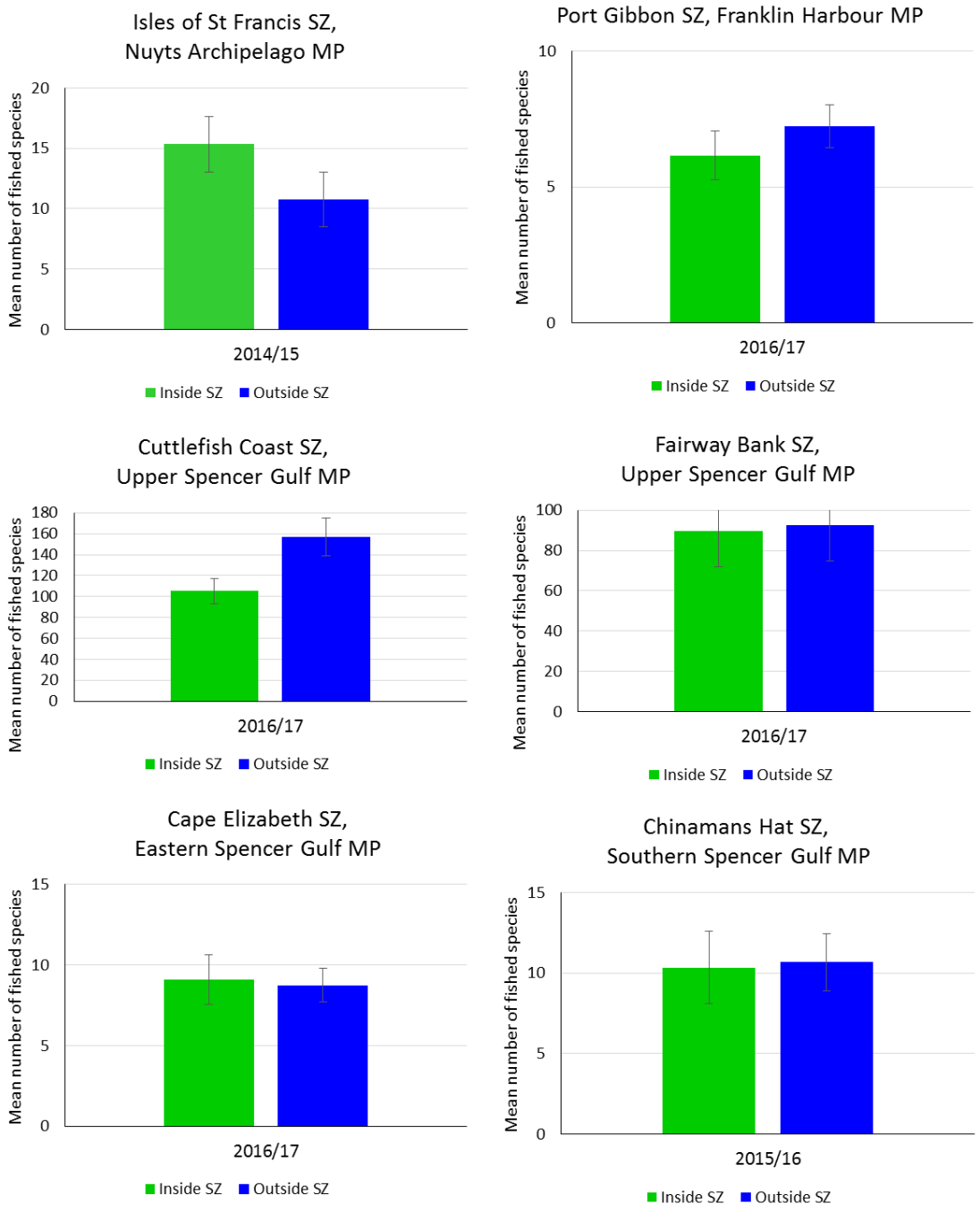


Figure 164. Mean (±SE) number of fished species per BRUVS drop for sites inside vs outside SZs for selected SZs and associated marine park

Mean biomass of fished species

In contrast to mean number of fished species, the biomass of fished species is highest at sites inside Isles of St Francis SZ with the next mean biomass of fished species occurring at sites inside Chinamans Hat SZ (Figure 165). Isles of St Francis SZ had nearly double the biomass of fished species at sites inside the SZ vs outside. All other SZs had mean biomass of fished species below 1 kg fish per drop at sites inside and outside of SZ.

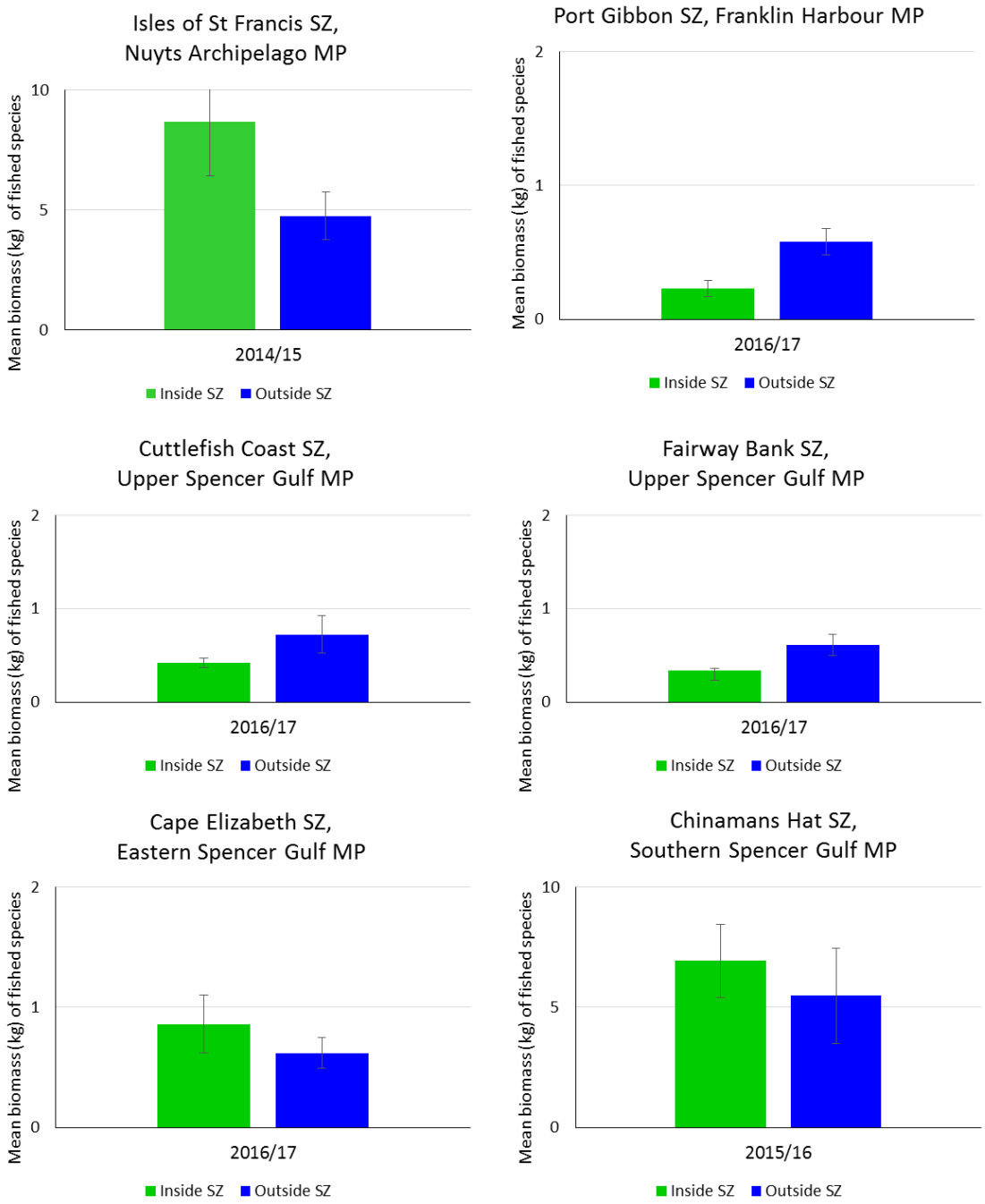


Figure 165. Mean (±SE) biomass of fished species per BRUVS drop for sites inside vs outside SZs at selected SZs and associated marine park

Abundance of large fish (>200 mm)

The mean number of large fish (>200 mm) was highest at the Isles of St Francis SZ and comparison sites (between 18-22 fish per drop) followed by Chinamans Hat SZ and comparison sites (Figure 166). Port Gibbon, Fairway Bank and Cuttlefish Coast SZ and comparison sites all had mean numbers of large fish lower than 2 fish per drop. In general mean number of large fish was similar between zones.

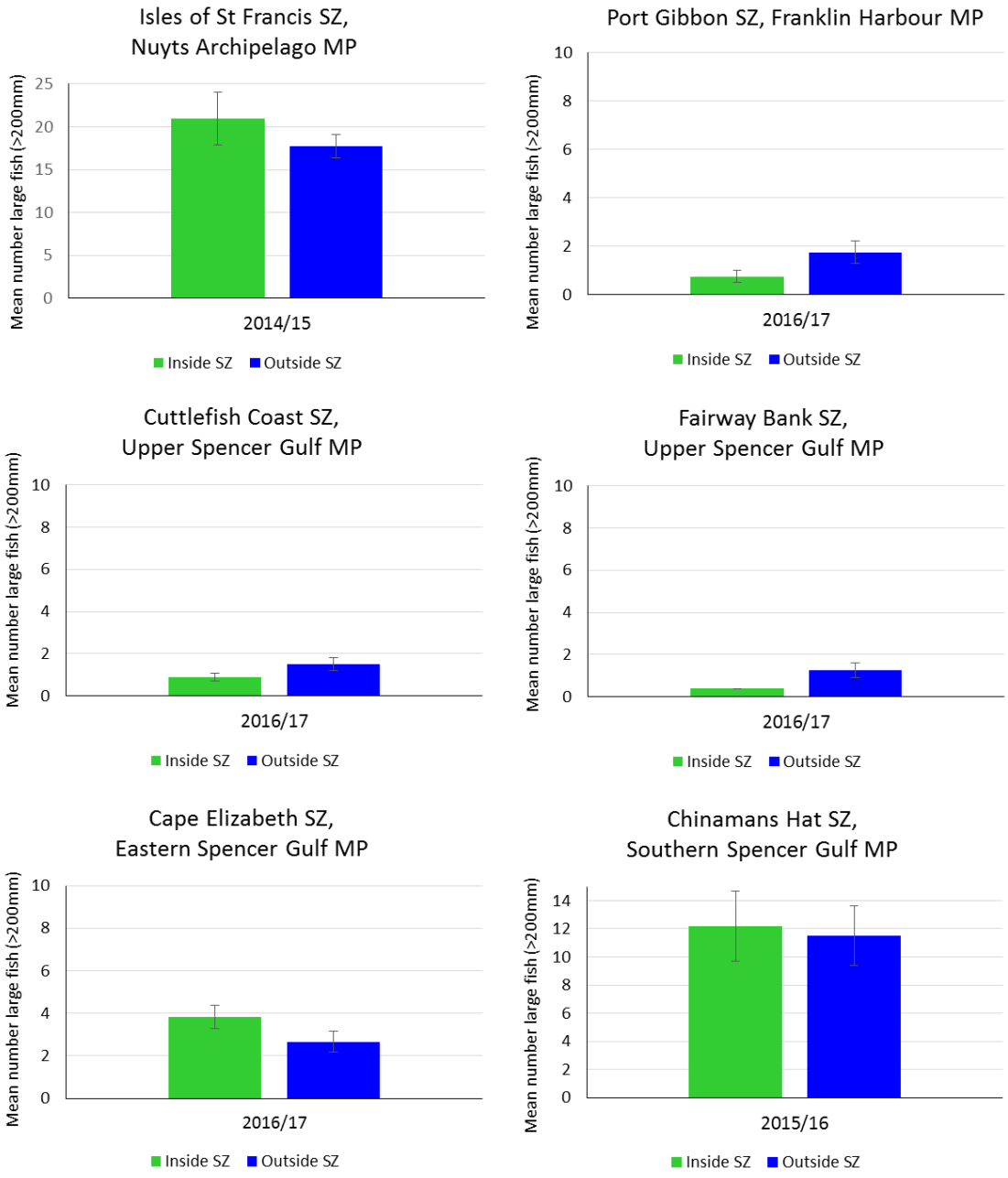


Figure 166. Mean (±SE) abundance of large fish (>200 mm) per BRUVS drop for sites inside vs outside at selected SZs and associated marine park

Mean biomass of large fish (>200 mm)

The mean biomass of large fish was highest at sites inside the Isles of St Francis SZ (~24 kg large fish per drop) and much larger than the mean biomass at sites outside the SZ (Figure 167). Cape Elizabeth SZ had the next higher biomass of large fish and in this case outside sites had higher biomass of large fish than inside sites. Port Gibbon, Fairway Bank and Cape Elizabeth SZs had low biomass of large fish, generally lower than a mean of 1 kg per drop.

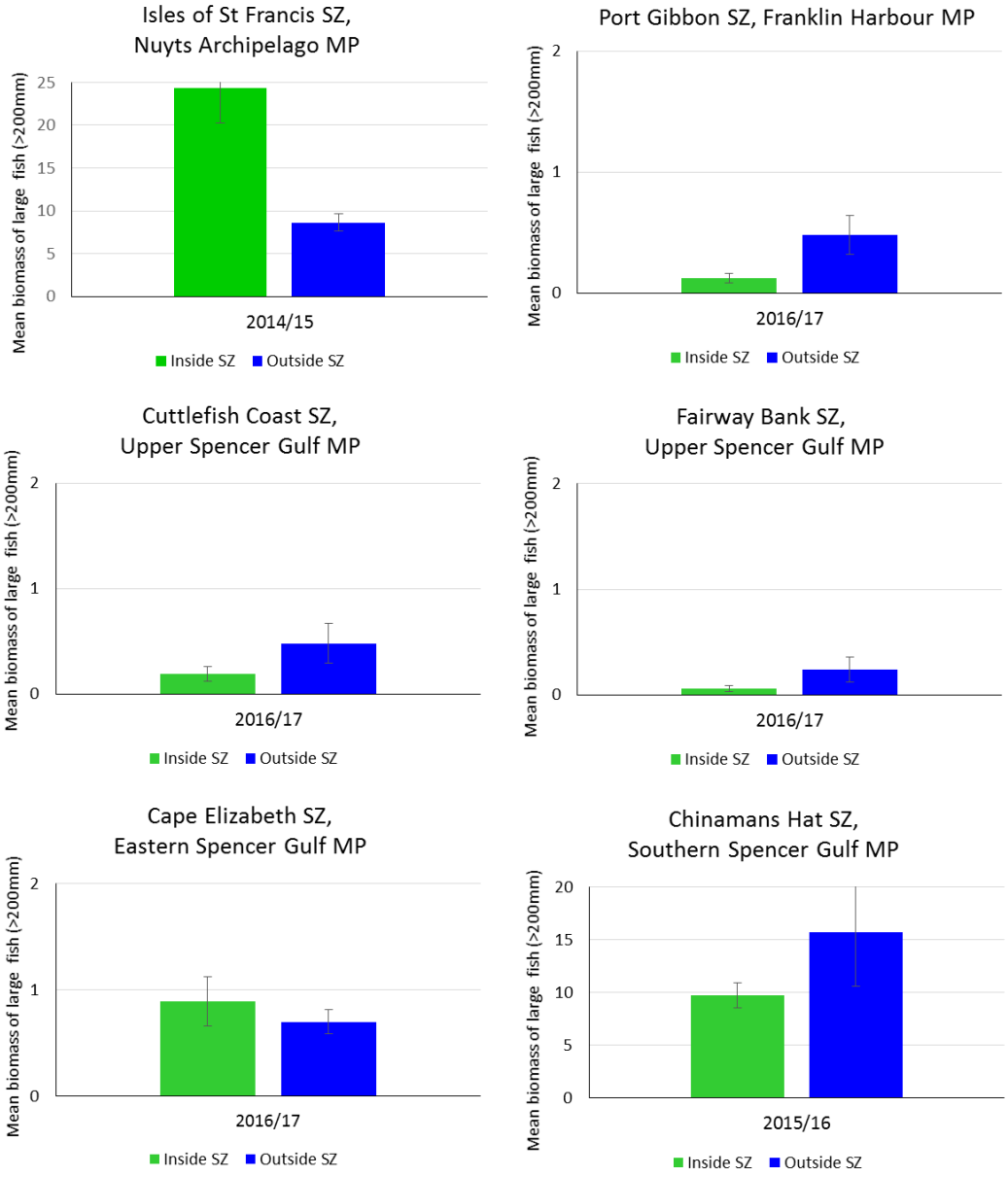


Figure 167. Mean (±SE) biomass (kg) of large fish (>200 mm) per BRUVS drop for sites inside vs outside at selected SZs and associated marine park

Abundance of site attached fish species

The mean number of sites attached fish was highest at Isles of St Francis and Cape Elizabeth SZs and associated comparison sites with both having higher abundances inside the SZ than outside (Figure 168). Fairway Bank SZ and comparison sites had the lowest mean number of sites attached fish. Apart from Isles of St Francis and Cape Elizabeth SZs the mean number of site attached fish was similar for both inside and outside sites.

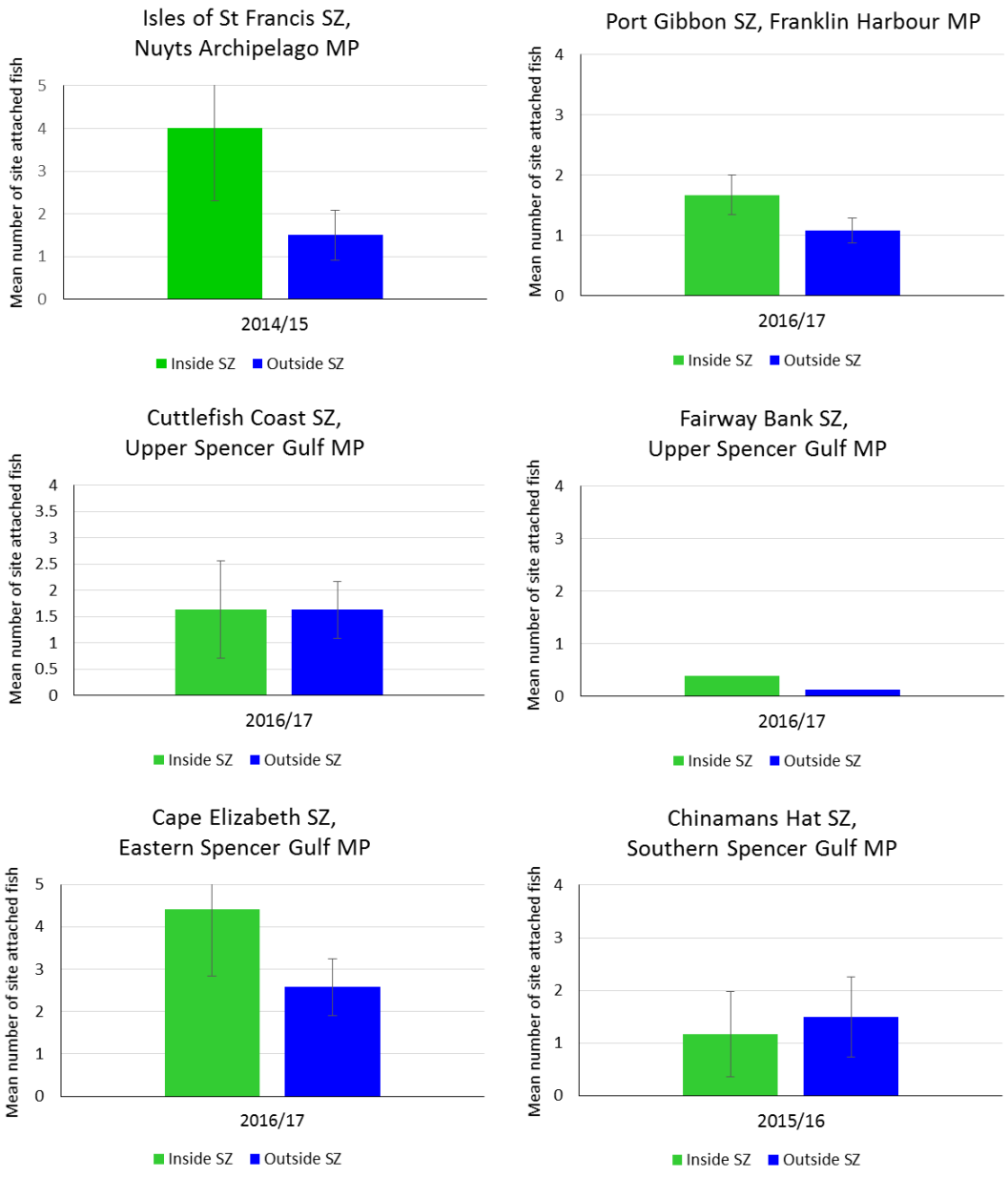


Figure 168. Mean (±SE) number of site attached fish species per BRUVS drop for sites inside vs outside at selected SZs and associated marine parks

Abundance of sharks and rays

Shark and ray numbers were low across all SZs and comparison sites and generally less than one shark or ray per BRUVS drop was recorded (Figure 169). Port Jackson (*Heterodontus portjacksoni*) and gummy (*Mustelus antacticus*) were the most common sharks observed. Shark numbers were higher inside SZs at Isles of St Francis, Fairway Bank and Chinamans Hat and were higher outside SZ sites at Port Gibbon SZ.

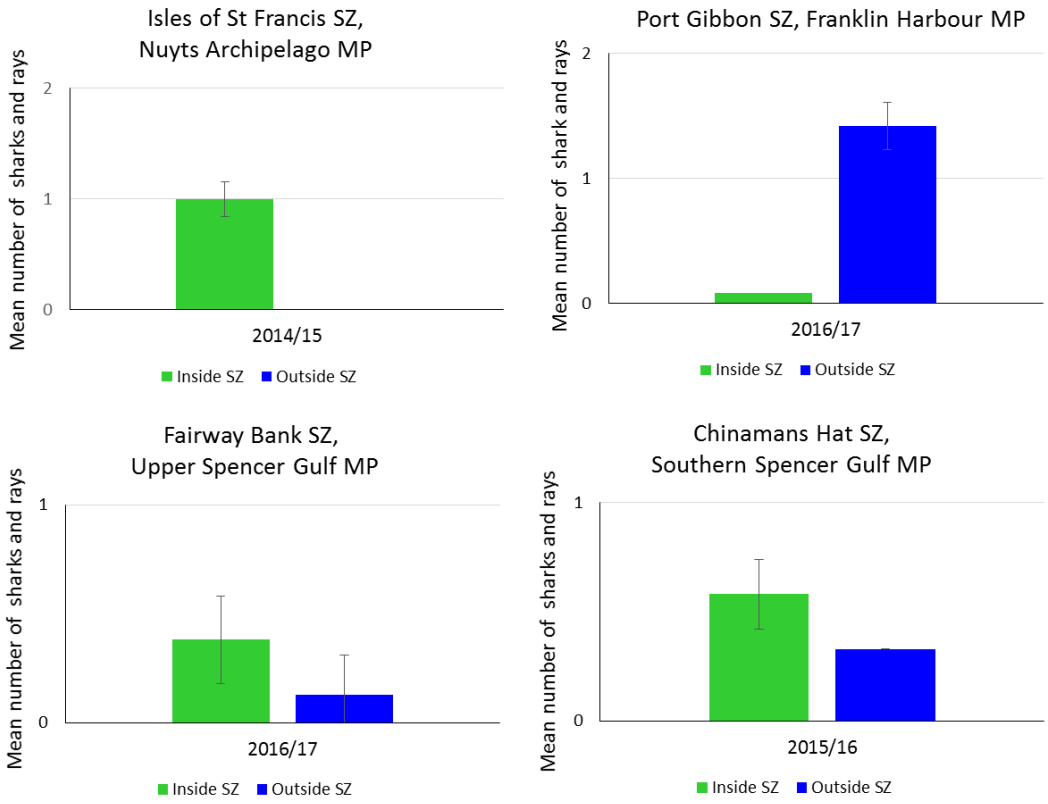


Figure 169. Mean (±SE) abundance of sharks and rays per BRUVS drop for sites inside vs outside at selected SZs and associated marine parks

Focal species indicators (Baited remote underwater video surveys)

Focal species indicators – Isles of St Francis SZ, Nuyts Archipelago Marine Park

Maori wrasse (*Opthalmolepis lineolatus*) was the most common fish seen at the Isles of St Francis SZ where the abundances were similar between sites inside and outside the SZ (Figure 170). Other common fish included trevally (*Pseudocaranx sp.*), toothbrush leatherjackets (*Acanthaluteres vittiger*) and yellowfin pike (*Dinolestes lewini*). The mean number of trevally was higher at outside SZ sites compared to inside while the mean number of toothbrush leatherjackets and yellowfin pike were more common at sites inside the SZ.

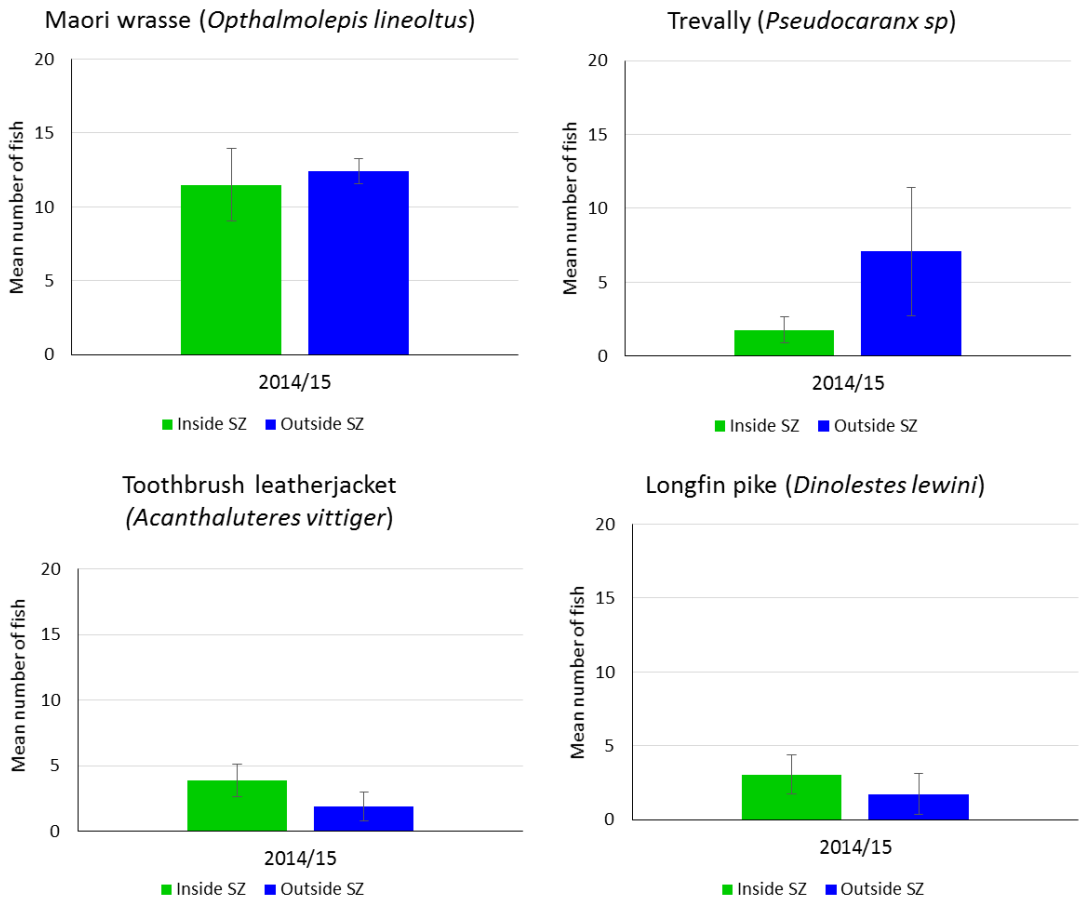


Figure 170. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at the Isles of St Francis SZ, Nuyts Archipelago Marine Park

Focal species indicators – Pt Gibbon SZ, Franklin Harbour Marine Park

Yellowtail scad (*Trachurus novazelandiae*) were the most abundant species in the Port Gibbon SZ with a higher mean number inside the SZ compared to outside (Figure 171). The next most common species were rough leatherjackets (*Scobinichthys granulatus*), silverbellies (*Parequula melbournensis)* and yellowfin pike (*Dinolestes lewini)*. The mean number of trevally was higher inside the SZ compared to outside while mean numbers of silverbellies and yellowfin pike were higher inside the SZ.

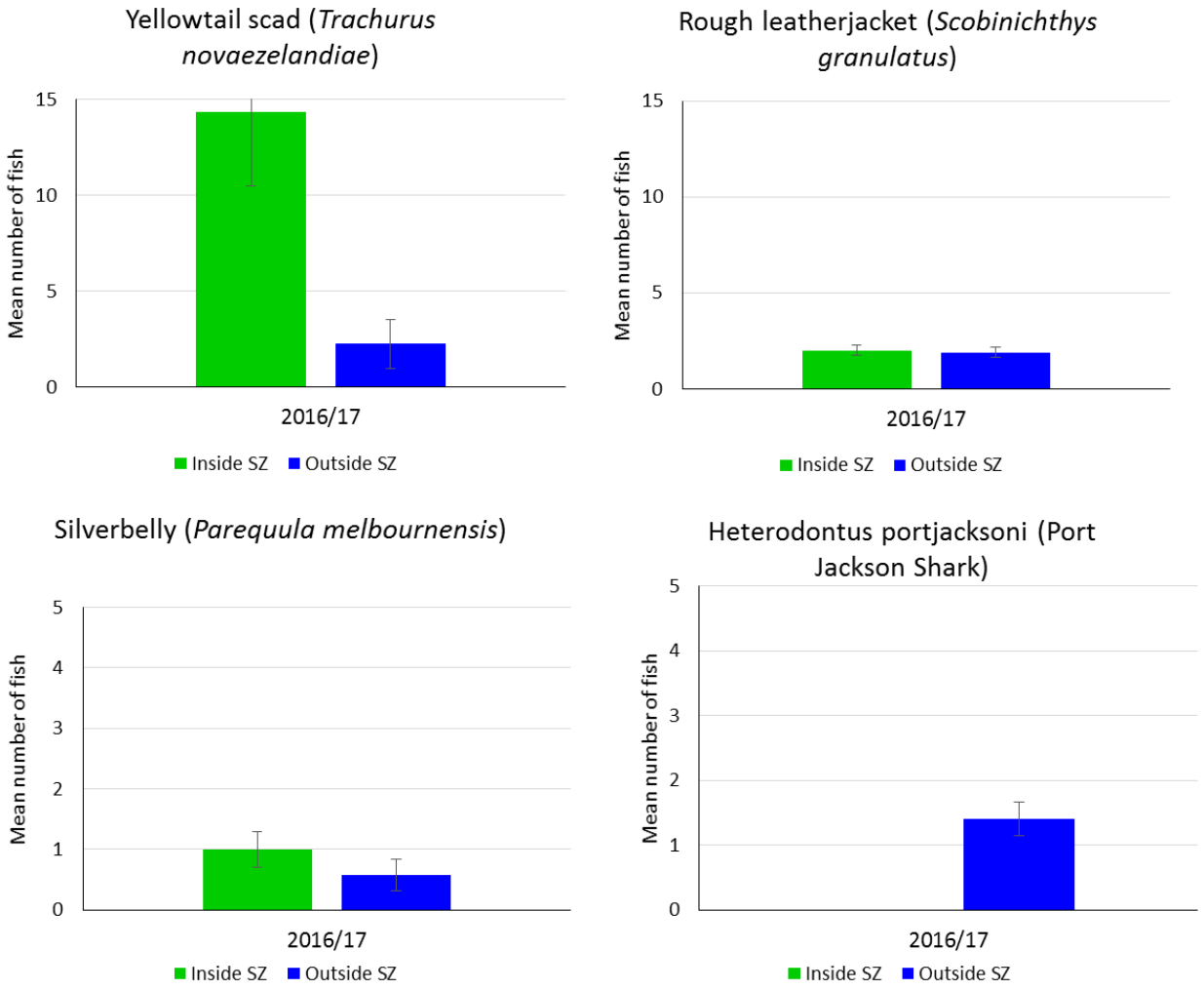


Figure 171. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at Port Gibbon SZ, Franklin Harbour Marine Park

Focal species indicators – Cuttlefish Coast SZ, Upper Spencer Gulf Marine Park

Striped trumpeter (*Pelates octolineatus*) were by far the most numerous fish species in the Cuttlefish Coast SZ with on average between 90–100 fish recorded per drop, numbers were slightly higher outside the SZ compared to inside (Figure 172). Tommy ruff (*Arripis georgianus*) were reasonably common and had higher mean numbers outside the SZ than inside followed by snapper (*Pagrus auratus*) and wavy grubfish (*Parapercis haackei*).

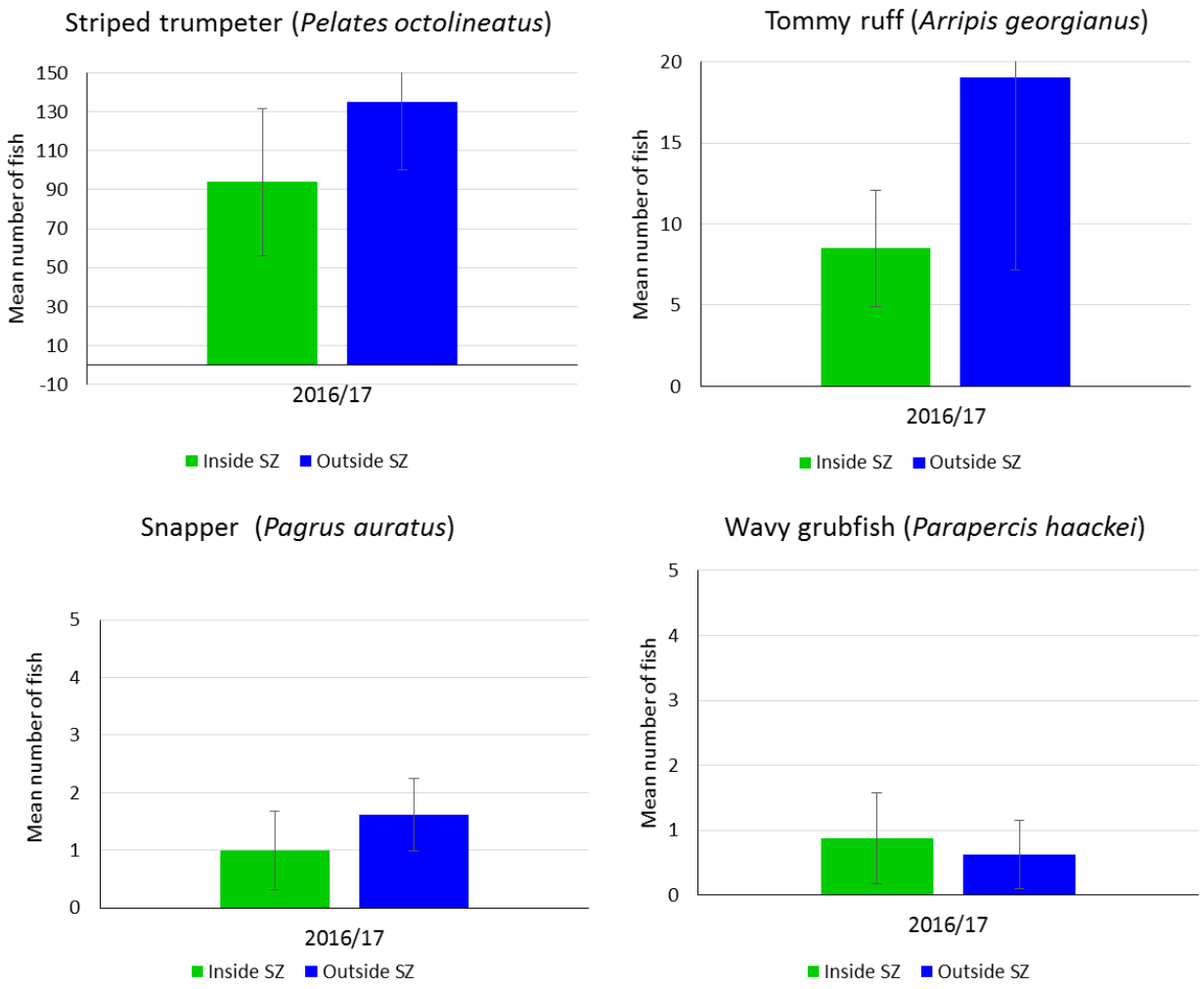


Figure 172. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at Cuttlefish Coast SZ, Upper Spencer Gulf Marine Park

Focal species indicators – Fairway Bank SZ, Upper Spencer Gulf Marine Park

Similar to Port Gibbon, striped trumpeter (*Pelates octolineatus*) had abundances much higher than the next most abundant fish with mean numbers between 85–90 fish per drop for sites inside and outside the SZ (Figure 173). Trevally (*Pseudocaranx sp*.) was the next most abundant species (mean number of 5-15 fish per drop) with higher numbers inside the SZ compared to outside while the next most common species were wavy grubfish (*Parapercis haackei*) and Port Jackson sharks (*Heterodontus portjacksoni*) both of which had similar numbers inside vs outside the SZ.

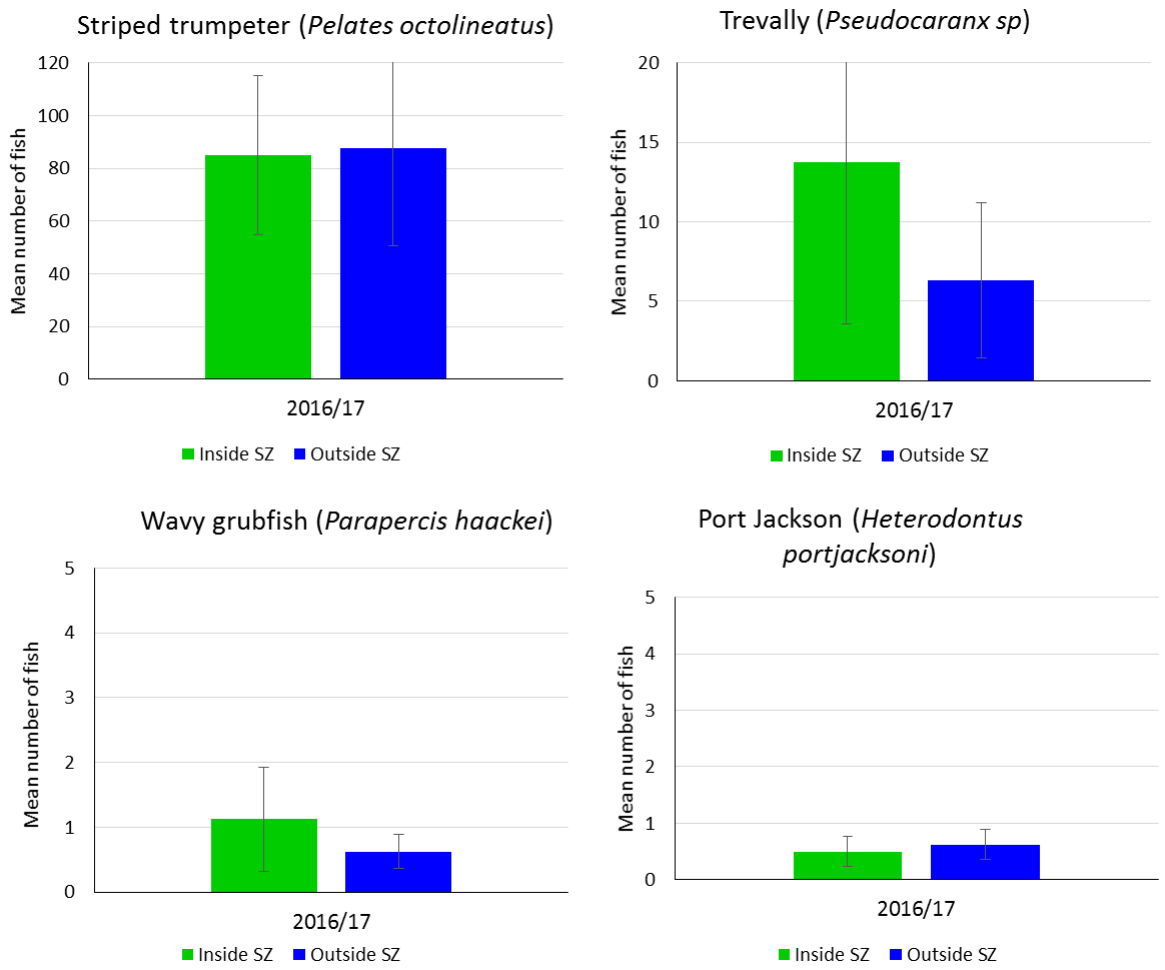


Figure 173. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at Fairway Bank SZ, Upper Spencer Gulf Marine Park

Focal species indicators – Cape Elizabeth SZ, Eastern Spencer Gulf Marine Park

Silverbellies (*Parequula melbournensis)* and Yellowtail scad (*Trachurus novazelandiae)* were the most abundant fish in the Cape Elizabeth SZ with higher mean numbers recorded outside the SZ compared to sites inside (Figure 174). Southern calamary (*Sepioteuthis australis*) and snapper (*Pagrus auratus*) were the next most common fish with slightly higher mean number inside SZ sites than outside.

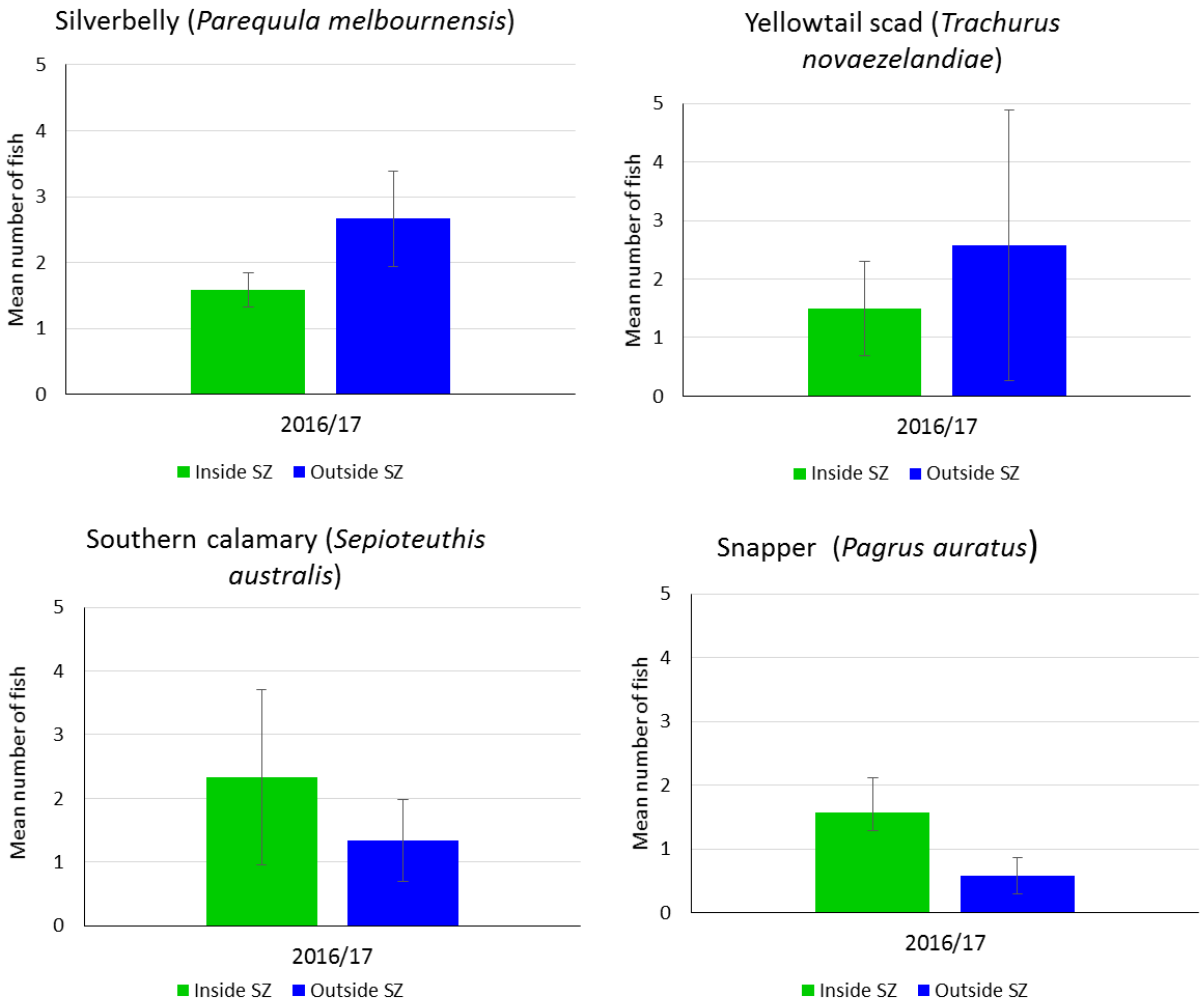


Figure 174. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at Cape Elizabeth, Eastern Spencer Gulf Marine Park

Focal species indicators – Chinamans Hat SZ, Southern Spencer Gulf Marine Park

Bluethroat wrasse (*Notolabrus tetricus*) and trevally (*Pseudocaranx sp*.) were the most abundant fish at Chinamans Hat SZ and comparison sites, with similar numbers of bluethroat wrasse inside and outside the zone while trevally had higher mean numbers of fish inside the SZ (Figure 175). Barber perch (*Caesioperca razor*) and senator wrasse *(Pictalabrus laticlavious*) were the next most abundant fish species with mean numbers higher outside the SZ than inside.

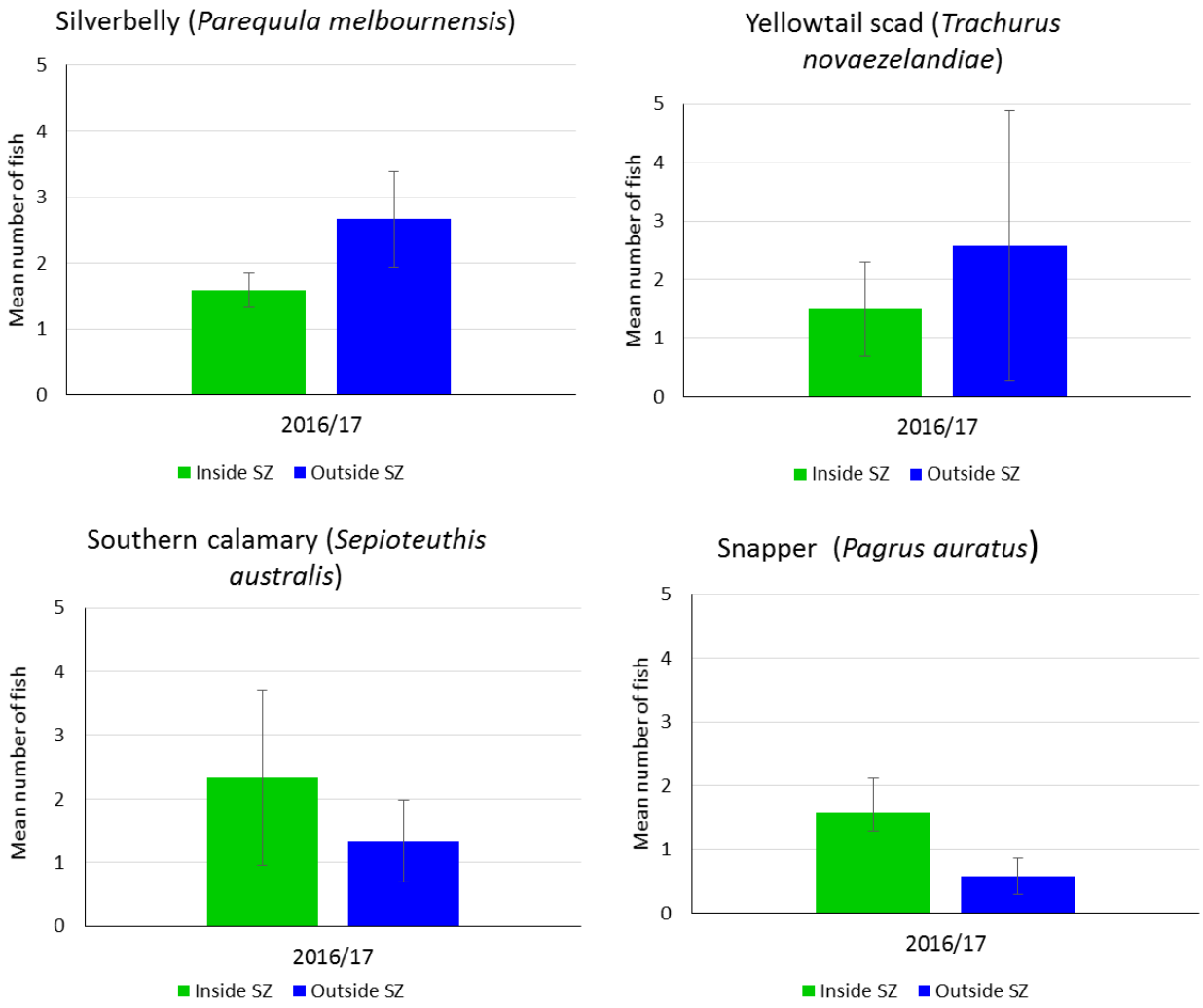


Figure 175. Mean (±SE) number of focal species per BRUVS drop for sites inside vs outside SZs at Chinamans SZ, Southern Spencer Gulf Marine Park

Community indicators (Dive surveys)

Fish species richness

Mean number of fish species varied from almost 30 species per survey at sites inside and outside of Isles of St Francis SZ to less than five species per survey at the Cuttlefish Coast SZ, Upper Spencer Gulf MP (Figure 176). Survey effort was variable with some sites zones lacking paired control sites and overall, mean number of fish species was similar at sites inside and outside SZs and higher overall at offshore Island SZs (Isles of St Francis, Pearson Isles and Top-Gallant Isles).

Macroinvertebrate Species Richness

The mean number of macroinvertebrate species varied between around 7 species per survey at outside sites in offshore islands SZs; Isles of St Francis, Pearson Isles and Top-Gallant Isles to around 2 macroinvertebrate species per survey at SZs in the Upper South East MP SZs; Lacepede Bay and Cape Dombey (Figure 177). In general, patterns in mean species-richness were variable between sites inside and outside SZs.

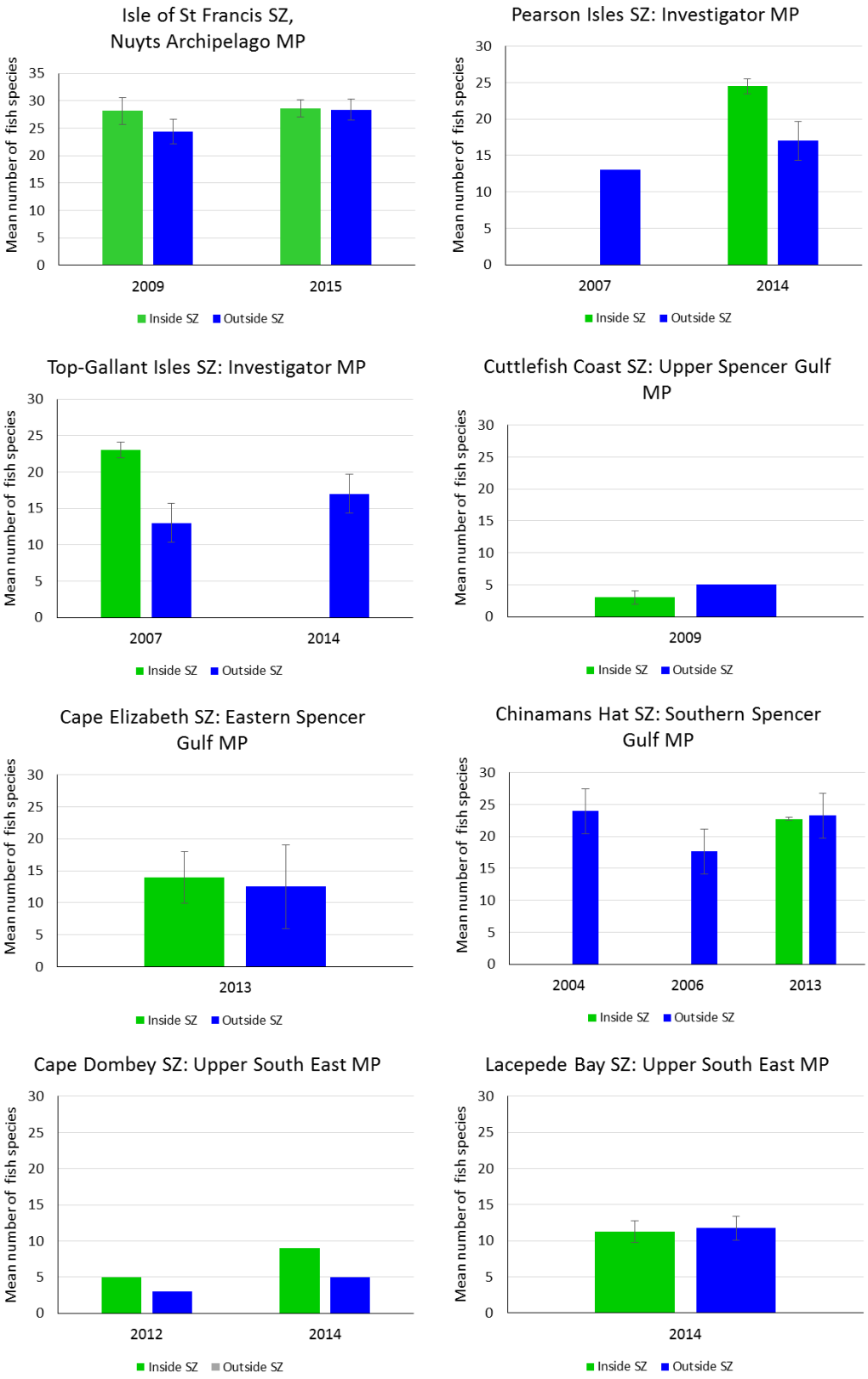


Figure 176. Mean (±SE) number of fish species per dive survey for sites inside vs outside SZs at selected SZs and marine parks. (Note: No sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014. No sites inside Chinamans Hat SZ were surveyed in 2004 and 2006).

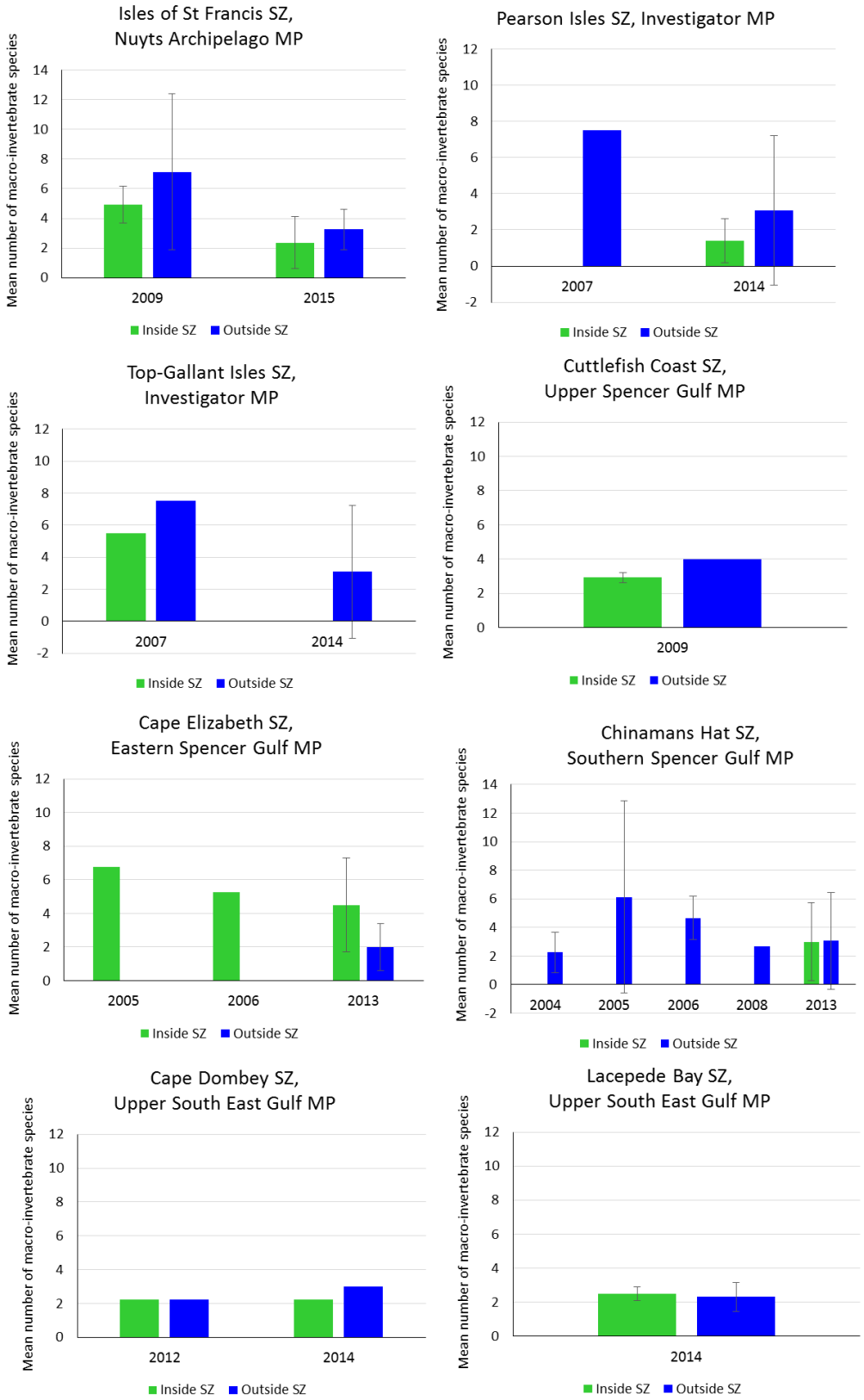


Figure 177. Mean (±SE) number of macroinvertebrate species per dive survey for sites inside vs outside SZs at selected SZs and associated marine park. (Note: no sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2005, 2006 and 2008).

Community temperature index

The mean CTI was highest in SZs and comparison sites located in Spencer Gulf marine parks, Cuttlefish Coast SZ, Upper Spencer Gulf MP and Cape Elizabeth SZ, Eastern Spencer Gulf MP (CTI = 18.5 -19°C) and lower at South East SZs and associated comparison sites, Cape Dombey and Lacepede Bay Marine Park, Upper SE MP (16.5 – 17.5°C) (Figure 178).

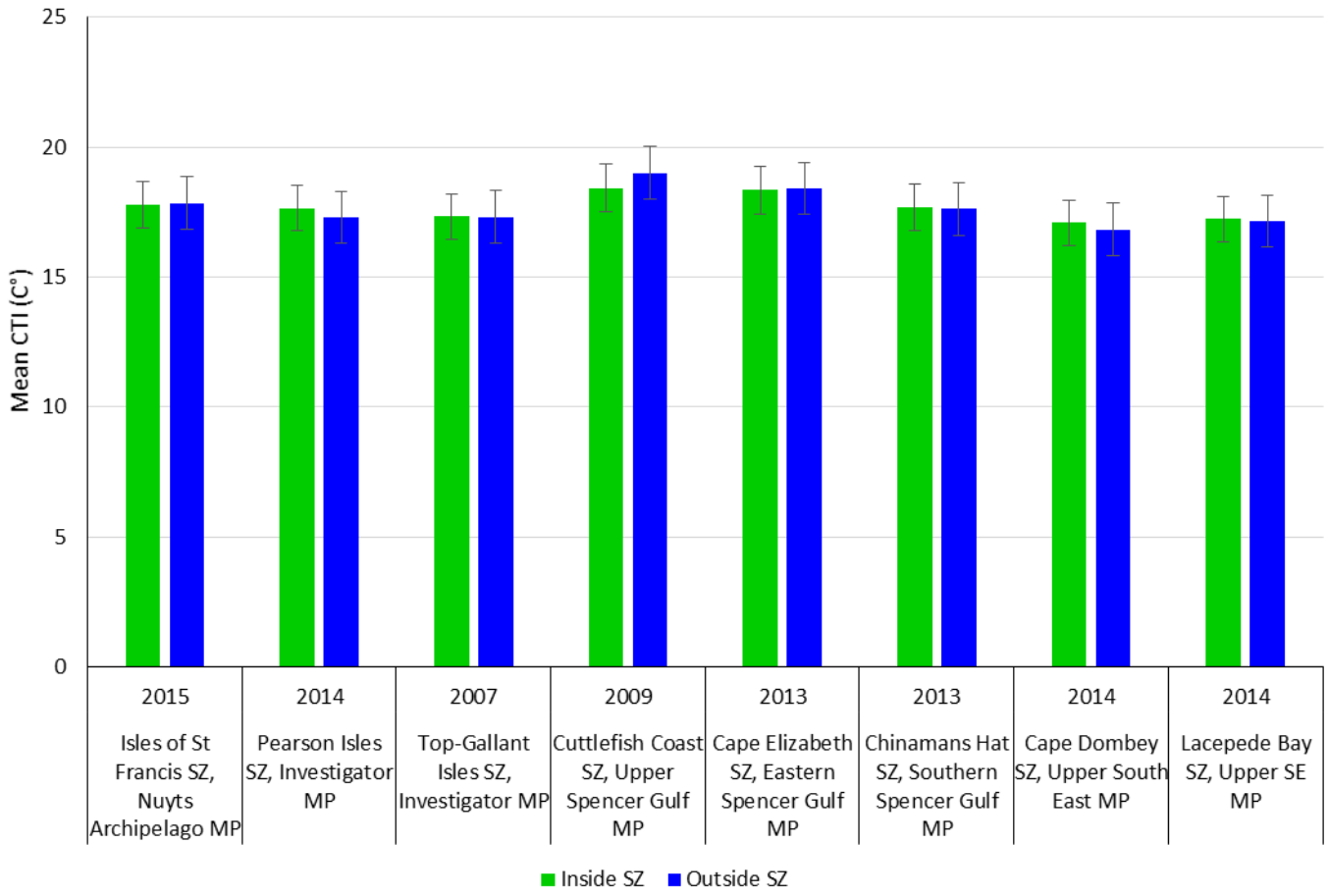


Figure 178. Mean (±SE) community temperature index (CTI) at inside SZ sites vs outside SZ sites at selected SZs and their associated marine parks

Trophic structure

The relative biomass in the different SZs and associated comparison siteswas variable both between SZs and between sites inside compared to sites outside (Figure 179). Isles of St Francis SZ, Nuyts Archipelago MP had similar relative biomass of fish species in the repsective trophic groups at sites inside and outside the SZ with most biomass in the omnivore and browsing herbivore groups. At Pearson Isles SZ (Investigator MP) sites outside the SZ lacked fish in the higher carnivore trophic group while biomass was highest in the plankitvore and browsing herbivore groups. Similarly at Top-Gallant Isles SZ, biomass was highest in the planktivore and browsing herbovire trophic groups while fish in the omnivore group were lacking from inside sites while fish from the higher carnivore trophic group were lacking from outside sites. The trophic groups; omnivores and plankitvores were absent from inside sites at Cuttlefish Coast SZ (Upper Spencer Gulf MP) while only higher carnivores and benthic invertivores were present at outside sites. Cape Elizabeth SZ had all trophic groups present at sites inside the SZ while higher carinovers were absent at sites outside the SZ. Chinamans Hat SZ had all trophic groups in similar proprotion at sites inside and outside with planktivores and browsing herbivores trophic groups had the highest relative biomass. Cape Dombey SZ had a relatively simple trophic structure lacking benthic invertivores and omnivores at sites inside and while only higher carnivores and browsing heribores were found outside the SZ. Lacepede Bay SZ had similar proportions of biomass in the respective trophic groups between sites inside compared to sites outside with the exception of higher carnivores which were absent from outside sites.

Abundance of fished species

Overall the mean number of fished species varied between sites; Top-Gallant Isles, Cuttlefish Coast, Cape Elizabeth and Cape Dombey SZ generally had higher abundance of fished species inside SZ compared to outside (Figure 180). The highest mean number of fished species recorded on dive surveys was inside Top Gallant SZ, Investigator Marine Park, at 11 630 fish per drop, followed by Pearson Isles SZ which had about 550 fish per drop at sites outside in 2007. Overall the abundance of fished species has generally increased over time at all SZs and associated comparison sites and their respective marine parks, with the exception of Pearson Isles and Top-Gallant Isles SZs.

Focal group indicators (Dive surveys)

Mean biomass of fished species

The mean biomass (kg) of fished species recorded on dive surveys was generally similar or higher inside SZs compared to outside sites for all locations with the exception of Lacepede Bay SZ and associated comparison sites (Figure 181). The overall highest mean biomass of fished species was inside Top-Gallant Isles SZ at almost 1000 kg per survey, followed by Pearson Isles SZ at 160 fished species per survey at inside sites. The South East SZs Cape Dombey and Lacepede Bay and associated comparison sites had an overall low biomass of fished species with less than 5 kg of fish per survey. Note that the biomass (kg) at Cuttlefish Coast SZ did not include calculations for cephalopods (i.e. giant cuttlefish), hence it was much lower at less than 1 kg per survey.

Abundance of large fish (>200 mm)

The mean number of large fish species (>200 mm) was highest inside Top-Gallant Isles SZ at around 1174 fish per survey, followed by outside Pearson Isles SZ sites at about 619 fish per survey (Figure 182). The South East SZs Cape Dombey and Lacepede Bay and associated comparison sites all had mean numbers of large fish lower than 35 fish per survey. The mean number of large fish species was generally higher inside SZ sites than outside sites across all SZ with the exception of Lacepede Bay where the outside sites where higher in abundance.

Mean biomass of large fish (>200 mm)

The mean biomass of large fish (>200 mm) was highest inside Top-Gallant Isles SZ at about 1007 kg recorded per dive survey followed by inside Pearson Isles SZ at about 257 kg per survey (Figure 183). Cuttlefish Coast, Cape Dombey and Lacepede Bay SZs and associated comparison sites all had a lower biomass of large fish species with less than 7 kg per survey. Overall there was generally a higher biomass of large fish species inside SZs across all locations, with the exception of Isles of St Francis and Lacepede Bay SZs where the outside sites had a higher biomass of large fish.

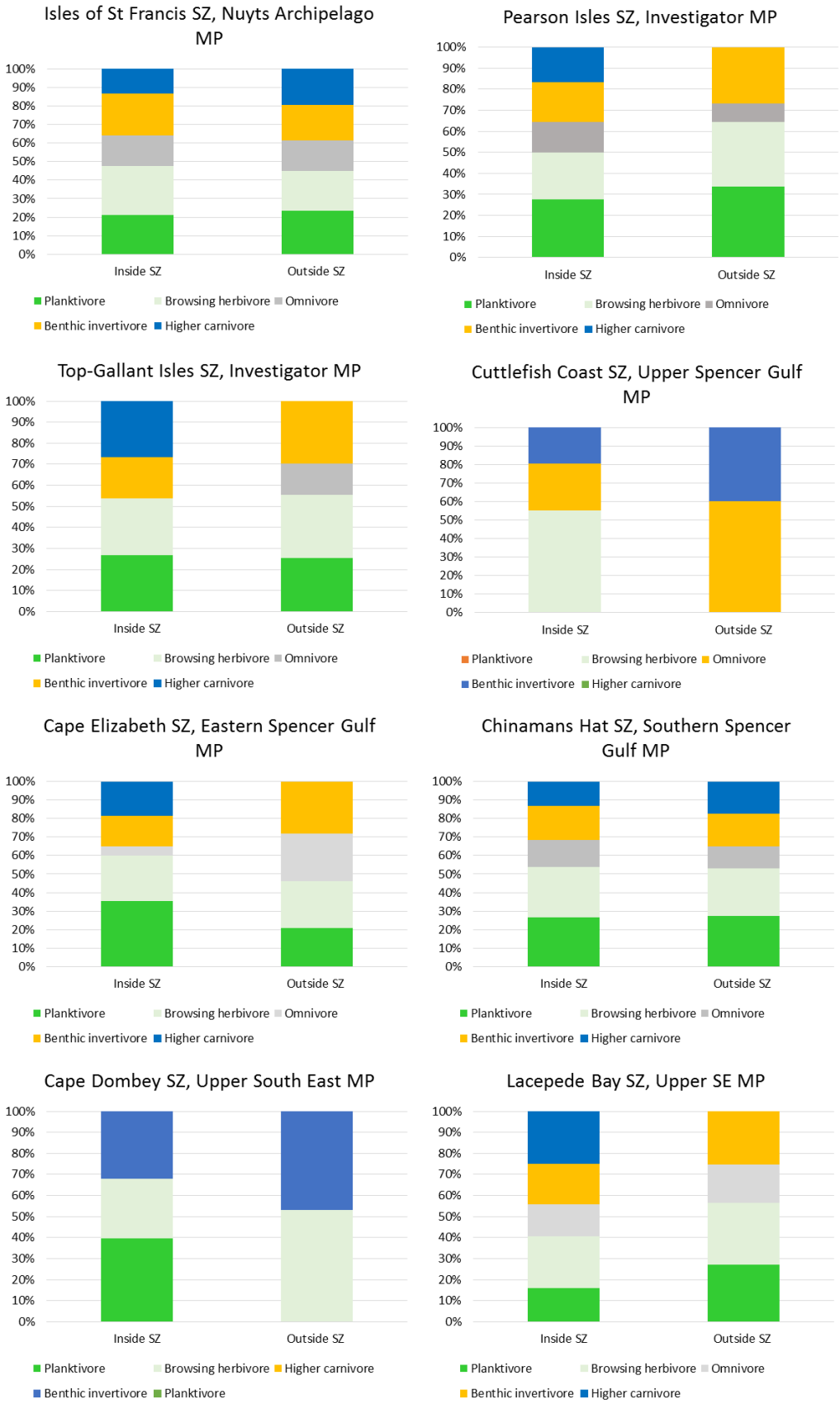


Figure 179. Relative proportion of biomass (kg) in the difference trophic groups for per dive survey for sites inside vs outside SZs at selected SZs and associated marine parks

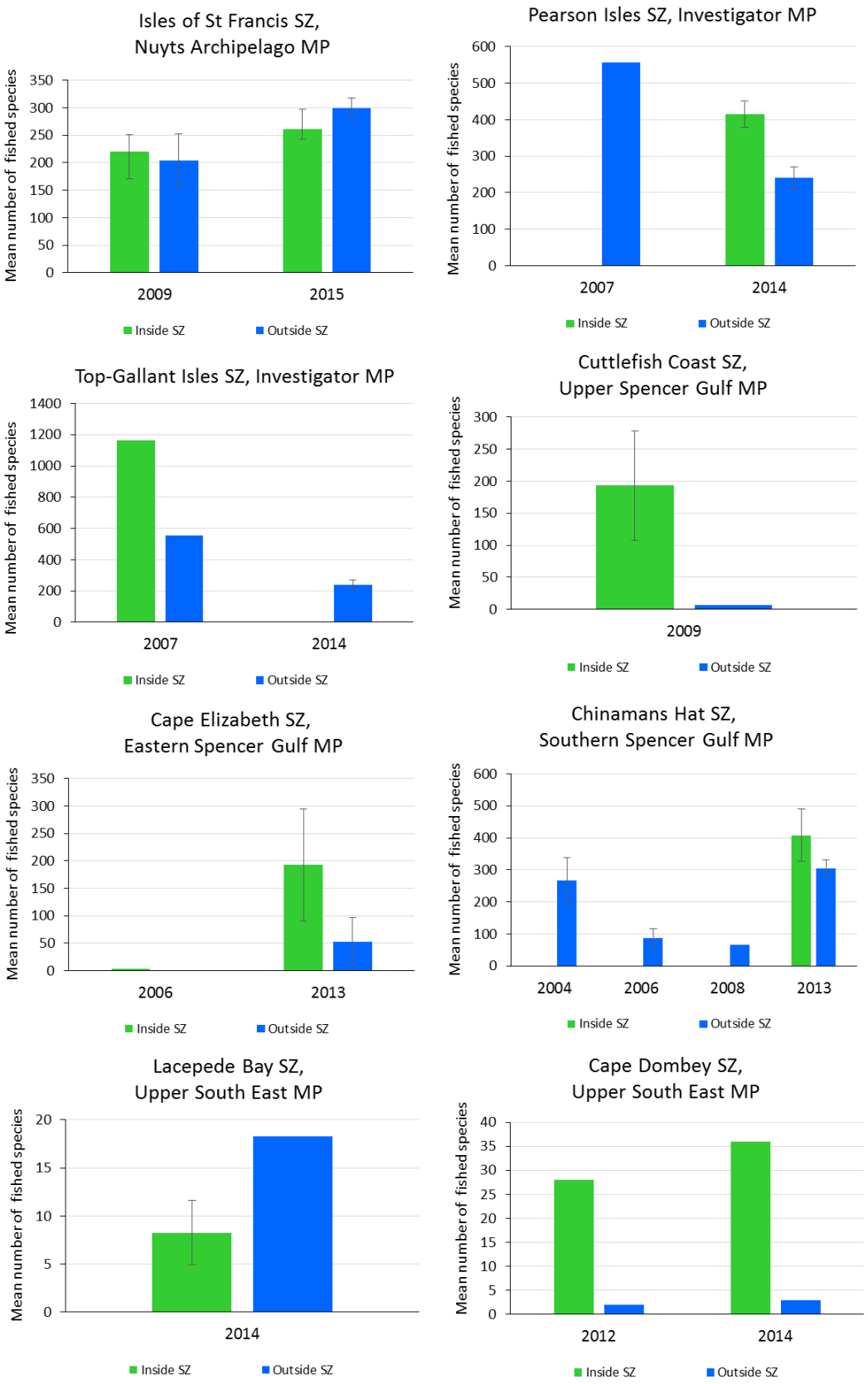


Figure 180. Mean (±SE) number of fished species per dive survey for sites inside vs outside SZ at selected SZs and associated marine parks (Note: no sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008)

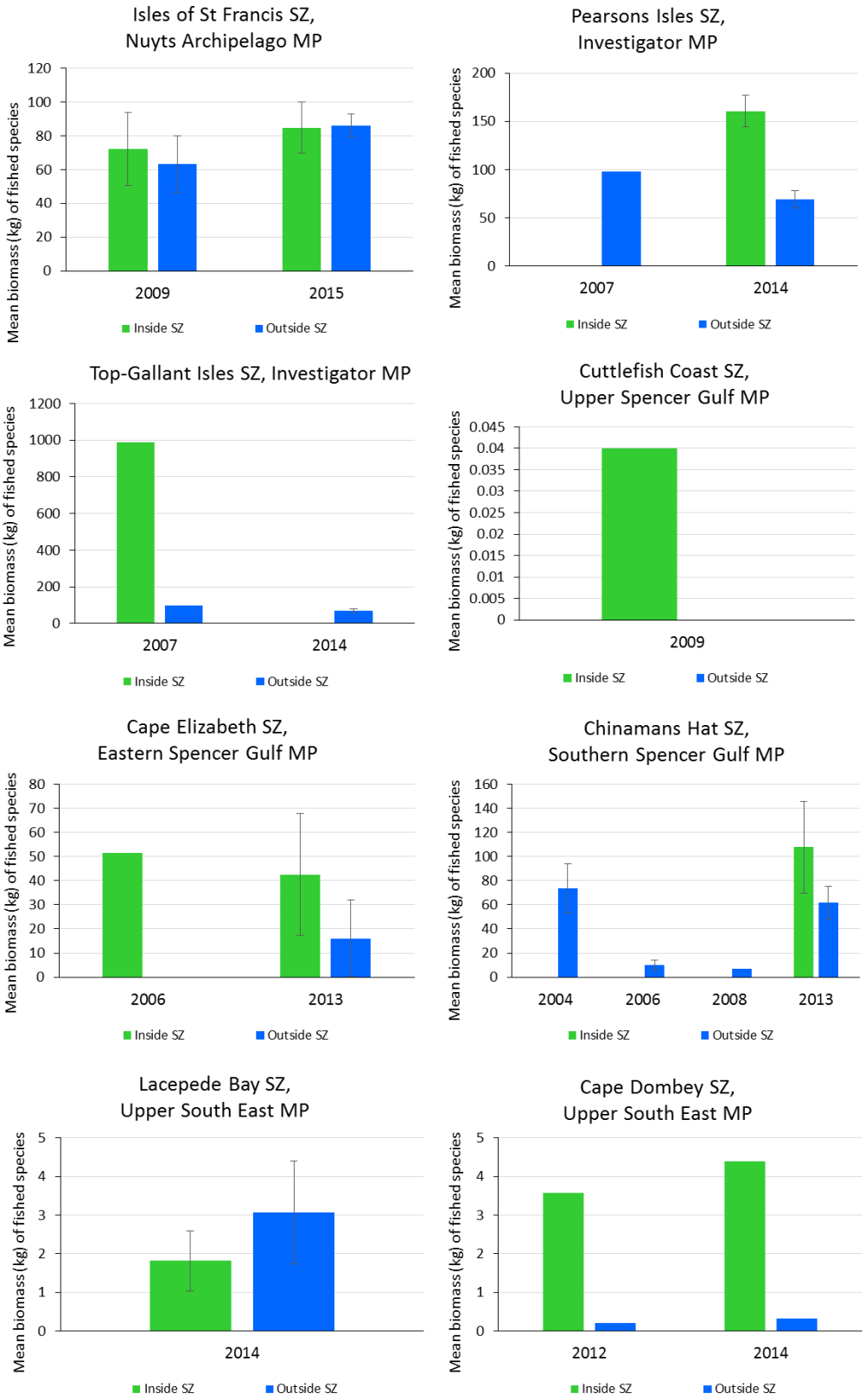


Figure 181. Mean (±SE) biomass of fished species per dive survey for sites inside vs outside SZs at selected SZs and associated marine parks. (Note: No sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008).

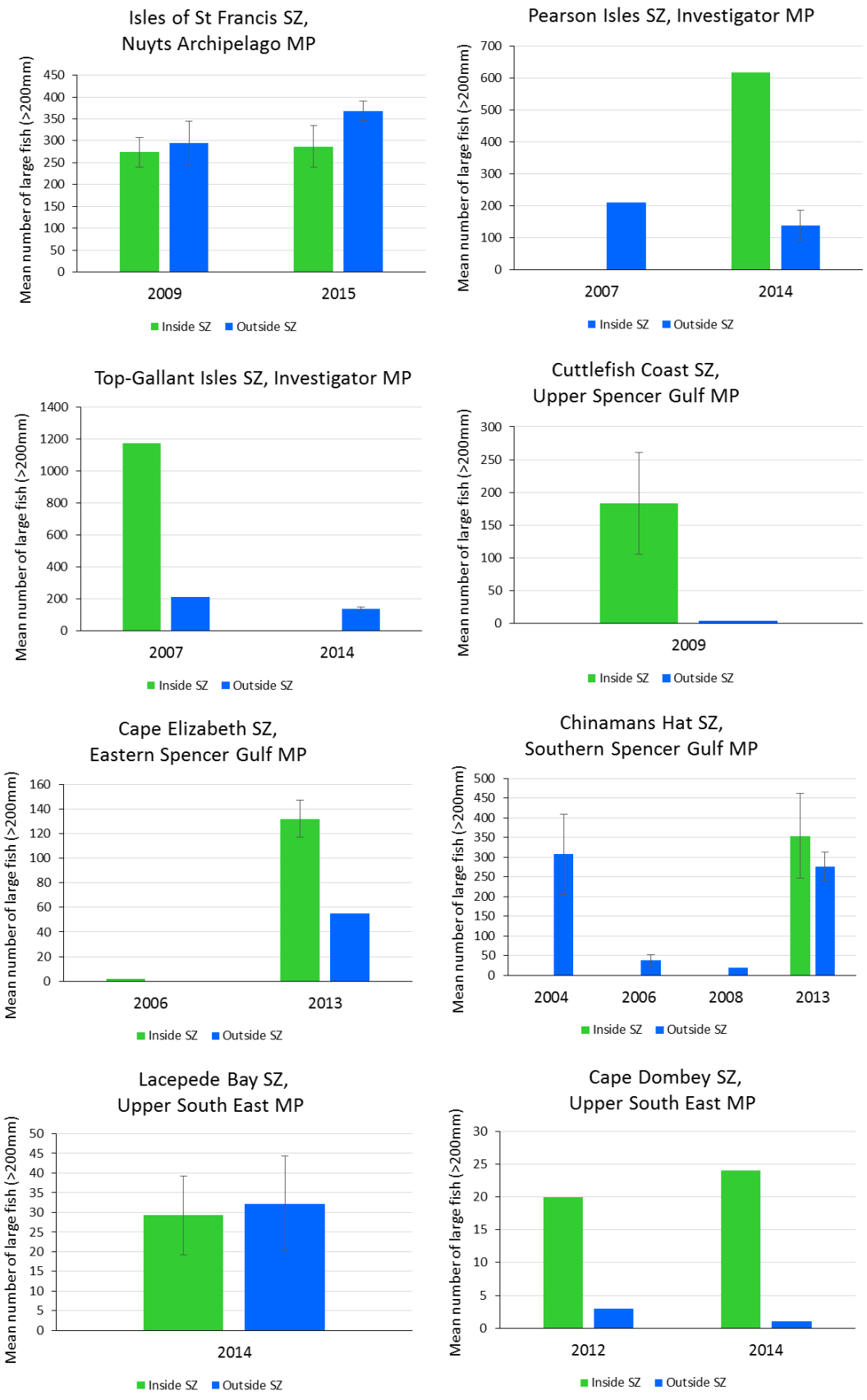


Figure 182. Mean (±SE) number of large fish (>200mm) per dive survey for sites inside vs outside at selected SZs and associated marine parks. (Note: no sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008).

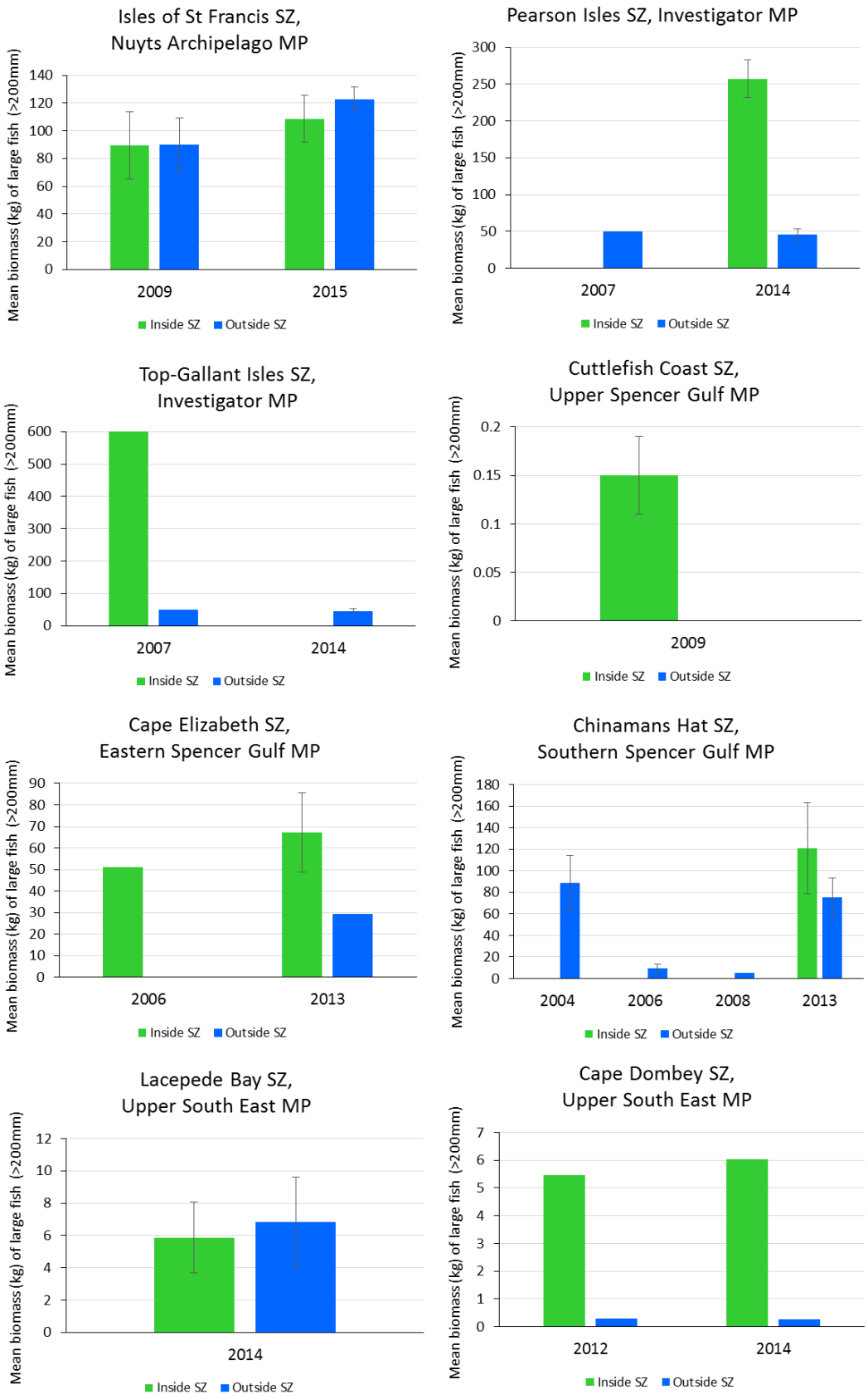


Figure 183. Mean (±SE) biomass of large fish (>200 mm) per dive survey for sites inside vs outside at selected SZs and associated marine parks. (Note: No sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008).

Abundance of site attached fish species

The mean number of site attached fish species recorded on dive surveys was generally higher inside SZs compared to outside with the exception of Top-Gallant Isles SZ and Lacepede Bay SZs (Figure 184). The highest abundance of site attached fish was recorded inside Isles of St Francis SZ at 250 fish per survey, followed by Cuttlefish Coast at about 193 fish per dive. The South East SZ sites Cape Dombey and Lacepede Bay had the lowest abundance of site attached fish species overall both at less than 20 fish per drop.

Mean biomass of site attached fish species

The mean biomass of site attached fish species recorded on dive surveys was highest inside Cape Elizabeth SZ at 39 kg of fish per survey, followed by sites inside Pearson Island SZ in 2014 at 31 kg fish per survey (Figure 185). There was generally a higher biomass of site attached fish inside SZs compared to outside sites across all location with the exception of Isles of St Francis and Lacepede Bay SZs where outside sites were higher.

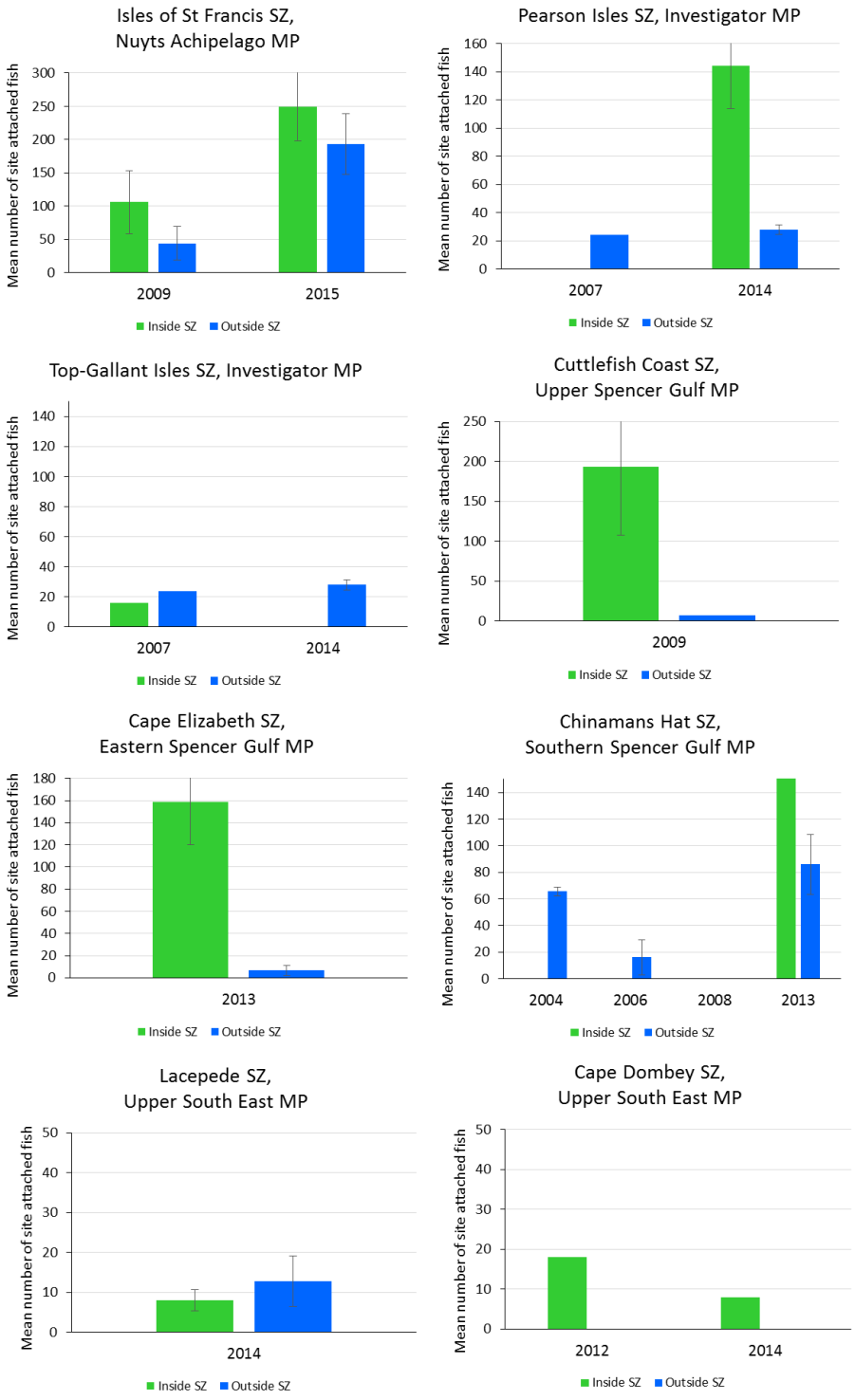


Figure 184. Mean (±SE) number of site attached fish per dive survey for sites inside vs outside at selected SZs and associated marine parks. (Note: no sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008).

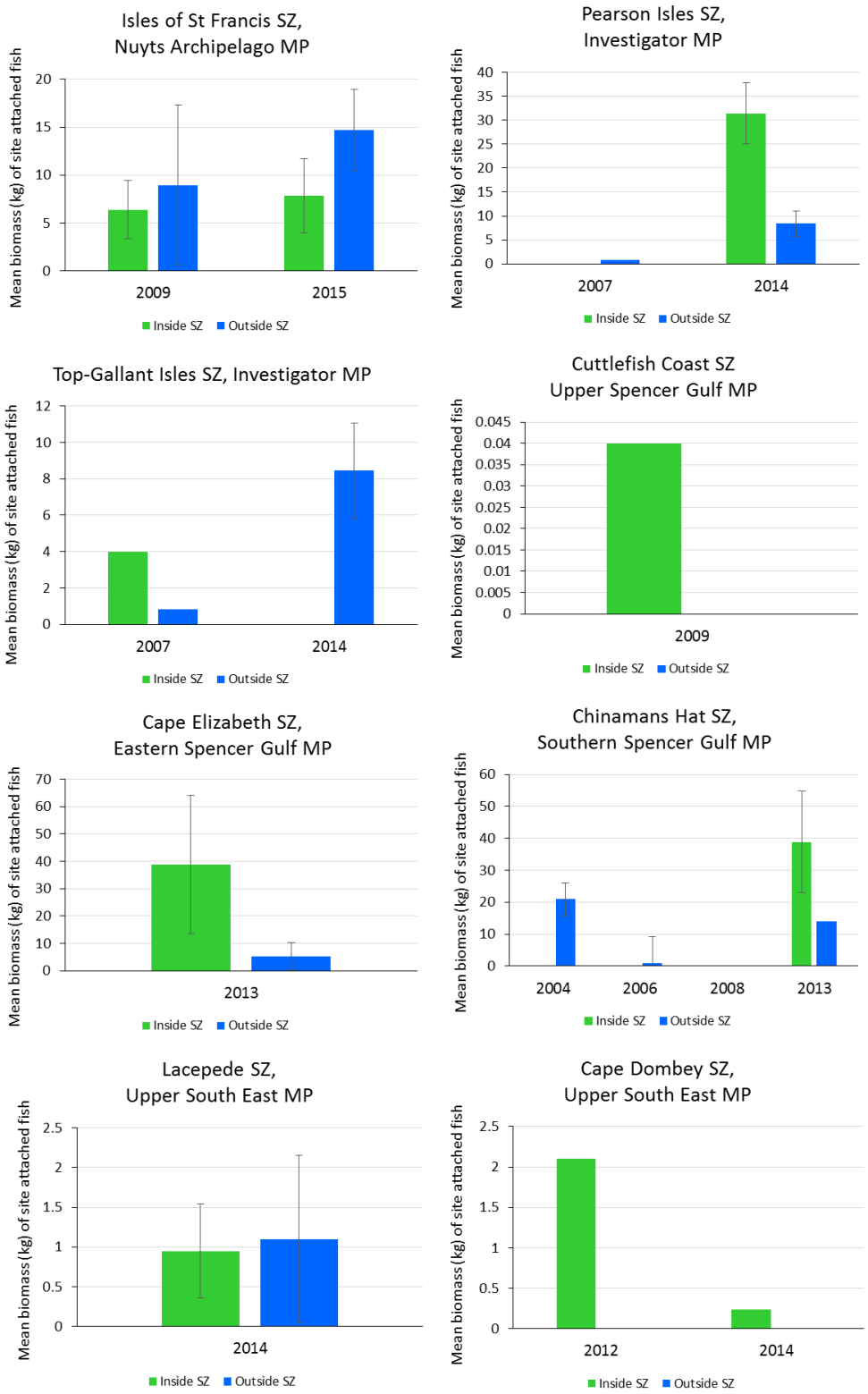


Figure 185. Mean (±SE) biomass (kg) of site attached fish per dive survey for sites inside vs outside at selected SZs and associated marine parks. (Note: no sites inside Pearson Isles SZ were surveyed in 2007, no sites were inside Top-Gallant Isles SZ were surveyed in 2014, no sites inside Chinamans Hat SZ were surveyed in 2004, 2006 and 2008).

Focal species indicators (Dive surveys)

Focal fish species indicators – Isles of St Francis SZ, Nuyts Archipelago Marine Park

Noarlunga hulafish (*Trachinops noarlungae*) was the most common fish species seen at the Isles of St Francis SZ and associated comparison sites, where the abundance was higher inside SZs, compared to outside sites in 2009 and relatively similar between zones in 2015 (Figure 186). Other common fish included bigscale bullseye (*Pempheris multiradiata*); elongate bullseye (*Parapriacanthus elongatus) and* bluethroat wrasse (*Notolabrus tetricus*). The mean number of bigscale bullseye and bluethroat wrasse was higher at inside SZ sites compared to outside, while the mean number of elongate bullseye were more common at sites outside SZ.

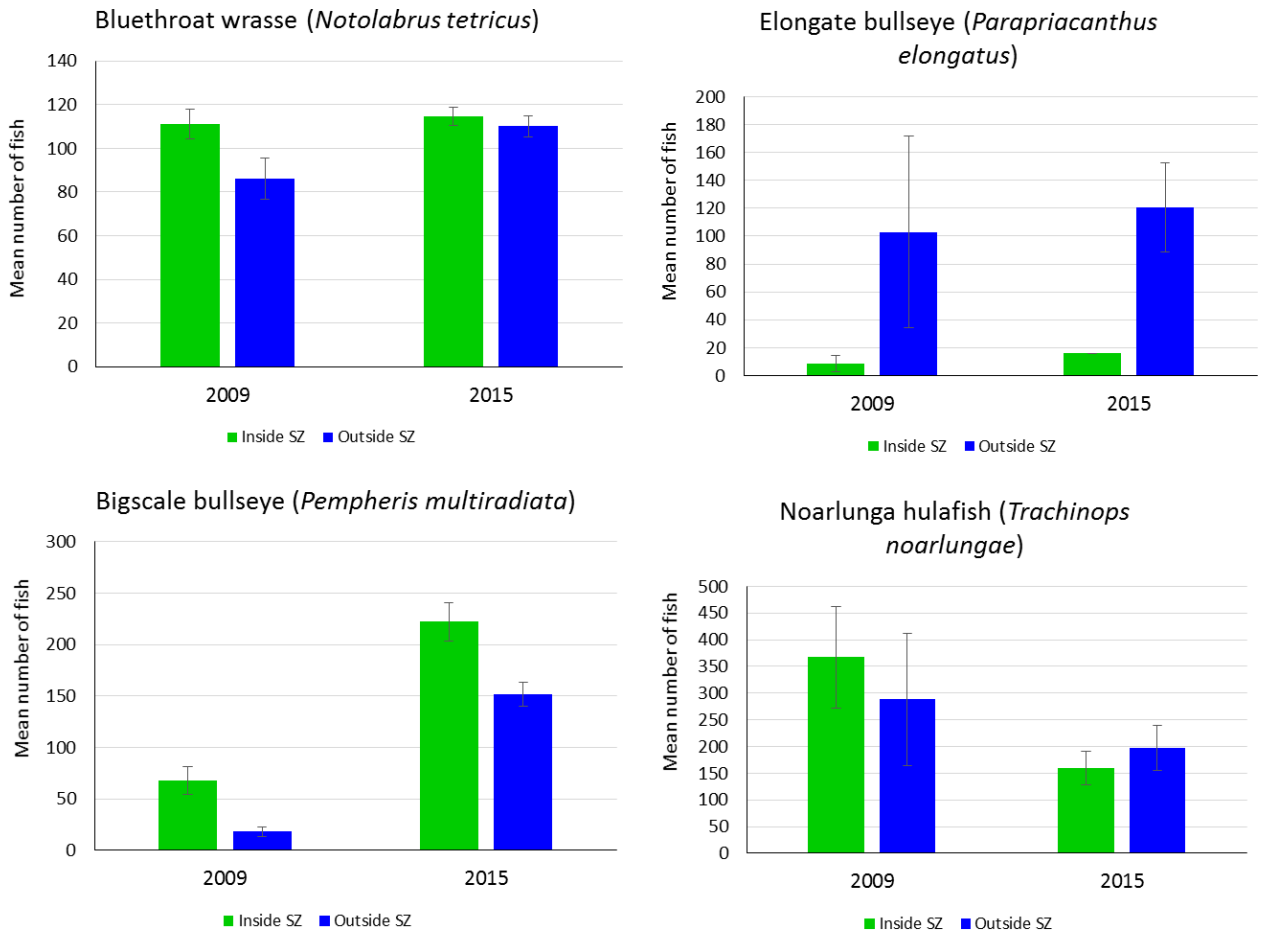


Figure 186. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at the Isles of St Francis SZ, Nuyts Archipelago Marine Park

Focal species indicators – Pearson Isles SZ, Investigator Marine Park

Bluethroat wrasse (*Notolabrus tetricus*) was the most common fish species seen at the Pearson Isles SZ and associated comparison sites where the abundance was higher outside SZs compared to inside sites (Figure 187). Other common fish included Noarlunga hulafish (*Trachinops noarlungae);* barber perch (*Caesioperca rasor*) and sea sweep (*Scorpis aequipinnis*). The mean number of barber perch and hulafish was higher inside SZ sites compared to outside.

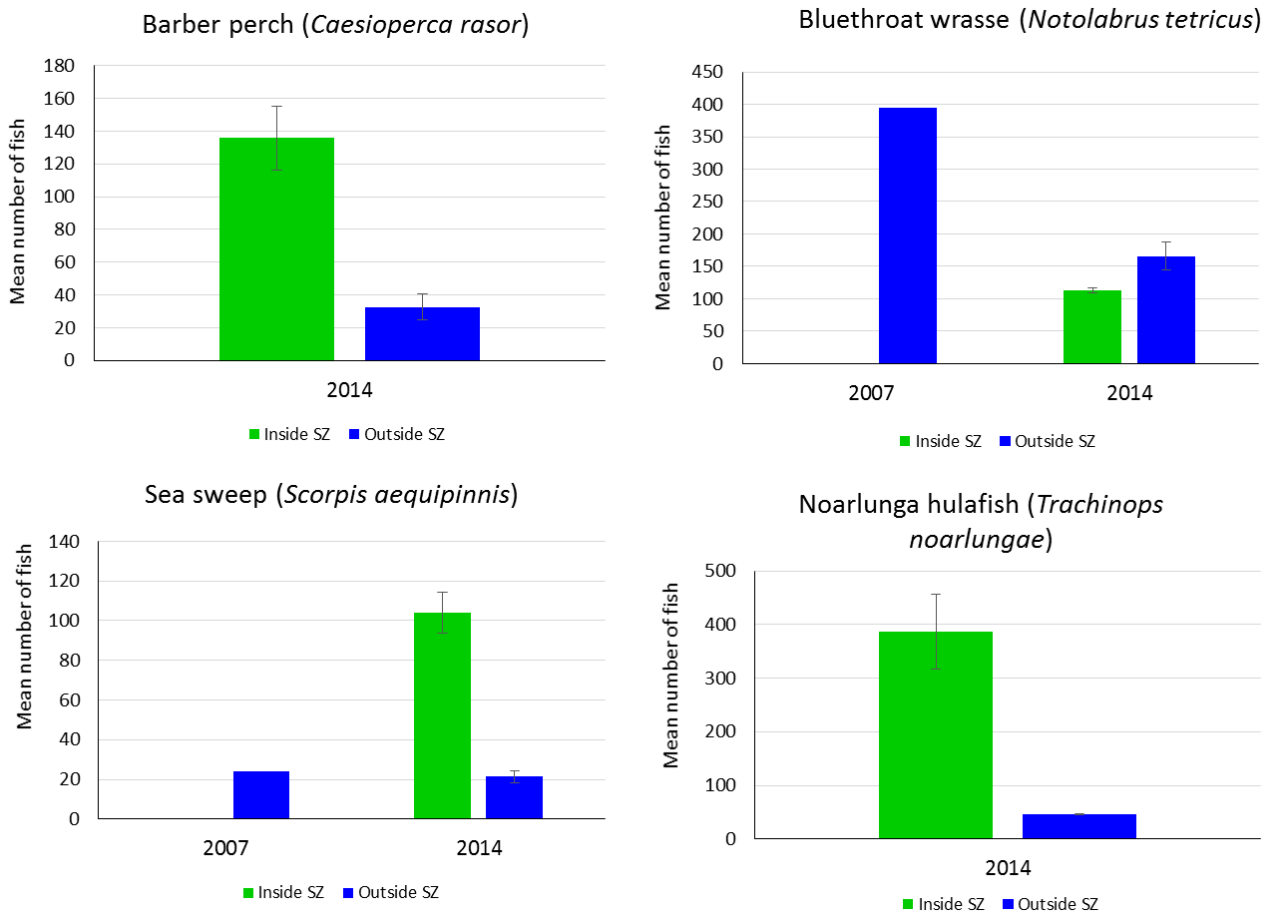


Figure 187. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Pearson Isles SZ, Investigator Marine Park (Note: no sites inside SZ were surveyed in 2007)

Focal species indicators – Top-Gallant Isles SZ, Investigator Marine Park

Australian salmon (*Arripis spp*.) was the most common fish species seen at the Top-Gallant Isles SZ and associated comparison sites where the abundance was higher inside SZs compared to outside sites (Figure 188). Other common fish included bluethroat wrasse (*Notolabrus tetricus*); Noarlunga hulafish (*Trachinops noarlungae*) and senator wrasse (*Pictilabrus laticlavius*). The mean number of bluethroat wrasse and senator wrasse was higher at outside SZ sites compared to inside while the mean number of Noarlunga hulafish was variable with only two data points SZ.

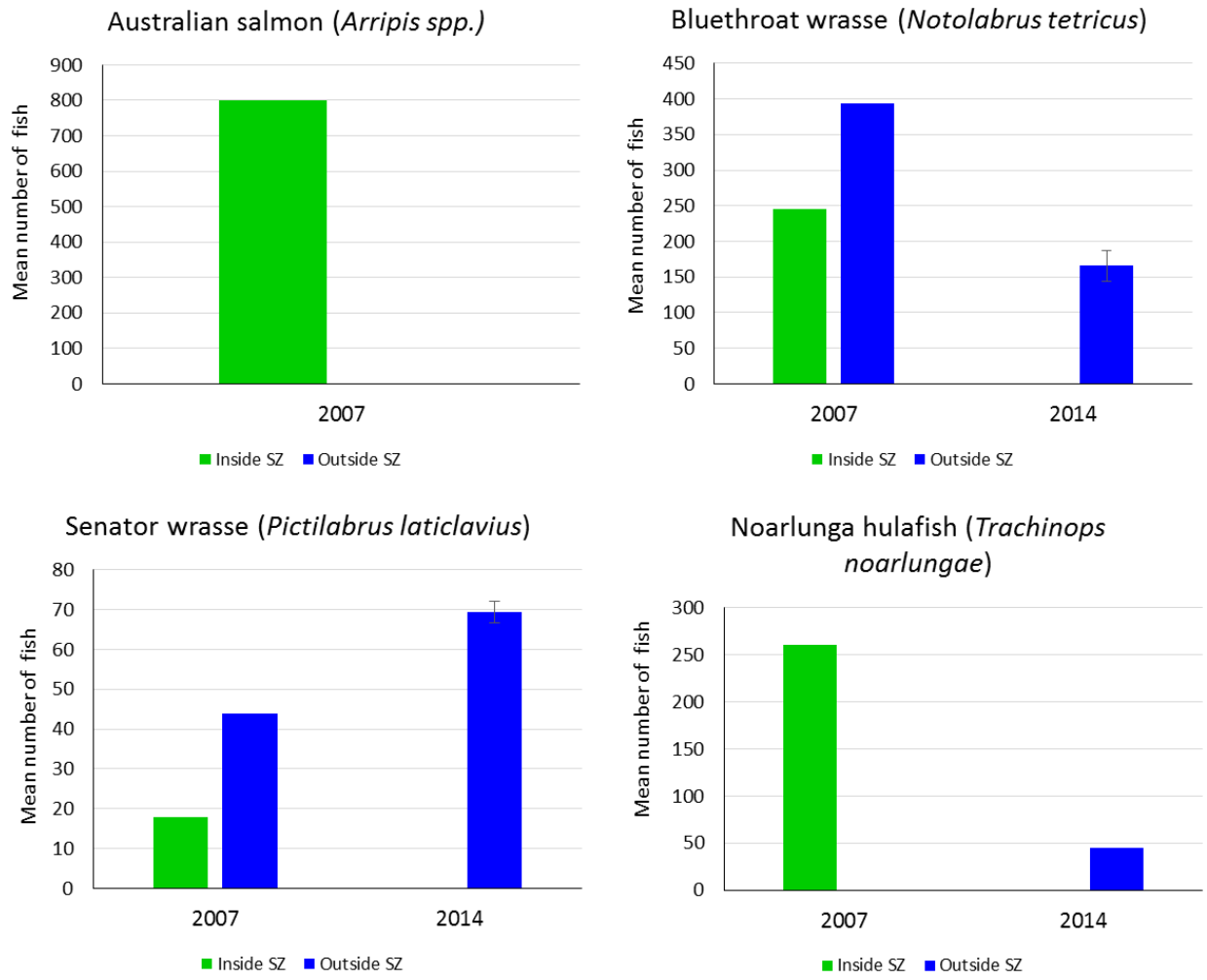


Figure 188. Mean (±SE) number of focal species recorded on dive surveys from inside vs outside sites associated with Top-Gallant Isles SZ, Investigator Marine Park. (Note: no sites inside SZ were surveyed in 2014).

Focal species indicators – Cuttlefish Coast SZ, Upper Spencer Gulf Marine Park

Giant cuttlefish (*Sepia apama*) was the most common species seen at the Cuttlefish Coast SZ and associated comparison sites where the abundance was higher inside SZ sites (Figure 189). Other common fish included Woods siphonfish (*Siphamia cephalotes*); wavy grubfish (*Parapercis haackei*) and little weed whiting (*Neoodax balteatus*). The mean number of Woods siphonfish, wavy grubfish and little weed whiting was all higher at inside SZ sites.

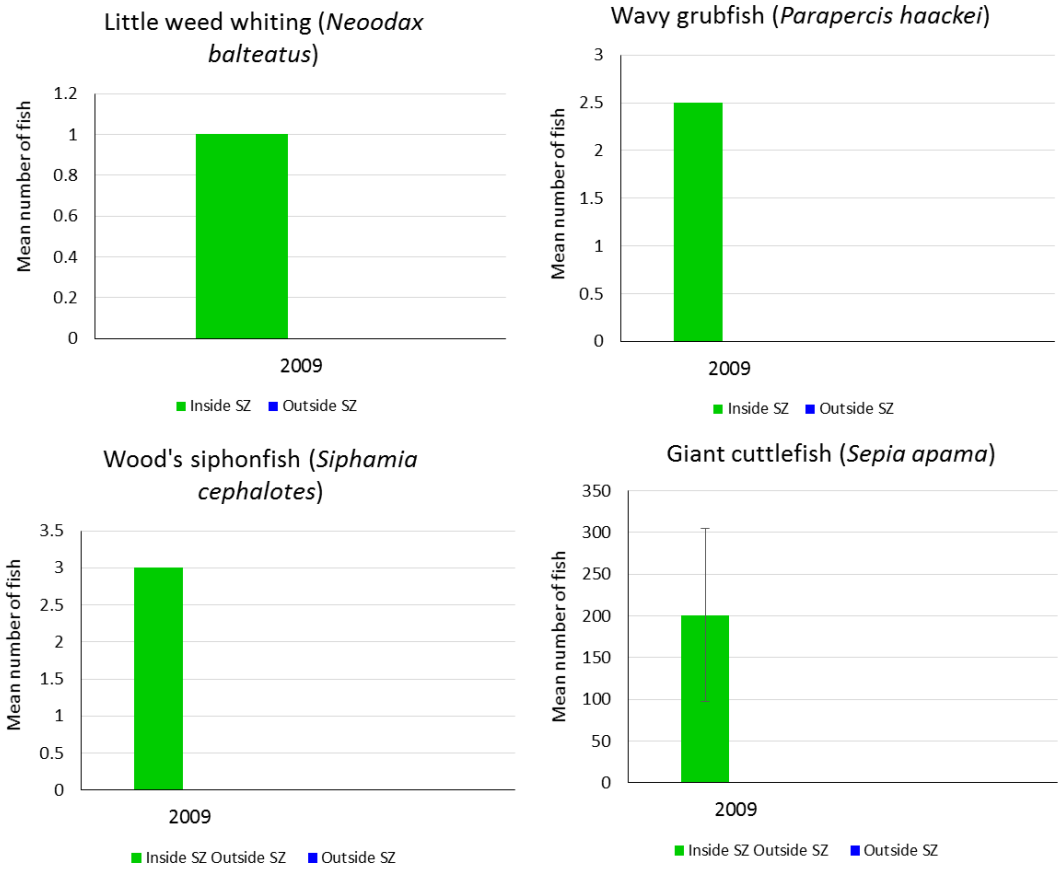


Figure 189. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Cuttlefish Coast SZ, Upper Spencer Gulf Marine Park. (Note: no sites outside SZ were surveyed in 2009).

Focal species indicators – Cape Elizabeth SZ, Eastern Spencer Gulf Marine Park

Noarlunga hulafish (*Trachinops noarlungae*) was the most common fish species seen at the Cape Elizabeth SZ and associated comparison sites where the abundance was higher outisde SZs compared to inside sites (Figure 190). Other common fish included sea sweep (*Scorpis aequipinnis*); Woods siphonfish (*Siphamia cephalotes*) and rough bullseye (*Pempheris klunzingeri*). The mean number of Woods siphonfish and rough bullseye were higher at outside SZ sites compared to inside while the mean number of sea sweep were more common at sites inside SZ.

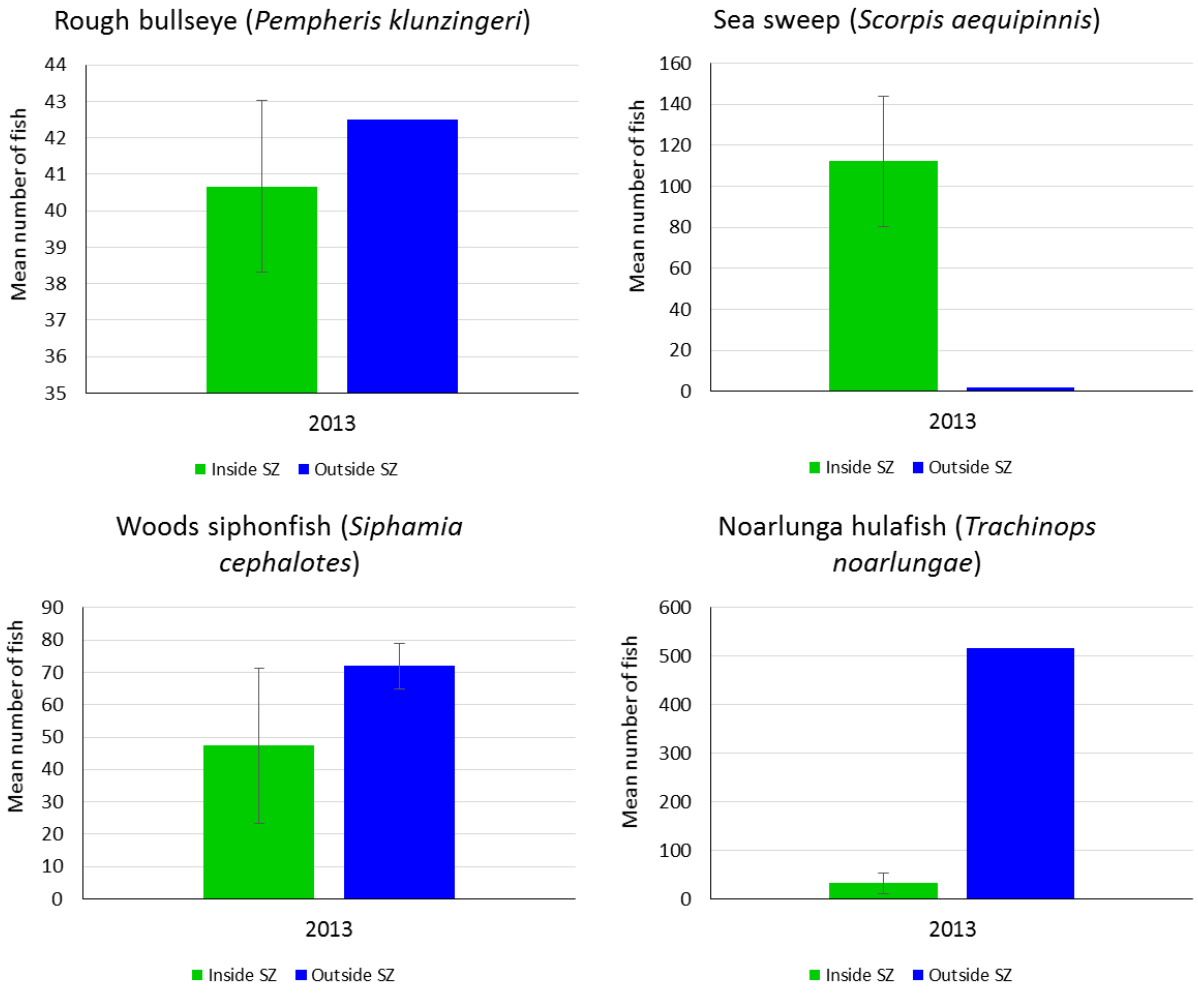


Figure 190. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Cape Elizabeth SZ, Eastern Spencer Gulf Marine Park

Focal species indicators – Chinamans Hat SZ, Southern SpencerGulf SZ

Sea sweep (*Scorpis aequipinnis*) was the most common fish species seen at the Chinamans Hat SZ and associated comparison sites, where the abundance was higher inside SZs compared to outside sites in 2013 (Figure 191). Other common fish included bluethroat wrasse (*Notolabrus tetricus*); zebrafish (*Girella zebra*) and horseshoe leatherjacket (*Meuschenia hippocrepis*). The mean number of zebrafish and bluethroat wrasse was generally similar between inside SZ sites compared to outside while the mean number of horseshoe leatherjacket were more common at sites inside SZ in 2013.

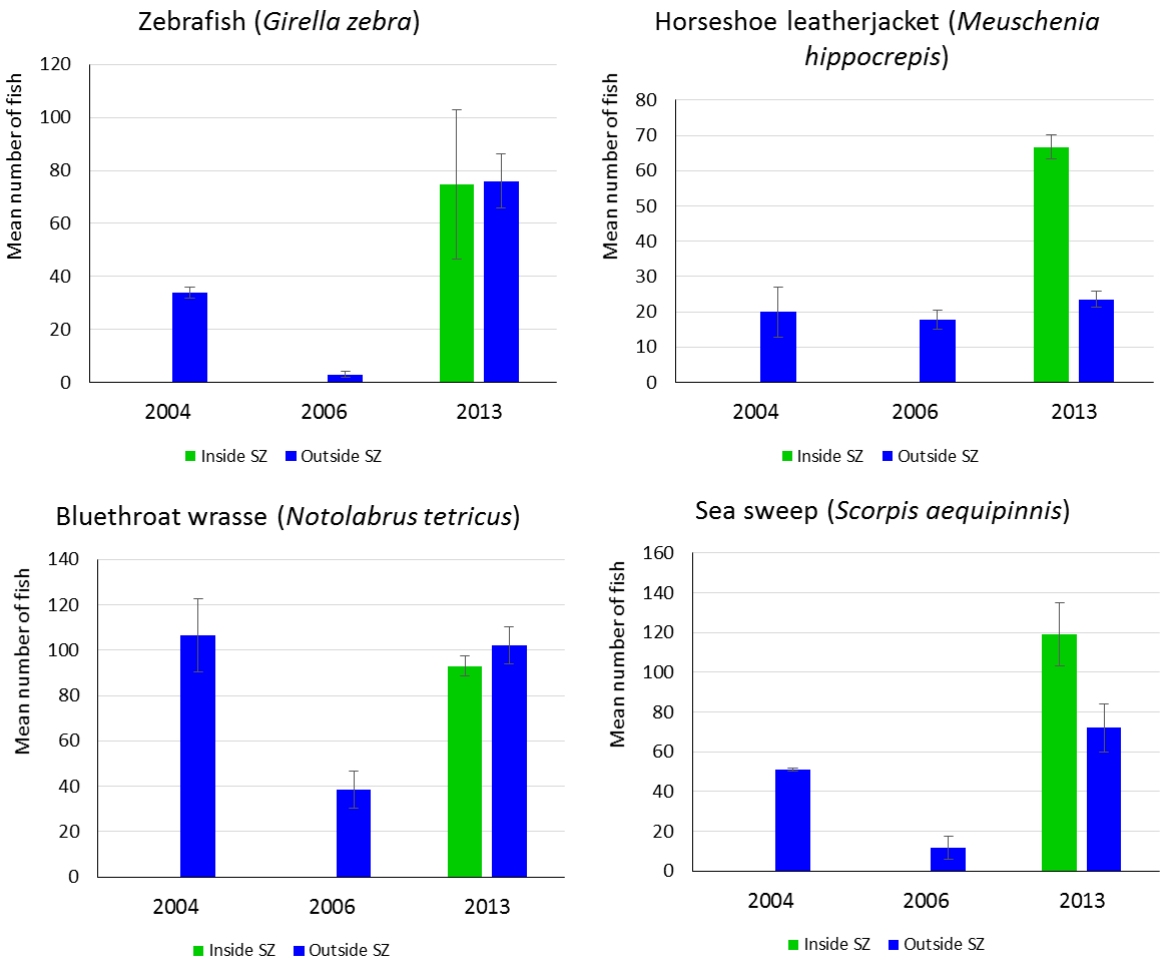


Figure 191. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Chinamans SZ, Southern Spencer Gulf Marine Park. (Note: no sites inside SZ were surveyed in 2004 and 2006).

Focal species indicators – Lacepede Bay SZ, Upper South East MP

Pencil weed whiting (*Siphonognathus beddomei*) was the most common fish species seen at the Lacepede Bay SZ and associated comparison sites where the abundance was higher inside SZs compared to outside sites (Figure 192). Other common fish included senator wrasse (*Pictilabrus laticlavius*); bigscale bullseye (*Pempheris multiradiata*) and bluethroat wrasse (*Notolabrus tetricus*) where the mean number of all species was higher at outside SZ sites compared to inside.

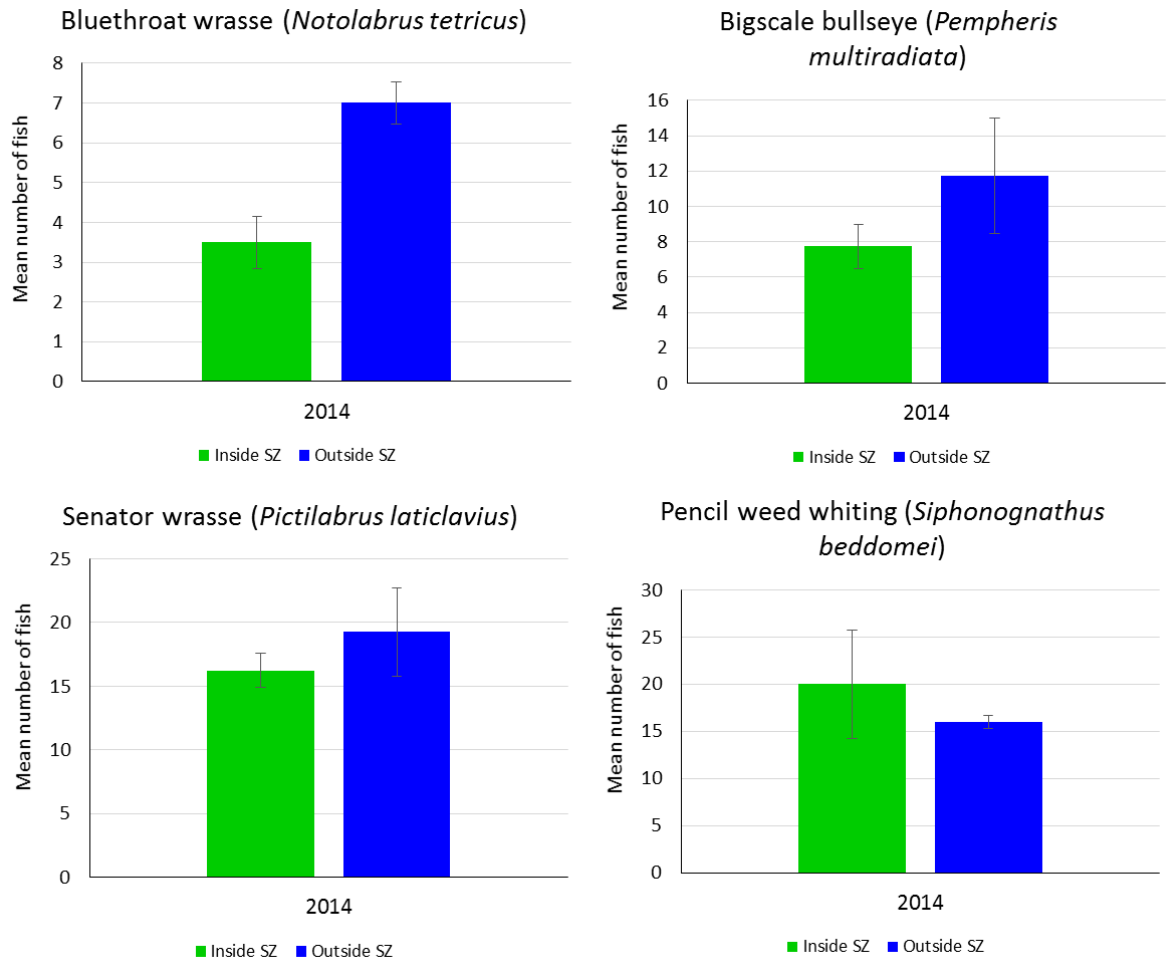


Figure 192. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Lacepede Bay SZ, Upper South East Marine Park

Focal species indicators – Cape Dombey SZ, Upper South East MP

Bluethroat wrasse (*Notolabrus tetricus*) was the most common fish species seen at the Cape Dombey SZ and associated comparison sites (Figure 193). Other common fish included sea sweep *Scorpis aequipinnis; Magpie perch (Cheilodactylus nigripes)* and Victorian scalyfin (*Parma victoriae*). There were no outside sites surveyed in this SZ.

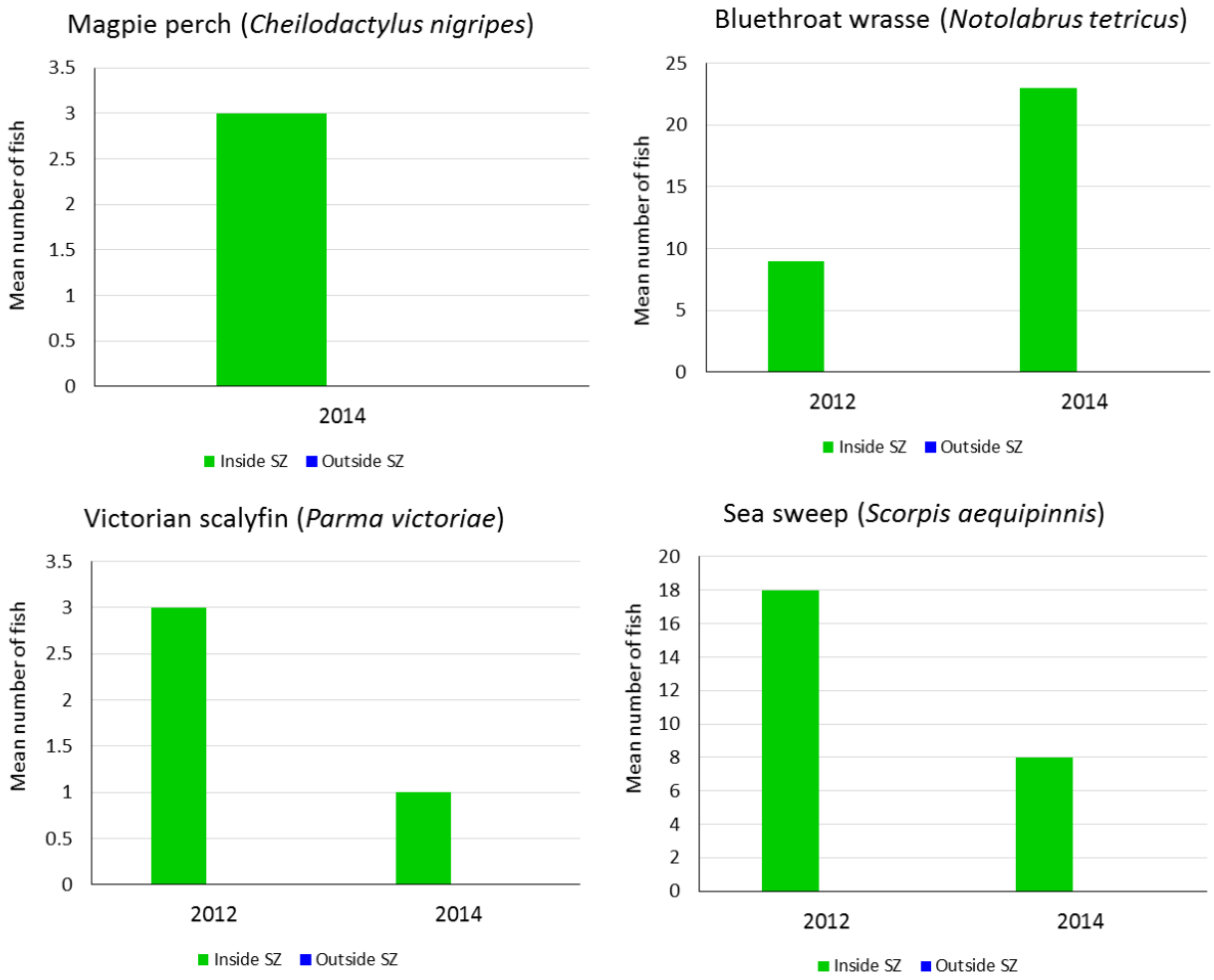


Figure 193. Mean (±SE) number of focal species recorded on dive surveys from sites inside vs outside SZs at Cape Dombey SZ, South East Marine Park. (Note: no sites outside SZ were surveyed in 2012 and 2014).

10.3 Key findings of ecological monitoring

- The marine parks ecological monitoring program has established an extensive dataset of biological indicators across seven of the eight marine bioregions, and in 16 of the 19 marine parks.
- Sanctuary zones have captured the biodiversity on offer in the marine parks network as demonstrated by the similarity in the suite of species, their distribution and abundances between sites inside sanctuary zones and associated comparison sites.
- Mapping of the seafloor is continuing to add to our knowledge base by cataloguing benthic habitats contained in the marine parks network
- The ecological sampling program implemented is rigorous and capable of detecting meaningful biological changes, and therefore appropriate for assessing the long term effectiveness of the marine parks network.
- Preliminary trends indicate that marine parks are maintaining biodiversity and ecosystem function.
- Offshore Islands are critical components of the marine parks network as they are biodiversity hotspots and contain mostly intact plant and animal communities, making them important reference sites.
- Sponge Gardens Sanctuary Zone is an important refuge for vulnerable, site attached iconic fish species – blue groper, harlequin fish and blue devil.
- In general insufficient time has passed since marine park implementation for changes in size, abundance and diversity of biota to be detected. An exception to this were the results from the rock lobster study at Cape du Couedic Sanctuary Zone, which were consistent with predictions of change that lobsters will increase in size and abundance when fishing pressure is removed.

10.4 Case studies 7–9

Case study 7. Jewels in the crown – monitoring offshore island sanctuary zones

Case study 8. Rock lobsters in the Cape du Couedic Sanctuary Zone

Case study 9. Joining forces; a collective approach to marine parks ecological monitoring

Case study 7: Jewels in the crown – monitoring offshore island sanctuary zones

Background

The Nuyts Archipelago Marine Park (NAMP) and Investigator Marine Park (IMP) encompass a network of remote island sanctuary zones, including St Francis and Pearson Isles. These sanctuary zones are some of the 'jewels in the crown' of South Australia's marine parks network. These areas are biologically diverse due to the geographical isolation and remoteness of the islands, combined with the influence of the subtropical Leeuwin Current mixing with the temperate Flinders Current.

The Isles of St Francis Sanctuary Zone in the NAMP is located in the remote waters off the far west coast of Eyre Peninsula. Pearson Isles Sanctuary Zone is located around an iconic group of islands about 30 nautical miles offshore from Eyre Peninsula within the IMP. The spectacular Pearson Island rises sharply to 200m above sea level. The ISFSZ forms part of the NAMP management plan while the PISZ forms part of the IMP management plan.

A biodiversity hotspot for South Australia, Pearson and St Francis sanctuary zones are an important refuge for Australian sea lions, sharks, seabirds and migratory birds, as well as the abundant and diverse reef fish such as western blue groper, southern blue devil, harlequin fish and southern Maori wrasse. The mix of subtropical and temperate waters has resulted in an abundance of invertebrates such as soft corals and sponges, offering a biologically unique area for South Australia.

Monitoring offshore island sanctuary zones is important but also difficult due to their remoteness. In March 2015 a 14-day expedition to the Nuyts Archipelago and Investigator Marine Parks was undertaken on the SARDI research vessel Ngerin. The expedition also visited the Cape du Couedic Sanctuary Zone on Kangaroo Island,. During the expedition the vessel steamed 1500 nautical miles, and conducted 60 seafloor video, 35 BRUVS and 32 dive surveys.

SARDI research vessel "Ngerin"

This case study highlights the key findings of the offshore expedition, the links with the NAMP and IMP management plan strategies, and some socio-economic and ecological outcomes as a result of implementation of the management plans.

Key findings

- Pearson Isles has the highest fish diversity of all Marine Park sanctuary zones surveyed statewide and Isles of St Francis has the third highest.
- Offshore island SZs have the highest abundance of large fish
- Confirmation that offshore island SZs are biodiversity hotspots and important reference areas
- High abundance of the colourful Maori wrasse and blue groper
- No incidences of non-compliance (illegal fishing) recorded
- Long-term ecological monitoring sites established which will form the basis to assess potential changes at the iconic locations.

Management plan strategies

The expedition addressed multiple strategies of the NAMP and IMP management plans:

Strategies addressed						
5	**7**	**10**	**11**	**12**	**13**	**15**
✓	✓	✓	✓	✓	✓	✓

Strategies 5 and 7: Education materials were developed to promote offshore islands and the results of the monitoring program.

Strategies 10, 11, 12 and 13: Conducted marine habitat surveys and prepared habitat maps for priority sanctuary zones; conducted ecological monitoring to establish a baseline of the marine parks; Conducted collaborative research.

Strategy 15: Coordinated compliance activity at key monitoring locations.

Ecological outcomes

Specific evaluation questions addressed:

✓ What biodiversity is included within the marine parks network?

✓ Have sanctuary zones maintained or enhanced biodiversity and habitats?

- The expedition confirmed the importance of isolated offshore islands by demonstrating the high biodiversity values of the Pearson Isles and Isles of St Francis Sanctuary Zones.
- Healthy marine ecosystems were observed as evidenced by the large average size of the fish communities at the islands indicating the minimal impacts from human harvesting. Bigger fish increase the productivity of the ecosystems, as they can produce an order of magnitude more and healthier offspring than smaller fish.
- This was the first time that fish communities were captured by BRUVS, and previously unmapped areas of the sea floor were mapped helping to increase our understanding of these ecosystems.
- Offshore islands are important reference sites by which to measure the effectiveness of other marine parks.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

- The expedition raised community awareness about the importance of remote offshore Islands.
- The splendour and beauty of these islands was captured by a photojournalist who accompanied DEWNR scientists on the expedition. These stills and videos are an important outreach tool and have been used in various fora to showcase the beauty of the remote locations (e.g. Marine Park Monitoring Expedition 2015 - Enjoy life in our marine parks www.environment.sa.gov.au/marineparks/Learn/understanding-effectiveness/monitoring/marine-park-monitoring-expedition-2015).

Offshore Islands are biodiversity hotspots

Case study 8: Rock lobsters in the Cape du Couedic Sanctuary Zone

Image credit: Stephen Barber

Background

The Cape du Couedic Sanctuary Zone (CDCSZ) lies within the Western Kangaroo Island Marine Park (WKIMP) and forms part of the WKIMP management plan. The CDCSZ was designed to protect rocky reef habitat characteristic of the region and also the species that live there including sea lions, fur seals, reef fishes and rock lobster. The CDCSZ at the south-western corner of Kangaroo Island was proclaimed in November 2012, and fully implemented on 1 October 2014 when fishing restrictions commenced, including the prohibition of commercial rock lobster fishing. In order to minimise potential impacts on rock lobster fishers the zoning of the South Australian marine parks network aimed to avoid key fishing grounds, and displaced fishing effort was removed from the fishery through a voluntary catch/effort reduction program (refer to Assessment 2a).

The commercial rock lobster industry had concerns that the CDCSZ had removed one of their most productive fishing grounds, and were also interested to find out if protection was having a positive effect on the rock lobster population. Following discussions and negotiations during 2016 a collaborative study was commenced involving DEWNR Marine Parks, PIRSA Fisheries, SARDI Aquatic Sciences and the SA Northern Zone Rock Lobster Fishermen's Association.

In February 2017 a survey was undertaken by SARDI researchers using an experienced, local rock lobster fisher to estimate the size and abundance of rock lobster (*Jasus edwardsii*) inside and outside the CDCSZ, using commercial pots and fishing techniques. As part of the study, changes over the previous 20 years in the catch rates of rock lobster both inside and outside the CDCSZ, were also investigated by SARDI through comparison with historical fisheries survey data (see McLeay et al. 2017).

This case study highlights the key findings of the rock lobster study, the links with the WKIMP management plan strategies, and some early socio-economic and ecological outcomes as a result of implementation of the WKIMP management plan.

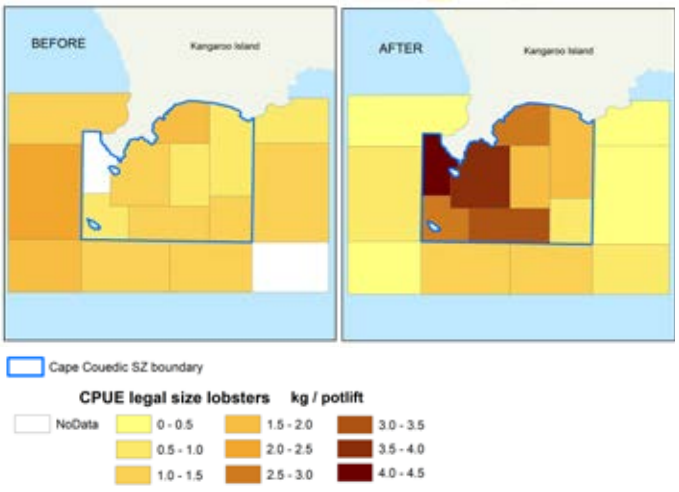
Key findings of the study (from McLeay et al. 2017)

The 2017 survey estimates of relative biomass (catch per unit effort (CPUE), kilograms per pot lift) and abundance (CPUE, number lobster per pot lift) of legal size lobsters (≥ 105 mm carapace length) were 4.4 and 3.5 times higher, respectively, inside compared to outside the CDCSZ.

Positive population responses within the CDCSZ were indicated by an 81.1% increase in relative biomass, 42.2% increase in relative abundance, and 4.1% and 12.5% increases in the mean size of legal size female and male lobsters, respectively, since the 2013/14 fishing season, when fishing was last permitted.

These results support other research into the effects of marine parks on commercial lobster stocks, and are biologically plausible considering that the lobsters have been protected through 3 summers and 2 winters since full implementation of sanctuary zones, providing ample time for the lobsters to moult and grow.

Analyses of the historical CPUE data indicate that the relative biomass and abundance inside and outside CDCSZ were similar between 1994/95 and 2013/14, prior to marine park implementation, indicating that the lobster population located south of Cape du Couedic was distributed relatively evenly across all rocky reef habitats inside and outside the CDCSZ during this period (see figure below).



Heat map showing historical catch rates before (=1994/95–2013/14) versus after (=2017 survey) implementation of the sanctuary zone (data taken from McLeay et al. 2017)

Management plan strategies

The rock lobster study has addressed multiple strategies of the WKIMP management plan:

Strategies addressed					
5	10	11	12	13	15
✓	✓	✓	✓	✓	✓

Strategies 5, 12: Results of the rock lobster study have been released in the publically-available document by McLeay et al. (2017) and in this Status Report.

Strategies 10, 13: The rock lobster study was undertaken as part of the marine parks MER Program after being identified as priority research. The results support the predictions of change for the WKIMP management plan.

Strategy 11: The rock lobster study was a collaborative project between DEWNR, PIRSA, SARDI and the rock lobster industry.

Strategy 15: The marine parks compliance sub-program has undertaken activities in the Cape du Couedic SZ that have assisted with the positive ecological outcome seen in the rock lobster study.

Ecological outcomes

Specific evaluation questions addressed:

✓ Have sanctuary zones maintained or enhanced biodiversity and habitats?

While it is predicted that ecological changes will generally take many years or even decades to be observed, the rapid response of rock lobster in the CDCSZ is an early demonstration of the effectiveness of sanctuary zones in enhancing marine biodiversity. Rock lobster is a keystone species in temperate reef ecosystems and the recovery of this species will assist with the recovery and resilience of the entire ecosystem within the CDCSZ. One study has shown that temperate reef ecosystems with large rock lobsters are more resilient to the impacts of climate change and invasive species (Ling et al 2009).

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

The positive ecological results of the rock lobster study demonstrate that compliance of illegal fishing has been good to date and that the rock lobster industry has respected the boundaries of the CDCSZ. While rock lobster fishers can no longer fish inside the CDCSZ, there is no evidence (based on catch rate) that the WKIMP zoning removed their most productive fishing ground. The Northern Zone Rock Lobster Fishery has continued to function since the CDCSZ and other sanctuary zones were fully implemented, with 99% of the Northern Zone quota taken in the first fishing season following 1 October 2014 and 97% taken in 2015/16; these values are consistent with the three seasons prior to SZs where the quota taken ranged from 94% to 99% (see Linnane et al. 2017a).

References

Ling, SD, Johnson, CR, Frusher, SD & Ridgway, KR (2009), Overfishing reduces resilience of kelp beds to climate-driven catastrophic phase shift, Proceedings of the National Academy of Science, vol. 106, no. 52, pp. 22341–22345.

Linnane, A., McGarvey, R., Feenstra, J. and Graske, D. (2017aziz). Northern Zone Rock Lobster Fishery 2015/16. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000320-11. SARDI Research Report Series No. 954. 78pp.

McLeay, L., McGarvey, R., Linnane, A., Feenstra, J. and Hawthorne, P. (2017). Rock Lobster Survey of the Western Kangaroo Island Marine Park – Cape Du Couedic (Sanctuary Zone 3). Report to the Department of Environment, Water and Natural Resources. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000282-1. SARDI Research Report Series No. 962. 38pp.

Marine park interpretive signs on Kangaroo Island

Rock lobsters are protected by the Cape du Couedic Sanctuary Zone

Case study 9: Joining forces; a collective approach to marine parks ecological monitoring

Background

Monitoring South Australia's marine parks presents significant challenges. The marine park network covers a total area of 26,937 km² and 44% of our state waters. One of the main aims of the ecological monitoring program is to collect data to answer the question "are marine parks protecting and conserving marine biodiversity and habitats?". With such an expansive network it is a challenge to undertake ecological monitoring across the park network, but with partnerships and through collaboration we can extend our reach further than by working alone. The Marine Parks are a whole-of-government initiative and the partnerships within, and external to the South Australian government are crucial to improving the efficiency and increasing the coverage of the ecological monitoring program.

This case study highlights the monitoring methods used in the marine parks Monitoring evaluation and reporting (MER) Program, the links with the management plan strategies, and some early ecological outcomes as a result of implementation of the 19 management plans.

Monitoring methods

A range of techniques are used to measure the health and condition of marine ecosystems within the marine park network. Seafloor habitats are mapped using aerial photography, drop videos, and side scan and multibeam sonar. Fish, macroinvertebrate and macroalgae communities are assessed using underwater visual census by divers and baited remote underwater video systems (BRUVS). Each of these techniques require specialist expertise and equipment.

Improving monitoring reach through partnerships

Marine monitoring is resource intensive, requires specialist skills and is limited by weather windows and availability of suitable vessels. The SA park network consists of 83 sanctuary zones of which around 25 have been identified as high priority for monitoring. Partnerships have been critical to improving the efficiency and effectiveness of the marine parks ecological monitoring program. Through our partnerships we have been able to monitor more sanctuary zones, gain access to the latest data analysis and sampling techniques, and learn from world leaders in their field.

Examples of key partnerships:

University of Tasmania: Research and monitoring partnership via shallow reef Australian Research Council (ARC) Linkage Grant – provides access to world leading scientists in the field of marine protected area research and management.

Reef Life Survey: Citizen science collaboration with international volunteer dive organisation that provides trained volunteers that help collect high quality ecological data and provide local advocacy regarding the benefits of marine parks.

Environment Protection Authority (EPA): The EPA has adopted the standard survey techniques used by the marine parks program and sites surveyed by them can be incorporated into the larger marine park monitoring network.

Management plan strategies

Strategies addressed						
5	7	8	10	11	12	13
✓	✓	✓	✓	✓	✓	✓

Strategies 5, 7: Monitoring activities and outcomes have been provided to the public through various forums to increase their appreciation, understanding and enjoyment of marine parks.

Strategies 8, 10, 11 and 13: Monitoring activities summarised in this case study demonstrate successful implementation of the MER Program and that a range of partnerships with varying stakeholders have been fostered.

Strategy 12: The outcomes of the study are being made publically available in the current Status Report and will be used to inform decision making on the direction of the MER Program. Longer term results will be made available in annual summary reports and the final evaluation report which will ultimately be used to inform the review of the management plans.

SARDI research vessel "Ngerin"

Current ecological monitoring partnerships

Ecological outcomes

Specific evaluation questions addressed:

✓ What biodiversity and habitats are included within the marine parks network?

✓ Have sanctuary zones maintained or enhanced biodiversity and habitats?

✓ Have habitat protection zones maintained biodiversity and habitats?

✓ Have sanctuary zones maintained or enhanced ecological processes?

✓ Have sanctuary zones enhanced ecosystem resilience?

Collaborations with stakeholders, universities and government agencies contributes to addressing all of the ecological specific evaluation questions by:

- Increasing the spatial and temporal resolution of our data.
- Continual improvement and innovation in monitoring methods.
- Increasing knowledge and capacity via relationships with leading scientists.
- Access to national and international datasets.
- Involving partners in marine research creating ownership and research custodians of our marine parks.
- Filling knowledge gaps and acquire baseline data.
- Increasing the ability to collect data across key sanctuary zone.
- SWATH mapping enables rapid assessment and detailed information collection of benthic habitats across large areas of unmapped seafloor (ranging from 5–50+ m). The mapping involves sending acoustic side scan sonar beams to the sea floor and analysing the reflecting signals to estimate bathymetry and acoustic backscatter. Outputs generate detailed 3D models of the seabed which can further be classified into habitat types such as sand, seagrass and reef.
- BRUVS is a method utilised for sampling fish communities across a broad range of depths and habitats. Cameras with bait are deployed in numerous locations inside and outside of the sanctuary zones. The resulting data provide information on fish abundance, diversity and size which will enable the MER Program to track any changes inside and outside of the sanctuary zone.
- Underwater dive surveys provide detailed information on reef communities, including abalone and rock lobster.

Degree of collaboration in current ecological monitoring program			
Total dive surveys	**120**	Total no of BRUVS surveys	**496**
Over 50% of all ecological monitoring has been undertaken in partnerships			

Divers conducting underwater surveys

11 Socio-economic monitoring and ongoing trends

11.1 Overview

Understanding the human dimension of implementing South Australia's 19 marine park management plans, including how people, industries and communities interact in them, value them, perceive them, and respond to environmental and societal changes is essential for long-term planning, and for evaluating the outcomes of management decisions. Information on socio-economic change is therefore required for the evaluation of the implementation of the plans and contributes to Step 2 of the evaluation; to determine if the predicted changes in socio-economic values were observed (see Section 2.2, Figure 194).

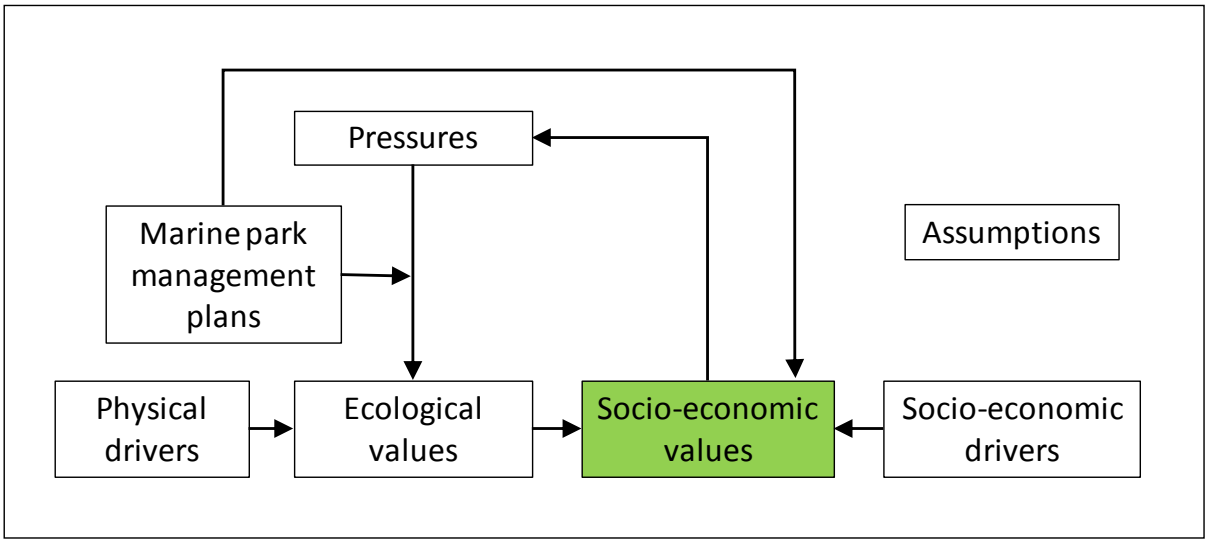


Figure 194. Framework for the seven components of the marine parks monitoring, evaluation and reporting program highlighting the socio-economic values component which is addressed in the current section. See Section 2.2 for further details.

This chapter documents information collected from monitoring of socio-economic indicators against each of the specific evaluation questions outlined in Section 5. The specific evaluation questions contribute to answering the higher level key evaluation questions 4, 5 and 6 (see Section 5). The activities undertaken for each of the management plan strategies (as documented in Section 9) have potential causal links with the ecological and socio-economic values that are being monitored for change. In each of the sections below these potential links are documented against each specific evaluation question to demonstrate the multi-faceted nature of the management plan strategies.

The marine parks were designed to minimise potential negative impacts on things such as fishing industries and to result in positive benefits by providing opportunities for things such as education, public appreciation and nature-based tourism. For most indicators it was predicted that the pre-marine parks trend would be maintained post- marine parks with a possible improvement in the trend or status for some indicators (Table 71). Due to the scale at which some types of data are available and the influence of other external factors, it was considered unlikely that any changes in some of the indicators (e.g. GRP, human population, unemployment) could ever be attributed to the

implementation of marine park management plans (Bryars et al. 2016a-s) unless there was a major impact.

Nonetheless, some indicators will be measured against specific evaluation questions in cases where no change is predicted to occur but where there may be unexpected outcomes, e.g., house prices, commercial fisheries, and fish prices. In line with the whole-of-government approach to the RIAS (Regional Impact Assessment Statement, see Kosturjak et al. 2015) the Marine Parks MER Program will focus on any potential negative impacts at a regional and State scale. It is beyond the scope of the MER Program to monitor for potential socio-economic impacts on individuals. However, holders of statutory authorisations who believe their conferred rights are affected may apply for compensation in accordance with Section 21 of the *Marine Parks Act 2007* and the *Marine Parks (Statutory Authorisation Compensation) Regulations 2015*.

In the following sections, data available at the time of report preparation are presented for various indicators with qualitative interpretations of change and comparisons against predictions of change. It should be noted that the volatile nature of certain data series at the regional level can mean short term movements reflect statistical noise rather than a response to marine parks (Kosturjak et al. 2015); they do however provide useful contextual information. Changes in socio-economic values will ultimately be assessed by analyzing spatial and temporal trends in the indicators listed in a multiple-lines-of-evidence approach that also considers external drivers and other factors; these quantitative analyses will be conducted as part of the final evaluation prior to the 10-year review and are beyond the scope of the status report.

Table 71. Specific Evaluation Questions and indicators used to assess change in socio-economic values (adapted from Bryars et al. 2017a)

Specific Evaluation Question	Indicator	Predictions of change from the pre-marine park baseline up to 2022
21. Have local businesses and communities changed due to marine park management plans?	1. Gross regional product	Maintain baseline trend post-marine parks
	2. Human population	Maintain baseline trend post-marine parks
	3. Count of the number of businesses	Maintain baseline trend post-marine parks
	4. Number of local jobs	Maintain baseline trend post-marine parks
	5. Unemployment rate	Maintain baseline trend post-marine parks
	6. Number of Newstart allowance recipients	Maintain baseline trend post-marine parks
	7. Annual individual salary or wage income	Maintain baseline trend post-marine parks
	8. Number and value of residential building approvals	Maintain baseline trend post-marine parks
	9. House sale prices	Maintain baseline trend post-marine parks
	10. Index of socio-economic advantage and disadvantage	Maintain baseline trend post-marine parks
	11. Community resilience to change	Maintain baseline trend post-marine parks
	12. Level of community support for and perceptions on marine parks	Maintain or improve baseline trend post-marine parks
	13. Price of seafood	Maintain baseline trend post-marine parks
22. Has coastal recreation changed due to marine park management plans?	1. Boat registrations/ licences	Maintain baseline trend post-marine parks
	2. Participation in coastal recreation	Maintain baseline trend post-marine parks
	1. Tourist expenditure	Maintain baseline trend post-marine parks

Specific Evaluation Question	Indicator	Predictions of change from the pre-marine park baseline up to 2022
23. Has tourism changed due to marine park management plans?	2. Tourist operator numbers	Maintain or improve baseline trend post-marine parks
	3. White shark cage diving participation numbers	Maintain or improve baseline trend post-marine parks
24. Have Aboriginal heritage values changed due to marine park management plans?	1. Level of protection for registered Aboriginal heritage sites	Maintain or improve baseline status post-marine parks
	2. Level of engagement, partnerships, educational activities	Improve baseline status post-marine parks
25. Have European heritage values changed due to marine park management plans?	1. Level of protection for registered heritage sites	Maintain or improve baseline status post-marine parks
26. Has shipping changed due to marine park management plans?	1. Number vessel calls	Maintain baseline trend post-marine parks
	2. Cargo exports/imports	Maintain baseline trend post-marine parks
27. Has aquaculture changed due to marine park management plans?	1. Number active licences	Maintain baseline trend post-marine parks
	2. Direct output	Maintain baseline trend post-marine parks
28. Has recreational fishing changed due to marine park management plans?	1. Participation rate	Maintain baseline trend post-marine parks
29. Have commercial fisheries changed due to marine park management plans?	1. Rock Lobster Fishery: Catch, catch value, and catch rate	Maintain baseline trend post-marine parks
	2. Abalone Fishery: Catch, catch value and catch rate	Maintain baseline trend post-marine parks
	3. Prawn Fishery: Catch, and catch value	Maintain baseline trend post-marine parks
	4. Blue Crab Fishery: Catch, and catch value	Maintain baseline trend post-marine parks
	5. Sardine Fishery: Catch, and catch value	Maintain baseline trend post-marine parks

Specific Evaluation Question	Indicator	Predictions of change from the pre-marine park baseline up to 2022
	6. Marine Scalefish Fishery: Catch, catch value, and catch rate	Maintain baseline trend post-marine parks
	7. Charter Boat Fishery: Catch, and catch value	Maintain baseline trend post-marine parks
	8. Commonwealth Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector): Catch, and catch value	Maintain baseline trend post-marine parks

Note that not all indicators listed in the table are reported on in this status report.

Note also that the 'baseline date' can vary between indicators depending on whether they are related to authorisation of the management plans in November 2012 or the commencement of fishing restrictions inside SZs on 1 October 2014, or potentially both.

11.1.1 SEQ 21 – Have local businesses and communities changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in local businesses and communities: Strategies 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12 and 15

Gross Regional Product

Gross regional product (GRP) is the monetary value of all the finished goods and services produced within the region in a given period of time. It is a measure of size or net wealth generated by the local economy. The GRP is a valuable measure of how the economy is performing. For instance, the higher the GRP the more income the region is generating. Changes in this figure over time can represent changes in employment, productivity or the types of industries in the area (.id community 2017). To fully understand the size and differences in the GRP, and the main contributors, GRP data should be viewed in conjunction with the number of local jobs, business counts and unemployment.

GRP has been calculated for Local Government Areas (LGAs, see Appendix map for boundaries) by the National Institute of Economic and Industry Research Pty Ltd (NIEIR) between 2010/11 and 2015/16 (National Economics and .id 2017). Reliable primary economic datasets exist only at the national, state and regional level at best. Therefore the only way to get a realistic measure of GRP, number of jobs and worker productivity at the local area level is to undertake economic modelling. The NIEIR modelling draws on many data sources to offer the most nuanced data possible at the local level. The NIEIR dataset is the result of a process of economic micro-simulation modelling – it is an amalgam of many different existing data sources (between 6 and 10 depending on the region and time period) which are synthesised to produce a series of estimates of the size and value of the local economy and is modelled annually ensuring the model is regularly updated to reflect global, national and local factors. Trends since 2010/11 in GRP have been similar in many LGAs to that of the Gross State Product (Figure 195). There is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincide with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014. These observations are consistent with predictions of change (Table 71).

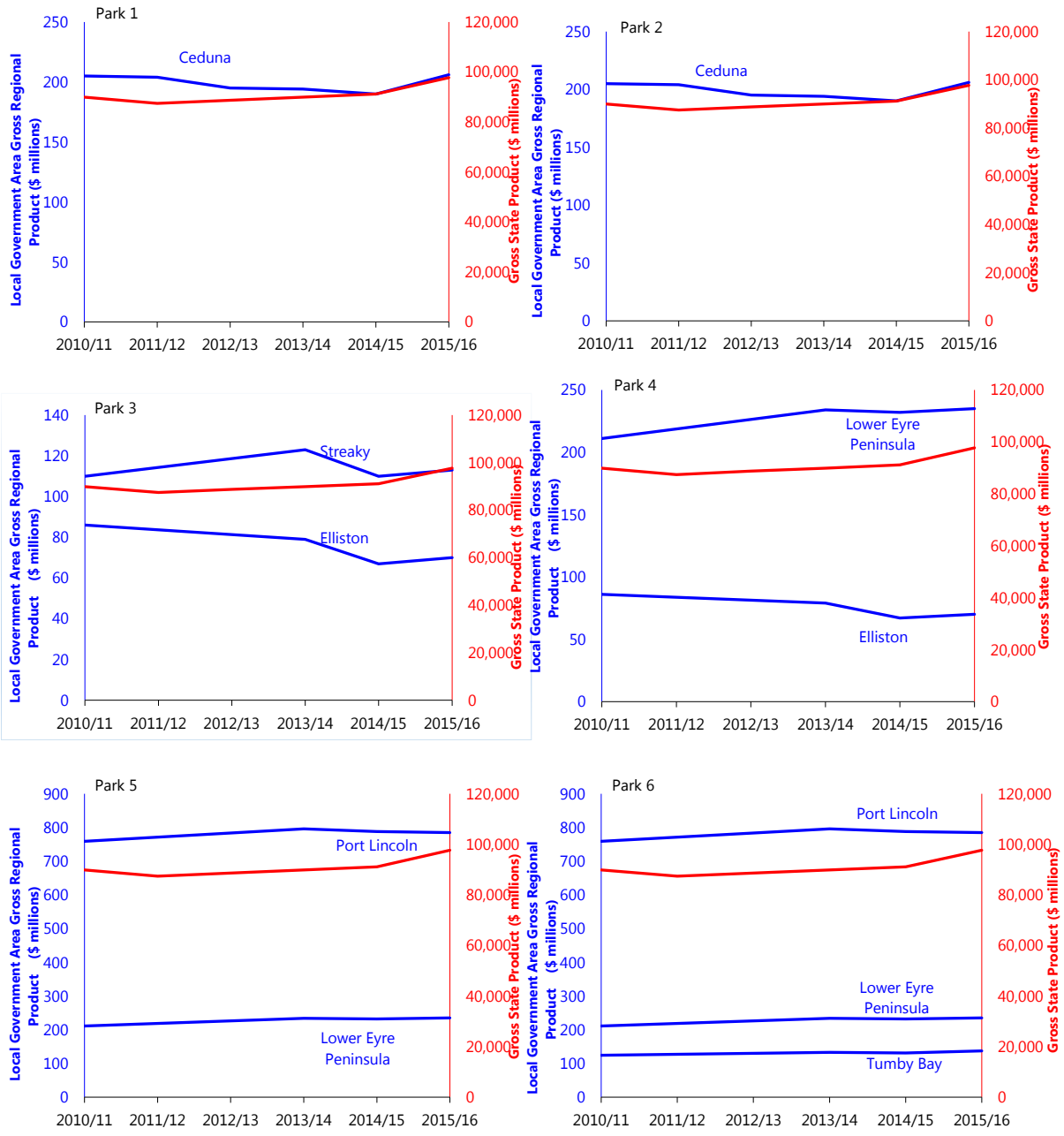


Figure 195. Gross regional product for the Local Government Areas in each marine park, and gross state product. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and i.d. (2017)

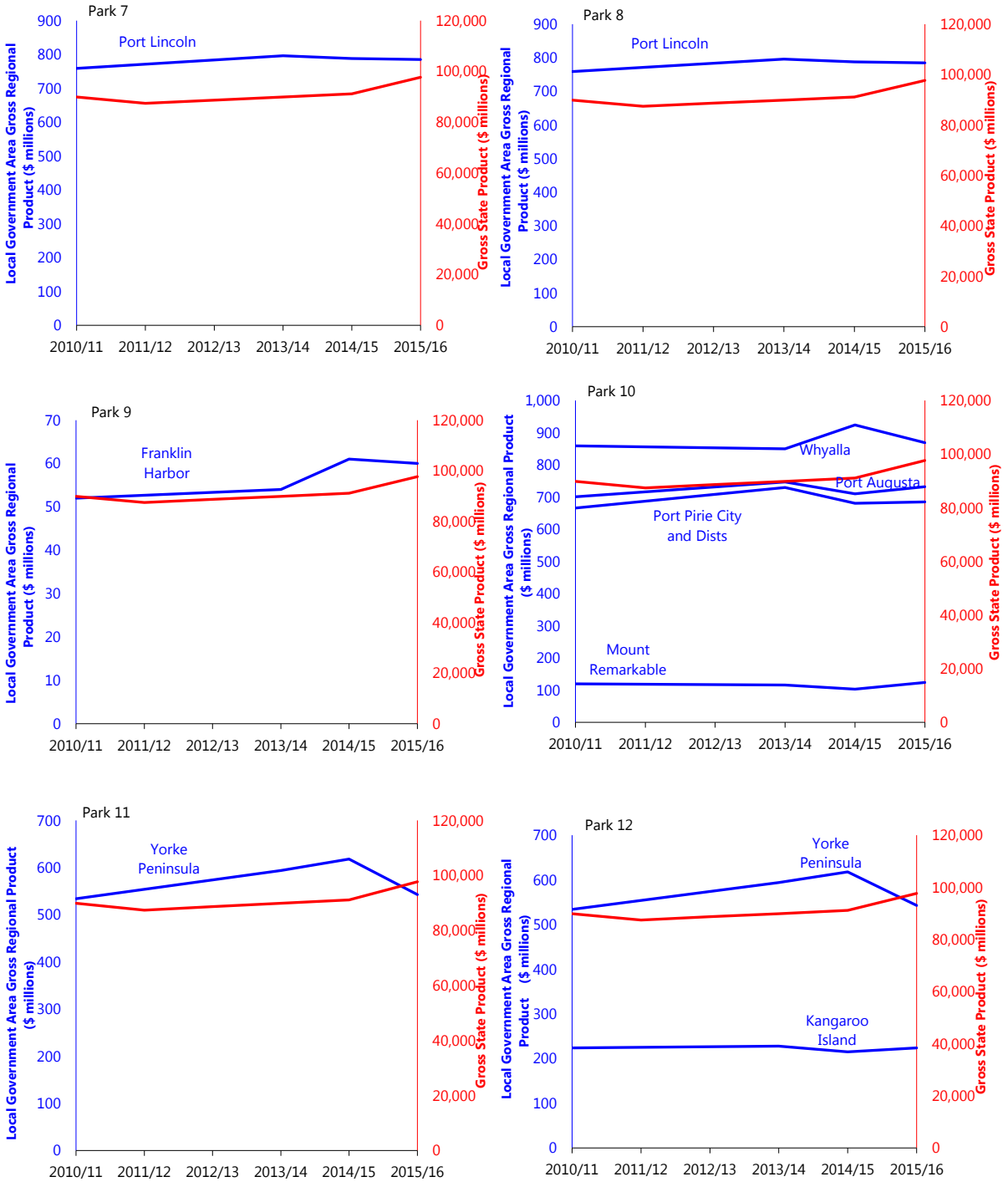


Figure 195 (cont'd). Gross regional product for the Local Government Areas in each marine park, and gross state product. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and i.d. (2017)

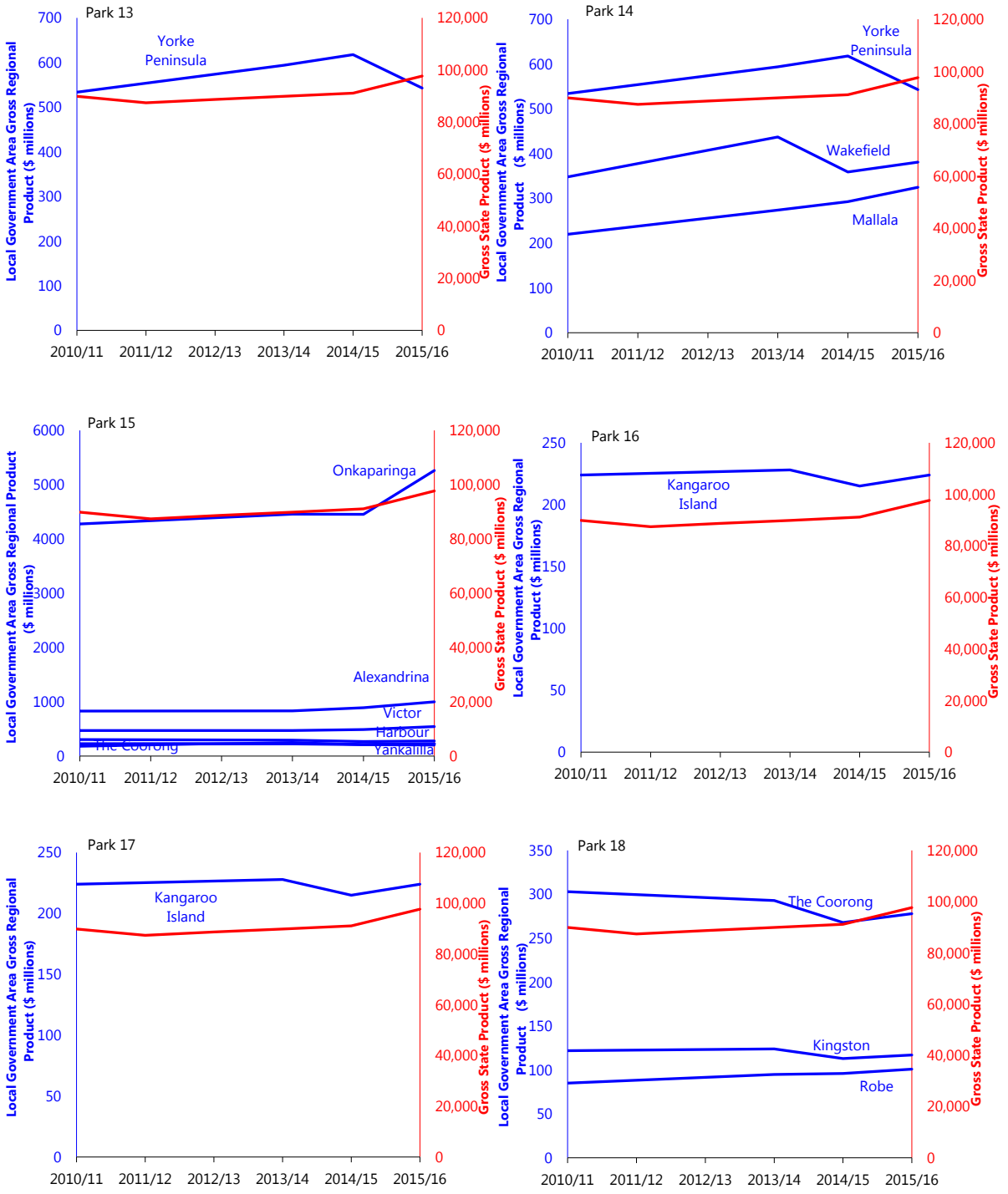


Figure 195 (cont'd). Gross regional product for the Local Government Areas in each marine park, and gross state product. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and i.d. (2017)

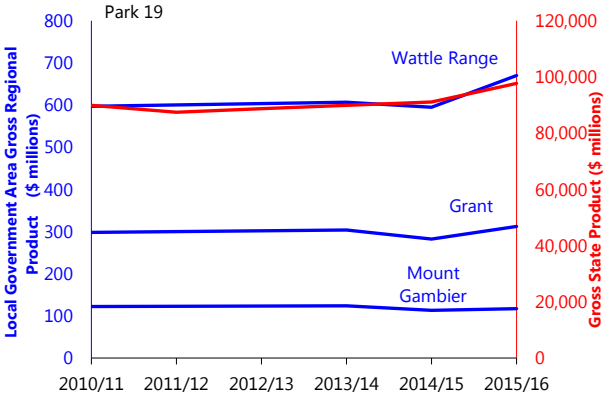


Figure 195 (cont'd). Gross regional product for the Local Government Areas in each marine park, and gross state product. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and i.d. (2017)

Human population

Population size is a basic demographic characteristic of the regions in which the marine parks are located. A growing population can indicate a growing economy, but this is not necessarily the case and depends on the residential role and function of the area (.id community 2017).

The Australian Bureau of Statistics (ABS) provides annual estimates of the resident population. This information is available for several spatial scales including LGAs which is presented below (ABS 2017a). The population for all LGAs adjacent to marine parks has remained relatively stable for the past decade, and the long-term trend across the different LGAs has not shown a perturbation that coincides with the implementation of marine parks in 2012, or the implementation of fishing restrictions in sanctuary zones in October 2014 (Figure 196). These observations are consistent with predictions of change (Table 71).

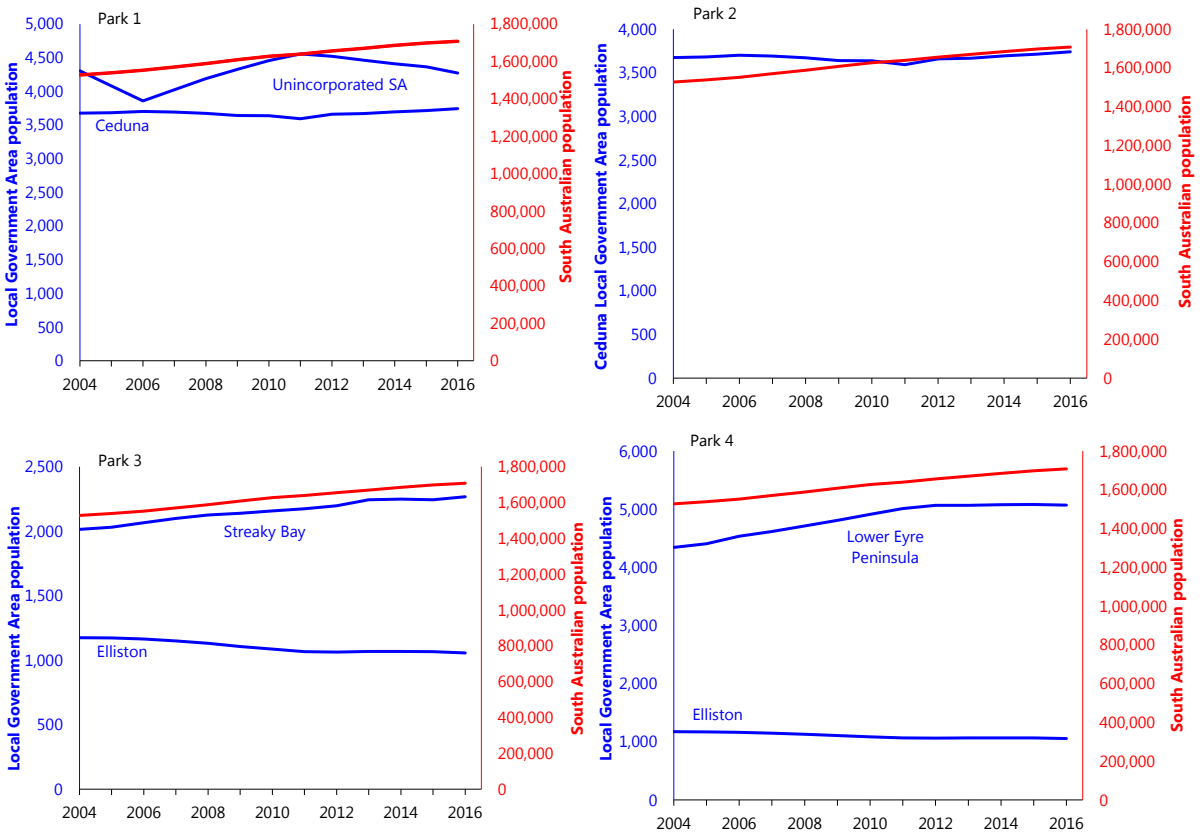


Figure 196. Population trends in the Local Government Areas in each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017a)

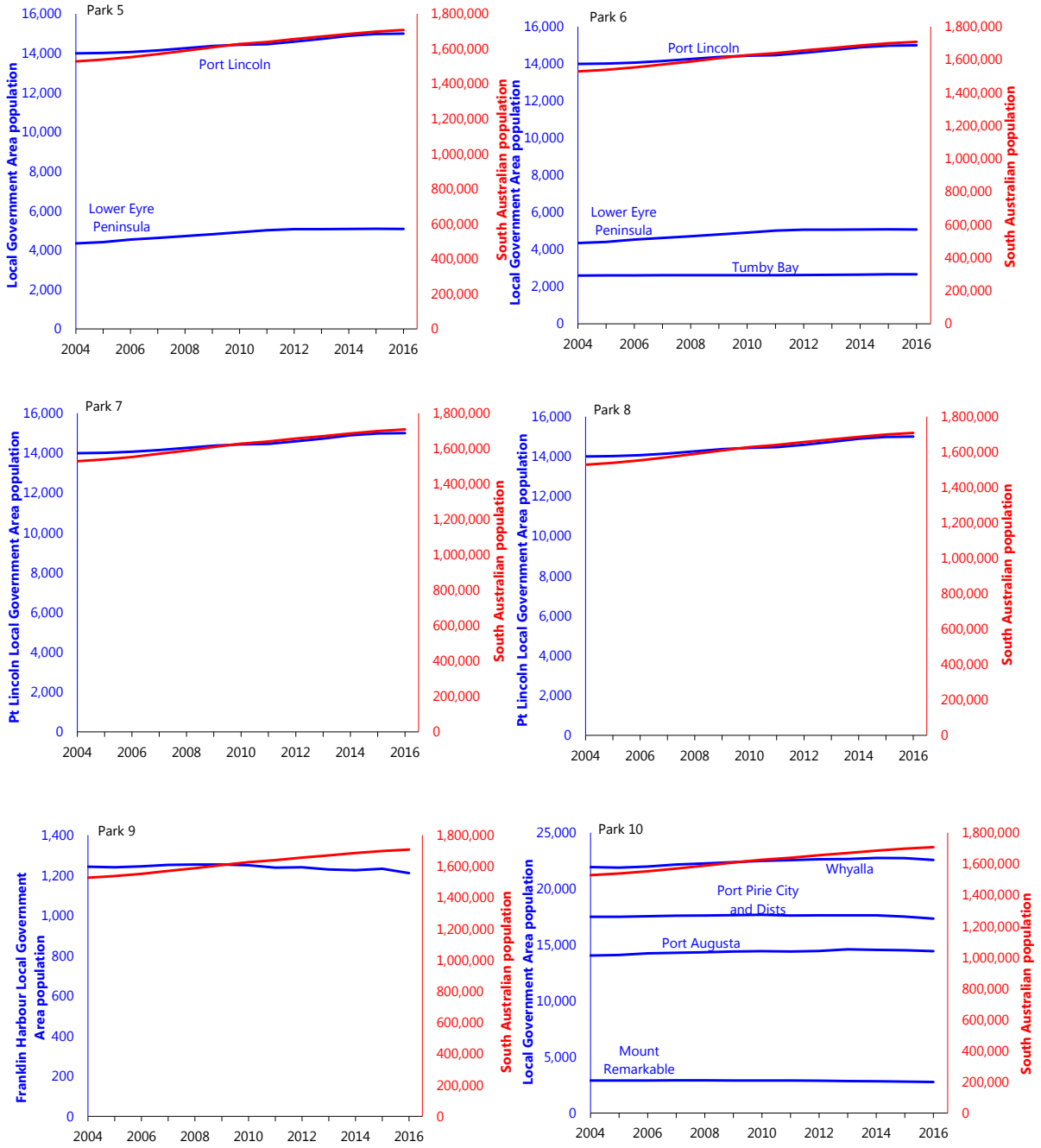


Figure 196 (cont'd). Population trends in the Local Government Areas in each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017a)

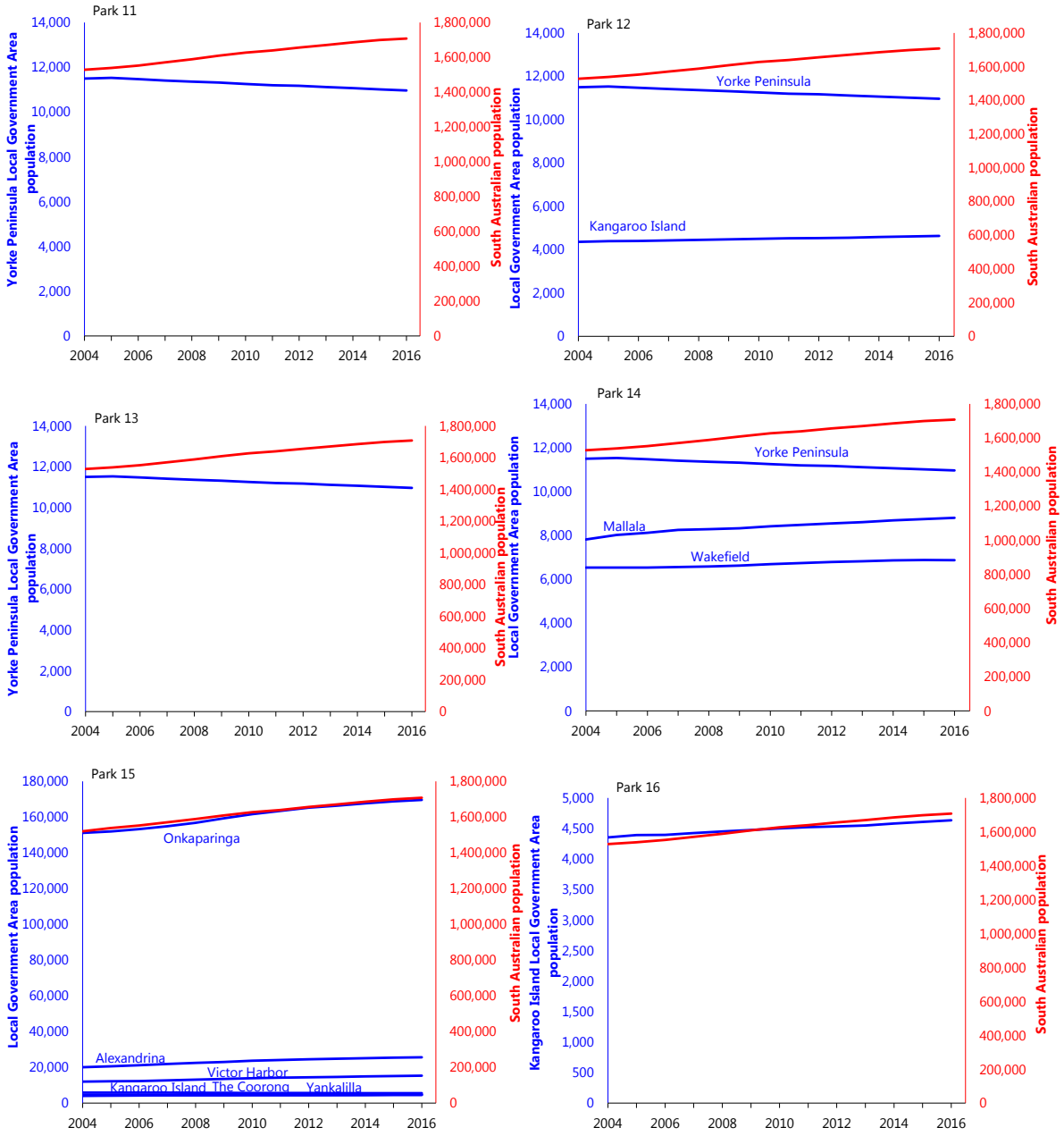


Figure 196 (cont'd). Population trends in the Local Government Areas in each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017a)

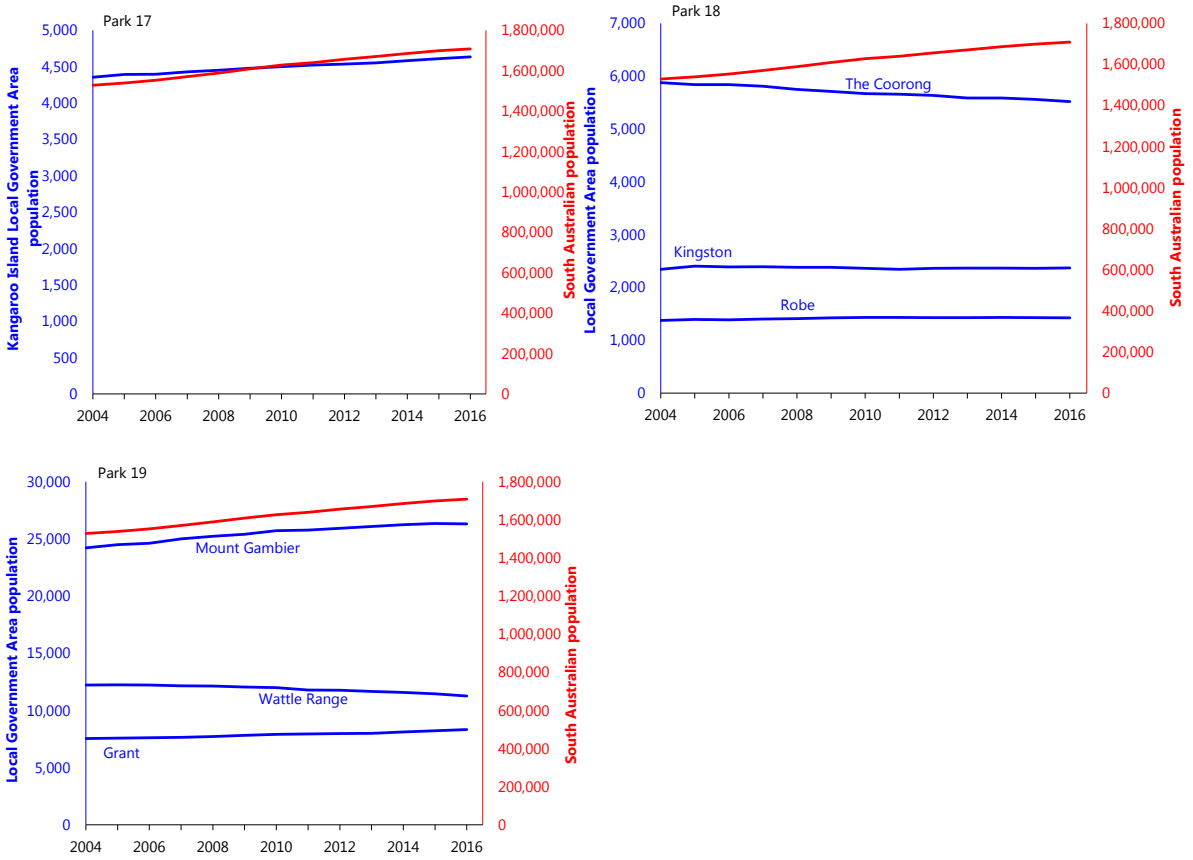


Figure 196 (cont'd). Population trends in the Local Government Areas in each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017a)

Business counts

Business counts measure the number of businesses in the local economy at a point in time. There are various factors that impact on business counts. Larger economies in general are associated with a larger number of businesses.

The number of businesses has been calculated for LGAs by the NIEIR between 2010/11 and 2015/16 (National Economics and .id 2017). The ABS also provides annual counts of Australian businesses sourced from the ABS Business Register. Information is available for Statistical Areas Level 2 between 2009 and 2016 (ABS 2017b). The marine parks monitoring program focussed on the number of businesses in the agriculture, forestry and fishing sector. The number of business counts in the LGAs for all 19 marine parks remained broadly stable between 2010/11 and 2015/16. Trends since 2010/11 in business counts have been similar in many LGAs to that of the whole state (Figure 197 and Figure 198). There is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincide with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014. These observations are consistent with predictions of change (Table 71).

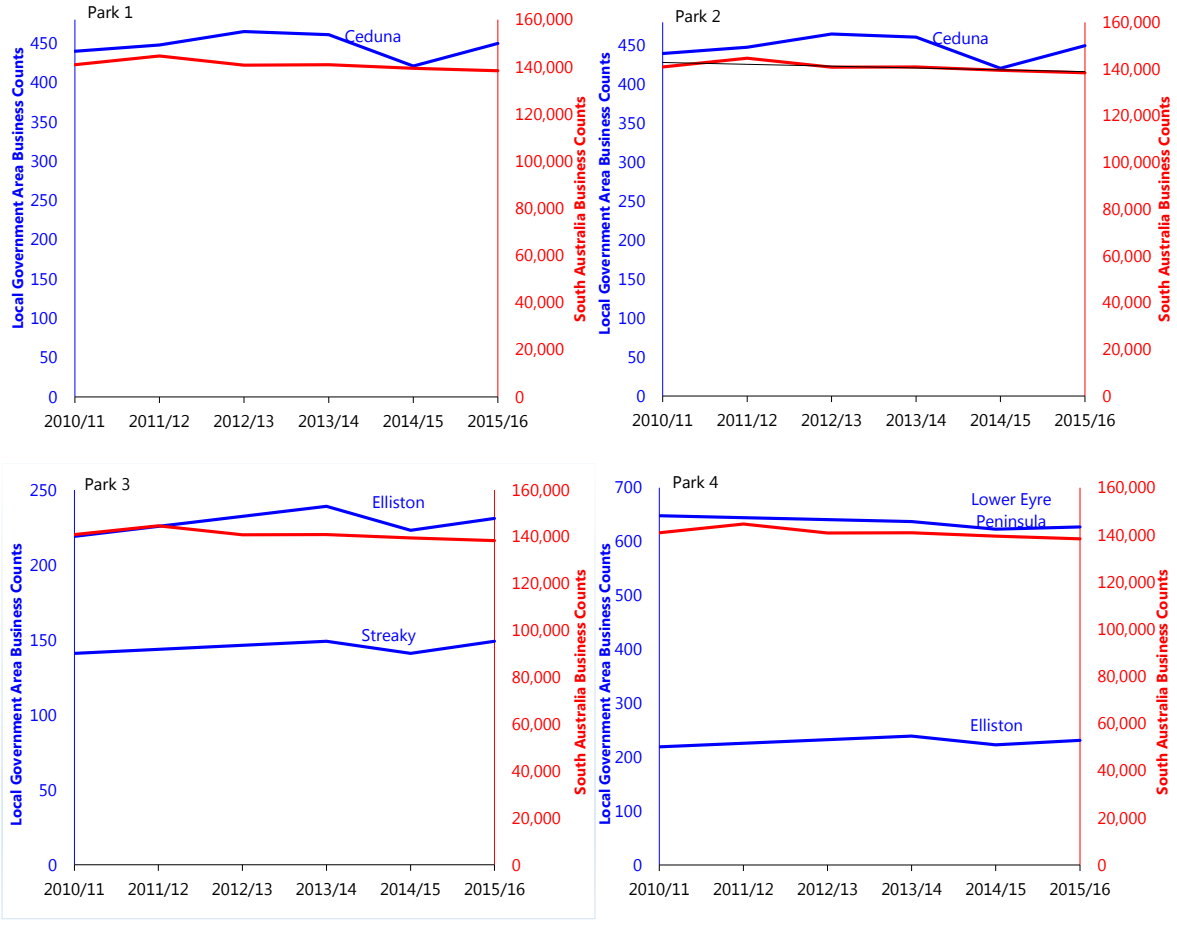


Figure 197. Business counts for Local Government Areas in each marine park, and South Australis's business counts. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

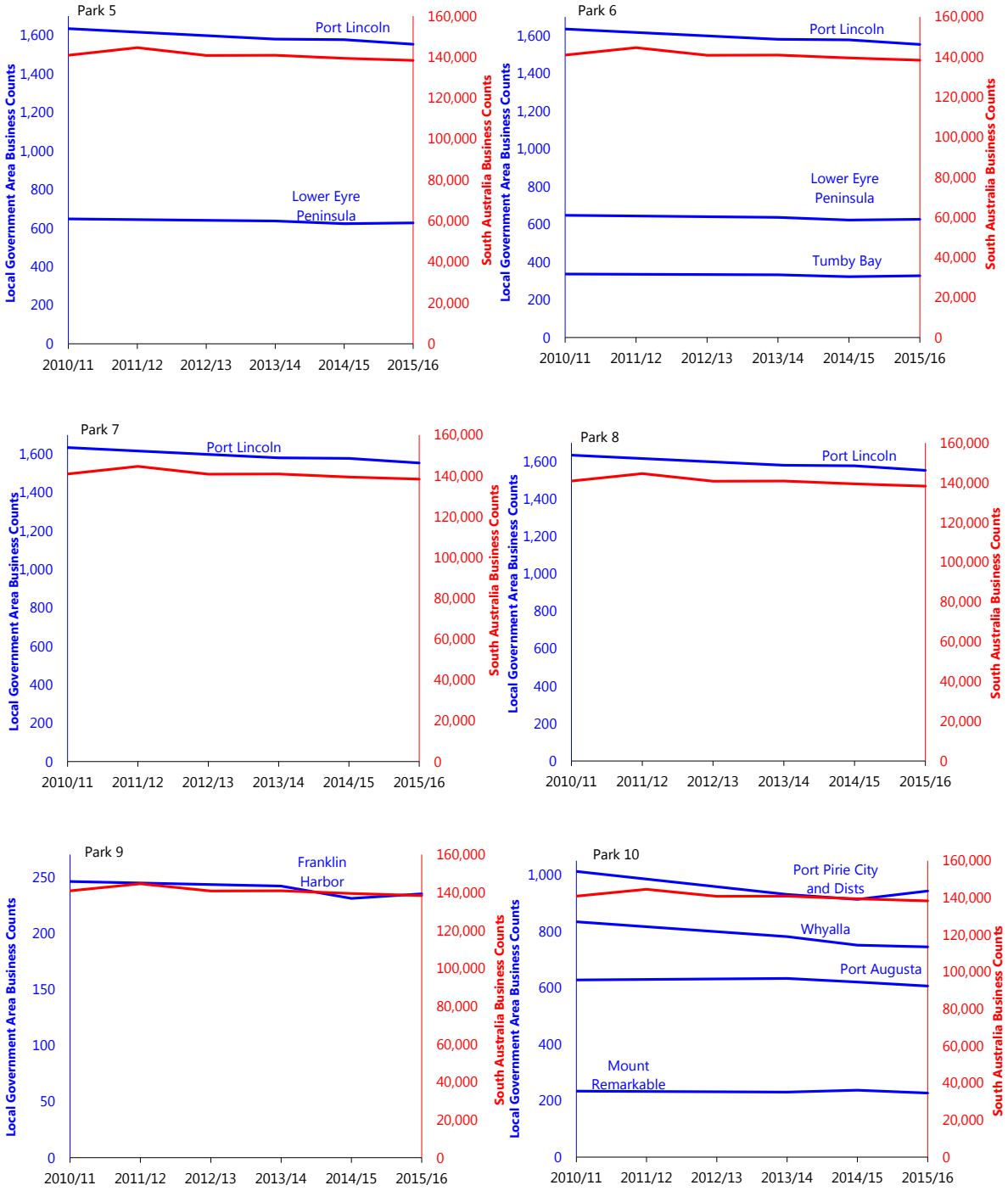


Figure 197 (cont'd). Business counts for Local Government Areas in each marine park, and South Australis's business counts. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

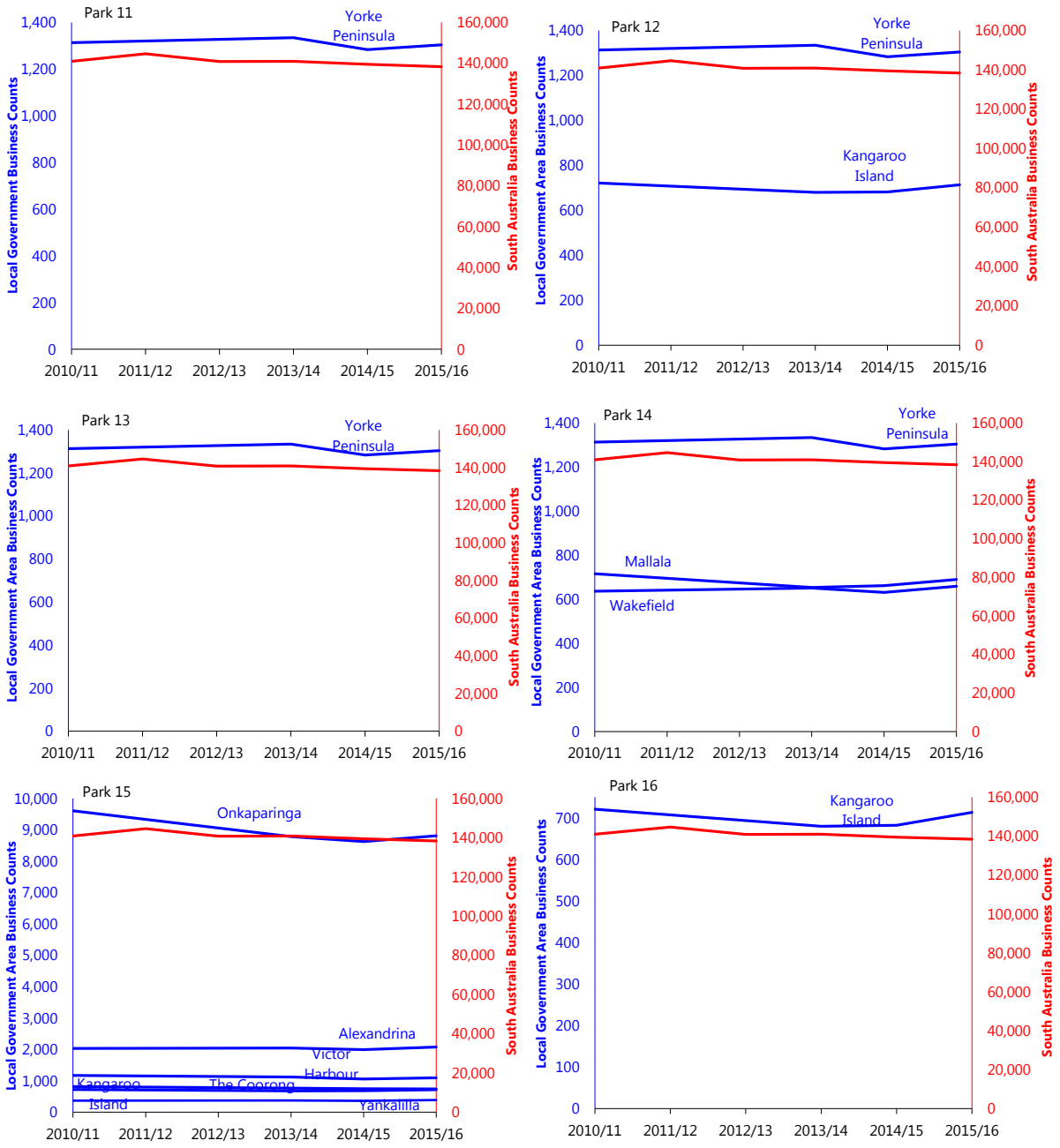


Figure 197 (cont'd). Business counts for Local Government Areas in each marine park, and South Australis's business counts. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

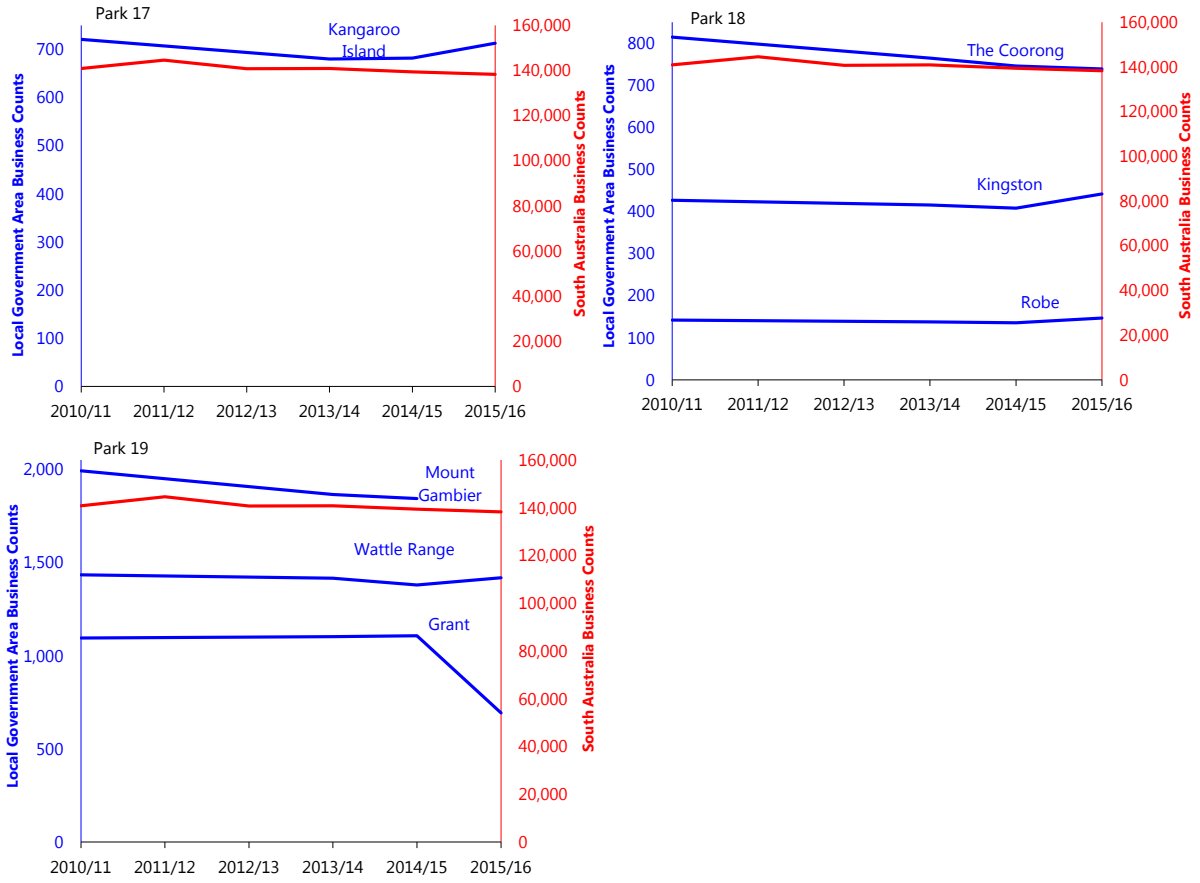


Figure 197 (cont'd). Business counts for Local Government Areas in each marine park, and South Australis's business counts. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

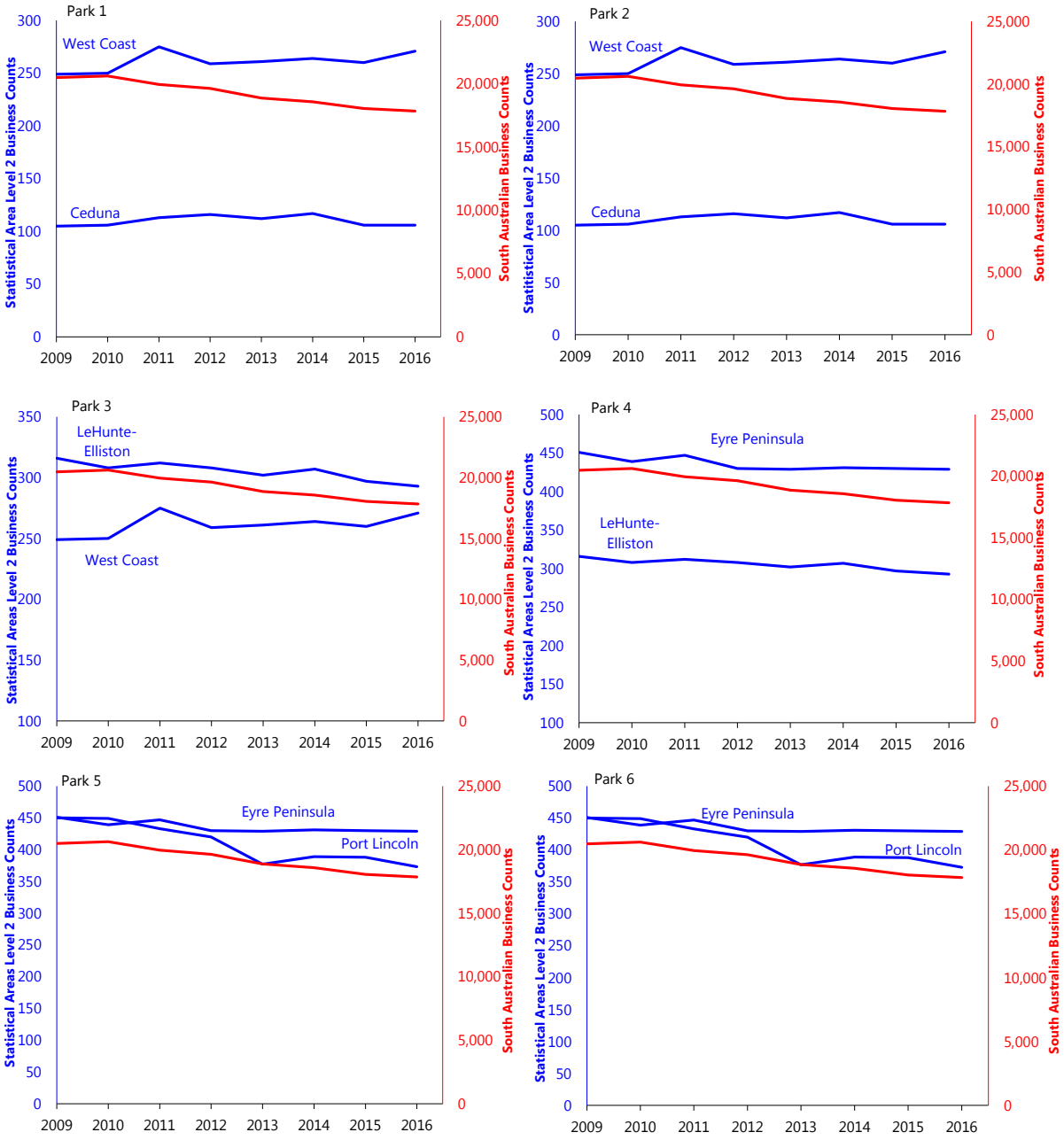


Figure 198. Business counts for the Agriculture, Forestry and Fishing sector for the Statistical Areas Level 2 for each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017b)

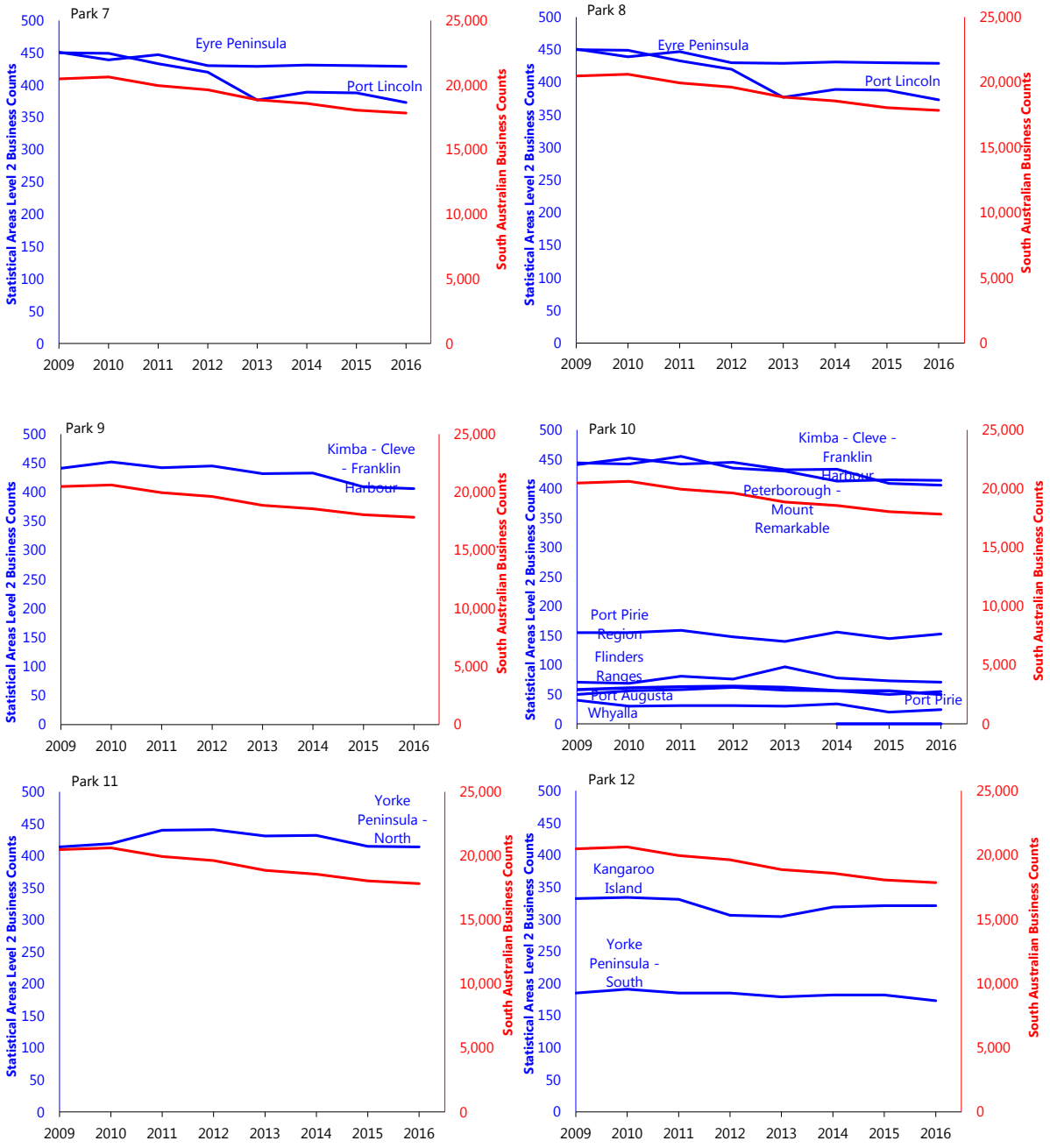


Figure 198 (cont'd). Business counts for the Agriculture, Forestry and Fishing sector for the Statistical Areas Level 2 for each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017b)

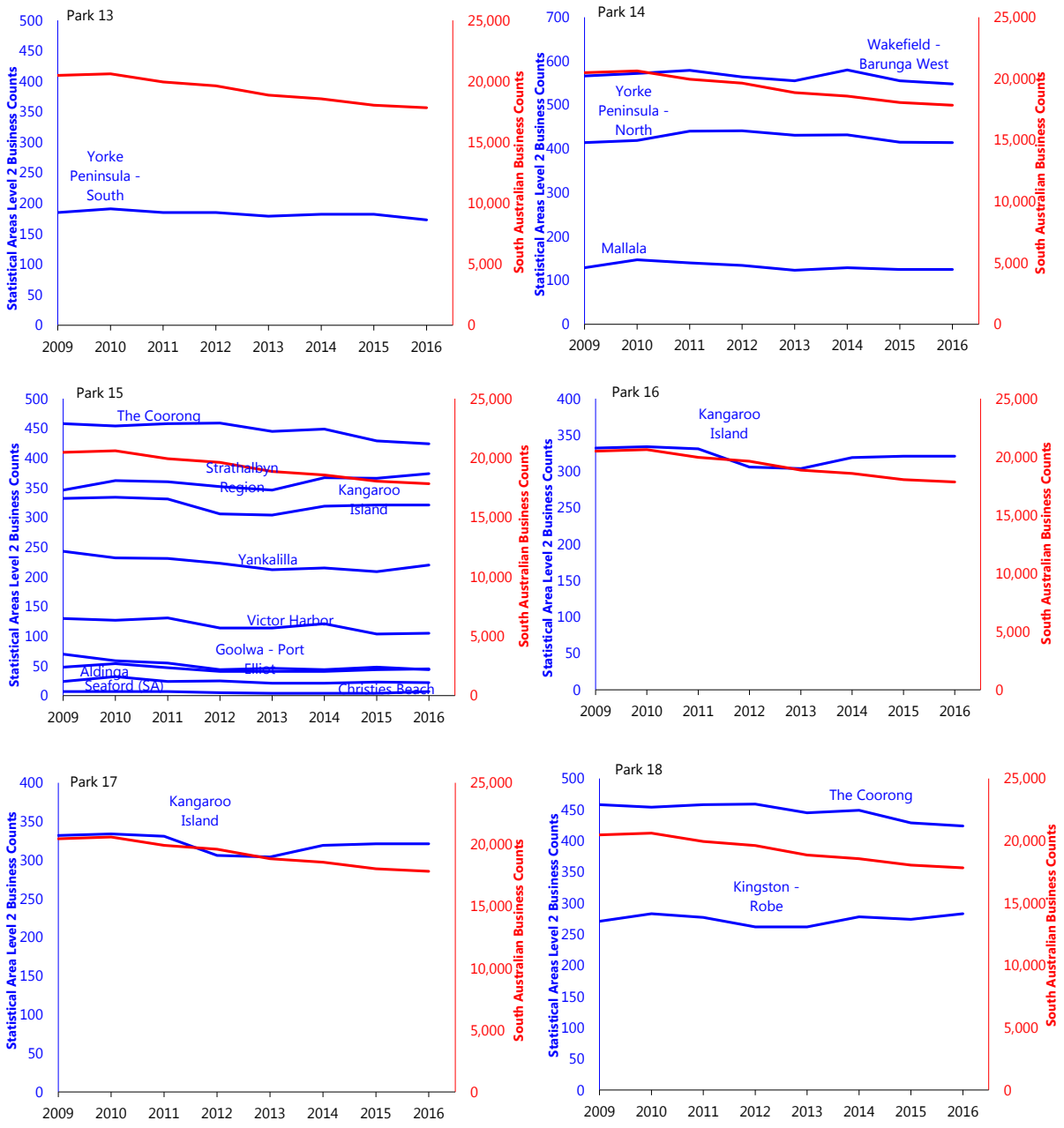


Figure 198 (cont'd). Business counts for the Agriculture, Forestry and Fishing sector for the Statistical Areas Level 2 for each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017b)

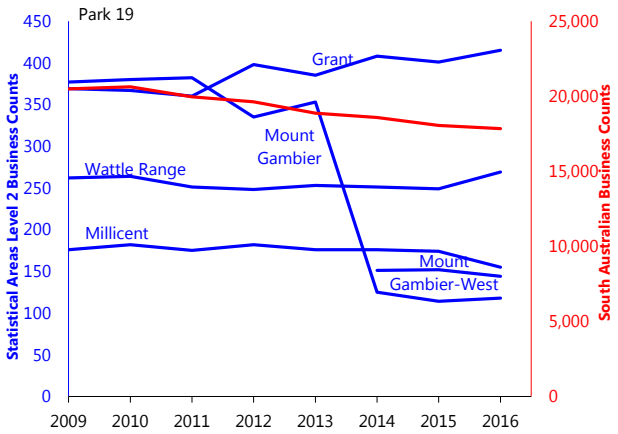


Figure 198 (cont'd). Business counts for the Agriculture, Forestry and Fishing sector for the Statistical Areas Level 2 for each marine park compared with South Australia. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017b)

Local Jobs

A count of jobs is one of the most fundamental economic indicators of the size of the local economy, and increasing numbers of jobs generally represent a growing economy. However, jobs are not necessarily full-time and the value of a job varies across areas. For this reason, job numbers should be viewed in conjunction with Employment by Industry (FTE) and Worker Productivity datasets (.id community 2017). This indicator shows the estimated number of jobs in the local area, on an annual basis from 2010/11.

The number of local jobs for LGAs has been estimated by the NIEIR between 2010/11 and 2015/16 (National Economics and .id 2017). These data are based on modelling from a number of sources, including tax data, and are more up-to-date than census data (National Economics and .id 2017). Trends since 2010/11 have been similar in many LGAs to that of the whole state (Figure 199).

There is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincide with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014. These observations are consistent with predictions of change (Table 71).

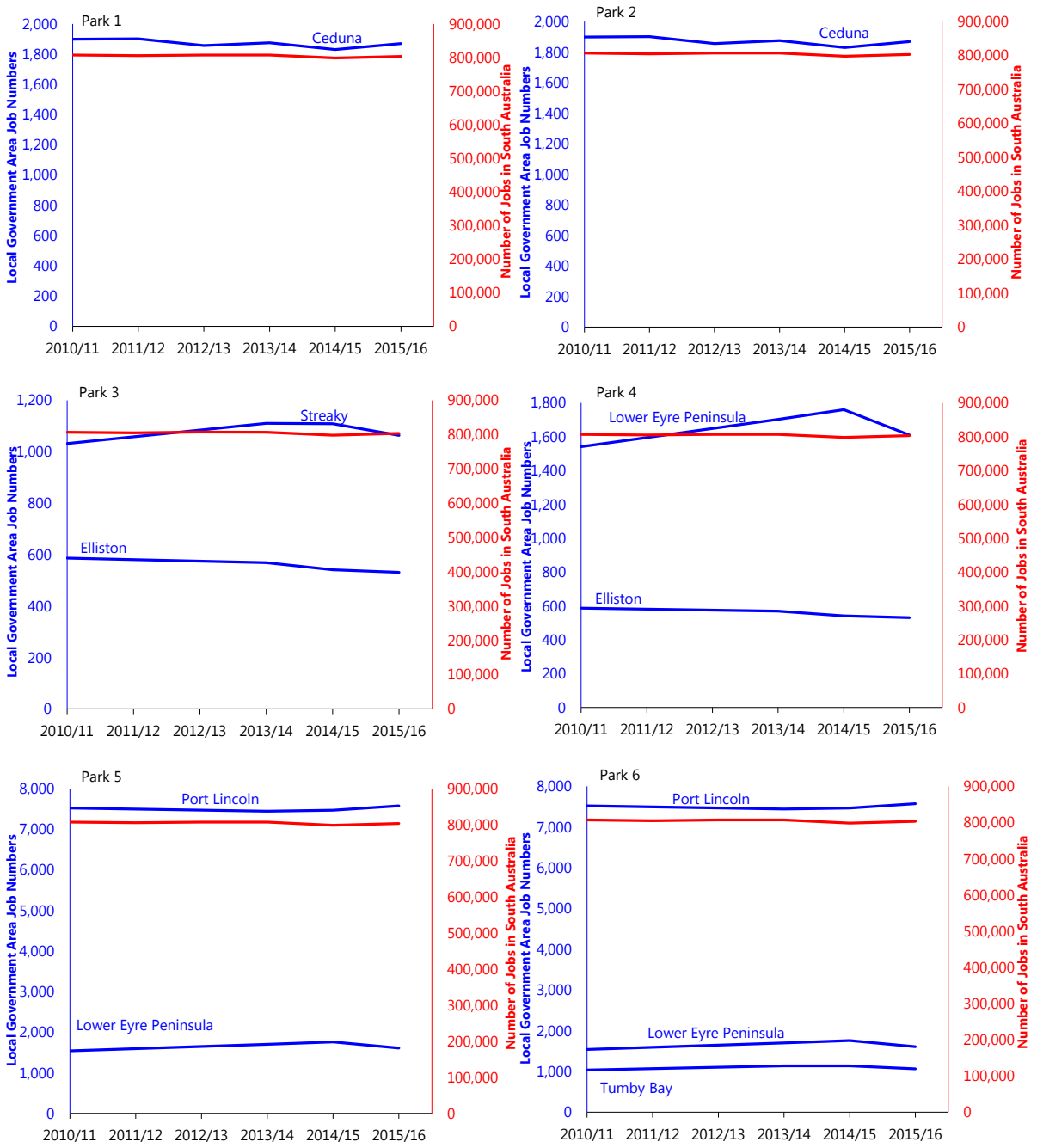


Figure 199. Local job numbers for the Local Government Areas for each marine park, and total state job numbers. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

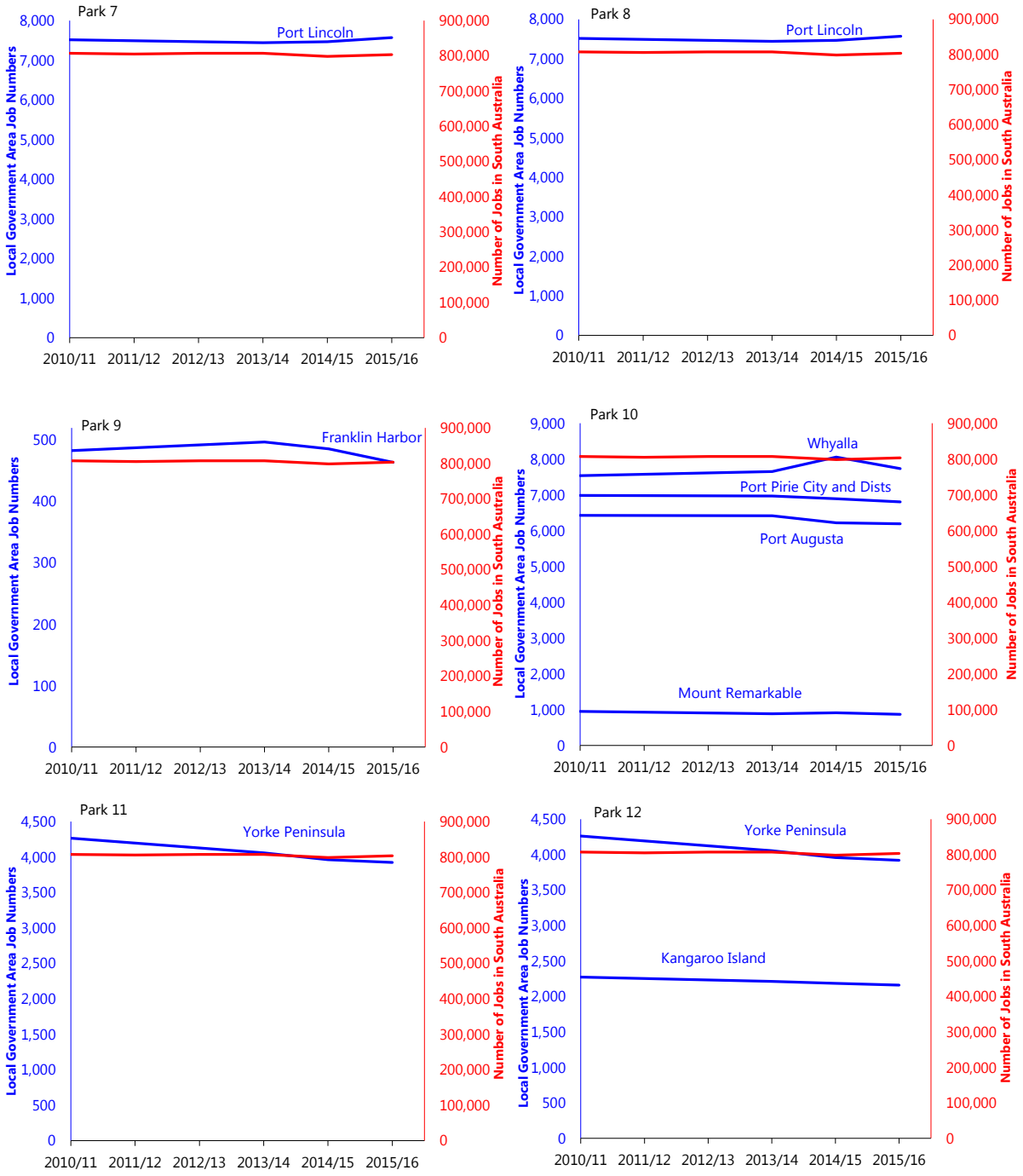


Figure 199 (cont'd). Local job numbers for the Local Government Areas for each marine park, and total state job numbers. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

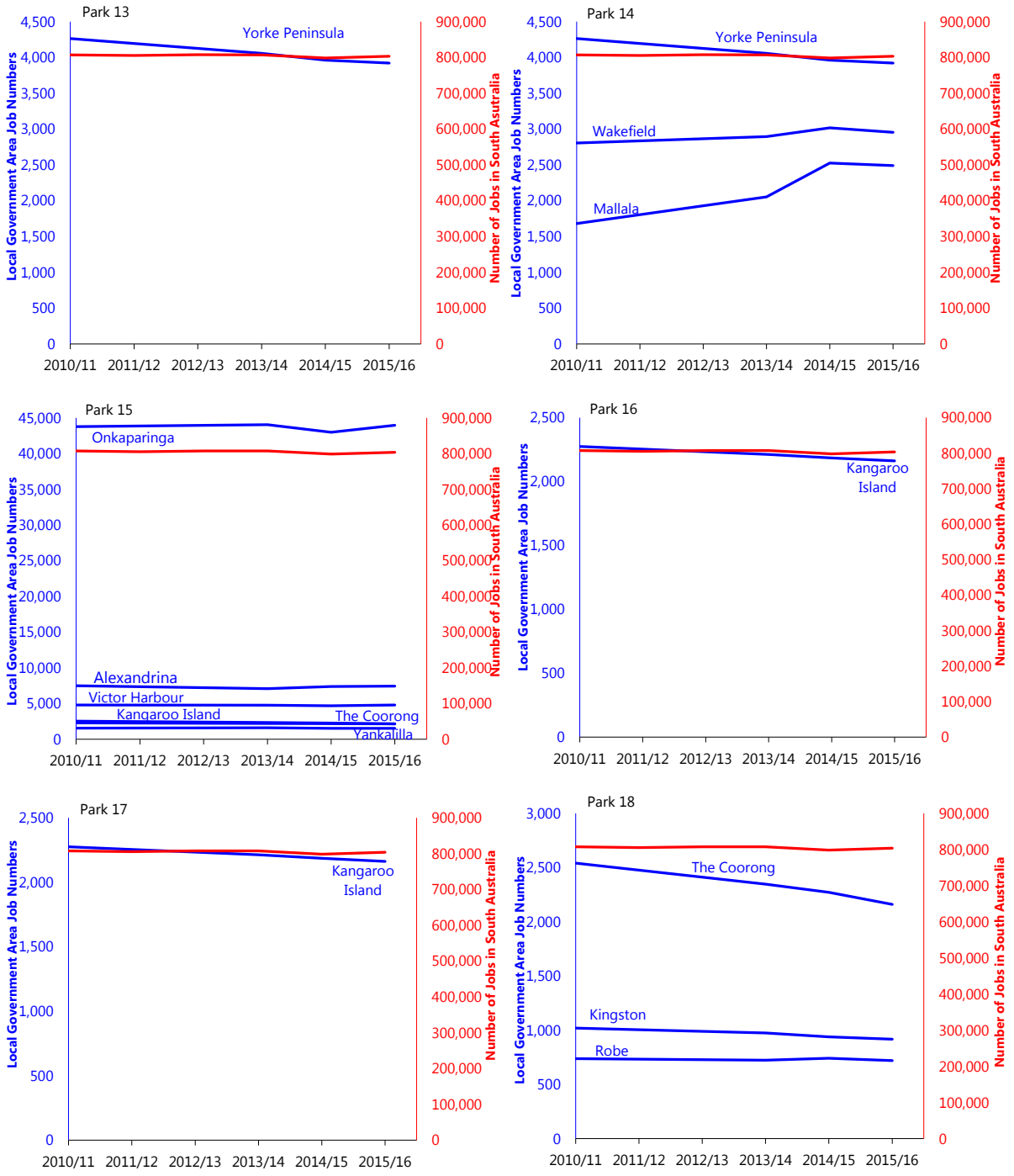


Figure 199 (cont'd). Local job numbers for the Local Government Areas for each marine park, and total state job numbers. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

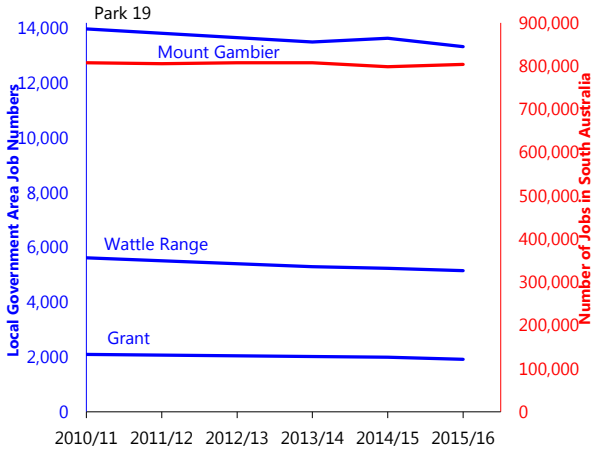


Figure 199 (cont'd). Local job numbers for the Local Government Areas for each marine park, and total state job numbers. Note marine park management plans were authorised in November 2012 and the sanctuary zones became fully operational on 1 October 2014. Source: National Economics and .id (2017)

Unemployment

Unemployment is an important indicator of the economic success of an area. A low unemployment rate can indicate an affluent area with a high rate of access to jobs, or a place where those who can't find jobs leave the area. A high rate can indicate a declining economy with closures of key industries, or a residential area with a significantly disadvantaged population (.id community 2017).

The unemployment rate is available from the Australian Government Department of Employment for Local Government Areas and Statistical Areas Level 2 since 2011, and for 2003 to 2013 for Statistical Local Areas (which generally follow local government boundaries). These data are available on a quarterly basis, smoothed using a four-quarter average (with unsmoothed data also available), but a focus on long-term annual comparisons is recommended (Department of Employment 2017). For the purposes of reporting, the quarterly data was averaged for each year to provide one data point per year. Unemployment is variable for all LGAs situtated next to marine parks (Figure 200). There is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincides with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014 (although in many LGAs the unemployment rate did drop after 2014). These observations are consistent with predictions of change (Table 71).

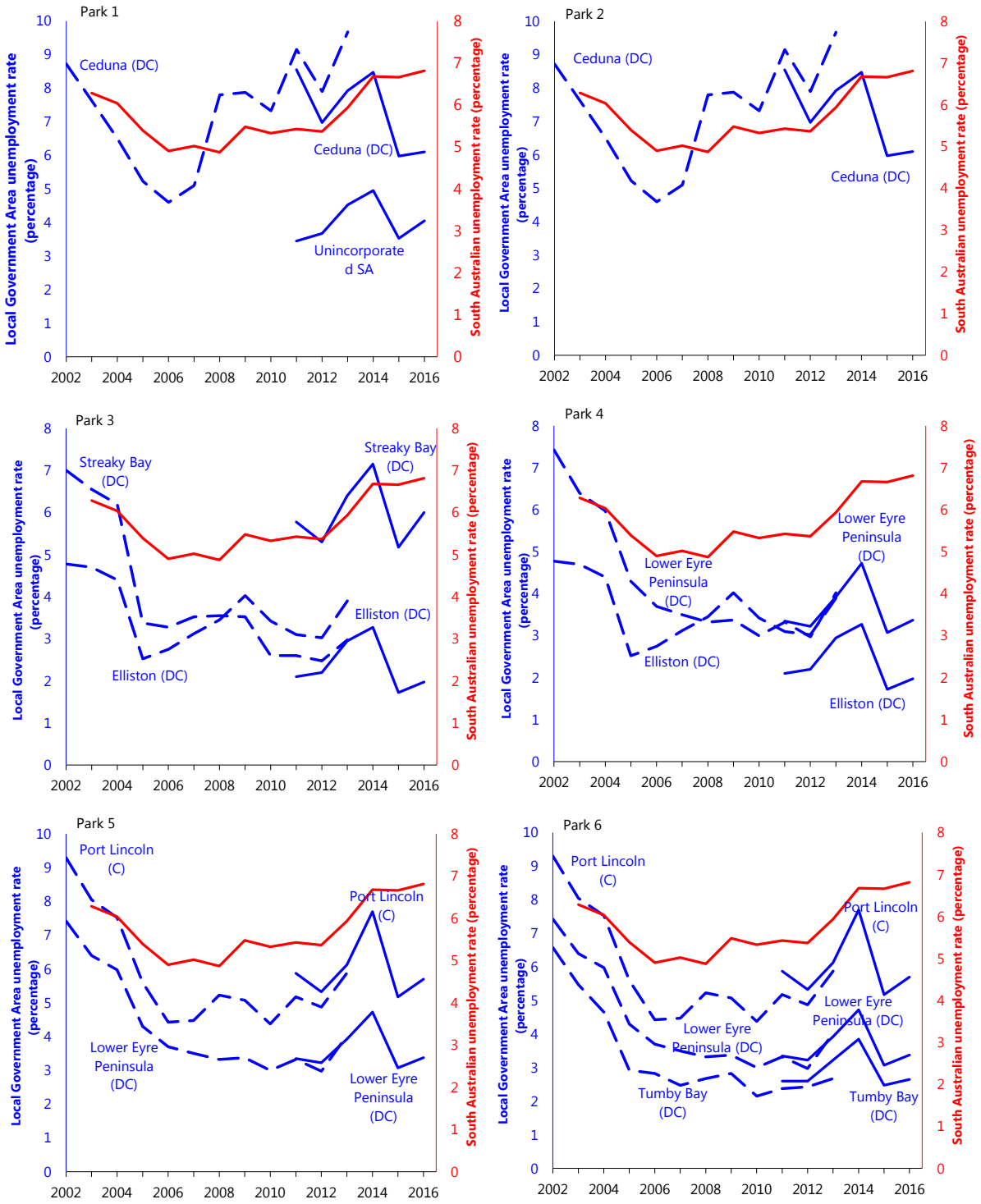


Figure 200. Unemployment rate (quarterly) in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Department of Employment (2017)

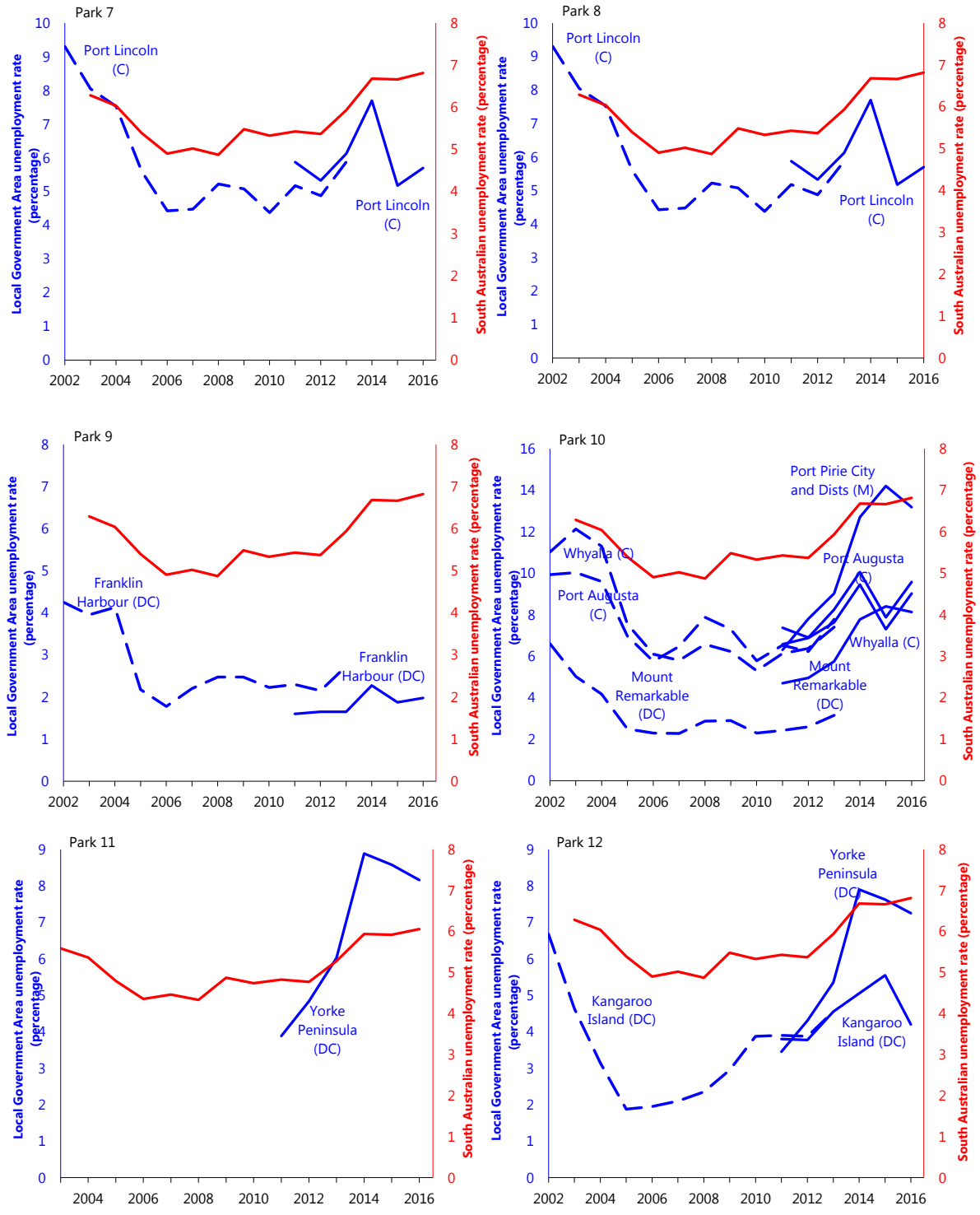


Figure 200 (cont'd). Unemployment rate (quarterly) in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Department of Employment (2017)

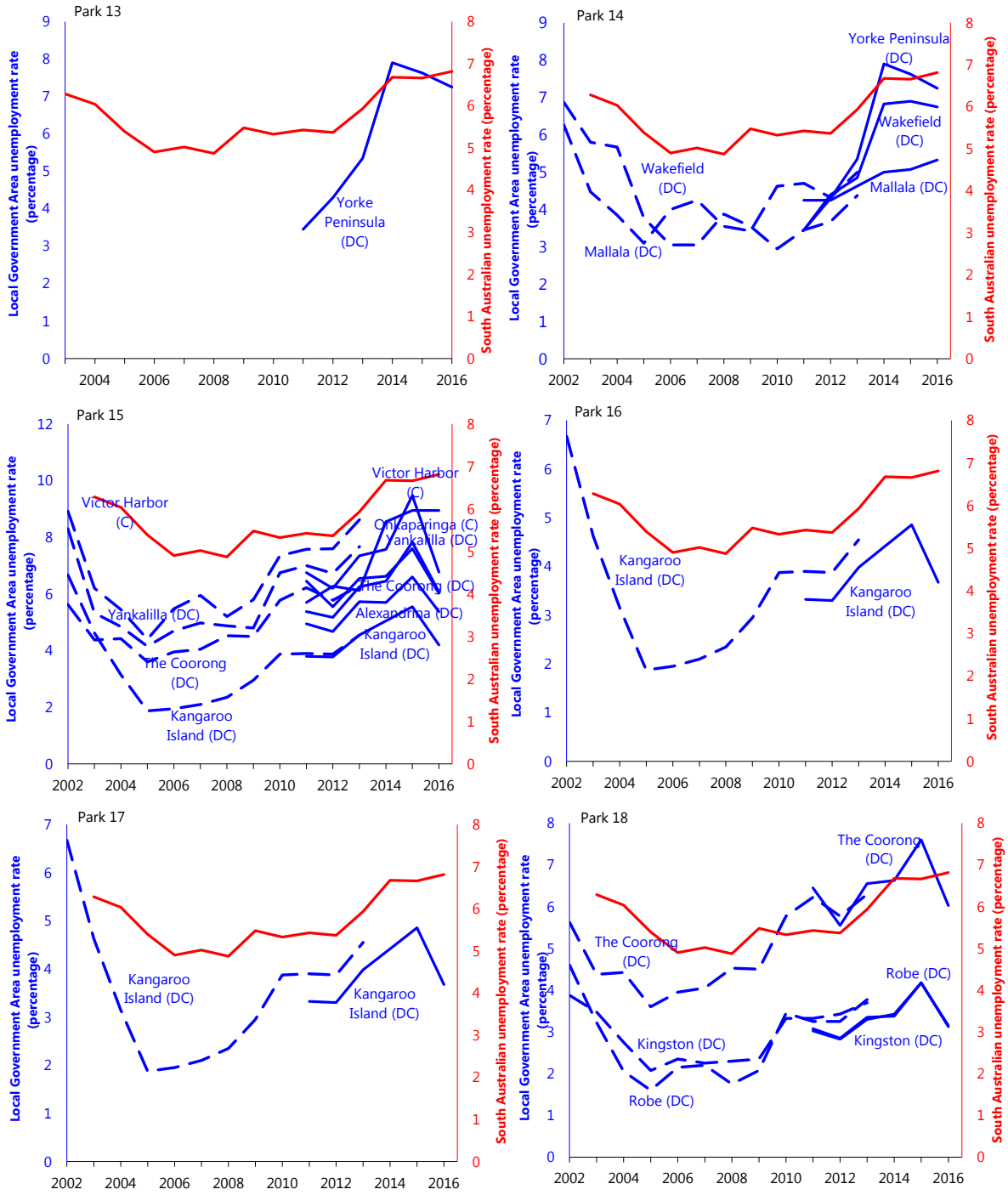


Figure 200 (cont'd). Unemployment rate (quarterly) in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Department of Employment (2017)

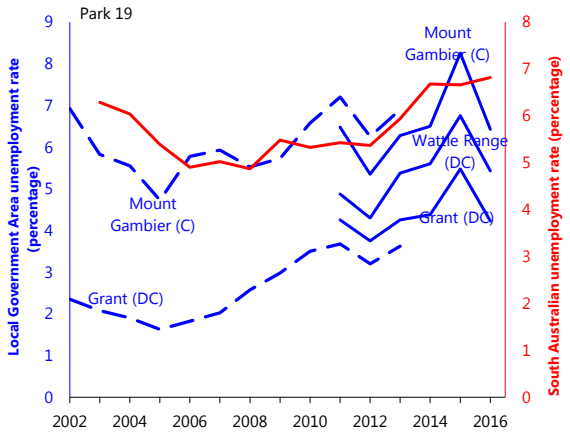


Figure 200 (cont'd). Unemployment rate (quarterly) in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Department of Employment (2017)

Number and value of residential building approvals

Information on buildings and properties is an economic indicator for regional communities and was an area of focus for previous regional economic impact assessments of the marine park network (Kosturjak et al. 2015). Building approvals data are considered to be one of the higher quality sources of information about regional economic activity (Kosturjak et al. 2015). Building approvals for an area can be highly variable over time. A high rate of building approvals can indicate a growth area with a construction-led economy. A low rate of building approvals may indicate a settled area with established infrastructure, or an area with little growth (.id community 2017).

The ABS provides monthly updates and annual summaries of the number and value of residential building approvals (ABS 2017c). This information is available for Statistical Areas Level 2 since 2011/12, for LGAs since 2012/13 and for Statistical Local Areas (similar to LGAs) between 2002/03 and 2011/12. Residential building approvals and value have been variable since 2006/07. Patterns in the regional LGAs are generally quite different to the overall state pattern and are variable across the different LGAs (Figure 201, Figure 202). For example, in some LGAs building approvals rose from 2012/13 to 2013/14 but have since declined (e.g. Streaky Bay, Port Lincoln, Yorke Peninsula) while in others the pattern across that same time period has been quite different (e.g. Onkaparinga, Kangaroo Island). Overall there is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincide with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014 (Figure 201, Figure 202). These observations are consistent with predictions of change (Table 71).

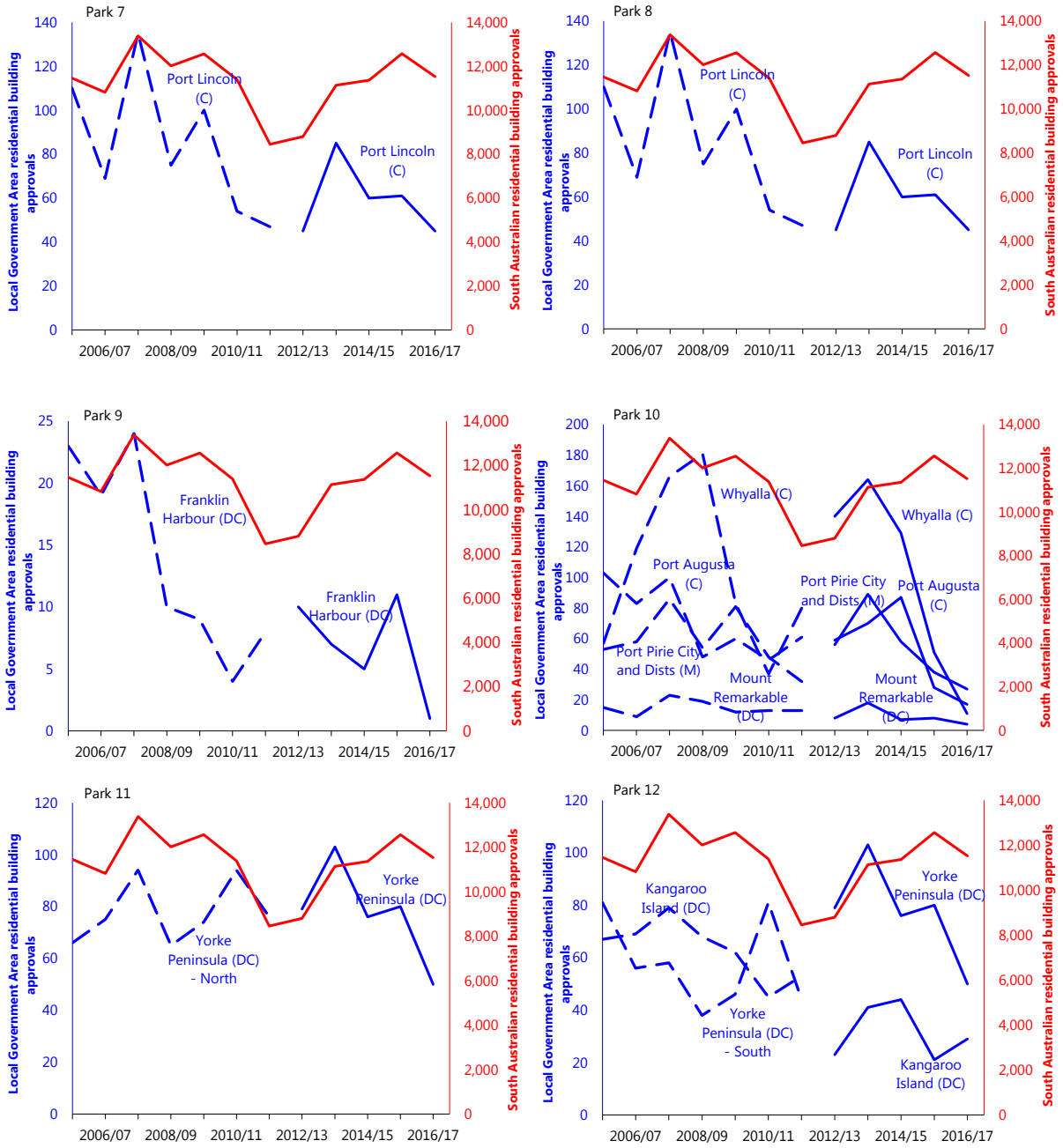


Figure 201. Residential building approvals in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

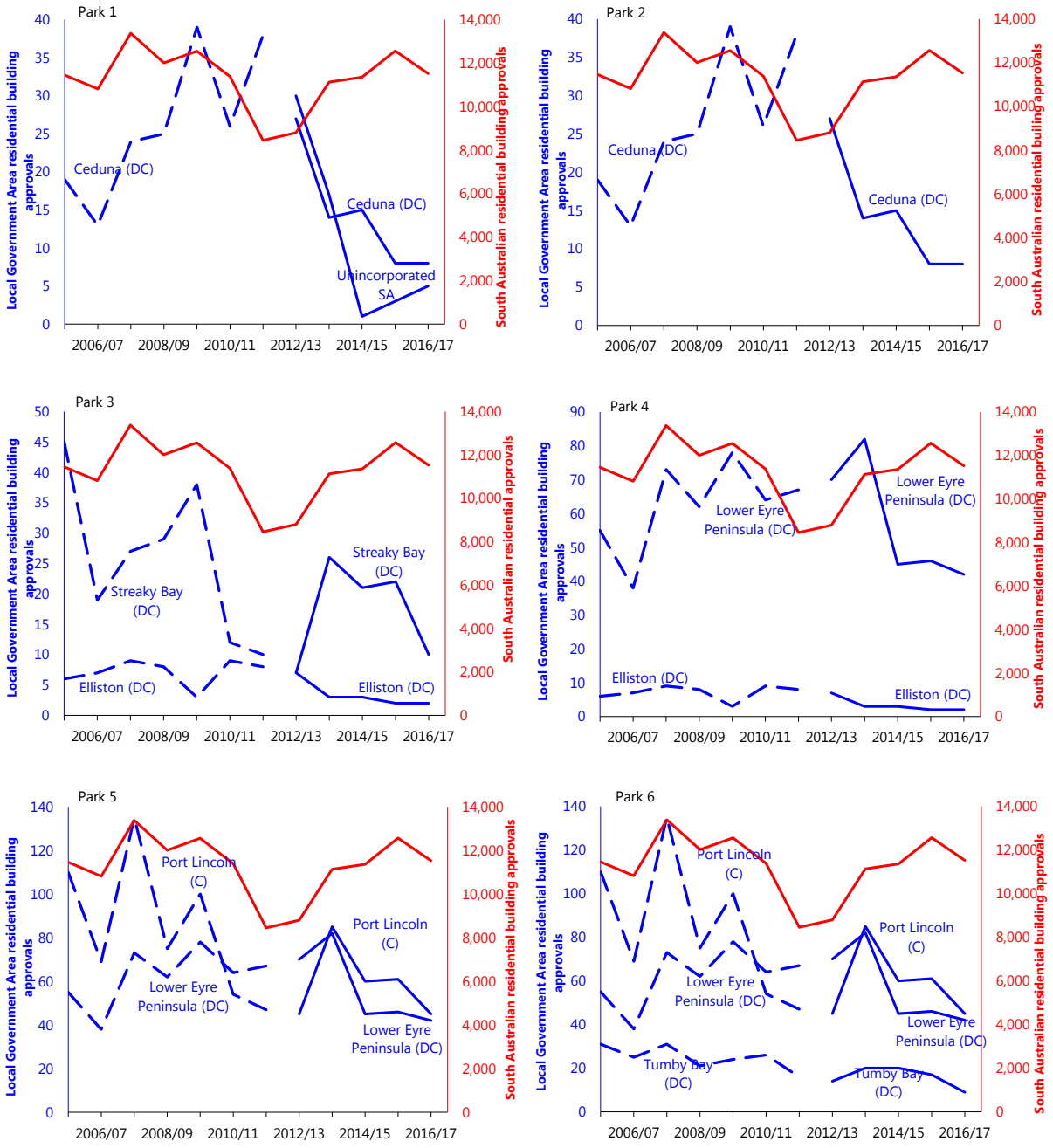


Figure 201 (cont'd). Residential building approvals in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

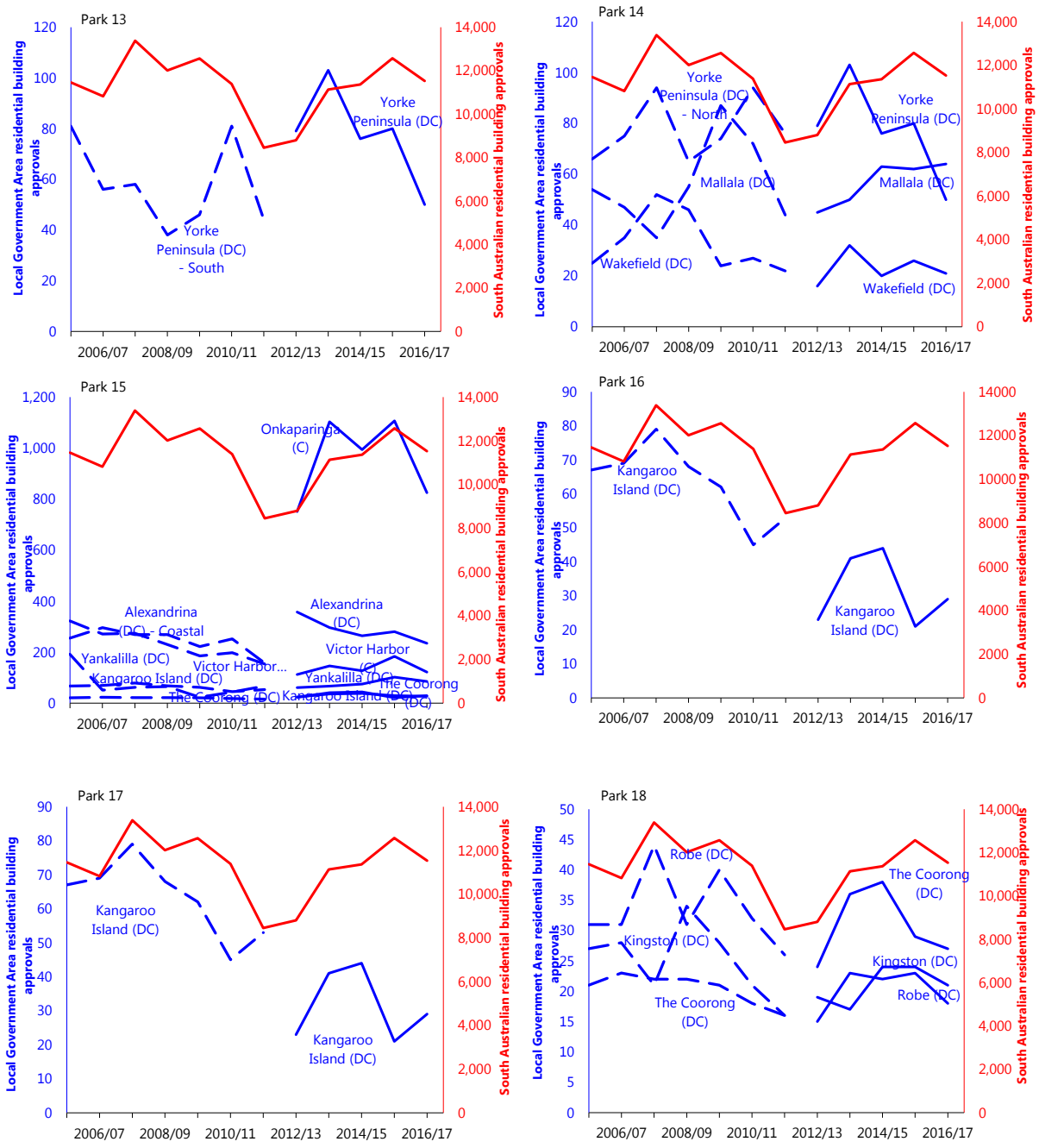


Figure 201 (cont'd). Residential building approvals in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

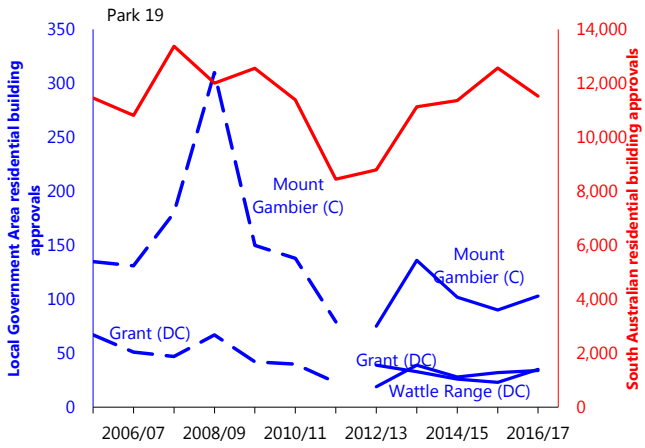


Figure 201 (cont'd). Residential building approvals in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Local Areas which is similar to the Local Government Area, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

Figure 202. Residential building value in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Areas Level 2 (see Appendix map) which is similar to the Local Government Areas, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

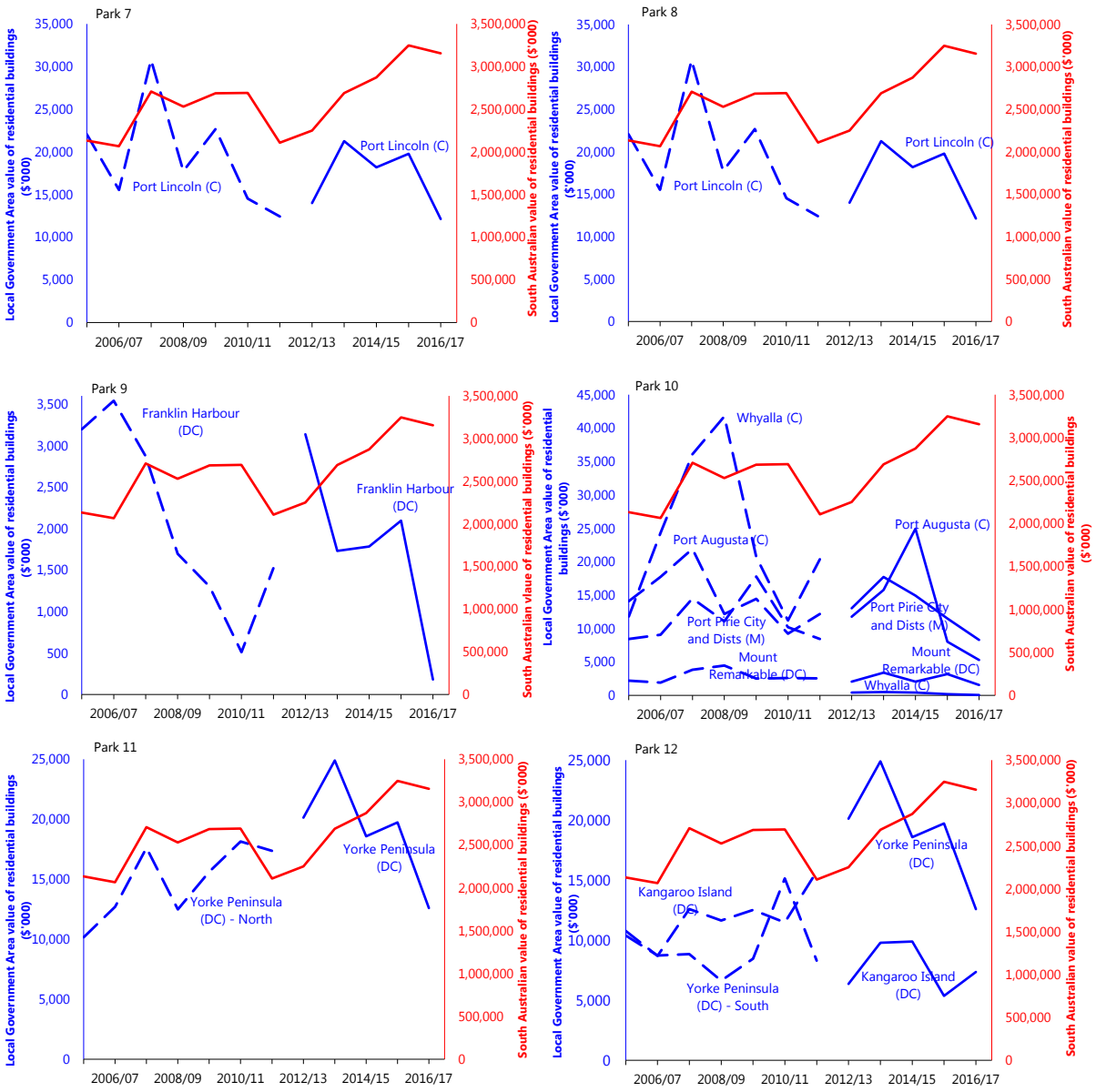


Figure 202 (cont'd). Residential building value in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Areas Level 2 (see Appendix map) which is similar to the Local Government Areas, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

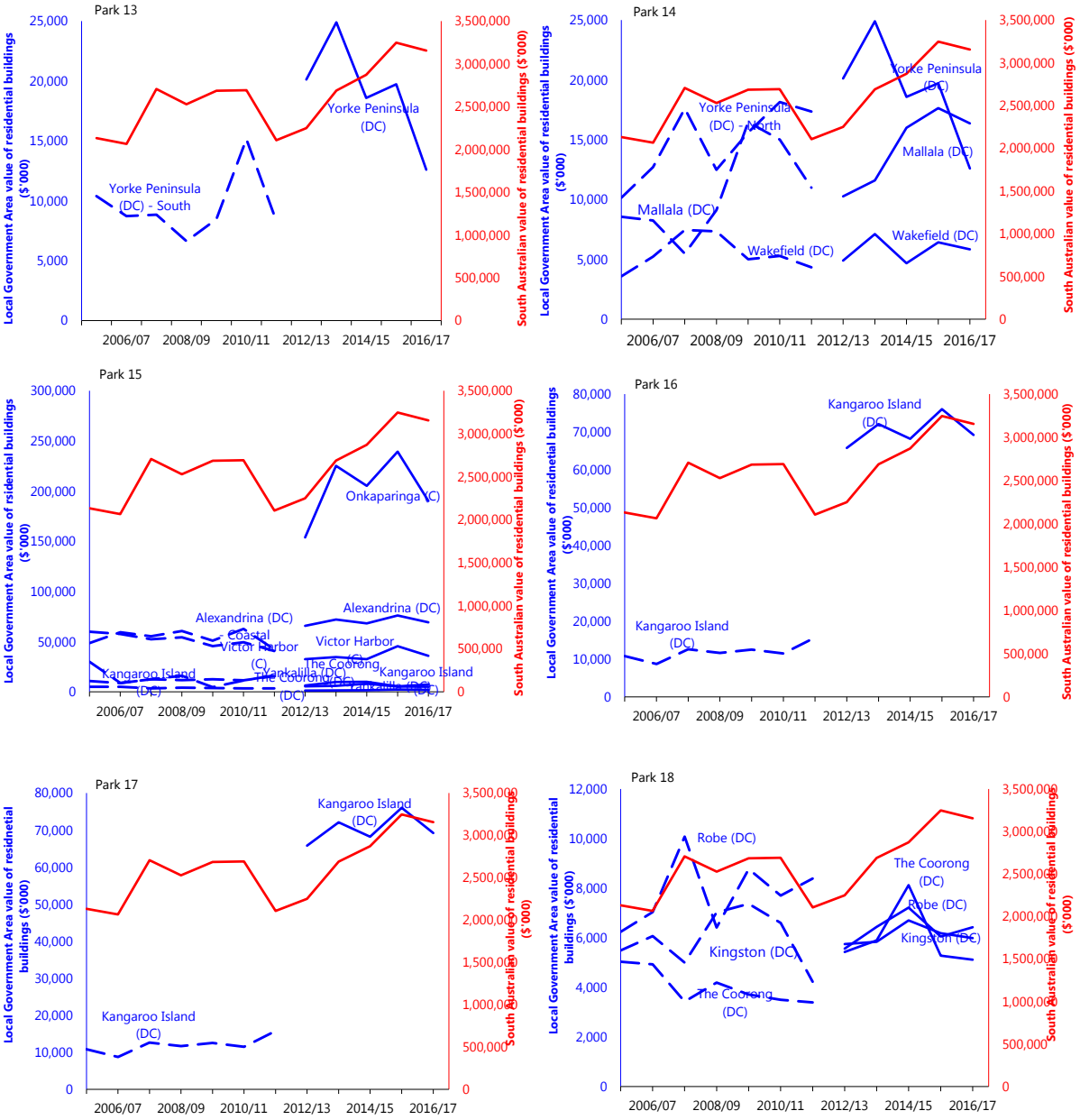


Figure 202 (cont'd). Residential building value in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Areas Level 2 (see Appendix map) which is similar to the Local Government Areas, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

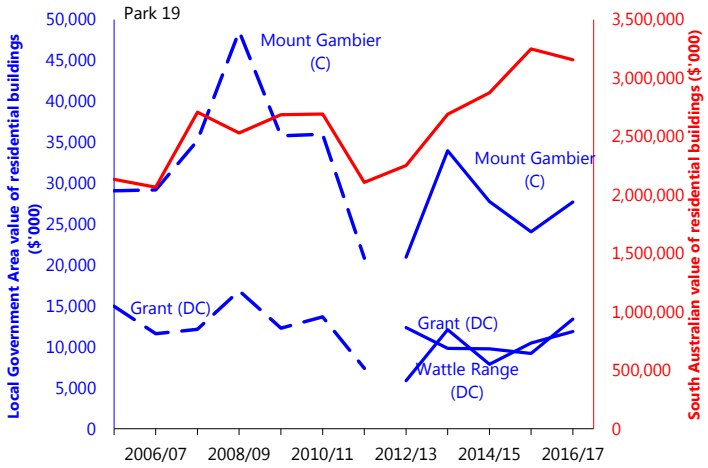


Figure 202 (cont'd). Residential building value in the Local Government Areas for each marine park compared with South Australia. Dashed blue line shows data for the Statistical Areas Level 2 (see Appendix map) which is similar to the Local Government Areas, but is no longer used for reporting. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: ABS (2017c)

House sale prices

This indicator shows the median sales price of houses in the LGAs for each marine park during the period 1990–2016. Housing sale prices are an indicator of the level of demand for housing in the area, as well as the type of housing available. Housing demand may be related to the desirability of the area and proximity to major employment destinations (.id community 2017).

The Department of Planning, Transport and Infrastructure maintains a database of properties which includes the most recent sales price and valuations by the Valuer-General (DEWNR 2017a). The median house price for all LGAs adjacent to marine parks is variable (Figure 203). The long-term increasing trend for the whole state is generally also seen in the regions at the LGA-scale. There is no indication of a consistent perturbation in the trend (positive or negative) across the different LGAs that coincide with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014. These observations are consistent with predictions of change (Table 71).

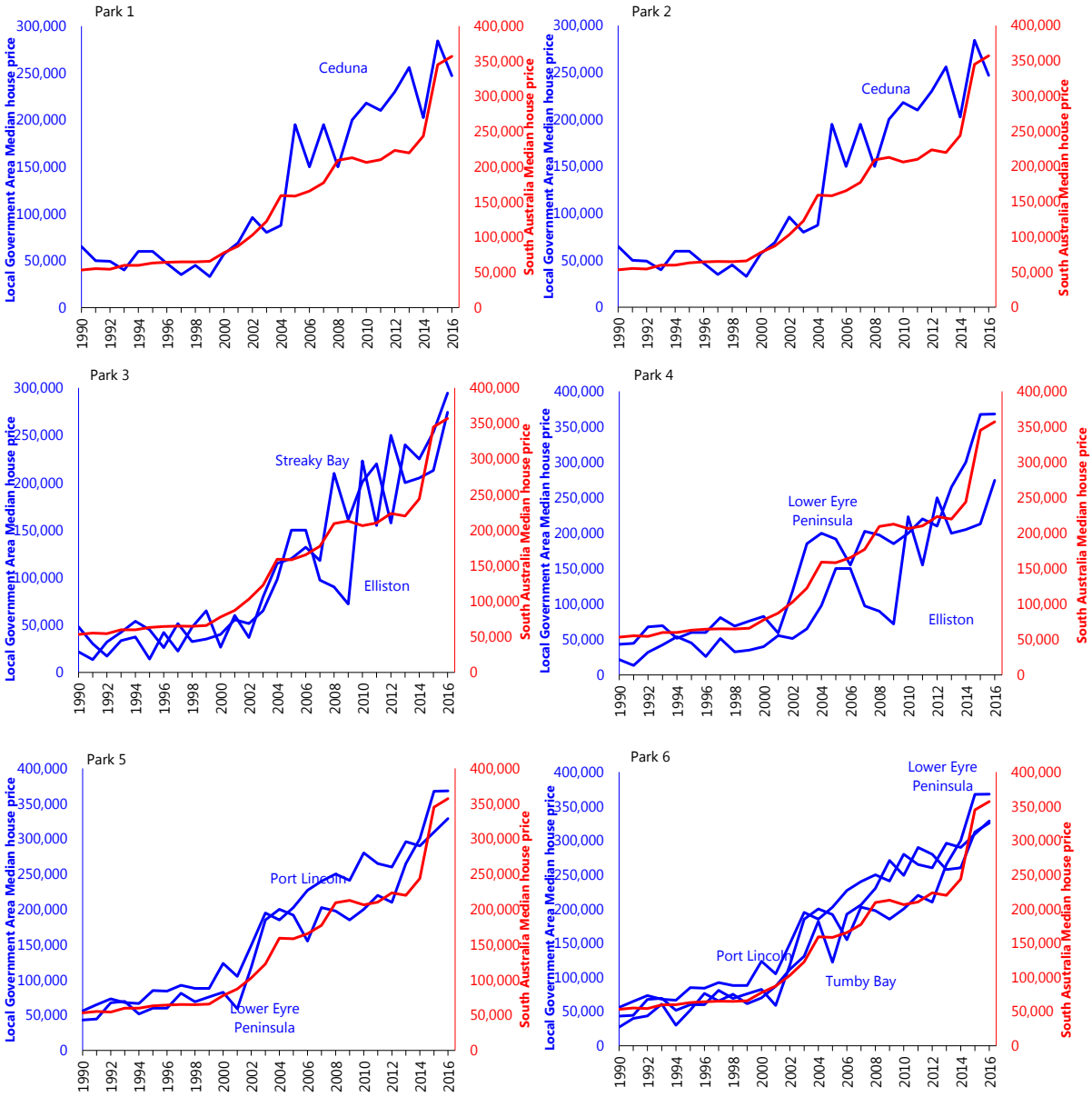


Figure 203. Median sale price for residential properties for Local Government Areas adjacent to marine parks. For each property, these data only include a transfer of the full value and whole of land. There is potential volatility in the median price due to random fluctuations in the quality of properties sold in particular years. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR (2017a)

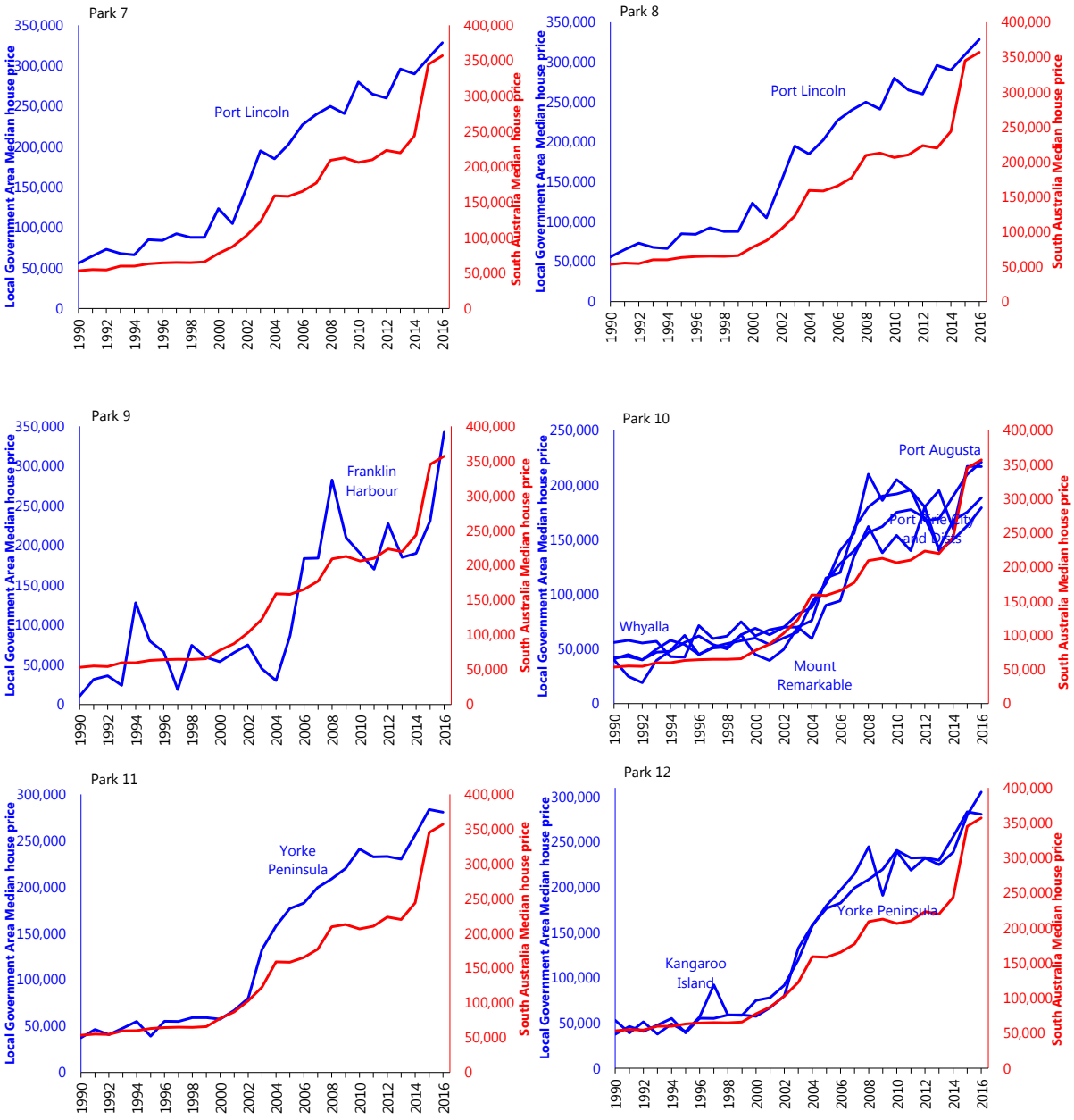


Figure 203 (cont'd). Median sale price for residential properties for Local Government Areas adjacent to marine parks. For each property, these data only include a transfer of the full value and whole of land. There is potential volatility in the median price due to random fluctuations in the quality of properties sold in particular years. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR (2017a)

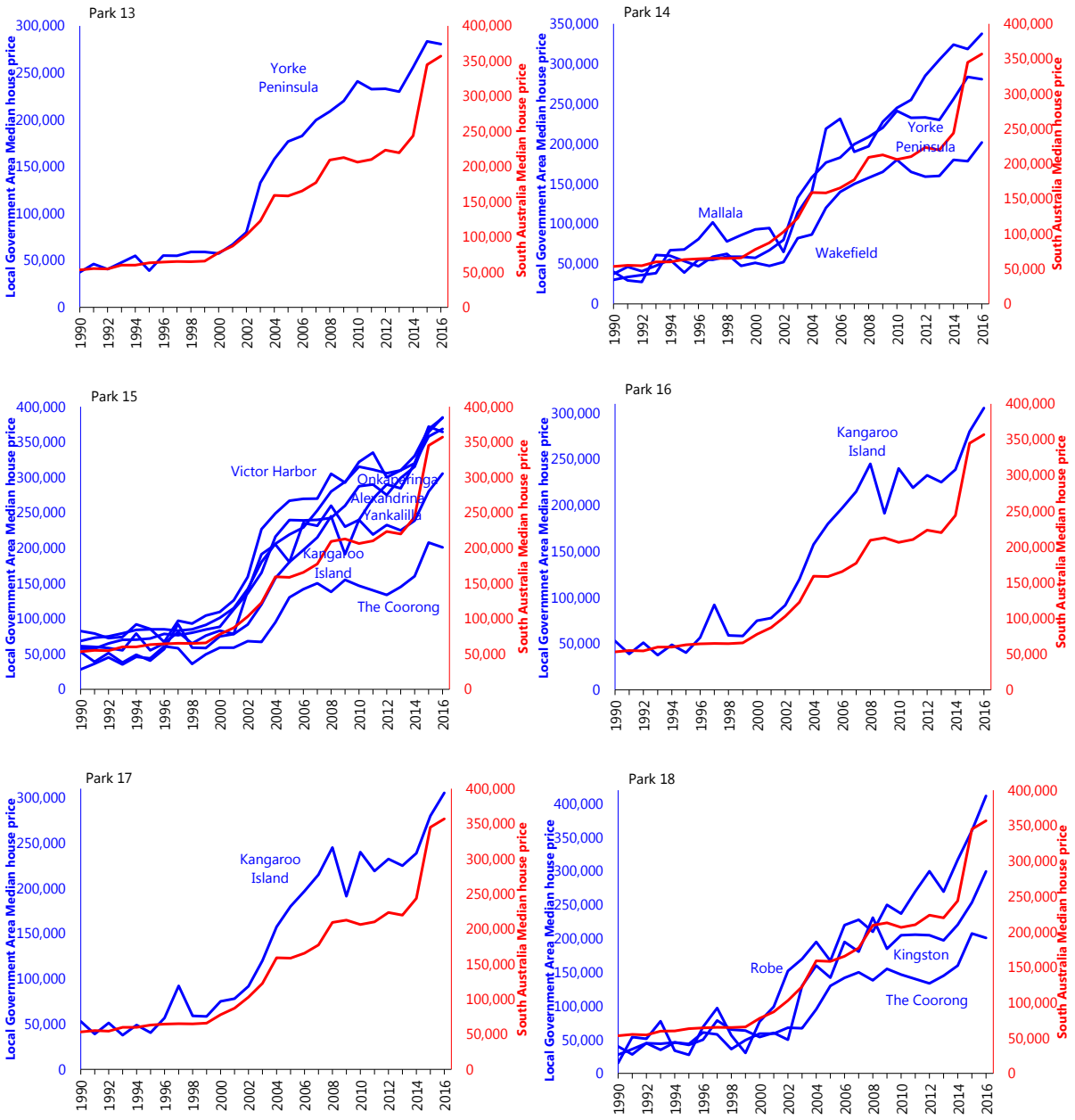


Figure 203 (cont'd). Median sale price for residential properties for Local Government Areas adjacent to marine parks. For each property, these data only include a transfer of the full value and whole of land. There is potential volatility in the median price due to random fluctuations in the quality of properties sold in particular years. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR (2017a)

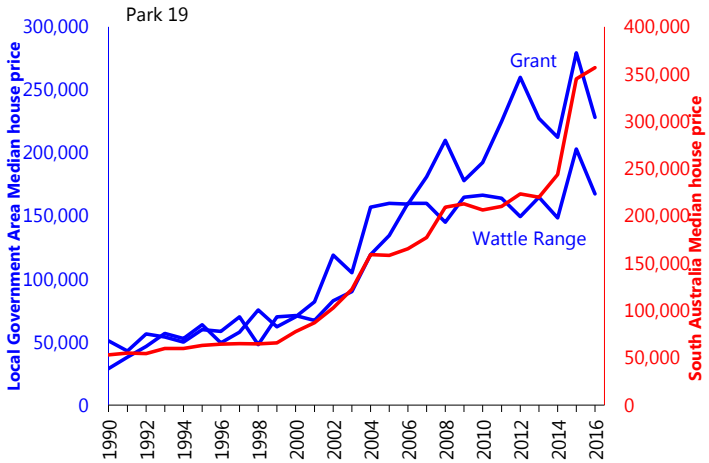


Figure 203 (cont'd). Median sale price for residential properties for Local Government Areas adjacent to marine parks. For each property, these data only include a transfer of the full value and whole of land. There is potential volatility in the median price due to random fluctuations in the quality of properties sold in particular years. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR (2017a)

Index of socio-economic advantage and disadvantage

Socio-economic advantage and disadvantage can be defined in terms of the access that people have to resources (material and social) and their ability to participate in society (ABS 2011a). This integrated indicator has not been used in previous impact assessments of marine parks in South Australia, but it could be used to track the socio-economic condition of regional communities.

The ABS ranks Statistical Areas Level 1 and 2, and LGAs, according to an index of relative socio-economic advantage and disadvantage based on income, education, employment, occupation, housing and other information from the five-yearly census (ABS 2011a). This information is currently only available from the 2006 and 2011 census. Information from the 2016 census regarding the socio-economic advantage disadvantage index was unavailable at the time of preparing this Status Report.

Community resilience to change

'Community resilience to change' is directly related to the socio-economic advantage and disadvantage index. Information for this indicator was unavailable at the time of preparing this Status Report.

Level of community support for and perceptions on marine parks

Community perception and acceptance of marine parks is widely acknowledged as being critical for success. Success is often predicated on local support for marine parks as well as conservation which is strongly influenced by perceptions of the impacts that are experienced by local communities and opinions of management and governance. Marine parks can have a broad array of positive and negative social, economic, cultural, and political impacts on local communities.

Regular phone surveys of the general public gauge community support and perceptions on a range of factors related to the marine environment and marine parks in South Australia. In almost every year since 2006, a representative sample of adult South Australians from across the state has been telephone interviewed. The structure of the survey has been changed over the years to reflect the progression from planning through to full implementation of marine parks. Thus some questions have remained unchanged since 2006 while others have been introduced post-implementation. As education activities are aimed at increasing public support it was predicted that the pre-marine parks trend would be maintained or improved post-marine parks (Table 71).

Public support for marine parks to protect marine plants and animals **in general** has averaged 88 per cent between 2006 and 2017. Public support for marine parks to protect marine plants and animals **in their local area** is lower than general support and has averaged 70 per cent between 2006 and 2017. The most recent survey shows 91 per cent of South Australians are in favour of marine parks in general and 78 per cent are in favour in their local area (Figure 204). Support for marine parks has increased since 2015. These observations are consistent with predictions of change (Table 71).

Since 2015, respondents have been asked if they feel there have been changes to local businesses in the areas where they reside or visit since the introduction of sanctuary zones. The majority of survey participants feel there has been no change to businesses both where they reside as well as visit since the introduction of sanctuary zones (Figure 205, Figure 206).

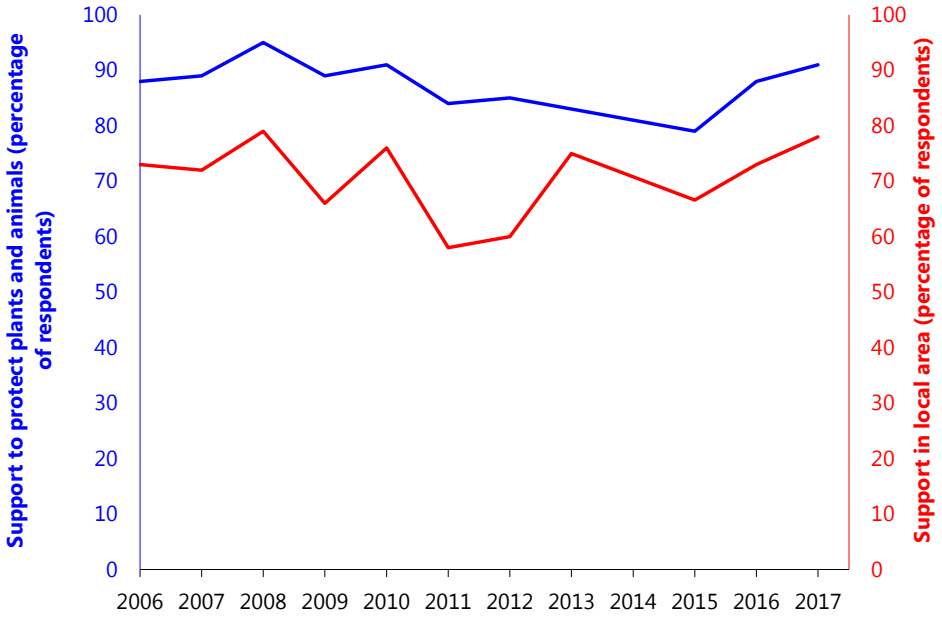


Figure 204. Percentage of statewide phone survey respondents who are in favour of marine parks to protect marine plants and animals. No data are available for 2014 or for general support in 2013. Source: DEWNR

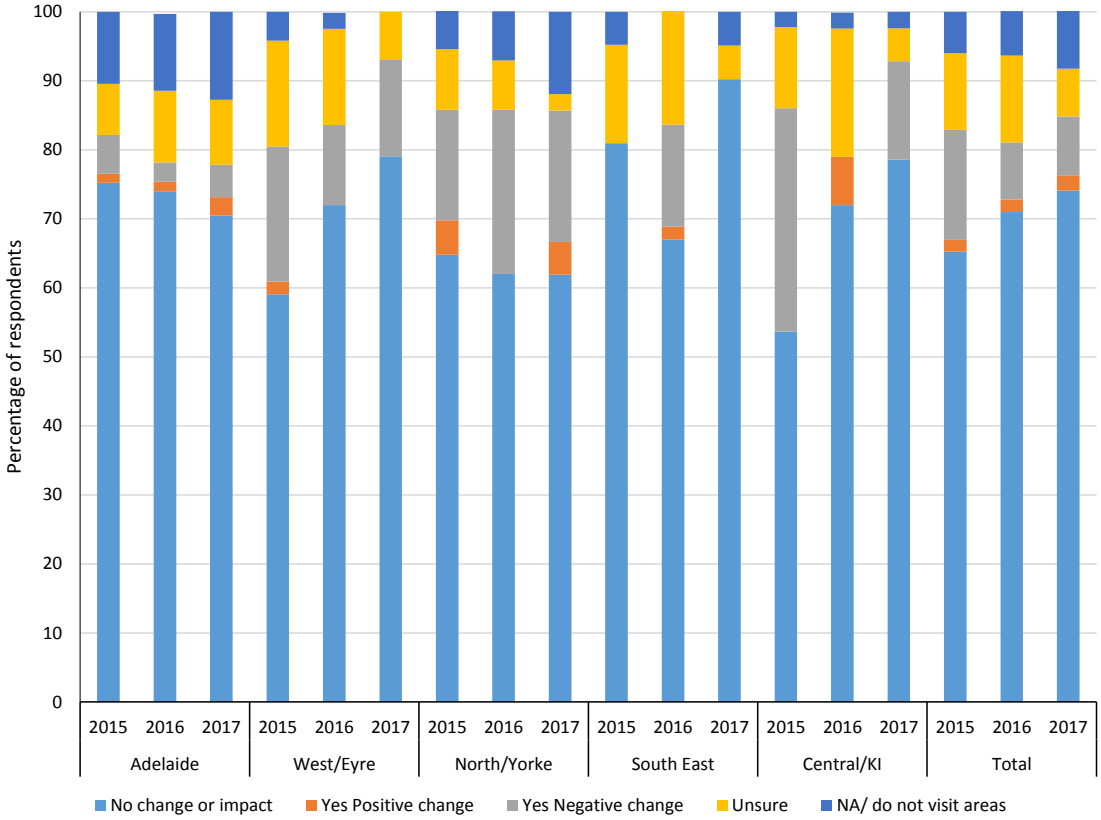


Figure 205. Percentage of phone survey respondents who feel they have seen changes to local businesses in the area where they reside since the introduction of fishing restrictions in sanctuary zones. Source: DEWNR

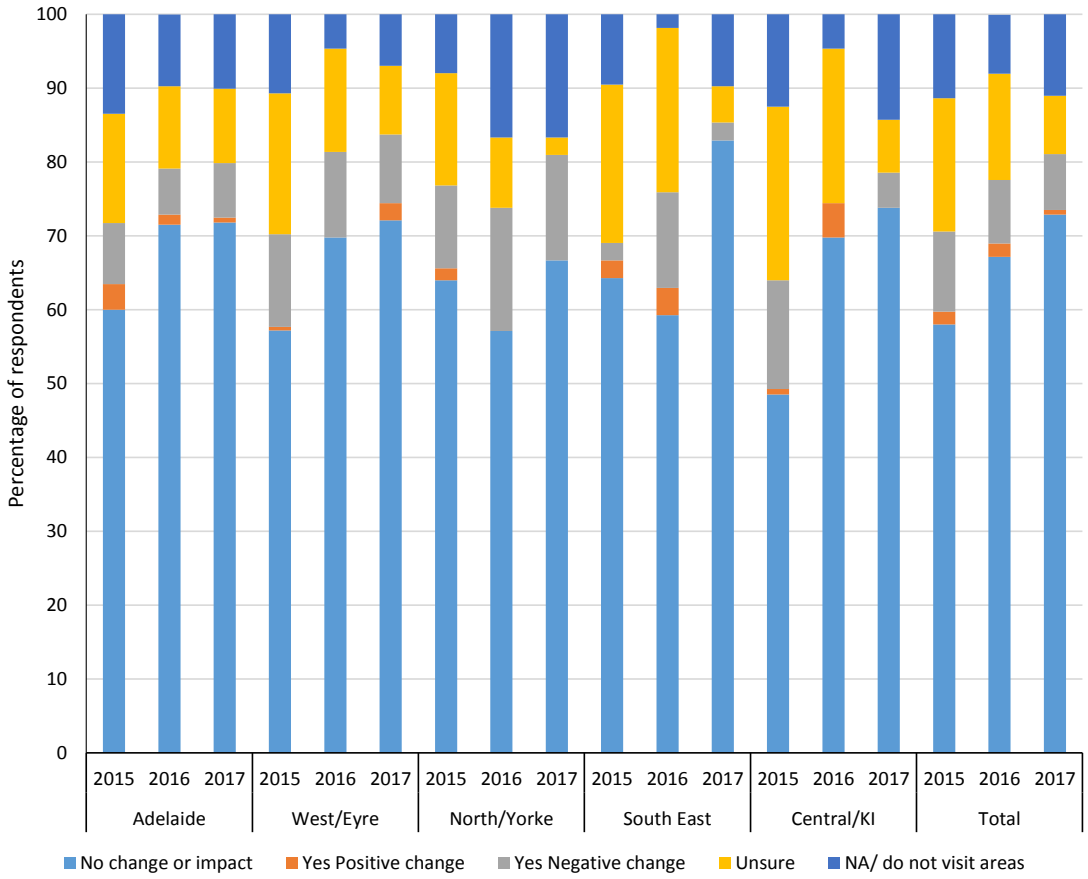


Figure 206. Percentage of phone survey respondents who feel they have seen changes to local businesses in the area where they visit since the introduction of fishing restrictions in sanctuary zones. Source: DEWNR

Phone surveys on community understanding of marine parks

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. Surveys have been conducted since 2006. Since 2006, some questions have changed or been added depending on the stage of marine park development, or the information needs of a particular year. The following section summarises data from surveys that are directly comparable. Some data gaps occur where questions have changed or raw data is unavailable.

Community understanding of the term 'marine park'

State level results

A large percentage of respondents understood correctly, that a marine park is an area to conserve and protect the local marine environment (44 per cent in 2017). Small percentages of respondents also understood that marine parks can be used for recreation (average 2.6 per cent since 2011) and research (average 1.5 per cent since 2011).

On average, since 2006 about 25 per cent of respondents incorrectly believed that a marine park meant that the area is restricted to public access and fishing is not allowed (this is incorrect as marine parks cover 44 per cent of state waters with only 6 per being restricted through sanctuary zones and restricted access zones). Around five per cent of respondents believed that a marine park was a theme park or recreational area and an average of 13 per cent of respondents did not know what a marine park was (Figure 207).

State level trends

There has been a decrease in the amount of respondents who understand that a marine park is an area to conserve and protect the local marine environment (from 59 (2006) to 44 (2017) per cent). At the same time the amount of respondents who believe that a marine park is an area restricted to public access and fishing was not allowed has increased from 21 per cent (2006) to 27 per cent (2017). In 2015 and 2016, these opposing trends resulted in more respondents indicating that a marine park meant restricted access than those that indicated marine parks were for conservation. In 2017 this reversed again with 44 per cent indicating marine parks were for conservation compared with 27 per cent restricted access. There has been little change in the amount of respondents who 'don't know' what a marine park is (from 14 (2006) to 15 (2017) per cent), or who think a marine park is a theme park (Figure 207).

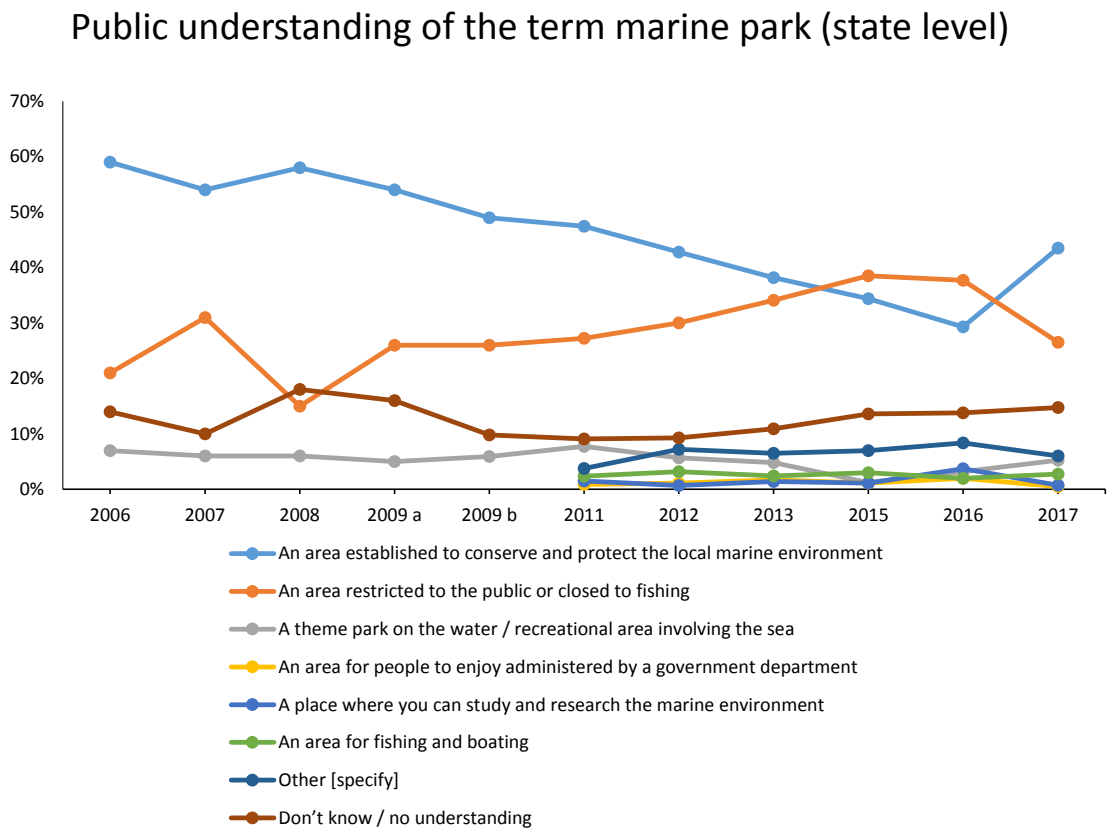


Figure 207. Annual phone survey results to the question, 'what is your understanding of the term marine park?' Results shown indicate statewide responses. Note that the x-axis indicates all surveys conducted and is not a true timeline. Two surveys were conducted in 2009 in March (2009 a) and December (2009 b). Source: DEWNR

Regional trends

Regional data is only available from 2011 and data tend to fluctuate between years. Since 2011, the state-wide decreasing trend in respondents who understand that a marine park is an area to conserve and protect the local marine environment can be attributed to decreases in the Adelaide and Northern and Yorke regions (50 to 44 per cent decrease in Adelaide, and 31 to 28 percent decrease in Northern and Yorke). West/Eyre Peninsula, Central/Kangaroo Island and South East all increased slightly in this measure since 2011 (Figure 208).

Since 2011, the statewide increasing trend in respondents who believe that a marine park is an area with restricted fishing and public access can be attributed to increases in the South East and Northern and Yorke regions (increase from 31 to 40 per cent in South East and increase from 22 to 40 percent in Northern and Yorke). West/Eyre Peninsula, Central/Kangaroo Island and Adelaide have decreased slightly or stayed the same in this measure since 2011. The percentage of respondents who have no understanding of the term 'marine park' has increased in Adelaide, Northern and Yorke and Central/Kangaroo Island NRM regions (Figure 208).

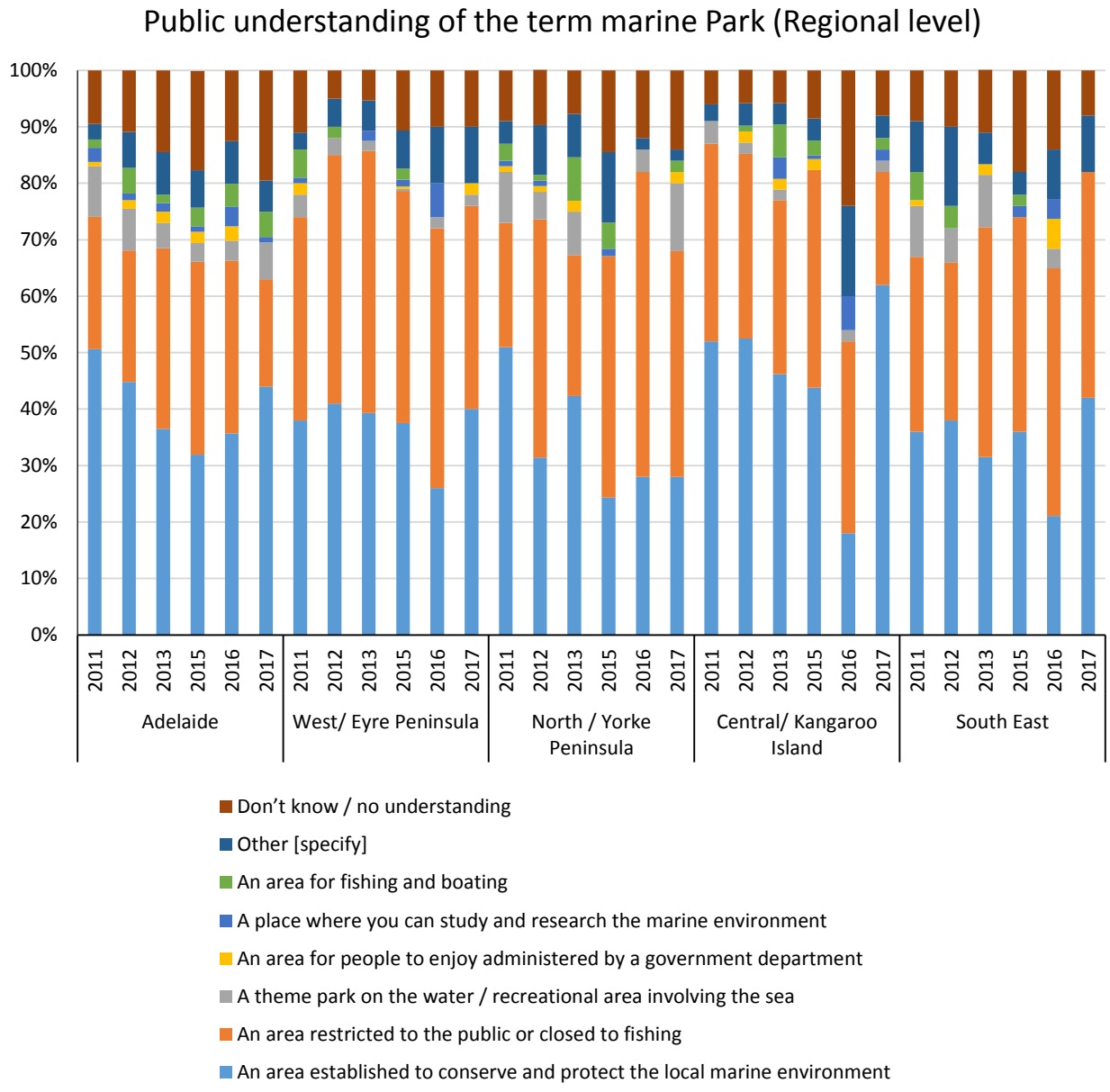


Figure 208. Annual phone survey results to the question, 'what is your understanding of the term marine park?' Results shown indicate regional responses. Source: DEWNR

Community understanding on the role of a marine park

Participants in the phone survey were given a definition of a marine park being an "area established to conserve and protect the local marine environment". After being given this definition, they were then asked what they believed the main role of a marine park was. Respondents can give more than one answer.

State and regional results

The most common responses between 2009 and 2017 were that the role of marine parks was to 'protect marine plants and animals' (average 61 per cent) and 'protect the environment' (average 42 per cent). Responses for 'preservation of the environment for future generations' and 'provide breeding places for marine life' also scored highly (average 24 and 17 per cent respectively). The third most common response was that the role of marine parks is to increase fish stocks (average 27 per cent (Figure 209, Figure 210).

State and regional trends

Responses to the role of marine parks have fluctuated but remained relatively stable across the state and NRM regions. There was a slight increase (from two to seven per cent between 2011 and 2017) in responses indicating the role of marine parks is to reduce pollution which was largely driven by responses from Adelaide region. There was a slight decrease in the amount of respondents indicating the role of marine parks was to protect marine life. This trend is due to decreases in all NRM regions except South East for this question (Figure 209, Figure 210).

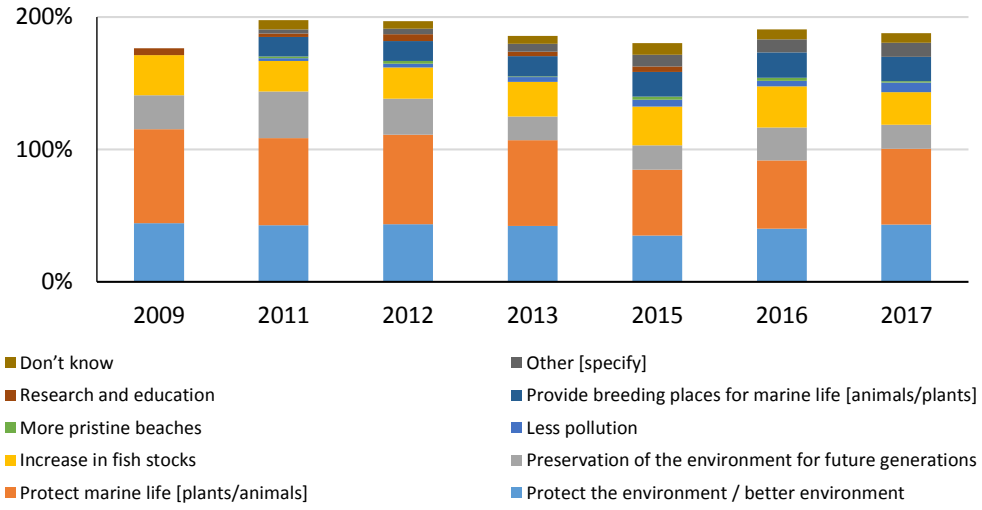


Figure 209. Statewide response to the question, 'what the role of a marine park?'Note that percentages are greater than 100 per cent because participants can respond with more than one answer. Source: DEWNR

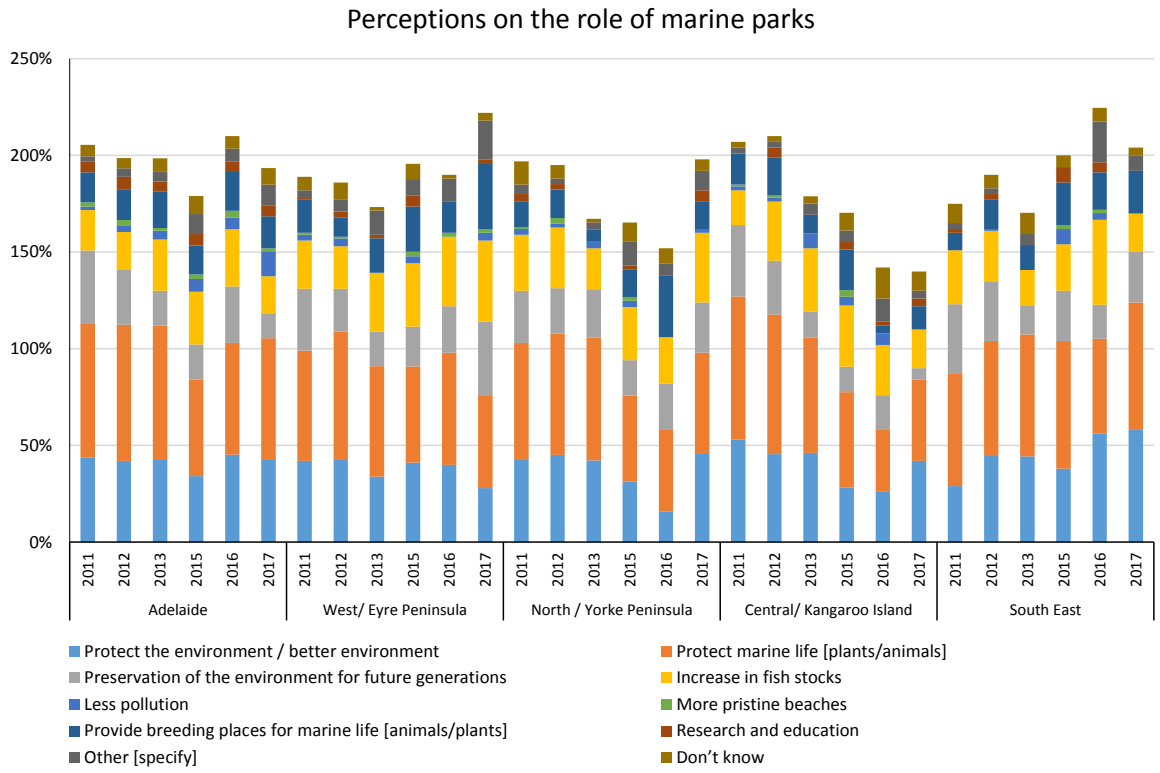


Figure 210. Regional level response to the question, 'what the role of a marine park?'. Note that percentages are greater than 100 per cent because participants can respond with more than one answer. Source: DEWNR

Community support for marine parks

Participants in the phone survey were asked if they were in favour of marine parks to protect marine plants and animals in general, in their local area, and in areas which they visit. Results are presented at a statewide level.

State results and trends

General support for marine parks has remained stable since 2006 averaging 88 per cent (Figure 204). *Note only displaying since 2011, however reports go back to 2006). The number of people who, in general, are not in favour of marine parks to protect marine plants and animals has reduced from ten to three per cent since 2015 (Figure 211).

Support for marine parks in 'your local area' has also remained stable since 2013 averaging 73 per cent (Figure 211).

Support for marine parks in areas 'you visit' has increased since 2015 from 68 to 80 per cent (Figure 211).

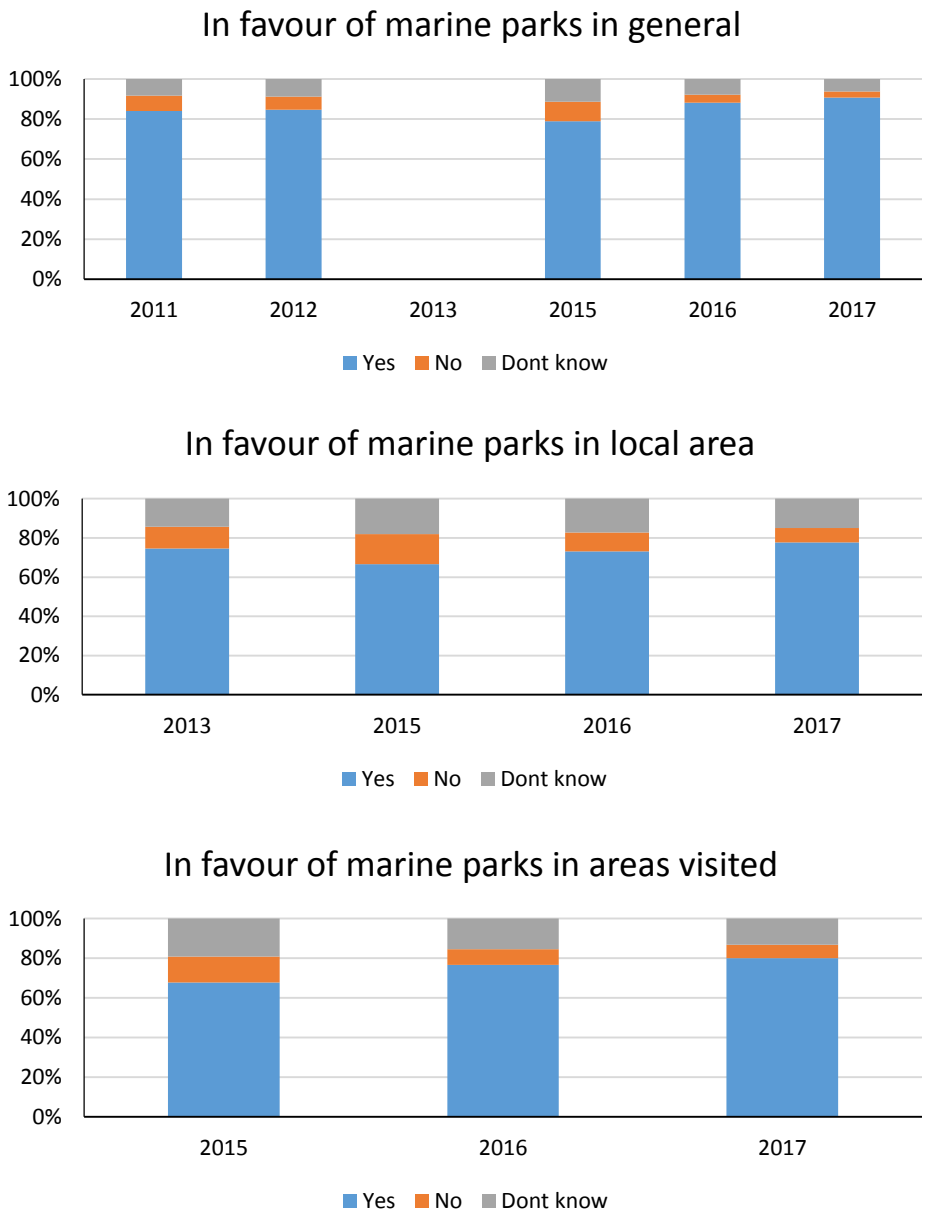


Figure 211. Statewide response to the question, 'are you in favour of marine parks to protect plants and animals in general, in your local area, or in areas you visit?' Source: DEWNR

Regional results and trends

General support for marine parks in regional areas has fluctuated but remained relatively unchanged since 2011. General support was higher in 2017 than in 2011 for all regions (Figure 212).

Support for marine parks in the respondents local area has also fluctuated but remains higher in 2017 than in 2013 for all NRM regions except Adelaide (80 per cent down to 74 per cent) and Northern and Yorke (85 per cent down to 80 per cent, Figure 213).

Support for marine parks in areas where respondents visit has increased in all regions since 2015 when this question was first asked (Figure 214).

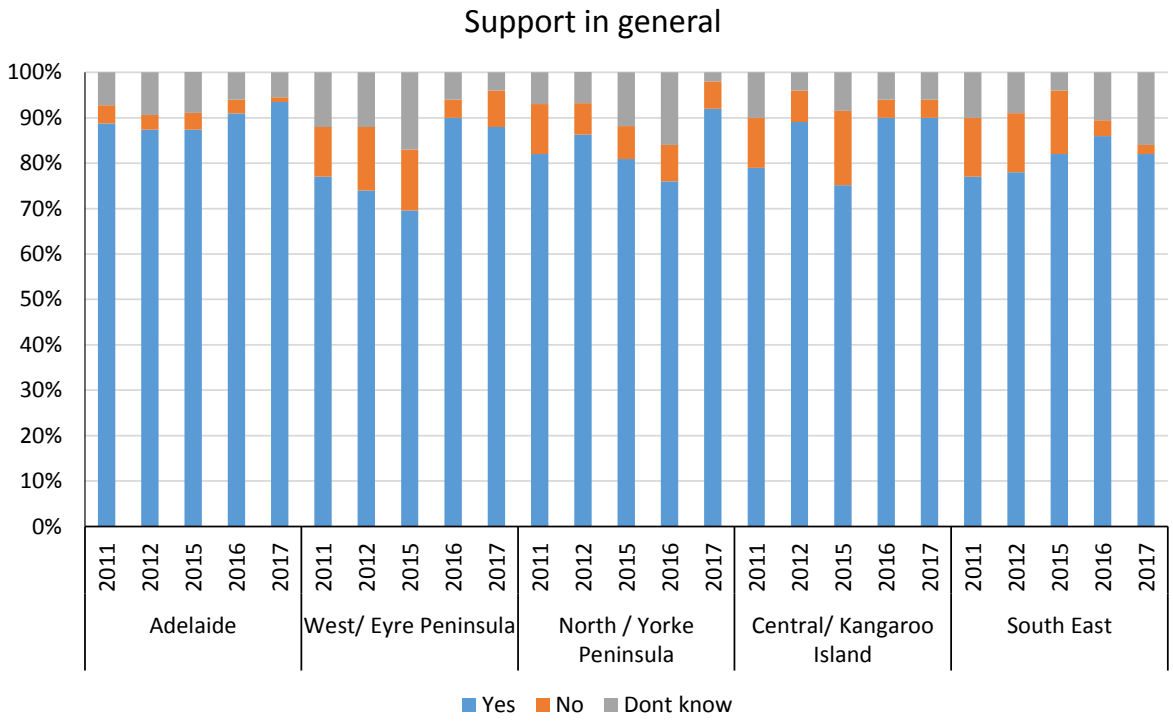


Figure 212. Regional response to the question, 'are you in favour of marine parks to protect plants and animals in general?' Source: DEWNR

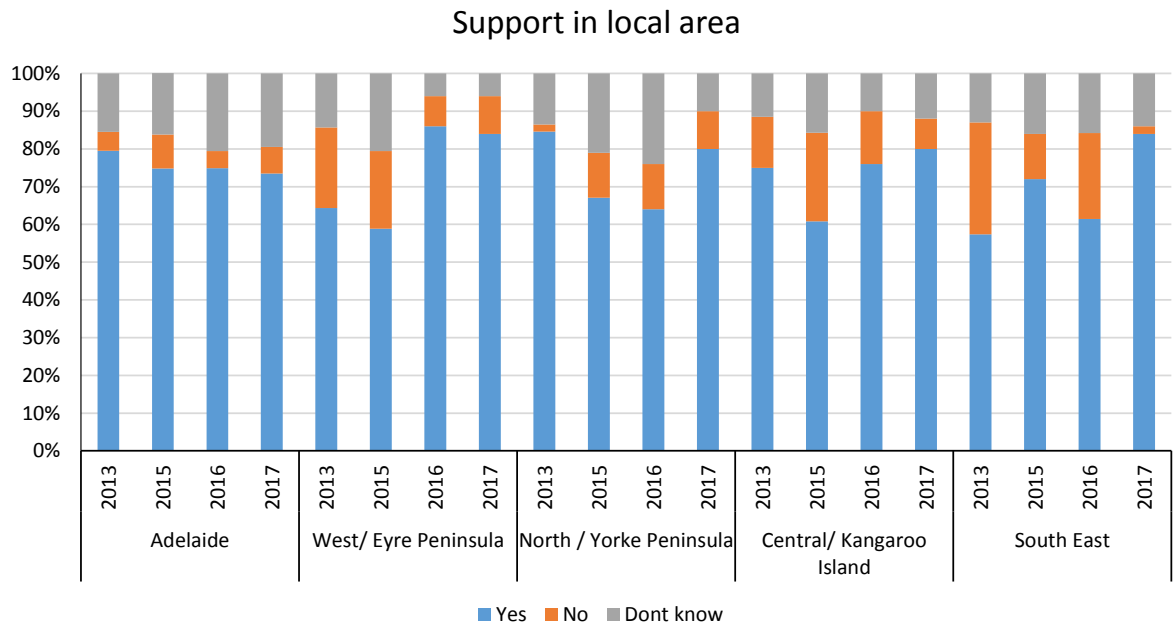


Figure 213. Regional response to the question, 'are you in favour of marine parks to protect plants and animals in your local areal?' Source: DEWNR

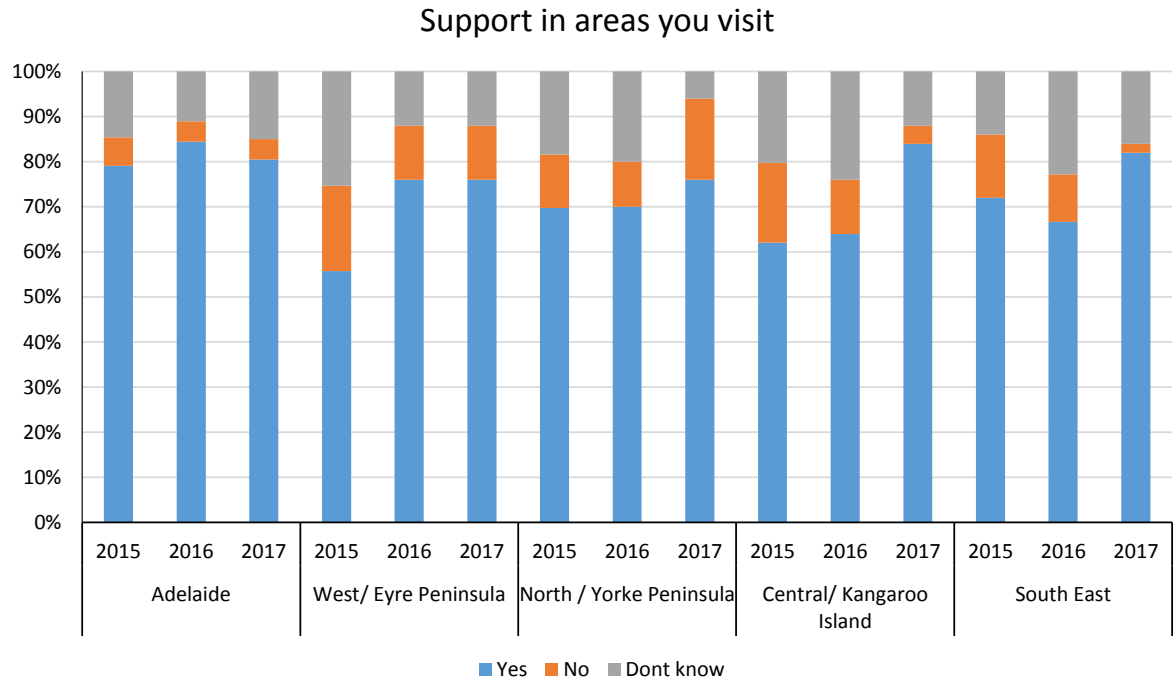


Figure 214. Regional response to the question, 'are you in favour of marine parks to protect plants and animals in areas you visit?' Source: DEWNR

Pressure on the marine environment

Survey participants were asked if they believed the marine environment was under pressure and the likely causes of that pressure. Results are presented at a statewide level.

State results and trend

Most survey respondents believe that the marine environment is under pressure from human activities (average 79 per cent since 2009). The trend is reasonably stable fluctuating between 74 and 85 per cent (Figure 215). On average, nine per cent of respondents didn't know if the marine environment was under pressure from humans.

The most common responses on the causes of environmental pressure were; over fishing (56 per cent), pollution (40 per cent), commercial fishing (26 per cent) and recreational fishing and boating (18 per cent) (Figure 216).

Note that respondents can give multiple responses to this question. This is in line with respondent's answers to 'what is the role of a marine park?' (Figure 209, Figure 210) where around 27 per cent indicated that the role of marine parks was to increase fish stocks, or provide breeding areas for animals and plants (17 per cent). Around four per cent of respondents indicated the role of marine parks is to reduce pollution but this response was the second largest perceived threat to the marine environment.

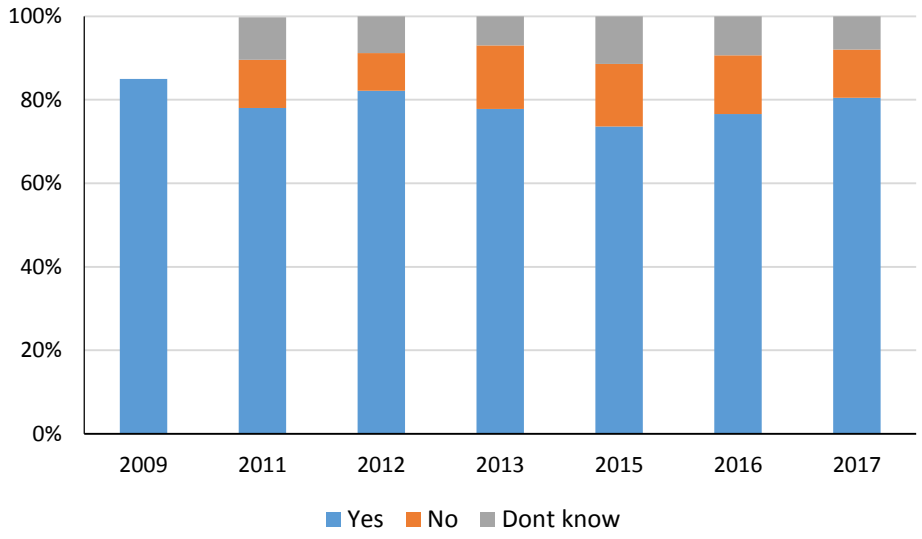


Figure 215. Statewide results to the question, 'do you think the marine environment is under pressure from human activity?' *Answers for no and don't know are unavailable for 2009. Source: DEWNR

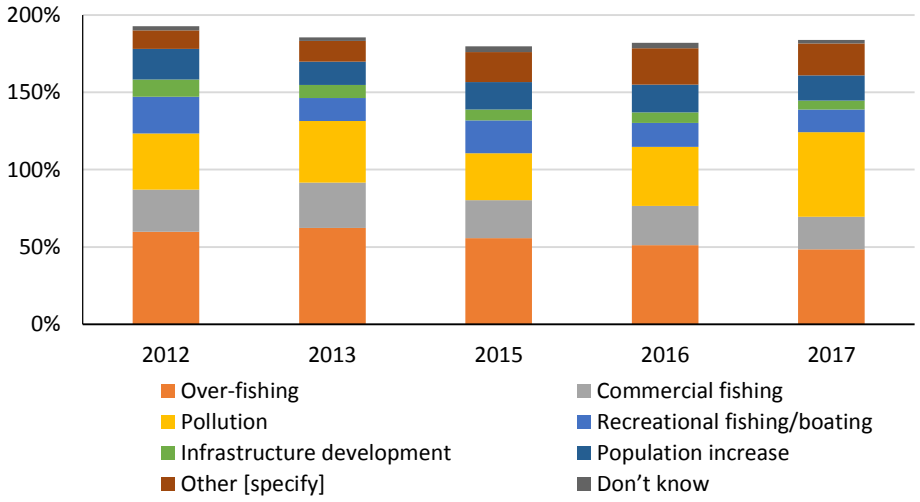


Figure 216. Statewide results to the question, 'why do you think the marine environment is under pressure?' *Note that percentages are greater than 100 per cent because participants can respond with more than one answer. Source: DEWNR

Regional results

All regions recorded a slight increase between 2011 and 2017, in respondents that believed the marine environment was under pressure from human activity while Adelaide remained about the same (Figure 217). It should be noted that this result varies considerably between years and the 2017 and 2011 figures do not necessarily represent the highest or lowest percentage of responses throughout this period for many regions.

Respondents from Adelaide however had a higher proportion (average 84 per cent since 2011) of respondents that answered 'yes' to the question while an average of 69 per cent answered 'yes' from West Eyre Peninsula (Figure 217).

The South East recorded the highest average percentage of respondents indicating 'overfishing' as a threat (65 per cent) between 2011 and 2017. Northern and Yorke region recorded the highest average percentage of respondents indicating 'commercial fishing' as a threat (32 per cent) and Adelaide region recorded the highest average percentage of respondents indicating 'pollution' as a threat between 2011 and 2017 (46 per cent, Figure 218).

Regional trends

Pollution: All regions recorded higher values in 2017 than in 2011 for respondents indicating pollution was a threat to the marine environment, although this varied throughout the time period (Figure 218).

Overfishing: Since 2011, Adelaide, Northern and Yorke and Central/Kangaroo Island recorded a decreasing trend in those responding that overfishing was a threat, although Northern and Yorke was quite variable. Western/Eyre Peninsula and South East were variable but both recorded more responses in 2017 (60 and 69 per cent respectively) compared to 2011 (51 and 65 per cent respectively, Figure 218).

Recreational fishing: Since 2011, Adelaide, South East and Central/Kangaroo Island recorded a variable trend but an overall decrease from 2011 to 2017 in those responding that recreational fishing was a threat. Western/Eyre Peninsula and Northern and Yorke recorded a variable trend but an increase from 2011 to 2017 (Figure 218).

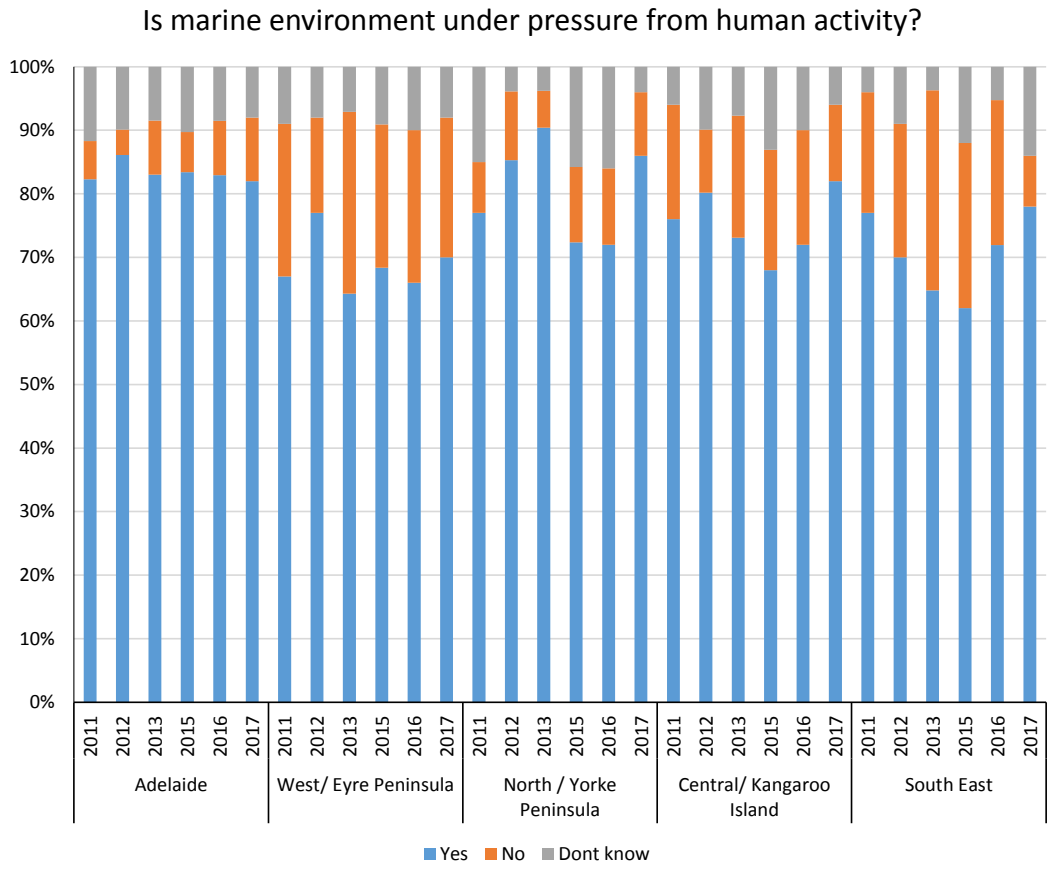


Figure 217. Regional results to the question, 'do you think the marine environment is under pressure from human activity?' Source: DEWNR

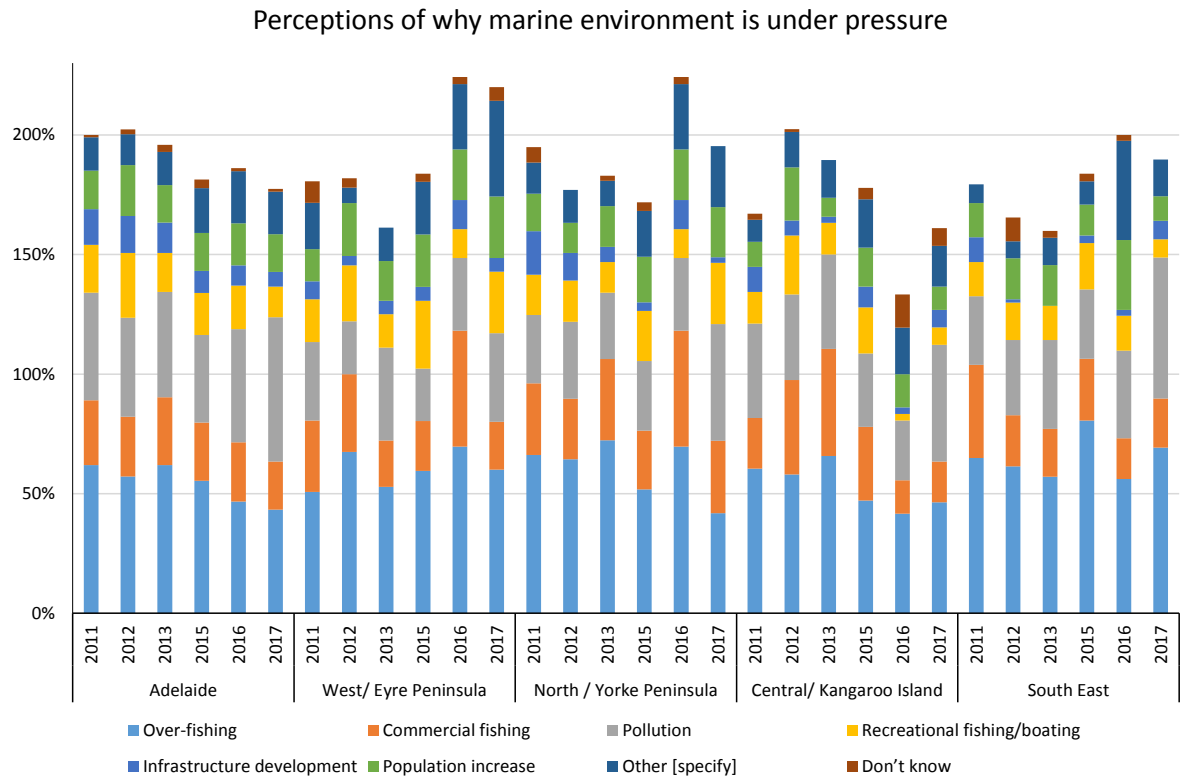


Figure 218. Regional response to the question, 'why do you think the marine environment is under pressure?' *Note that percentages are greater than 100 per cent because participants can respond with more than one answer. Source: DEWNR

Survey respondents understanding of fishing in marine parks?

Participants were given four options ranging from 'fishing permitted in all parts' of the marine parks to 'no fishing allowed' in marine parks. The correct answer is that 'people are allowed to fish in most parts of marine parks'.

State results and trends

There was an increase between 2011 and 2012 in respondents who understood that fishing was allowed in most parts of the marine park network (increase from 7 to 22 per cent). This number continued to increase until 2015 (up to 34 per cent) but has since decreased to 26 per cent in 2017. Between 2011 and 2012, there was a decrease in respondents who thought fishing in marine parks was prohibited (decrease from 44 to 23 per cent) but this has increased to 42 per cent in 2017. In 2017, 64 per cent of respondents indicated they believed fishing is not allowed in any part of the marine parks or in only some small parts of the marine parks, nine percent of respondents answered 'don't know', and only 26 per cent gave the correct answer that people are able to fish in most parts of the marine parks, except for sanctuary zones. These results possibly indicate continued confusion in the community around what is allowed in marine parks (Figure 219).

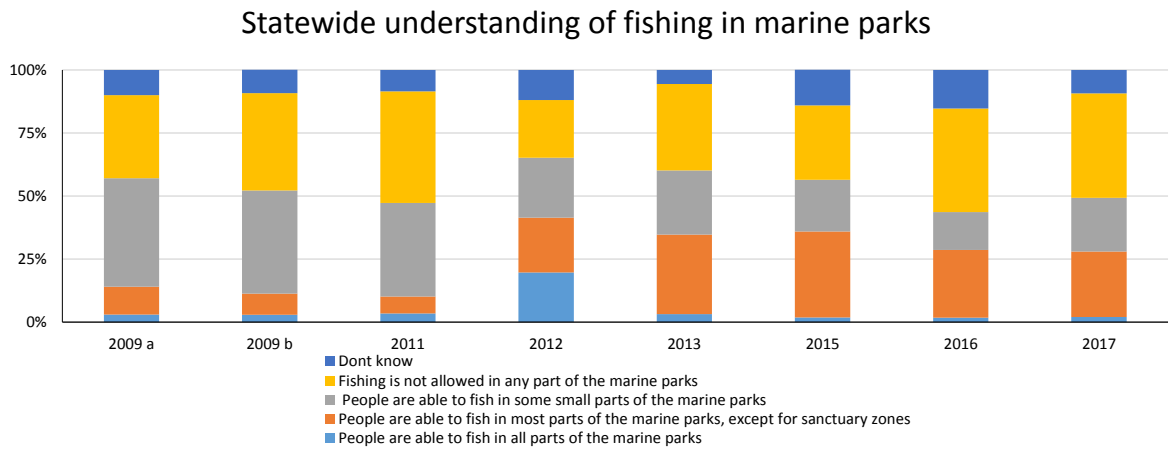


Figure 219. Statewide response to the question, 'which of the following best describes your understanding of fishing in marine parks?' Two surveys were conducted in 2009 in March (2009 a) and December (2009 b). Source: DEWNR

Regional results and trends

Similar trends to the state results are observed in regional results. In 2017 respondents from the West Coast/Eyre Peninsula were more likely to understand that fishing is allowed in most areas except sanctuary zones (42 per cent) and least likely to answer correctly from Northern and Yorke (18 per cent). Respondents from Northern and Yorke were also most likely to believe that fishing is not allowed in any part of the marine park (48 per cent, Figure 220).

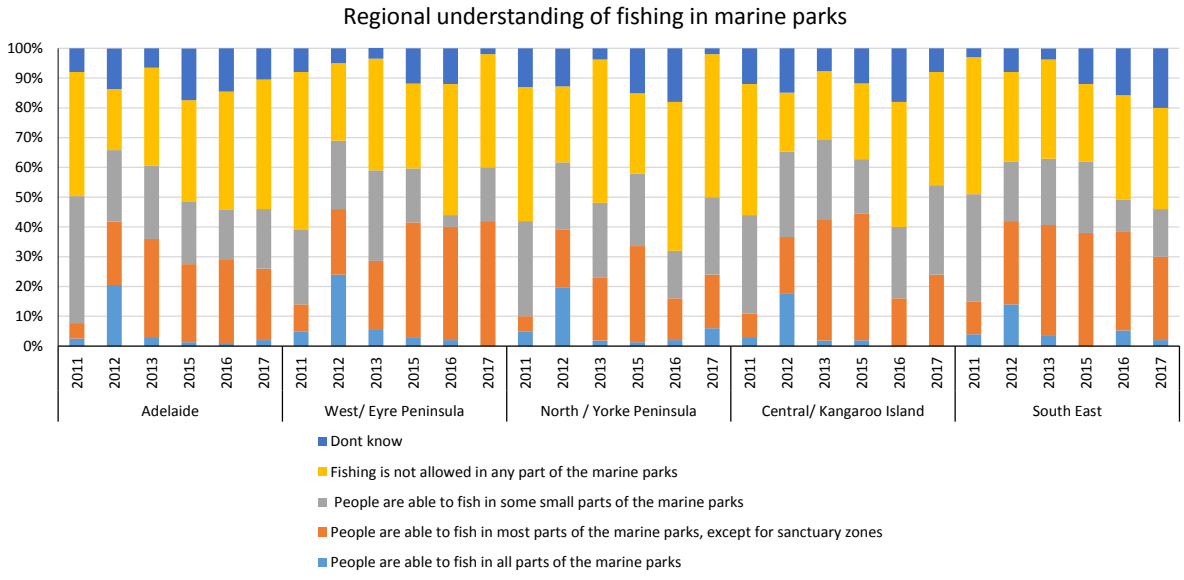


Figure 220. Regional response to the question, 'which of the following best describes your understanding of fishing in marine parks?' Source: DEWNR

Do fishers understand fishing in marine parks?

To understand if the confusion around where you can fish in a marine park was due to the participants not being regularly involved in fishing, the data was further sorted to assess the answers by participant's fishing monthly or more often ('regular fishers').

State results and trends

The results for respondents who fish regularly are similar to the whole of population results. There was a sharp increase between 2011 and 2012 in respondents understanding that marine parks can be fished in most parts except in sanctuary zones (increase from 10 to 27 percent). At the same time there was a reduction in respondents that believed fishing was prohibited in marine parks (decrease from 47 to 27 per cent), but this has returned to 48 per cent in 2017. Regular fishers understanding that fishing is allowed in most parts of the marine park was recorded at 30 per cent in 2017 although this is down from the 2015 result of 47 per cent. Overall more fishers believe that fishing in marine parks is *highly restricted or prohibited* than correctly understanding that they can fish in all areas except sanctuary zones. This indicates significant unfamiliarity of marine park rules and permitted uses for an active marine park user group (Figure 221).

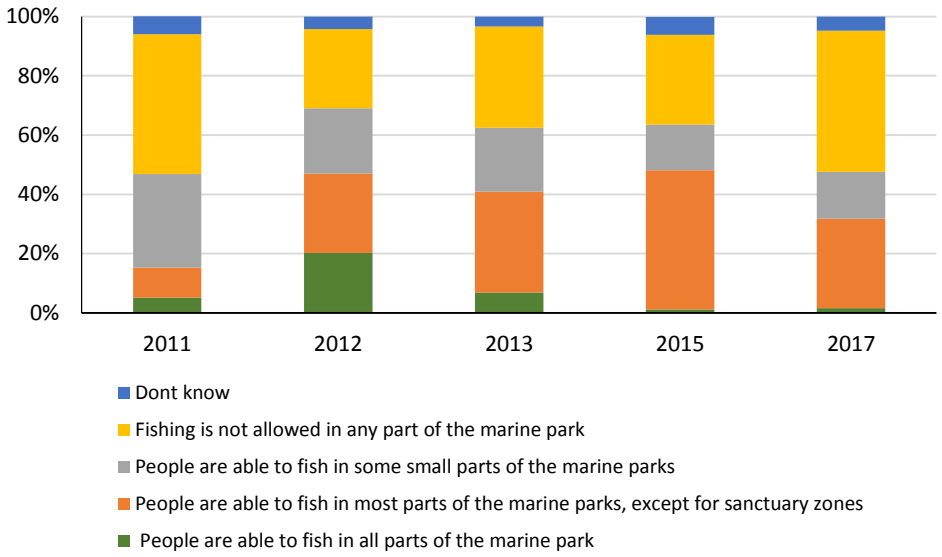


Figure 221. Statewide response to the question, 'which of the following best describes your understanding of fishing in marine parks?' by survey respondents that fish monthly or more ('regular fishers'). Data unavailable for 2016. Source: DEWNR

Regional results and trends

In 2017, West/Eyre Peninsula was the only region to record greater than 35 per cent of respondents with the correct understanding of fishing in marine parks (41 per cent). The lowest percentage of correct answers occurred in Central/Kangaroo Island and the South East (17 and 25 per cent respectively). In 2017, all regions recorded greater than 40 per cent of respondents believing fishing was prohibited (Adelaide and Central/Kangaroo Island with 53 and 50 per cent respectively). The 2017 survey indicated more respondents believed that fishing was not allowed in marine parks than what was recorded in 2011 from both the Adelaide and South East regions (52 and 75 per cent respectively), although this should be interpreted carefully as the 2015 survey for both of these regions recorded their lowest percentage of this response (40 and 18 per cent respectively). The overall low number of respondents correctly identifying that fishing is allowed in most areas except sanctuary zones may suggest poor understanding amongst marine users (Figure 222).

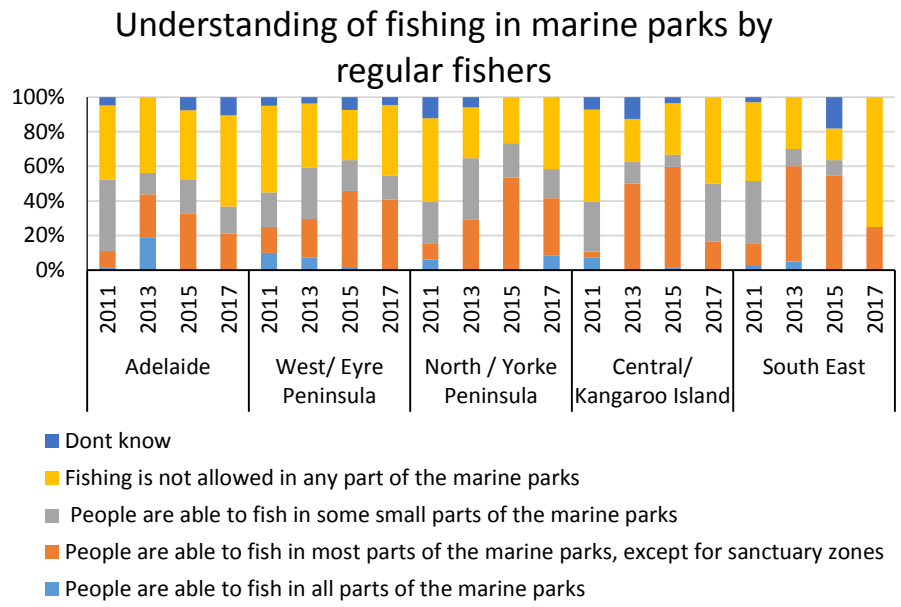


Figure 222. Regional response to the question, 'which of the following best describes your understanding of fishing in marine parks?' by survey respondents that fish monthly or more ('regular fishers'). Data unavailable for 2012 and 2016. Source: DEWNR

Awareness of Sanctuary zones where no fishing is allowed

State and regional results and trends

This question was added to the survey in 2015 following the full implementation of sanctuary zones in 2014. Most survey respondents were aware that sanctuary zones or "no take" zones exist within marine parks. Since 2015 the average 'yes' response was 81 per cent with results between 79 and 82 per cent annually (Figure 223). The regional data is also stable with little variation between years. The lowest awareness is evident in the Adelaide region (75 per cent). All other regions exceed 80 per cent awareness (Figure 224).

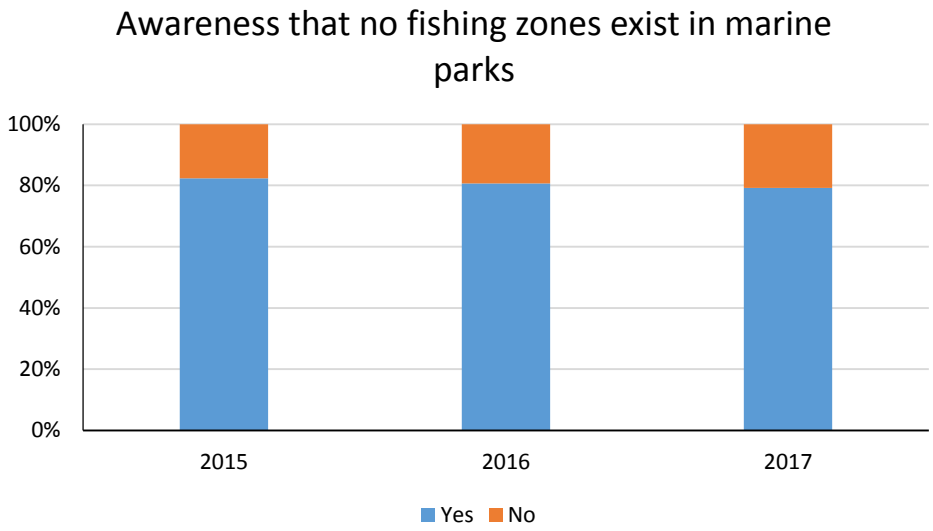


Figure 223. Statewide response to the question, 'are you aware that some areas in marine parks are no fishing or sanctuary zones where no fishing is allowed?' Source: DEWNR

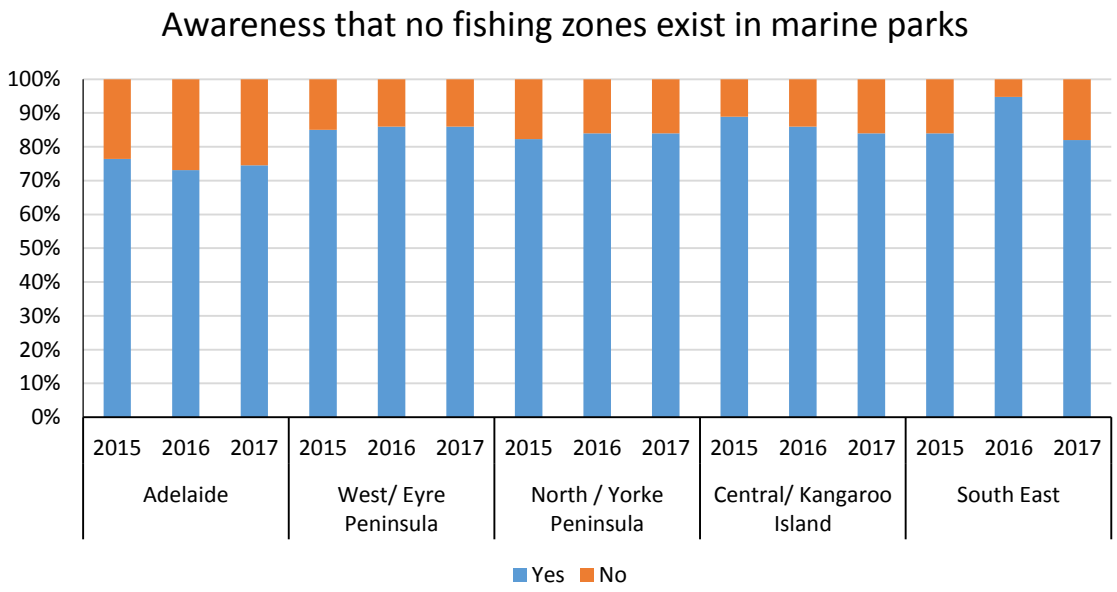


Figure 224. Regional response to the question, 'are you aware that some areas in marine parks are no fishing or sanctuary zones where no fishing is allowed?' Source: DEWNR

Awareness of sanctuary zones in respondent's local area or areas they visit

State and regional results and trends

This question was added to the survey in 2015 following the full implementation of sanctuary zones in 2014. Most respondents are aware that sanctuary zones exist (Figure 225) however the majority do not know where they are. There has been no increase in the amount of respondents who know where sanctuary zones are in their local areas or in the areas they visit with around 66 per cent of respondents answering 'no' to this question in 2017. Greatest awareness is observed in the West/Eyre Peninsula region (2015–17 average 50 per cent) and the Central/Kangaroo Island area (2015–17 average 45 per cent). Lowest awareness was observed in the Adelaide region (2015–17 average 24 per cent, Figure 226). There is better knowledge of sanctuary zone locations amongst those fishing regularly with state awareness around 63 per cent (Figure 227). Awareness of sanctuary zones among regular fishers has remained fairly consistent between 2015 and 2017. A significant drop in awareness is observed in the South East going from the highest recorded awareness of any region to the lowest in 2017 (Figure 227). This is possibly due to the small sample size of regular fishers surveyed from this region.

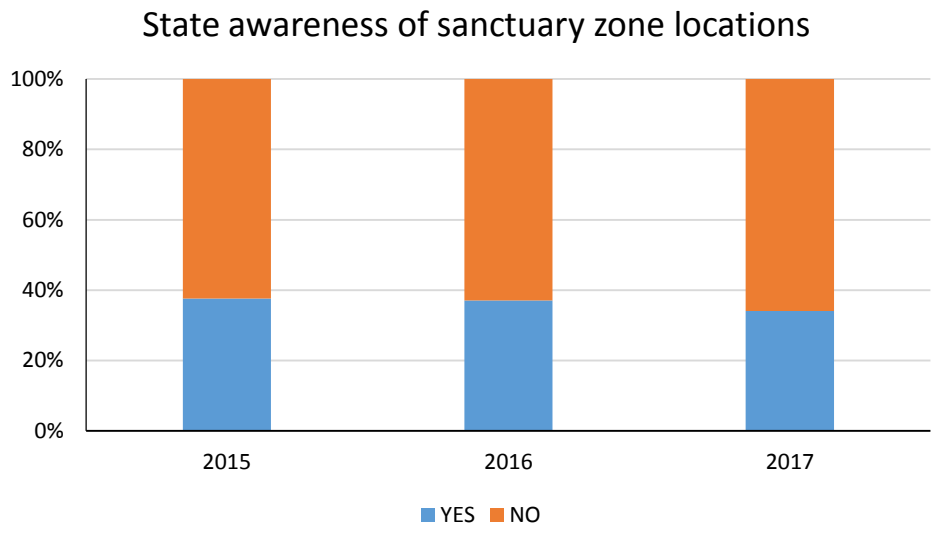


Figure 225. Statewide response to the question, 'do you know where the sanctuary zones are in your local area or areas where you visit?' Source: DEWNR

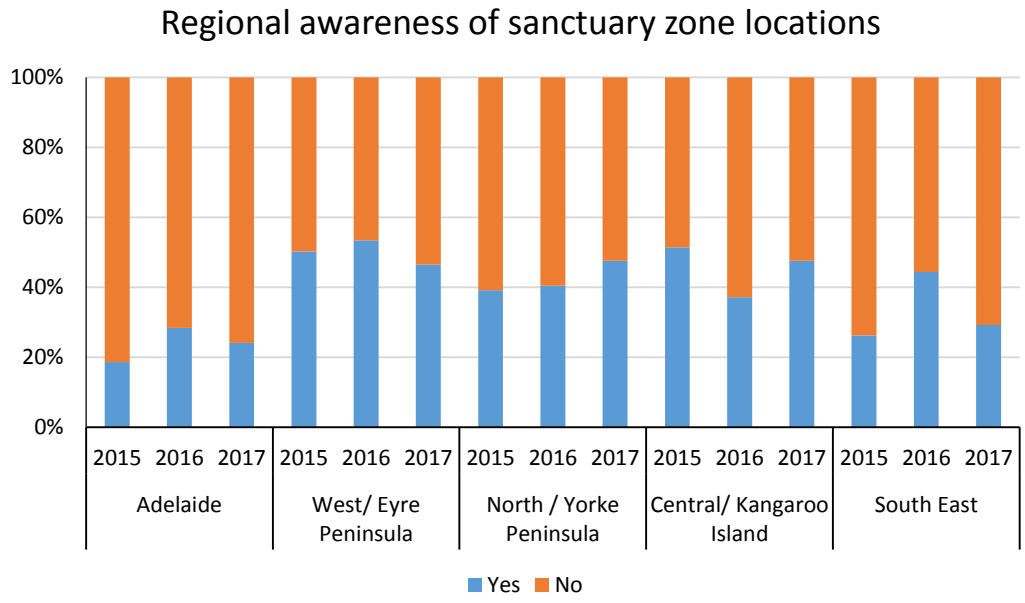


Figure 226. Regional response to the question, 'do you know where the sanctuary zones are in your local area or areas where you visit?' Source: DEWNR

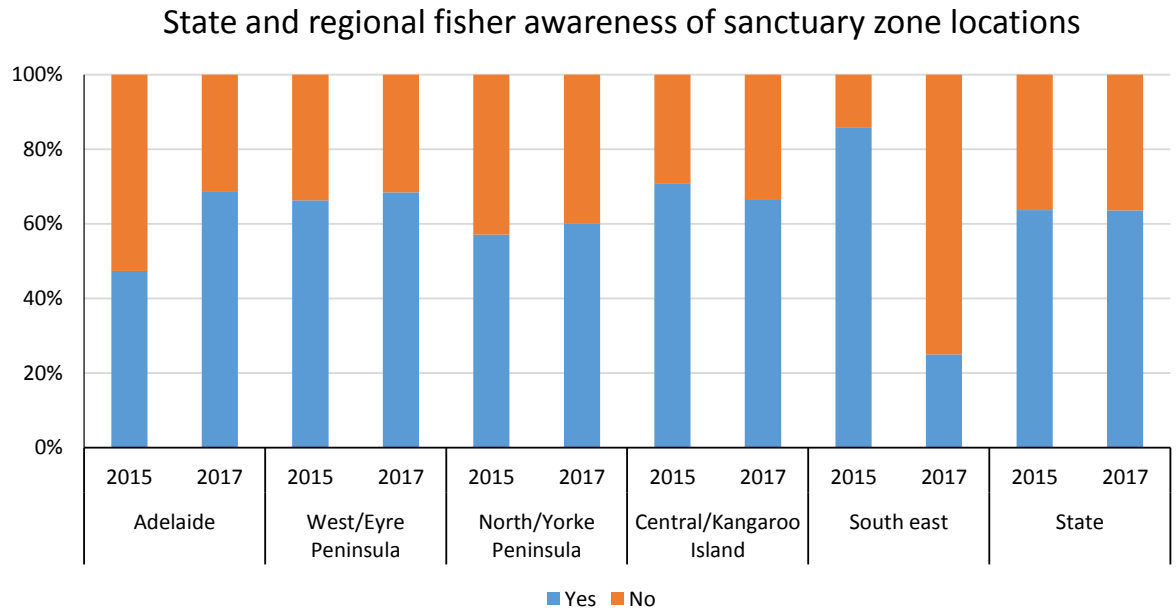


Figure 227. Statewide and regional response by regular fishers to the question, 'do you know where the sanctuary zones are in your local area or areas where you visit?' Source: DEWNR

South Australian National Parks Visitation Survey

In addition to the phone surveys conducted on behalf of the marine parks program, since 2015 DEWNR has also conducted an annual South Australian National Parks Visitation Survey. There are two questions specifically related to marine parks in this survey:

1) How familiar are you with what a marine park is? Are you very familiar, somewhat familiar, or not familiar?
2) Overall, would you say your attitude towards marine parks in South Australia is positive negative or neutral?

Statewide results and trends

In 2017, 64 per cent of survey respondents indicated they were 'somewhat' or 'very familiar' with marine parks. Thirty-two per cent were 'not familiar' and four per cent answered 'don't know'. These results are very consistent with the results for 2015 and 2016 (Figure 228). Since 2015, the majority of respondents reported a neutral (average 30 per cent) or positive attitude (average 58 per cent) to marine parks. About 10 per cent held a negative attitude and three percent answered 'don't know' (see Figure 229 under question three).

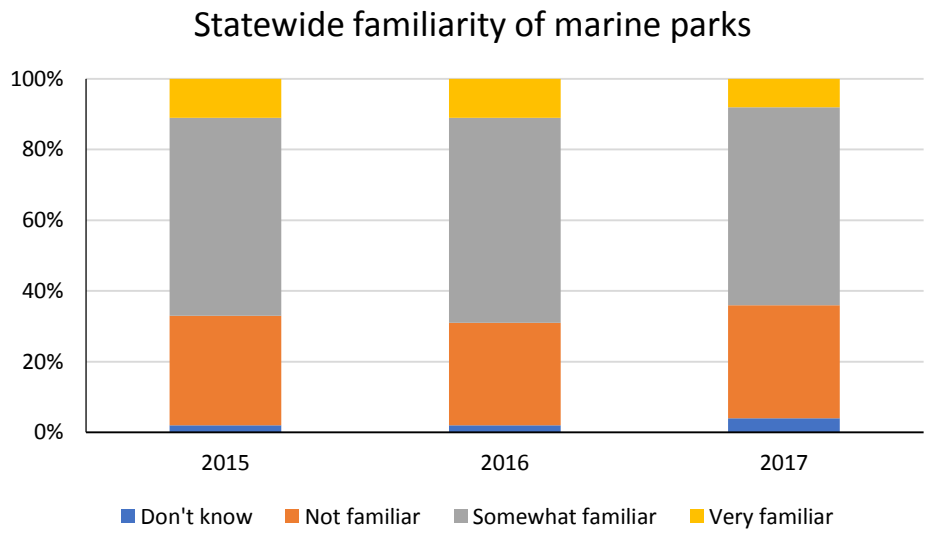


Figure 228. Statewide response to the question, 'how familiar are you with what a marine park is?' Results from the South Australian national parks visitation survey. Source: DEWNR

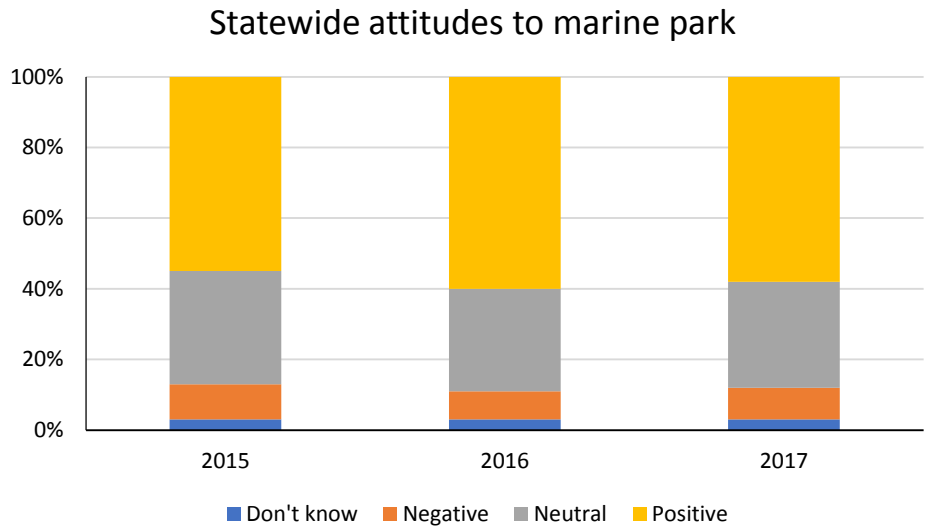


Figure 229. Statewide response to the question, 'would you say your attitude towards marine parks in South Australia is positive negative or neutral?' Results are from the South Australian national parks visitation survey. Source: DEWNR

2017 Region results:

In 2017, respondents were least likely to be familiar with marine parks from the South Australian Arid Lands NRM region (50 per cent). Respondents from Eyre Peninsula were most likely to be 'somewhat' or 'very familiar' with marine parks (81 per cent), followed by South East (69 per cent). South Australian Murray-Darling Basin, Adelaide and Mt Lofty, and Northern and Yorke NRM regions all recorded around 60 per cent of respondents being 'somewhat' or 'very familiar' with marine parks (Figure 230).

In 2017, respondents were more likely to have a positive or neutral attitude to marine parks from Adelaide and Mt Lofty, and Eyre Peninsula regions (86 and 85 per cent respectively). Respondents were most likely to have a negative attitude to marine parks from Kangaroo Island (23 per cent) and the Northern and Yorke region (22 per cent) and least likely to have a negative attitude from the Adelaide and Mt Lofty region (four per cent, Figure 231).

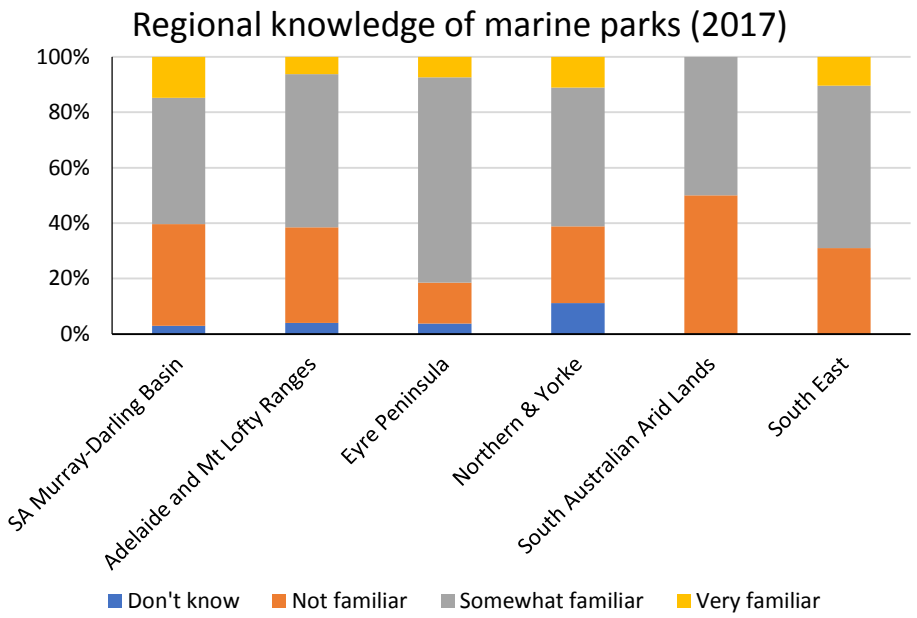


Figure 230. Regional response to the question, 'how familiar are you with what a marine park is?' Results from the South Australian national parks visitation survey. Source: DEWNR

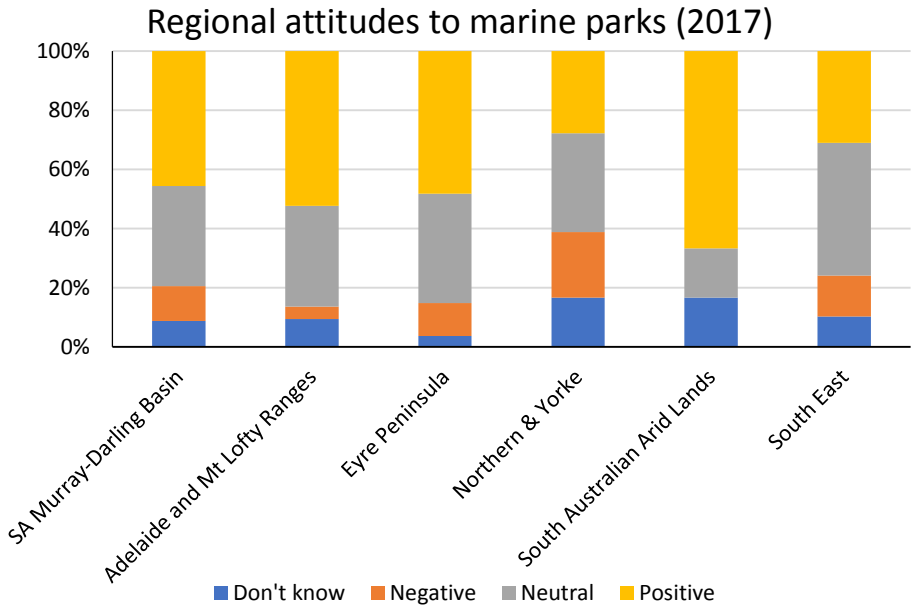


Figure 231. Regional response to the question, 'would you say your attitude towards marine parks in South Australia is positive negative or neutral?' Results are from the South Australian national parks visitation survey. Source: DEWNR

Price of seafood

Market prices for fish are important because they highlight the economic benefit to businesses involved in the supply chain, and the availability of seafood for the South Australian community and for export to Sydney and Melbourne, and overseas markets.

Supply of local fish species relies on wild harvest and is subject to the condition of the fishery, seasonal availability and prevailing weather conditions. This in turn impacts the harvest quantities and market demand. Fish prices will therefore naturally fluctuate over time and with high demand periods such as Christmas and Easter. For southern rock lobster and abalone there will be a small loss of product due to the SA Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program and reduced quotas, however, most of this product is exported overseas such that local buyers would not be impacted. For locally-caught and locally-sold marine scalefish such as King George whiting which are available to average households it was expected that total catches would be maintained despite the loss of some fishing grounds through fishing restrictions in sanctuary zones and the reduction in the number of fishing licences through the SA Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program. The catches and therefore prices of other species such as prawns, blue crabs and sardines are not expected to be affected by marine parks (Bryars et al. 2016a-s).

The retail prices of six species have been recorded at three Adelaide retail outlets since June 2014 (King George whiting (KGW), snapper, calamary, garfish, yellowfin whiting (YFW) and snook) (Figure 232, see Case study 11). The first four of those species are the most important MSF species by value.

Figure 232. The six species of fish that were monitored for retail price between June 2014 and August 2017, King George whiting (upper left), snapper (upper middle), calamary (upper right), garfish (lower left), yellowfin whiting (lower middle), and snook (lower right)

There has been speculation by some sectors that retail fish prices will increase markedly due to the implementation of marine parks. However, the long-term trends have shown no indication of an increase in price

since marine parks became fully operational in October 2014 (Figure 233). The long-term trends also show seasonal patterns of variation (which are consistent with beach price fluctations – see EconSearch 2017h) and it is most appropriate to compare the winter 2014 pre-sanctuary zone baseline mean value with subsequent winter mean values (Figure 234, Figure 235); again these data show no indication that prices have increased since full implementation of sanctuary zones with three of the six species having a lower price in winter 2017 than winter 2014, and three of the six having a higher price in winter 2017 than in winter 2014. These observations are consistent with predictions of change (Table 71). These patterns are also consistent with annual beach prices (i.e. what the fishers receive for their catch) for four of the same species that are monitored by EconSearch (2017h); King George whiting, calamary and snapper which have remained stable from 2013/14 to 2015/16, and garfish which has increased from 2013/14 to 2015/16 (noting that data for 2016/17 are not presented). Based upon the ABS fish and other seafood price index, a gradual increase in the price of fish over time should be expected by consumers (Figure 236, see Bryars et al. 2016a-s) but this has not been observed across all six species monitored.

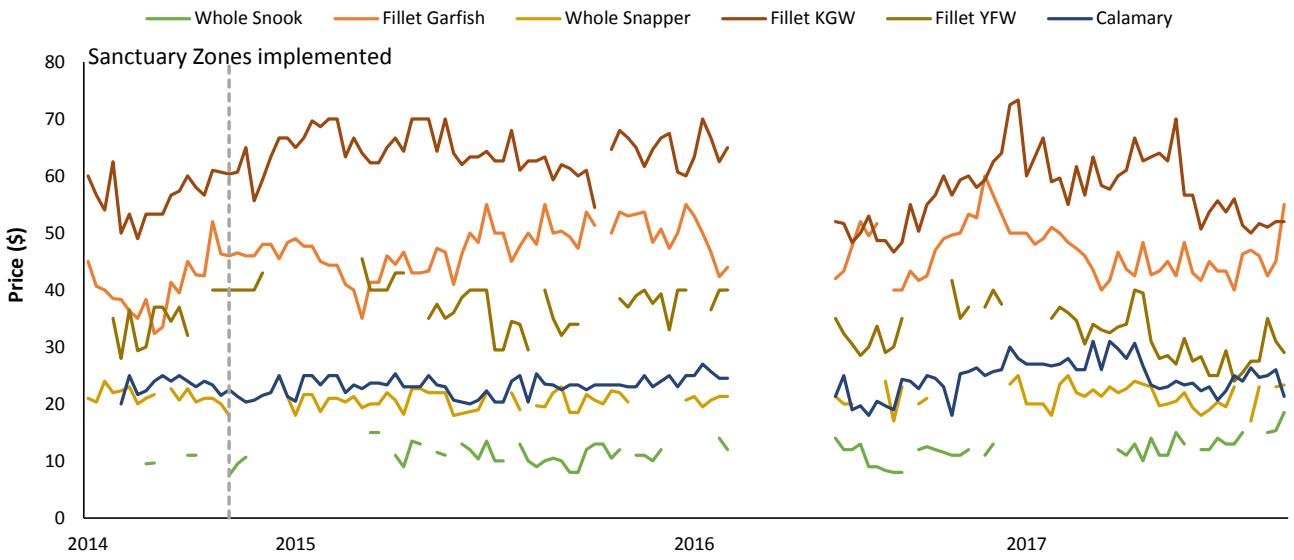


Figure 233. Weekly fluctuations in the retail price of six species of fish since June 2014. Plotted data are mean raw data collected from three stores usually once a week. Gaps in lines indicate that no product was available at that point in time. No data were collected during autumn 2016. The vertical dotted line represents the time when fishing restrictions in sanctuary zones were implemented on 1 October 2014. Source: DEWNR

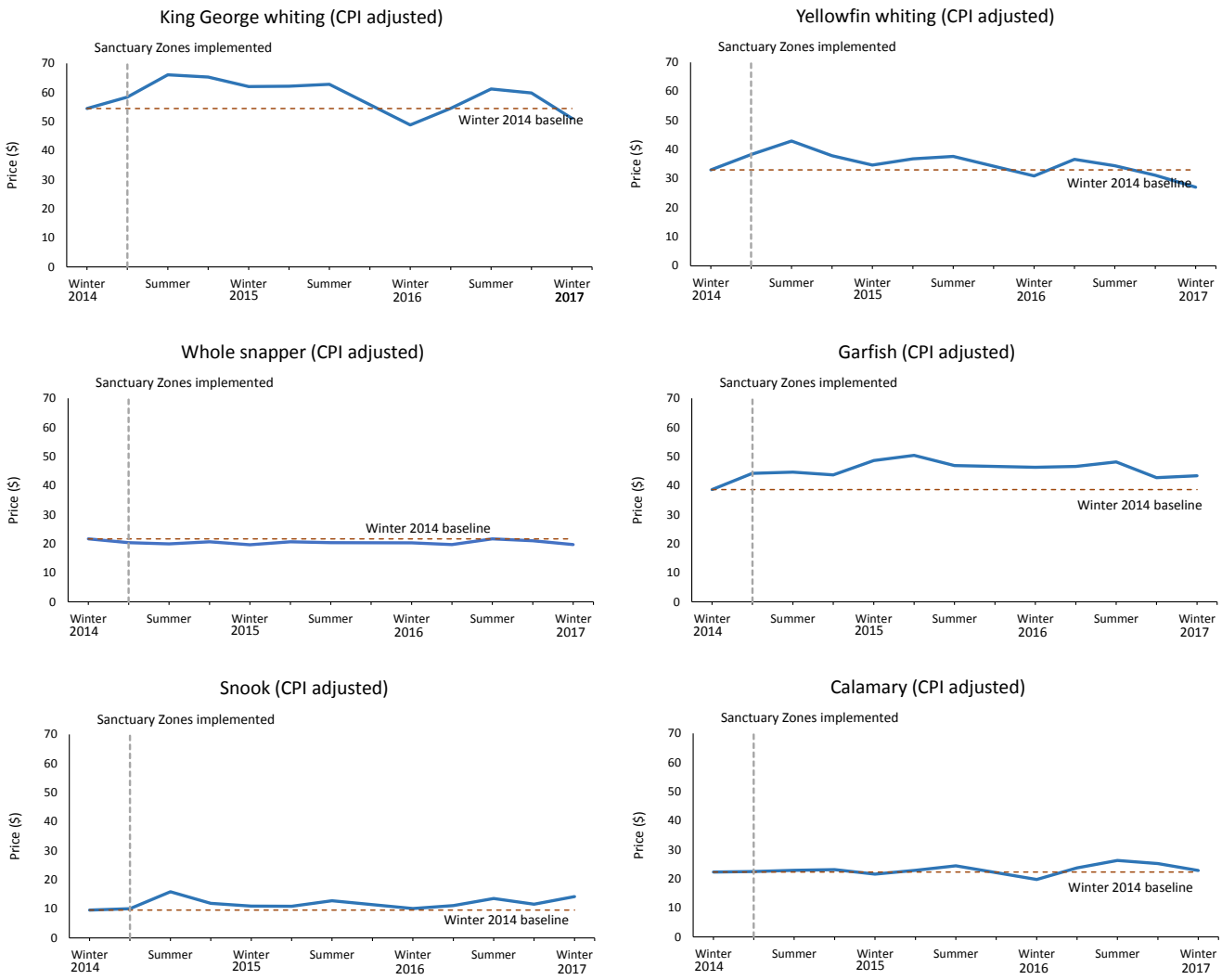


Figure 234. Seasonal fluctuations in the retail price of six species of fish since June 2014. Plotted data are seasonal means and are adjusted to real terms (2017 dollars) using the consumer price index (CPI) for Adelaide. No data were collected during autumn 2016. The vertical dotted line represents the time when fishing restrictions in sanctuary zones were implemented on 1 October 2014. The 'winter 2014 baseline' horizontal dotted line represents the winter value prior to sanctuary zone implementation to allow comparison with subsequent winter values. Source: DEWNR

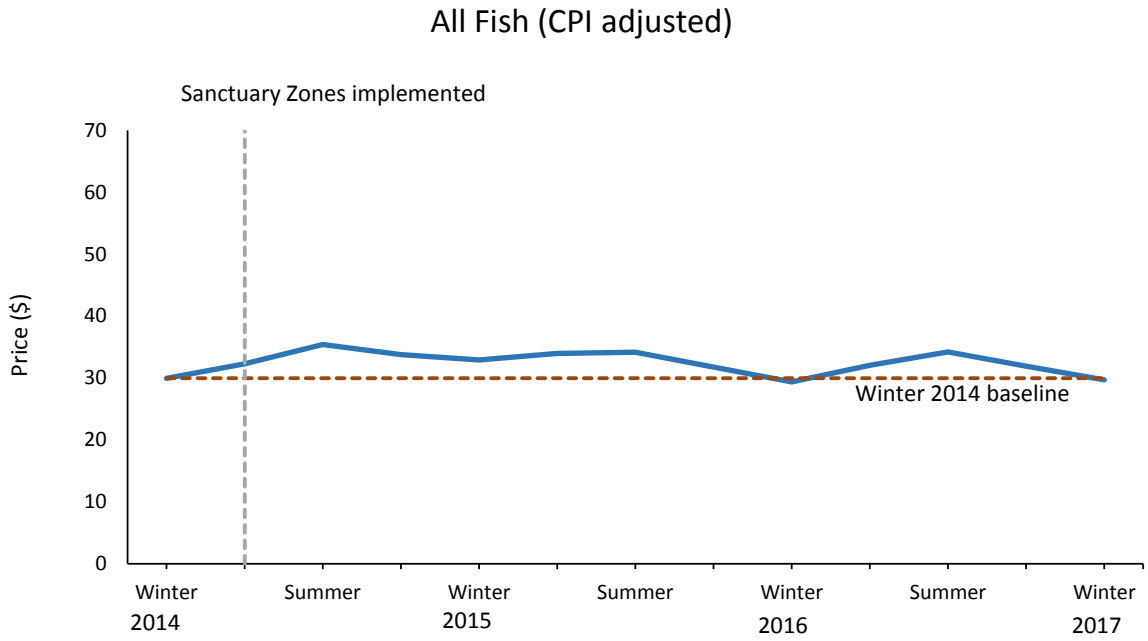


Figure 235. Seasonal fluctuations in the combined average retail price of six species of fish since June 2014 (calamary, whole snook, whole snapper, fillet King George whiting, fillet yellowfin whiting, fillet garfish). Plotted data are seasonal means and are adjusted to real terms (2017 dollars) using the consumer price index (CPI) for Adelaide. No data were collected during autumn 2016. The vertical dotted line represents the time when fishing restrictions in sanctuary zones were implemented on 1 October 2014. The 'winter 2014 baseline' horizontal dotted line represents the winter value prior to sanctuary zone implementation to allow comparison with subsequent winter values. Source: DEWNR

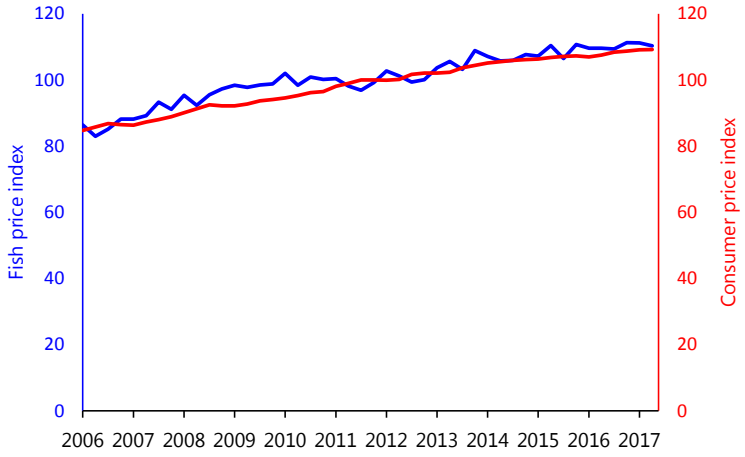


Figure 236. Fish and other seafood price index for Adelaide, compared with Consumer Price Index. Source: ABS (2017d)

11.1.2 SEQ 22 – Has coastal recreation changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in coastal recreation: Strategies 1, 2, 3, 4, 5, 6, and 7

Boat Registrations and Boat Licences

Boat registrations and licences can be used to indicate participation in recreational boating and fishing. The marine parks allow for continued access to popular fishing locations and don't restrict recreational boating, except for boat-based fishing and water sports inside sanctuary zones. It was predicted that the pre-marine parks trend in annual boat registrations and licences would be maintained post-marine parks (Table 71).

The Department of Planning, Transport and Infrastructure (DPTI) publishes annual statewide statistics on boat registrations and licences (DPTI 2017a, b). General boat registrations have remained relatively stable between 2007 and 2016, while Jet Ski registrations have increased substantially during that period. (Figure 237). Boat licences have fluctuated considerably between 1992 and 2016 (Figure 238, note that data on boat licences are available from 1975 but only data from 1992 are presented). In 2015, the option for six-monthly registration renewals was introduced, which may result in a short-term perturbation in the time-series. There is no indication of a perturbation in the trend (positive or negative) in general boat registrations or boat licences since 1992 that coincides with the implementation of marine parks in 2012 or the implementation of fishing restrictions in sanctuary zones in October 2014, i.e. registration numbers have remained relatively stable, and while licence numbers have declined since 2012, this is consistent with previous fluctuations in the period between 1992 to 2012 in which the mean was 6,354 (2016 value = 5,956). These observations are consistent with predictions of change (Table 71).

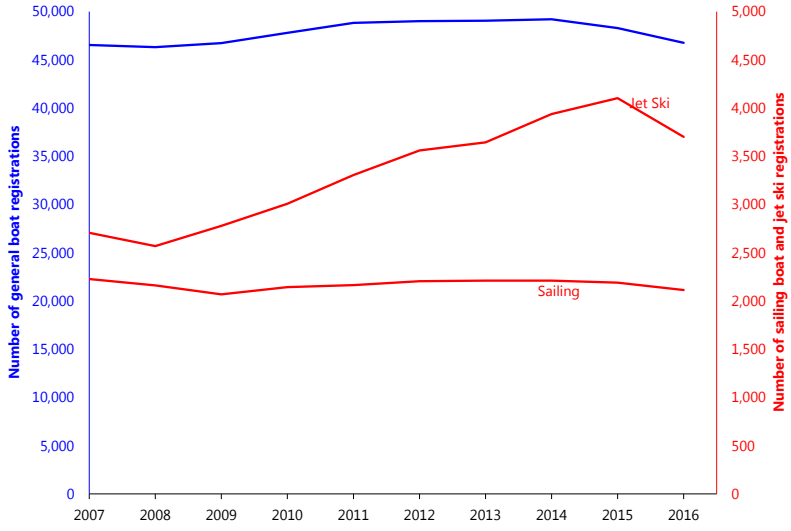


Figure 237. Annual number of South Australian boat registrations for general boats, and sailing vessels and jet skis. General boat registrations include cabin cruisers, half cabins, cuddy cabins, centre consoles, inflatables, open boats and runabouts. Catamarans are grouped with sailing vessels. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DPTI (2017a)

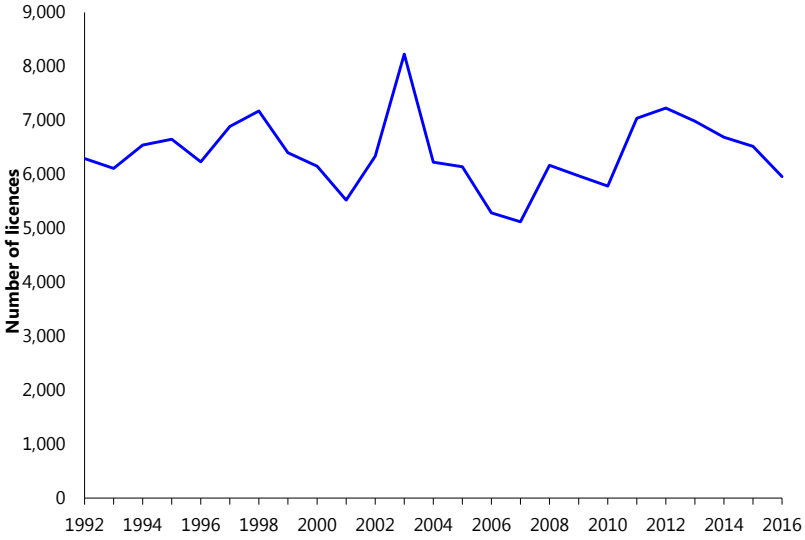


Figure 238. Annual number of South Australian boat licences. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DPTI (2017b)

Participation in coastal recreation

The marine environment is used for a range of coastal recreation activities including fishing, boating, snorkelling, scuba diving, swimming, surfing, camping and sightseeing.

Education activities are identified as strategies of marine park management plans and are aimed at improving participation rates in coastal recreation. Nonetheless, it is unlikely that the pre- marine parks trend in this indicator would be improved post-marine parks or that any change from the pre-marine parks trend could be attributable to marine park education activities (Bryars et al. 2016a-s).

Regular phone surveys of the general public since 2006 have been commissioned by DEWNR to gauge community use of the marine environment and marine parks in South Australia. Between 45 and 65 per cent of the statewide respondents made general recreational use of the marine environment at least monthly, between 15 and 34 per cent participated in fishing, and between 12 and 31 per cent participated in boating (Figure 239). These uses declined from 2007 to 2008 but then remained relatively stable until 2016, with a noticeable decline in general use from 2016 to 2017. There is no indication that the statewide trend between 2008 and 2017 has changed since the implementation of marine parks in 2012 or fishing restrictions in sanctuary zones in 2014 with values from 2008 to 2012 being comparable to values from 2013 to 2017 for general use (with the exception of the low 2017 value), fishing, boating and snorkelling. Regional data are available only since 2011 (Figure 240) and when comparing against the 2011-13 pre-sanctuary zone values, there is no consistent trend (increasing, decreasing or stable) across the four regions from 2015-17 for any of the categories of recreational use including fishing, boating and snorkelling (Figure 240). These observations are consistent with predictions of change (Table 71).

Across all regions, there is little evidence of an impact on frequency of participation in recreational activities in the marine environment since the introduction of sanctuary zones with >90 per cent feeling that they have not changed their frequency of participation in all three years surveyed (Figure 241). Again these observations are consistent with predictions of change (Table 71).

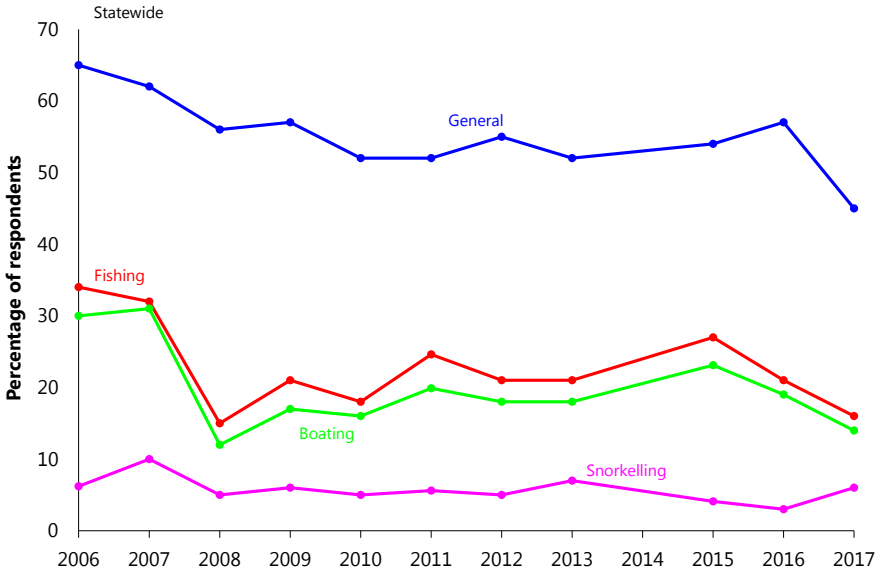


Figure 239. Percentage of statewide respondents who participate in general recreational, fishing, boating and snorkelling activities in the marine environment at least monthly. No data were available for 2014. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR

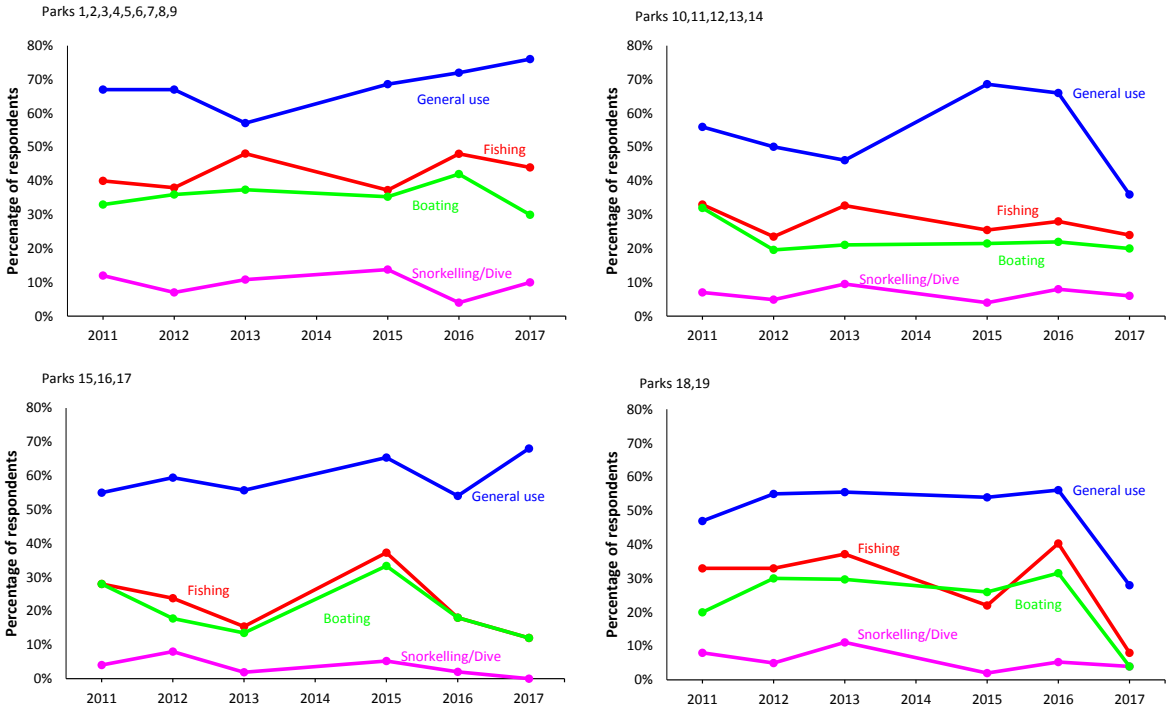


Figure 240. Percentage of phone survey respondents who participate in general recreational, fishing, boating and snorkelling activities in the marine environment at least monthly. No data were available for 2014. The data from the survey was separated into five regions: Adelaide, West/Eyre Peninsula (parks 1,2,3,4,5,6,7,8,9), North/Yorke Peninsula (parks 10,11,12,13,14), Central/Kangaroo Island (parks 15,16,17) and South East (parks 18,19). Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR

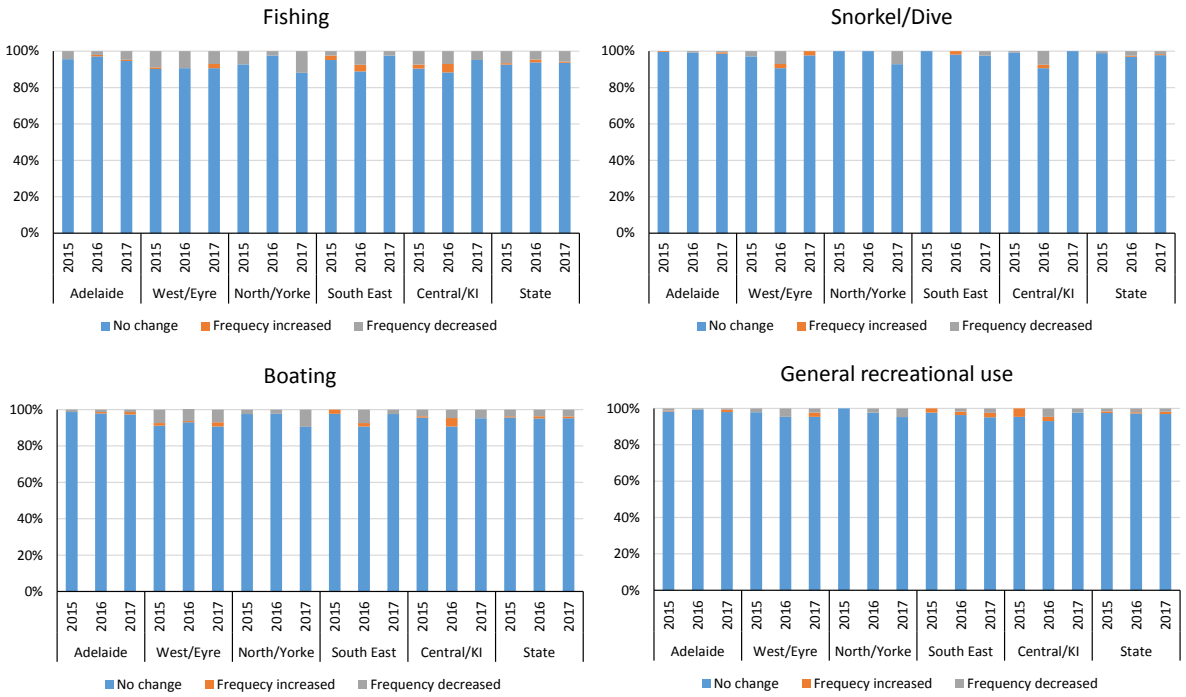


Figure 241. Percentage of phone survey respondents indicating if they have changed their frequency of participation in general recreational use, fishing, boating and snorkelling/diving activities in the marine environment since the introduction of sanctuary zones. Source: DEWNR

11.1.3 SEQ 23 – Has tourism changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in tourism: Strategies 1, 2, 3, 4, 5, 6, and 7

The majority of all tourism takes place in coastal areas, with beaches and coastal environments amongst the most popular destinations (WWF 2017, Sydney Marine Park 2017). The causal link between marine park declaration and increased nature based tourism is yet to be established. Other studies of marine parks have demonstrated that significant economic values and benefits can be attributed to the tourism that they generate. These benefits generally increase over time and furthermore may not be realised for several years post declaration. It was predicted that marine parks would have a positive influence on tourist operator numbers and tourist expenditure (Bryars et al. 2016a-s) and that the pre-marine parks trends would be maintained or improved post-marine parks (Table 71).

Tourism visitor numbers and tourism businesses

Tourism is an important social and economic contributor to South Australia as a whole as well as the regional areas in which the marine parks are situated. Tourism Research Australia provides time series of international and domestic tourism numbers and expenditure, and the number of tourism businesses, for South Australia's tourism regions (see Appendix map for regions, Tourism Research Australia 2017a-e). Tourism visitors and expenditure as well as tourism businesses have generally remained fairly stable between 2008/09 and 2014/15 and 2013/14 for tourism businesses (note that values for 2015/16 and 2016/17 were unavailable at the time of publication of the current report). There is no indication of a consistent perturbation in the trend (positive or negative) across the different coastal tourism regions since 2008/09 that coincides with the implementation of marine parks in 2012 or fishing restrictions in sanctuary zones in 2014 (Figure 242 and Figure 243). These observations are consistent with predictions of change (Table 71).

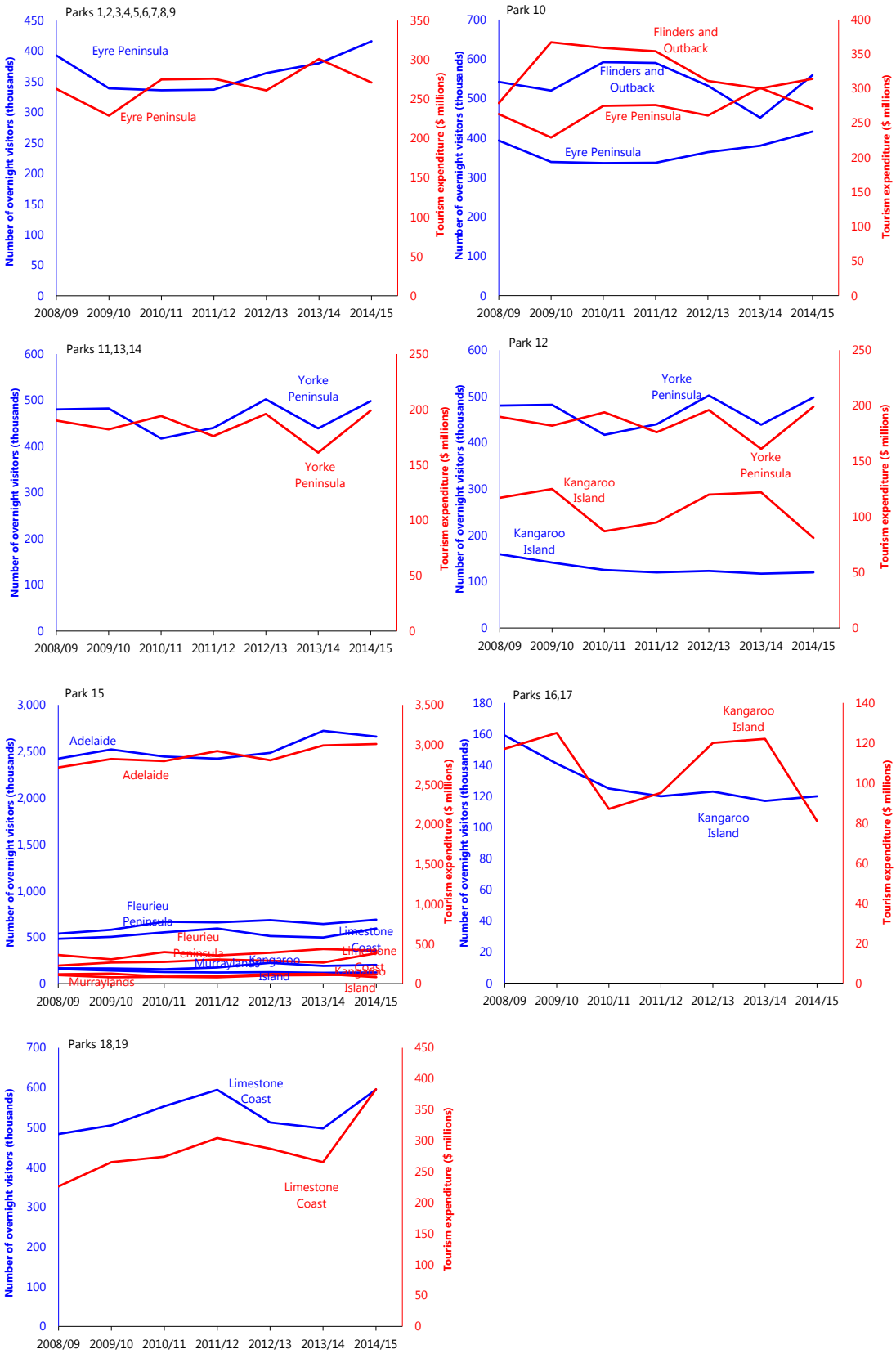


Figure 242. Number of overnight visitors and tourism expenditure for South Australia's coastal tourism regions adjacent to marine parks. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Tourism Research Australia (2017 a-e)

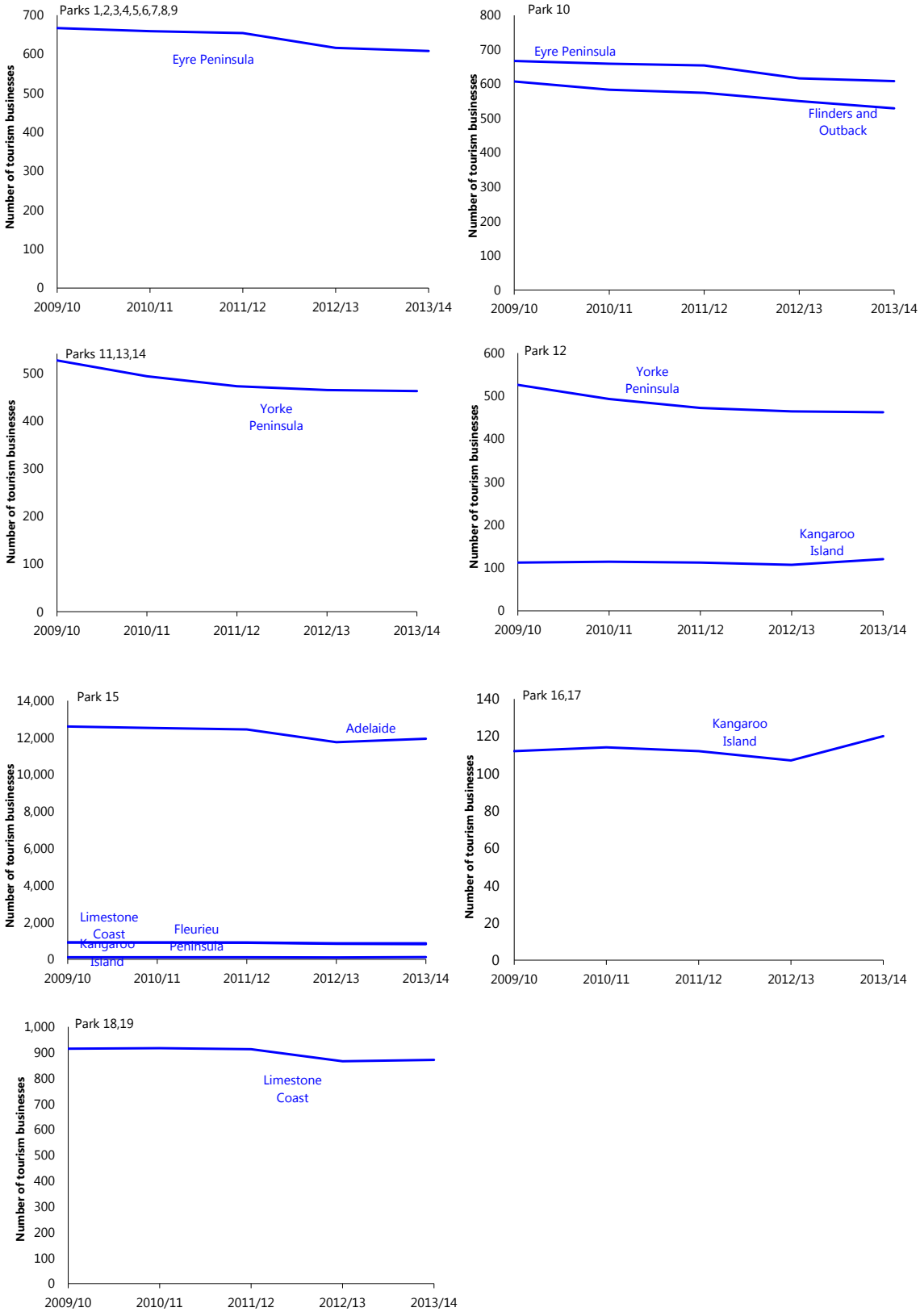


Figure 243. Number of tourism businesses in South Australia's coastal tourism regions adjacent to marine parks. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. No data were available for 2014/15 at the time of publishing the Status Report. Source: Tourism Research Australia (2017a-e)

White shark cage diving participation rates

White shark cage diving has occurred in the Neptune Islands since 2007 (refer to Case study 10). The Neptune Islands Sanctuary Zone 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. Visitor numbers have steadily increased over time up to and beyond the implementation of the management plan for Neptune Islands Group (Ron and Valerie Taylor) Marine Park. Visitor numbers increased from 1127 visitors in 2008/09 to 9807 in 2016/17 (Figure 244). These observations are consistent with predictions of change (Table 71). The white shark cage-diving industry has injected $12.8 million into the economy and provided 80 jobs (SATC 2017).

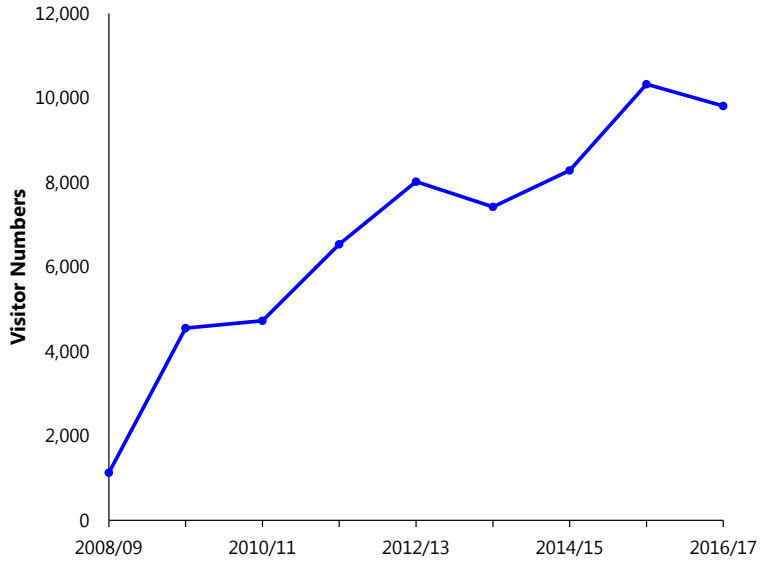


Figure 244. White shark cage diving visitor numbers. Source: DEWNR

Tour operator numbers

DEWNR maintains a database of coastal and marine tourism operators in South Australia (DEWNR unpublished data). The coastal and marine tourism operators offer a range of activities including fishing charters, marine mammal watching and/or general cruises and sight-seeing. The total number of tour operators utilising marine parks has increased slightly from 59 in 2014 to 63 in 2017 with the trend of change (stable, increase or decrease) varying between the different parks (Table 72). These observations are consistent with predictions of change (Table 71). Since 2014, four new operators have commenced operating inside marine parks: Oceanic Victor within the Encounter Marine Park, and Joy Flights Port Lincoln, Pure Coffin Bay Oyster Farm Tours and Oyster Farm Tours within the Thorny Passage Marine Park. In 2016, Kangaroo Island Ocean Safari received the first South Australian Commercial Marine Mammal Interaction Permit to swim with long-nosed fur seals. This permit allows for sightseeing, viewing wildlife and if possible, swimming with dolphins and long-nosed fur seals within a sanctuary zone.

Table 72. Number of tour operators utilising each marine park and the total number of operators utilising at least one marine park. Source: DEWNR

Marine Park	Number of tour operators 2014	Number of tour operators 2017
Far West Coast (MP1)	4	4
Nuyts Archipelago (MP2)	7	7
West Coast Bays (MP3)	3	3
Investigator (MP4)	6	6
Thorny Passage (MP5)	12	15
Sir Joseph Banks Group (MP6)	11	17
Neptune Islands Group (MP7)	6	6
Gambier Islands Group (MP8)	1	1
Franklin Harbor (MP9)	3	3
Upper Spencer Gulf (MP10)	3	4
Eastern Spencer Gulf (MP11)	2	2
Southern Spencer Gulf (MP12)	6	5
Lower Yorke Peninsula (MP13)	2	2
Upper Gulf St Vincent (MP14)	0	0
Encounter (MP15)	19	19
Western Kangaroo Island (MP16)	2	1
Southern Kangaroo Island (MP17)	1	0
Upper South East (MP18)	1	0
Lower South East (MP19)	4	4
Total no. of tour operators*	59	63

* Total does not equal the column total as some operators utilise more than one park

11.1.4 SEQ 24 – Have Aboriginal heritage values changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in Aboriginal heritage values: Strategies 1, 2, 3, 4, 5, 7, 9, 14 and 15

Aboriginal people have traditional associations (which may include Aboriginal traditional fishing) with the coastal and marine environment across South Australia. There are native title claims in many coastal areas across the state. Unique Aboriginal heritage sites such as constructed fish traps are still visible on the coastline in some of the parks. It is predicted that the level of protection for registered heritage sites will improve due to marine park management plans (Table 71).

The Central Archive, including the Register of Aboriginal Sites and Objects, is maintained by the Aboriginal Affairs and Reconciliation Division of the South Australian Department of State Development. Information on the site register is confidential and is only released with the permission of the traditional owners. There are a total of 126 Aboriginal sites within the 19 marine parks (Table 73). Sanctuary zones offer 11 Aboriginal sites a greater level of protection than they had prior to 2014. These observations are consistent with predictions of change (Table 71).

Table 73. Number of registered and reported Aboriginal sites in marine parks. Source: South Australian Department of State Development

Marine Park	Number of registered Aboriginal sites	Number of reported Aboriginal sites	Number of Aboriginal sites in sanctuary zones
Far West Coast (MP1)	1		
Nuyts Archipelago (MP2)	28	5	1
West Coast Bays (MP3)		1	
Investigator (MP4)			
Thorny Passage (MP5)	11	4	3
Sir Joseph Banks Group (MP6)		1	
Neptune Islands Group (MP7)			
Gambier Islands Group (MP8)			
Franklin Harbor (MP9)	4	2	
Upper Spencer Gulf (MP10)	3	4	
Eastern Spencer Gulf (MP11)	2	2	
Southern Spencer Gulf (MP12)	3	3	
Lower Yorke Peninsula (MP13)	2		
Upper Gulf St Vincent (MP14)	1		
Encounter (MP15)	11	18	6
Western Kangaroo Island (MP16)			
Southern Kangaroo Island (MP17)			
Upper South East (MP18)	6	5	1
Lower South East (MP19)	5	4	
Totals	77	49	11

11.1.5 SEQ 25 – Have European heritage values changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in European heritage values: Strategies 1, 2, 3, 4, 5, 7, and 15

South Australia has a diverse maritime history which includes exploration, whaling, sealing, lighthouses, pastoralism, trade and shipping. Remaining sites, structures and objects now provide a tangible link with the past and encourage an understanding of the activities, people and values that have shaped our European history and environment. It is predicted that the level of protection for registered heritage sites will improve due to marine park management plans (Table 71).

DEWNR maintains the South Australian Shipwrecks Database, which includes all known shipwrecks located in South Australian waters. It incorporates the Register of Historic Shipwrecks and the Register of Historic Relics as required under the (Commonwealth) *Historic Shipwrecks Act 1976* and the (South Australian) *Historic Shipwrecks Act 1981*, and includes shipwrecks that have not been declared under either of these Acts. There are more than 800 shipwrecks in South Australia, recorded along the coast and inland waters (DEWNR 2017b). Of the 800 shipwrecks, 433 are protected under the *Historic Shipwrecks Act 1981* (Under this Act significant shipwrecks or relics are protected as declared historic shipwrecks, with people encouraged to visit them on a look but don't interfere basis). Sanctuary zones offer 26 protected shipwrecks a greater level of protection than they had prior to 2014 (see Table 74) by reducing damage due to boat anchors and fishing gear. The on-going marine parks compliance program assists with this protection (refer to *Zanoni* Case study 6). These observations are consistent with predictions of change (Table 71).

Table 74. Number of shipwrecks per park. Source: DEWNR

Marine Park	No. found ship-wrecks	No. ship-wrecks not found	No. ship-wrecks protected under *Historic Shipwrecks Act 1981*	No. ship-wrecks in sanctuary zones	No. found ship-wrecks in sanctuary zones	No. protected shipwrecks in sanctuary zones
Far West Coast (MP1)	2					
Nuyts Archipelago (MP2)	6	33	7	5		1
West Coast Bays (MP3)		7	1	1		
Investigator (MP4)	2	8	4			
Thorny Passage (MP5)	2	18	5			
Sir Joseph Banks Group (MP6)	4	12	10	2		1
Neptune Islands Group (MP7)	1	6	1			
Gambier Islands Group (MP8)	1	3	2			
Franklin Harbor (MP9)	1	2	2			
Upper Spencer Gulf (MP10)	4	5	6	3	1	3
Eastern Spencer Gulf (MP11)	12	3	14	1		1
Southern Spencer Gulf (MP12)	9	28	25	3	1	2
Lower Yorke Peninsula (MP13)	9	4	11			
Upper Gulf St Vincent (MP14)	1	1	2	2	1	2
Encounter (MP15)	15	76	69	16	1	13
Western Kangaroo Island (MP16)	3	10	9	4	1	3
Southern Kangaroo Island (MP17)	1	3	2			
Upper South East (MP18)	1	13	9			
Lower South East (MP19)	1	7	6			
Totals	75	239	185	37	5	26

11.1.6 SEQ 26 – Has shipping changed due to marine park management plans?

Potential causal links between management plan strategies and observed changes in shipping: Strategies 1, 2, 3, 4, 5, and 7

Shipping provides an important socio-economic activity in South Australia. The ports around South Australia are important for the export of a variety of commodities including grain, limestone, iron ore, cement, gypsum, mineral sands and salt. The marine parks were designed to accommodate shipping and it is not expected that shipping will change due to implementation of marine park management plans. It was predicted that the pre-marine parks trend in the number of vessel calls per port and the amount of exports/imports per port would be maintained post-marine parks (Table 71).

Flinders Ports provides an annual summary report which includes bulk cargo import and export, and the number of vessel calls (visits). Viterra Ltd provided a summary of bulk cargo export, and the number of vessel calls (visits) since 2008 for Ardrossan. Trends in annual vessel calls and exports were variable pre-marine parks and have continued to be variable post-marine parks (Figure 245). These observations are consistent with predictions of change (Table 71).

Figure 245. Annual cargo exports and vessel calls for ports within marine parks, excluding Whyalla and Port Bonython, between 2008 and 2016. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Flinders Ports (2017)

11.1.7 SEQ 27 – Has aquaculture changed due to marine park management plans?

Potential causal links between management plan strategies and observed changes in aquaculture: Strategies 1, 2, 3, 4, 5, and 7

The South Australian marine environment supports an aquaculture industry based mainly on intertidal Pacific oysters, and sea cage grow-out of southern bluefin tuna and yellowtail kingfish (Econsearch 2016a). The marine parks were designed to accommodate aquaculture with numerous aquaculture operations occurring within marine parks (Table 75) and it is not expected that aquaculture will change due to implementation of marine park management plans. It was predicted that the pre-marine parks trend in the number of active licences and direct output would be maintained post-marine parks (Table 71). EconSearch Pty Ltd estimated the regional and state economic impact of aquaculture activity in South Australia in most years between 1997 and 2015. Estimates since 2003 consider the farm gate value of production, the net value of local processing, the net value of local retail and food service trade, and the value of local transport services at all stages of the marketing chain (EconSearch 2016). Since the implementation of marine parks in 2012 and sanctuary zones in 2014, aquaculture output has continued on a similar trend as before except for Eyre Peninsula where it has risen noticeably (Figure 246). These observations are consistent with predictions of change (Table 71).

Table 75. Number of active aquaculture licences per marine park as of September 2017. Source: DEWNR

Marine Park	Number of active aquaculture licences
Nuyts Archipelago (MP2)	105
Thorny Passage (MP5)	154
Sir Joseph Banks Group (MP6)	3
Franklin Harbor (MP9)	32
Upper Spencer Gulf (MP10)	12
Lower Yorke Peninsula (MP13)	3
Encounter (MP15)	8

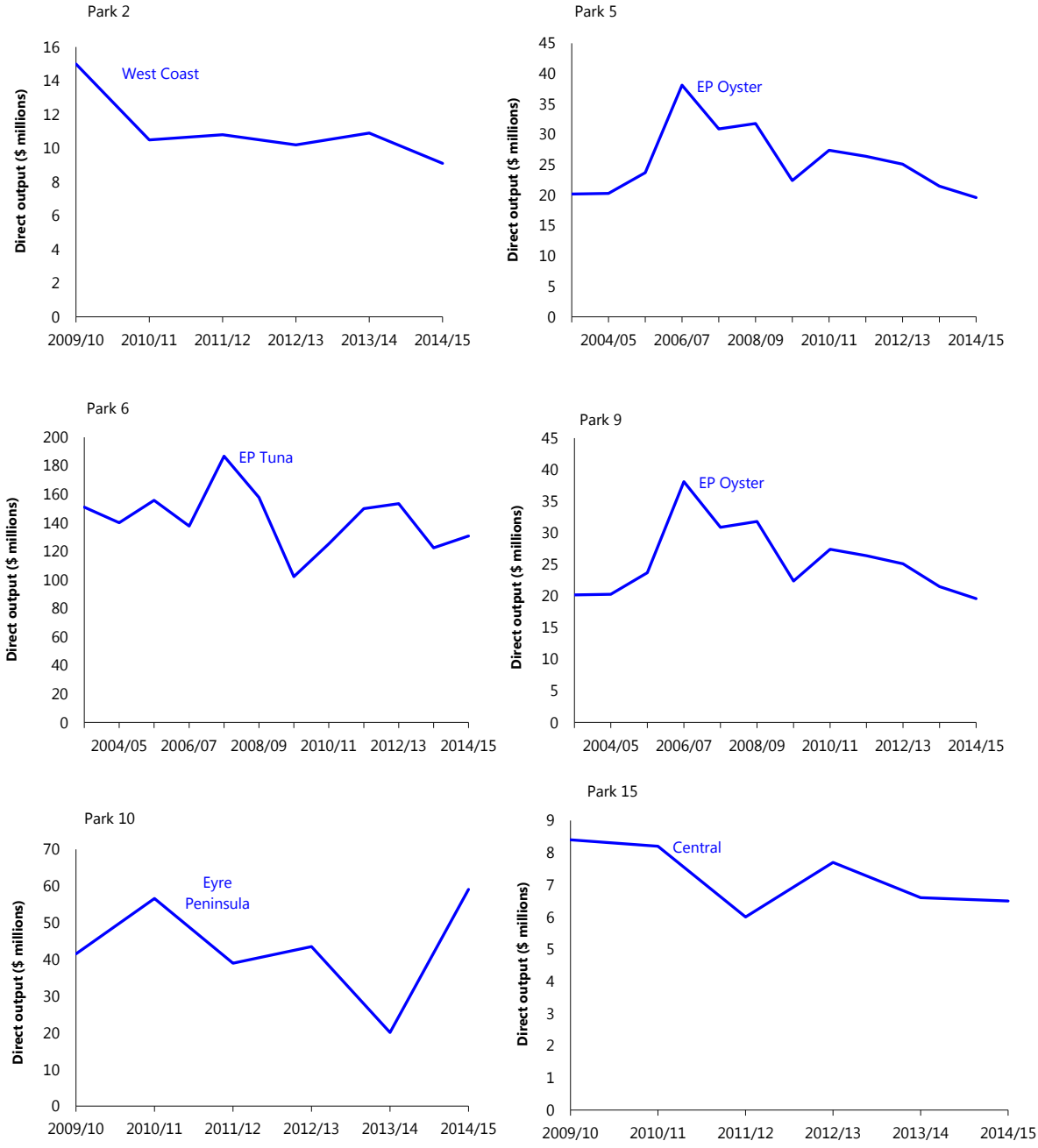


Figure 246. Direct output (business turnover) from aquaculture in South Australia. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Econsearch (2016)

11.1.8 SEQ 28 – Has recreational fishing changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in recreational fishing: Strategies 1, 2, 3, 4, 5, 7, 8, and 15

Recreational fishing has an important socio-economic value across South Australia. A recreational fishing survey conducted by Primary Industries and Regions SA indicated that 16 and 18 percent of South Australians went fishing in 2007 and 2013, respectively (Jones 2009, Giri and Hall 2015). The marine parks were designed to accommodate recreational fishing with some spatial displacement being unavoidable due to implementation of sanctuary zones. A number of government initiatives associated with marine parks implementation were instigated to enhance recreational fishing (refer Assessment 2). It is not expected that participation rates in recreational fishing would change due to marine park management plans. It was predicted that the pre-marine parks trend in participation rate would be maintained post-marine parks (Table 71).

Three statewide targeted recreational fishing surveys have been undertaken in South Australia – in 2000/01 (The National Recreational and Indigenous Fishing Survey, Henry and Lyle 2003, Jones and Doonan 2005), in 2007/08 (Jones 2009), and in 2013/14 (Giri and Hall 2015). Only data from the 2007/08 and the 2013/14 surveys will be presented. Another targeted recreational fishing survey has not been conducted since the full implementation of sanctuary zones on 1 October 2014 to enable comparison with previous surveys.

The estimated number of days fished in South Australia by South Australian resident recreational fishers was about 1,054,200 in 2007/08 and 965,561 in 2013/14. Between 2007/08 and 2013/14, the estimated number of South Australian resident recreational fishers in South Australia increased by about 17 per cent from about 236,463 in 2007/08 to 277,027 in 2013/14 (Giri and Hall 2015). Recreational fishing across the statistical divisions within marine parks remained relatively stable from 2007/08 to 2013/14 (Figure 247).

Regular phone surveys of the general public since 2006 have been commissioned by DEWNR to gauge community use of the marine environment and marine parks in South Australia. Between 43 and 69 per cent of respondents fished recreationally at least once each year, and between 15 and 34 per cent fished monthly (Figure 248). Recreational fishing activity declined noticeably from 2007 to 2008 but has since relatively stable. For regular fishers (at least monthly) and irregular fishers (at least once per year) there is no indication that the statewide trend since 2008 has changed since the implementation of marine parks in 2012 or fishing restrictions in sanctuary zones in 2014 with values from 2008 to 2014 being comparable to values from 2015 to 2017. Regional data are available only since 2011 (Figure 249) and when comparing against the 2011–13 pre-sanctuary zone values, there is no consistent trend (increasing, decreasing or stable) across the four regions from 2015-17 for the two categories of recreational fishing participation (Figure 249). These observations are consistent with predictions of change (Table 71).

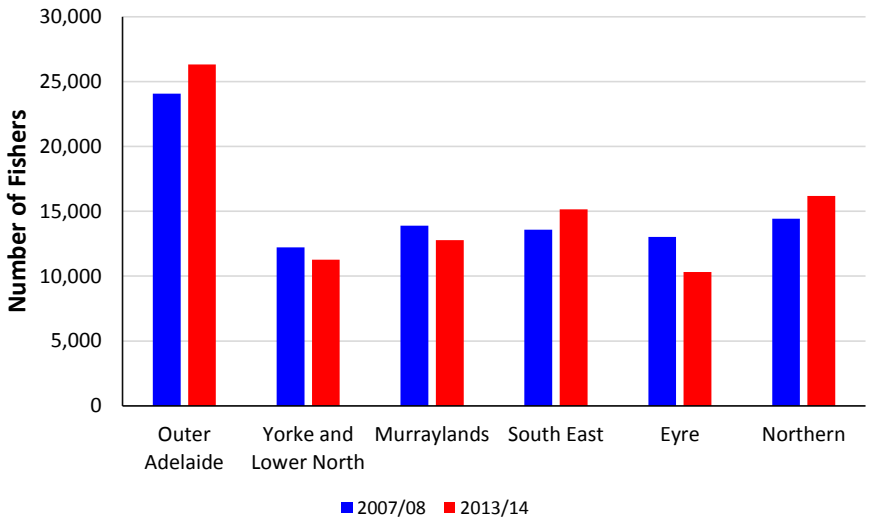


Figure 247. Number of recreational fishers for six of the seven statistical divisions for 2007/08 and 2013/14. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Jones (2009) and Giri and Hall (2015)

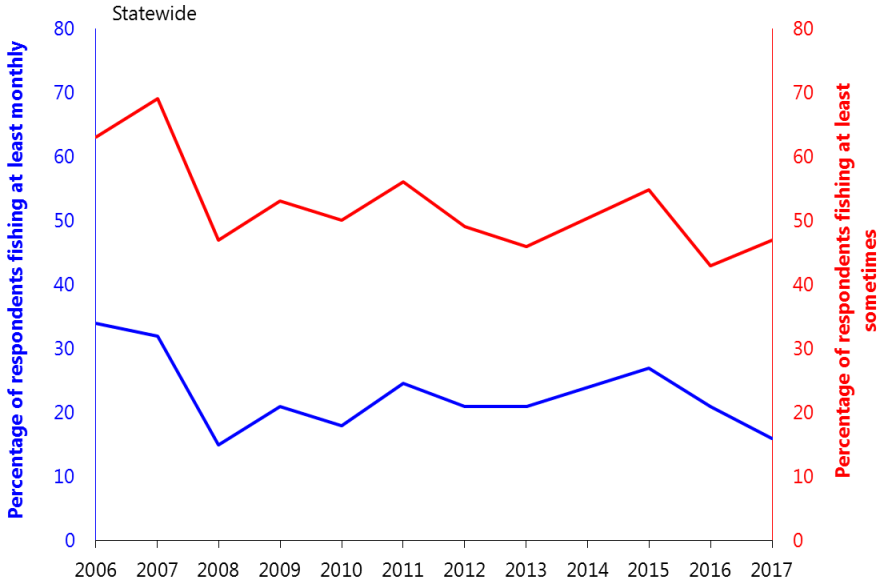


Figure 248. Percentage of statewide phone survey respondents who participate in recreational fishing. No data were available for 2014. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR.

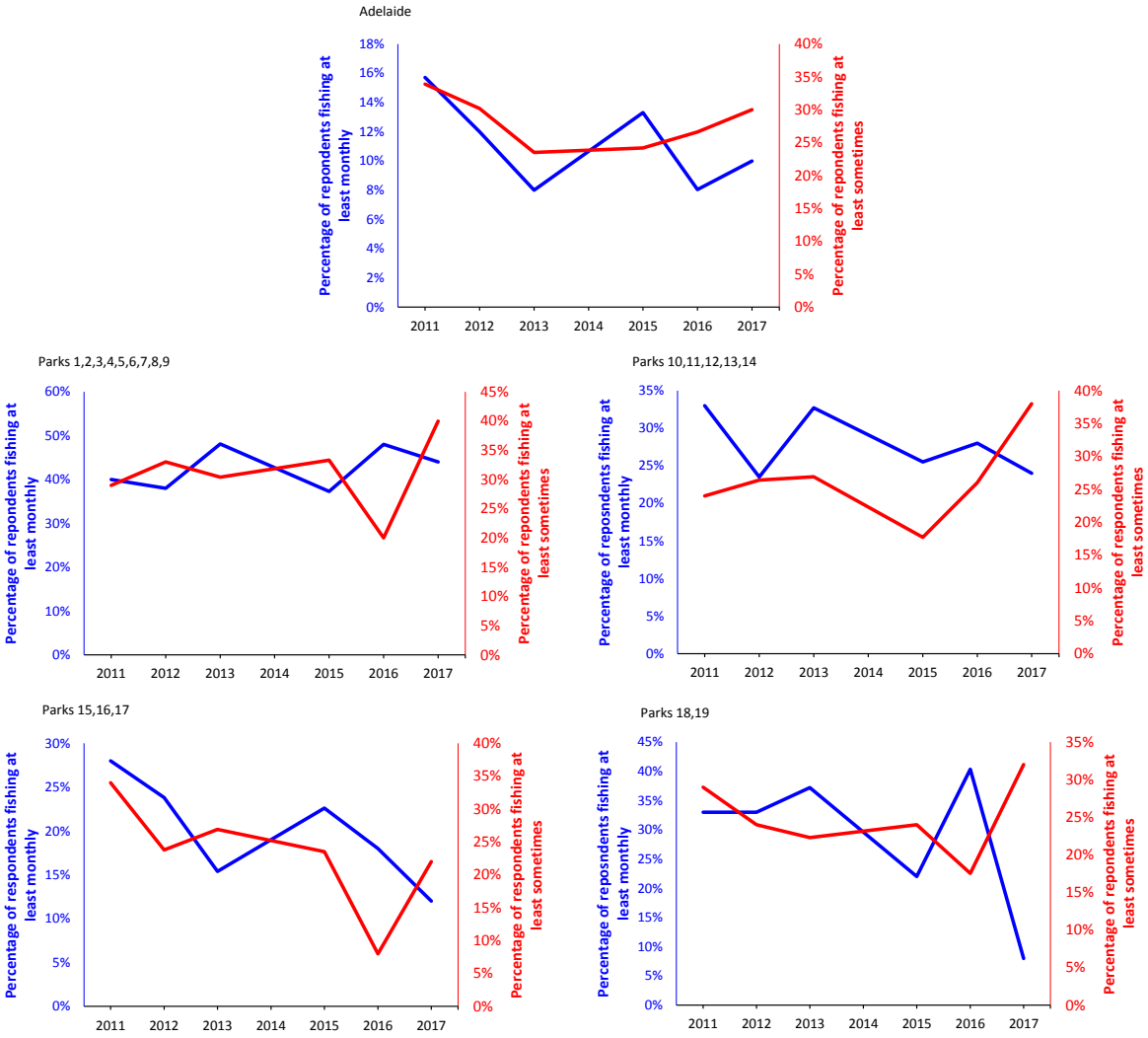


Figure 249. Percentage of phone survey respondents who participate in recreational fishing. No data are available for 2014. The data from the survey was separated into five regions: Adelaide, West/Eyre Peninsula (parks 1,2,3,4,5,6,7,8,9), North/Yorke Peninsula (parks 10,11,12,13,14), Central/Kangaroo Island (parks 15,16,17) and South East (parks 18,19). Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: DEWNR

11.1.9 SEQ 29 – Have commercial fisheries changed due to implementation of marine park management plans?

Potential causal links between management plan strategies and observed changes in commercial fisheries: Strategies 1, 2, 3, 4, 5, 7, 8, and 15

There are a number of commercial fisheries operating in South Australia. The marine parks were designed to accommodate commercial fishing with some spatial displacement being unavoidable due to fishing restrictions in sanctuary zones. A number of government initiatives associated with marine parks implementation were instigated to minimise potential negative impacts on commercial fisheries (refer to Assessment 2). It was predicted that the pre-marine parks trends in catch and value for various commercial fisheries would be maintained post-marine parks (Bryars et al. 2016a-s, Table 71).

Historical data are available on the volume and value of production from South Australian commercial fisheries between 1984/85 and 2010/11 (Knight and Tsolos 2012) and between 1990/91 and 2014/15 (EconSearch 2017a, b, 2016b, c, d, e, f, g, h). A range of economic information is available, including gross value of production, costs, profit, return on investment, economic impact and exports (EconSearch 2017a, b, 2016b, c, d, e, f, g, h).

The following sections present publically available information on catch, catch value and catch rates at a broad spatial scale that is relevant to potential regional impacts of marine parks. Data are publically available on either calendar years (January to December) or financial years (July to June) and vary between the different fisheries. Fisheries are managed by PIRSA Fisheries and for further detailed information see http://www.pir.sa.gov.au/research/publications/research_reports.

Rock Lobster Fishery

There are two zones that form the South Australian Rock Lobster Fishery; the Northern Zone, which extends from the Western Australian border to the Murray Mouth and the Southern Zone which extends from the Murray Mouth to the Victorian border. The fishery allows potting for rock lobster, and various by-product species including Maori octopus. Fishing is conducted on subtidal reef habitat. There are 63 commercial licences in the Northern Zone Rock Lobster Fishery (Linnane et al. 2017a) and 180 commercial licences in the Southern Zone Rock Lobster Fishery (Linnane et al. 2017b). The Southern Zone fishing season runs from October to April while the Northern Zone has traditionally run from November to May but has recently been extended to year round in the outer sub-region (Linnane et al. 2017a, b).

The annual value of the Northern Zone Rock Lobster Fishery between 2002/03 and 2015/16 ranged between $15 and $26 million (EconSearch 2017a). The annual value of the Southern Zone Rock Lobster Fishery between 2002/03 and 2015/16 ranged between $66 and $113 million (EconSearch 2017b).

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch has continued on the same trend as the previous few years (i.e. it has remained relatively constant) while value has continued to increase in both the Northern and Southern Zones (Figure 250, Figure 251). In the two full fishing seasons since sanctuary zone implementation (i.e. 2014/15 and 2015/16 fishing seasons), catch rates in the Northern Zone have continued to decline on the same decreasing trend that they have been on since 2011/12 while catch rates in the Southern Zone have stabilised from the increasing trend that they were on since 2009/10 (see Linnane et al. 2017a, b). In the two years since implementation of fishing restrictions in sanctuary zones the quota has been reached in both years in the Southern Zone and 99 per cent and 97 per cent taken in the Northern Zone which is consistent with the previous three years where the quota taken ranged from 94 per cent to 99 per cent (see Linnane et al. 2017a, b). These observations are consistent with predictions of change (Table 71).

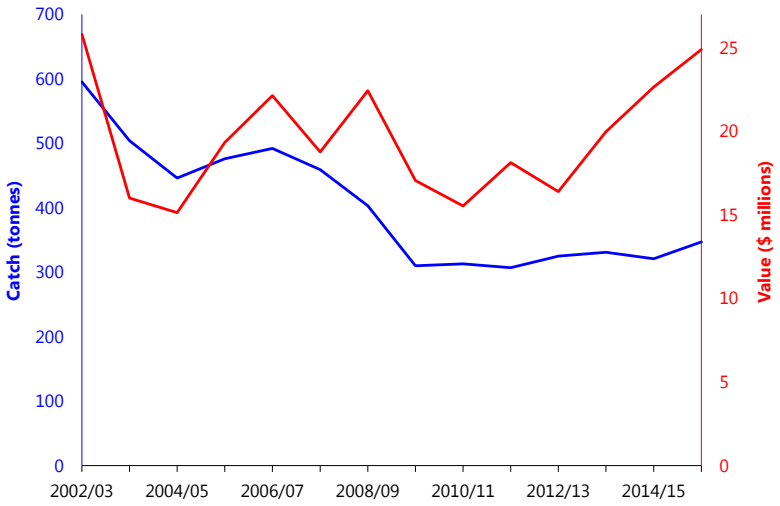


Figure 250. Catch and value of catch for the Northern Zone Rock Lobster Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017a)

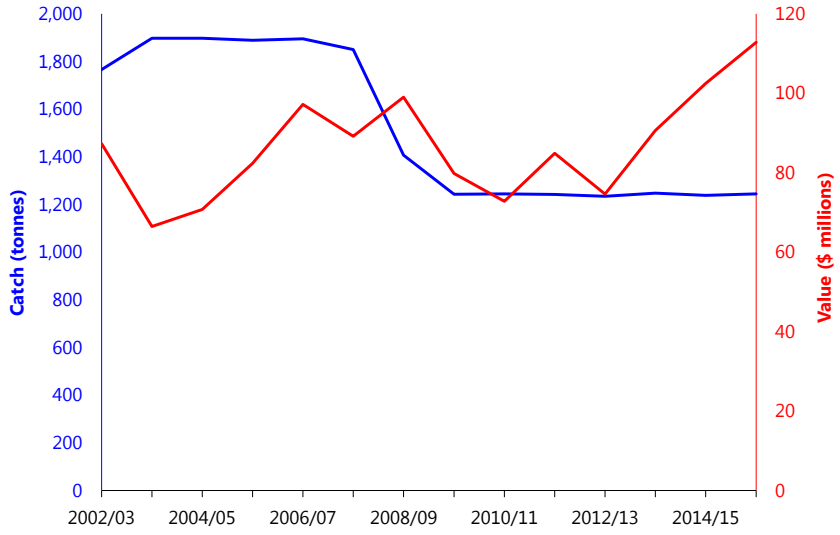


Figure 251. Catch and value of catch for the Southern Zone Rock Lobster Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017b)

Abalone Fishery

Three zones form the South Australian Abalone Fishery; the Western Zone, which extends from the Western Australian border to near Arno Bay on Eyre Peninsula, the Central Zone, which extends from Cowell to west of the Murray Mouth, and the Southern Zone, which extends from Cape Jaffa to the Victorian Border. The South Australian Abalone Fishery allows removal of greenlip and blacklip abalone. Fishing is conducted on subtidal reef habitat. There are 22 licences in the Western Zone (Stobart et al. 2015a, b). The main regional areas associated with the fishery are Port Lincoln, Streaky Bay and Elliston (PIRSA 2009). There are six licences in the Central Zone (Mayfield and Ferguson 2015). The main regional areas associated with the fishery are Port Hughes and Kangaroo Island (PIRSA 2009). There are six licences in the Southern Zone (PIRSA 2017). The main regional area associated with the fishery is Mount Gambier (PIRSA 2009).

The annual value of the Western Zone Abalone Fishery between 2002/03 and 2015/16 ranged between $13 and $31 million (EconSearch 2017c). The annual value of the Central Zone Abalone Fishery between 2002/03 and 2015/16 ranged between $6 and $11 million (EconSearch 2017c). The annual value of the Southern Zone Abalone Fishery between 2002/03 and 2015/16 ranged between $3 and $8 million (EconSearch 2017c).

Since the implementation of fishing restrictions in sanctuary zones in October 2014, catch and value have continued on the same long-term trends in all three zones (Figure 252, Figure 253, Figure 254). The catch and value in the two years since sanctuary zones were implemented (2014/15, 2015/16) are comparable to the previous year (2013/14) in all three zones.

In the first full fishing season (i.e. 2015) since sanctuary zone implementation in the Western Zone:

- Catch rate of blacklip abalone was equivalent to the previous year (2014) and consistent with the general declining trend since 2003 (see Stobart and Mayfield 2016a).
- Catch rate of greenlip abalone was substantially higher (17%) than the previous year (2014) and inconsistent with the declining trend since 2003 (see Stobart and Mayfield 2016b).

In the first full fishing season (i.e. 2015) since sanctuary zone implementation in the Central Zone:

- Catch rate of greenlip abalone was equivalent to the previous year (2014) and consistent with the stable trend since 2011 (see Burnell et al. 2016).
- Catch rate of blacklip abalone was slightly higher than the previous year (2014) and consistent with the stable trend since 2012 (see Burnell et al. 2016).

At the time of publishing the Status Report, data on catch rates for the Southern Zone were available only for 2014/15 which partially overlaps with the time of sanctuary zone implementation (i.e. October 2014). In 2014/15 catch rate of blacklip abalone was equivalent to the previous year (2013/14) and consistent with the general declining trend since 2010/11 (Ferguson et al. 2016). No data were available on the first full season since implementation, i.e. 2015/16. No data are available on Southern Zone greenlip catch which is negligible compared to blacklip catch (Ferguson et al. 2016).

The observations on catch, catch value and catch rate are consistent with predictions of change (Table 71).

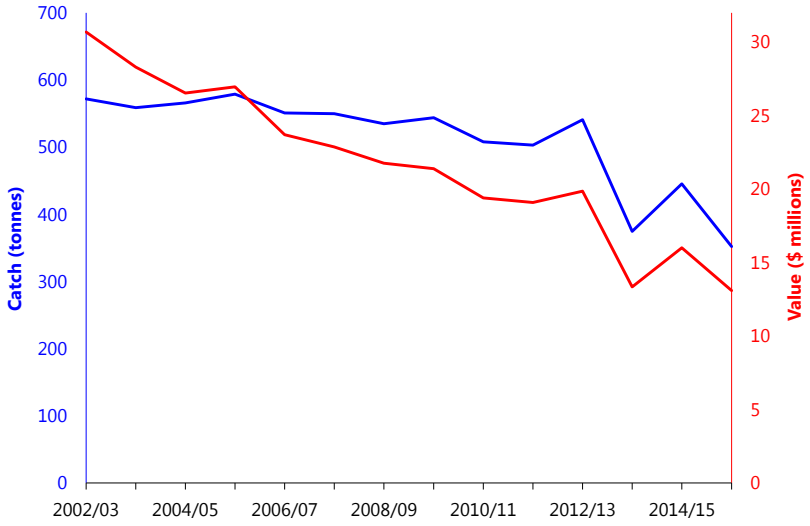


Figure 252. Catch and value of catch for the Western Zone Abalone Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017c), Knight and Tsolos (2012). Post 2010/11, catch was calculated using values for GVP divided by average price per kilogram from EconSearch annual reports for the fishery.

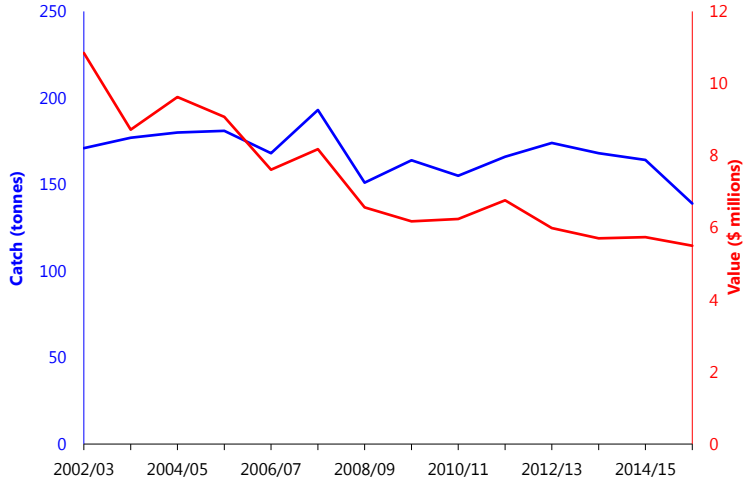


Figure 253. Catch and value of catch for the Central Zone Abalone Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017c), Knight and Tsolos (2012). Post 2010/11, catch was calculated using values for GVP divided by average price per kilogram from EconSearch annual reports for the fishery.

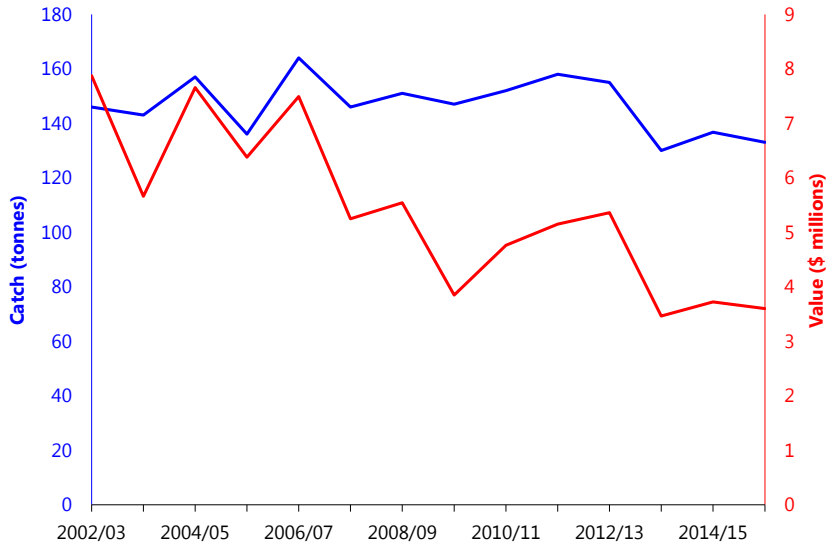


Figure 254. Catch and value of catch for the Southern Zone Abalone Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017c), Knight and Tsolos (2012). Post 2010/11, catch was calculated using values for GVP divided by average price per kilogram from EconSearch annual reports for the fishery.

Prawn Fishery

There are three sectors of the South Australian Prawn Fishery which target western king prawn using an otter trawl; the West Coast Prawn Fishery, the Spencer Gulf Prawn Fishery and the Gulf St Vincent Prawn Fishery. Fishing is conducted on subtidal sand habitat. In the West Coast Prawn Fishery there are currently three licences (Beckmann and Hooper 2016). There are currently 39 licences in the Spencer Gulf Prawn Fishery (Noell and Hooper 2017). There were 10 licences in 2009/10 in the Gulf St Vincent Prawn Fishery (Beckmann et al. 2015) which closed in December 2012 (PIRSA 2012) and reopened in November 2014.

The annual value of the Spencer Gulf Prawn Fishery was between about $26 and $53 million between 2003/04 and 2015/16 (EconSearch 2017d). The annual value of the Gulf St Vincent Prawn Fishery ranged between about $2 and $6 million between 2002/03 and 2015/16 (Knight and Tsolos 2012, Econsearch 2017e). Recent estimates of the value of the West Coast Prawn Fishery were unavailable at the time of preparing the Status Report.

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch has continued to increase in the West Coast Prawn Fishery, catch and value have continued on the same long-term variable trends in the Spencer Gulf Prawn Fishery, and catch and value have increased in the Gulf St Vincent Prawn Fishery since re-opening of the fishery in 2014/15 (Figure 255, Figure 256, Figure 257).These observations are consistent with predictions that the pre-marine park sanctuary zone trends in catch and value would be maintained post-marine parks (Bryars et al. 2016a-s). These observations are consistent with predictions of change (Table 71).

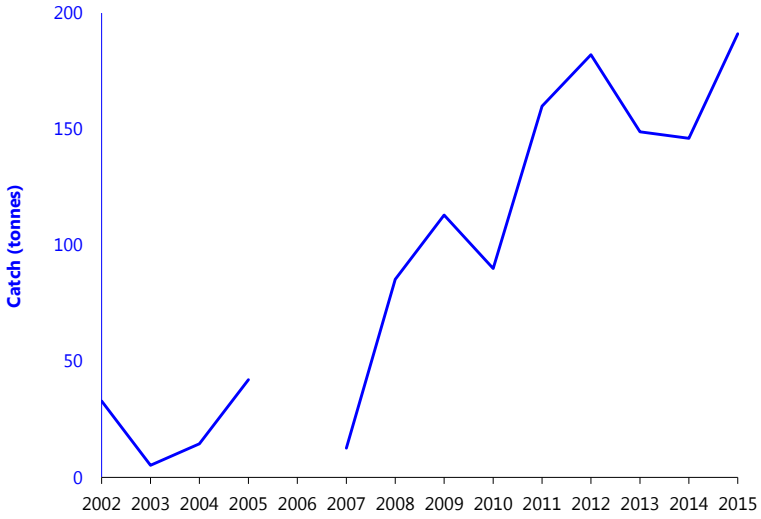


Figure 255. Catch for the West Coast Prawn Fishery. Note that the fishery was closed in 2006/07. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Beckmann & Hooper 2016

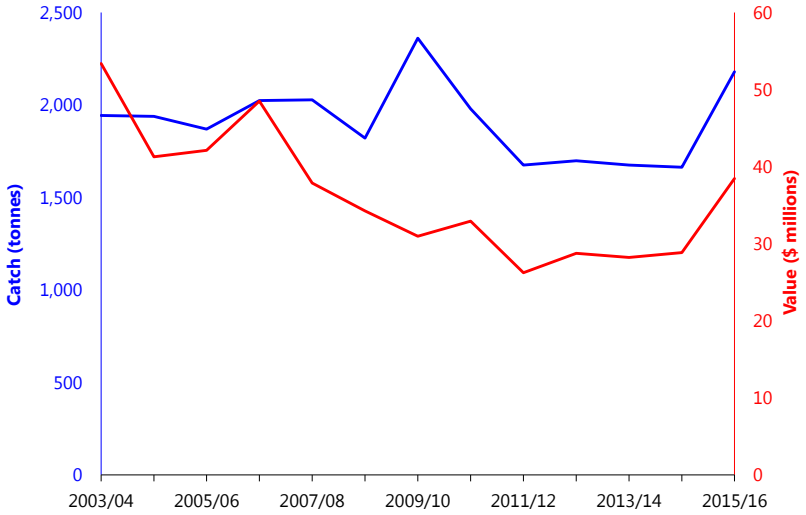


Figure 256. Catch and value of catch for the Spencer Gulf Prawn Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: (Noell & Hooper 2017, Econsearch 2017d, Knight and Tsolos (2012)

Figure 257. Catch and value of catch for the Gulf St Vincent Prawn Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. The fishery was closed from December 2012 to November 2014. Note that marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Econsearch (2017e, Knight and Tsolos (2012)

Blue Crab Fishery

The South Australian Blue Crab Fishery is divided into two zones, the Spencer Gulf fishing zone and the Gulf St Vincent fishing zone. This fishery uses specifically designed pots to target blue swimmer crab, although other crab species may also be landed (Beckmann and Hooper 2015b). Fishing is conducted on subtidal seagrass and sand habitats. There are five Blue Crab Fishery licences for the Spencer Gulf sector which take about half of the statewide catch, and there are four Blue Crab Fishery licences for the Gulf St Vincent sector which take about half of the statewide catch. There are also three Marine Scalefish Fishery licences with blue crab quota entitlements, which take only about one per cent of the statewide catch (Beckmann and Hooper 2015b). Most of the commercial catch is sold at the Sydney and Melbourne fish markets.

The annual statewide value of the Blue Crab Fishery was between about $5 and $7 million between 2003/04 and 2015/16 (Knight and Tsolos 2012, EconSearch 2017f). The total annual catch of the Blue Crab Fishery was about 625 tonnes in 2015/16 (EconSearch 2017f).

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch and value have continued on the same variable long-term trends (Figure 258). These observations are consistent with predictions of change (Table 71).

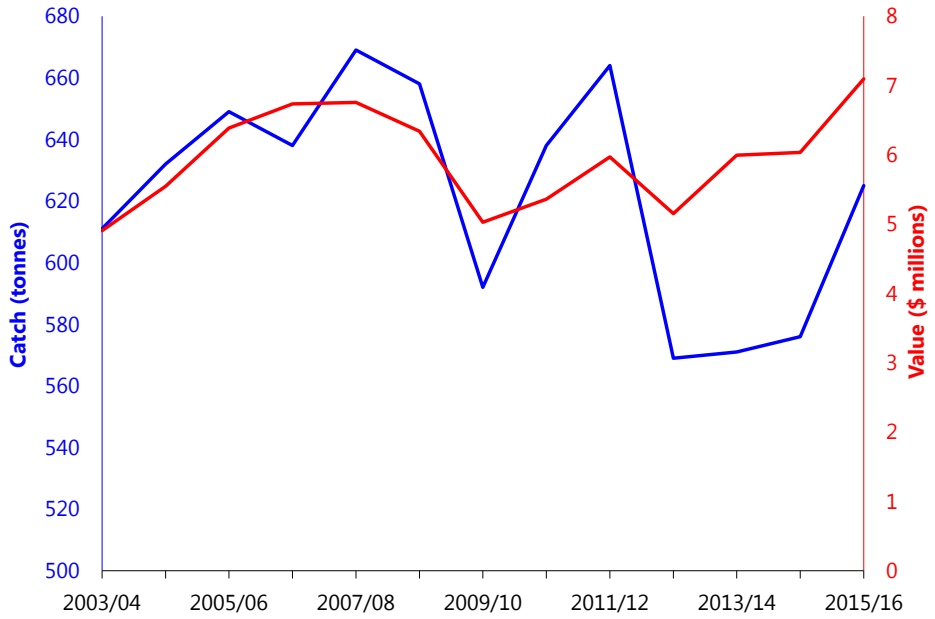


Figure 258. Catch and value of catch for the Blue Crab Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017f)

Sardine Fishery

The South Australian Sardine Fishery targets Australian sardines using a purse seine net, and is also permitted to take Australian anchovy (PIRSA 2014). Fishing is conducted in the pelagic environment over benthic habitats. There are 14 licences, with fishing activity concentrated at the southern end of Spencer Gulf but some fishing near Western Eyre Peninsula (including near Flinders and Cap Islands), in Investigator Strait and to the west of Kangaroo Island (PIRSA 2014, Ward et al. 2015).

The statewide value of the Sardine Fishery was between $19 and $30 million between 2002/03 and 2015/16 (EconSearch 2017g).

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch and value have continued on the same long-term trends (Figure 259). These observations are consistent with predictions of change (Table 71).

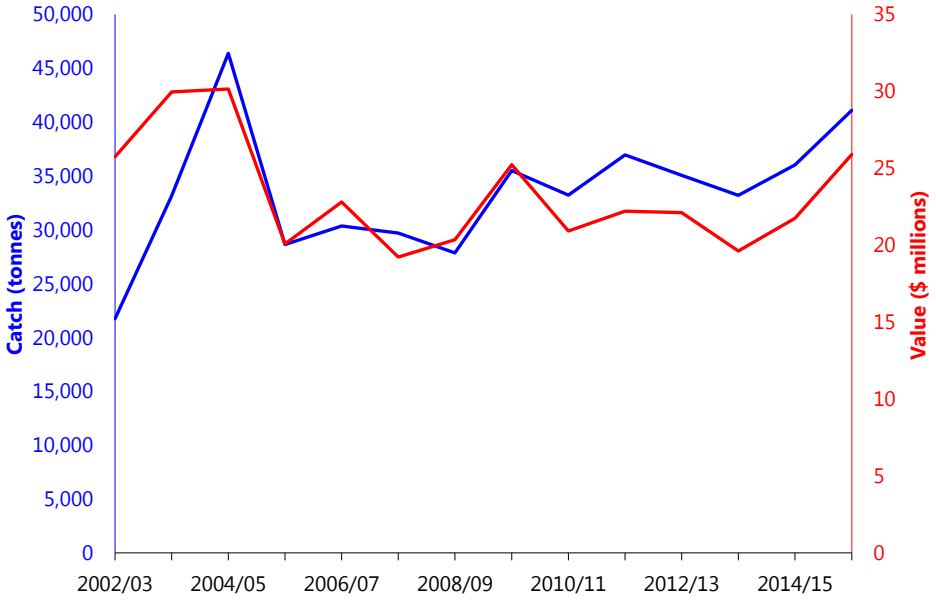


Figure 259. Catch and value of catch for the Sardine Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: EconSearch (2017g)

Marine Scalefish Fishery

The Marine Scalefish Fishery is a statewide, multi-gear fishery that targets more than 50 species, of which the four most important are King George whiting, snapper, southern calamary and southern sea garfish (PIRSA 2013). Fishing is conducted mainly on subtidal reef, seagrass and sand habitats. There are 309 Marine Scalefish and 12 Restricted Marine Scalefish Fishery licences (PIRSA 2017). Most fishing effort is concentrated in Spencer Gulf and Gulf St Vincent. Razorfish and mud cockles are also targeted by some Marine Scalefish licence holders.

The annual statewide value of the Marine Scalefish Fishery was between $22 and $31 million between 2002/03 and 2015/16 (Knight and Tsolos 2012, EconSearch 2017h).

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch and value have continued on the same long-term trends (Figure 260). The total catch and value in the two years since sanctuary zones were implemented (2014/15, 2015/16) are comparable to the previous two years (2012/13, 2013/14) (Figure 260). These observations are consistent with predictions of change (Table 71).

Catch rates in the Marine Scalefish Fishery are unavailable at the fishery level because they are species- and gear-specific, and trends are complex (see Fowler et al. 2016 for further information).

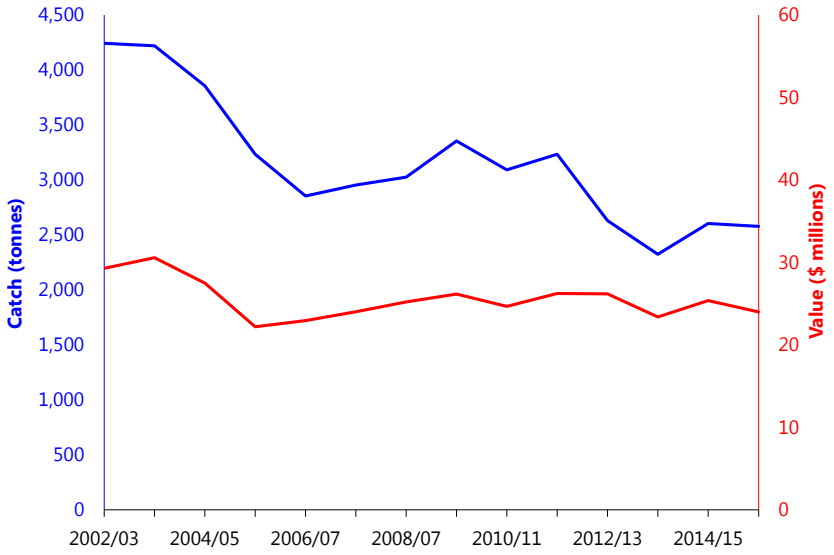


Figure 260. Catch and value of catch for the Marine Scalefish Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Knight and Tsolos (2012), EconSearch (2017h), Fowler et al. (2016)

Charter Boat Fishery

The Charter Boat Fishery (Tsolos 2013) is a statewide multi-gear fishery that typically targets King George whiting, snapper, bight redfish and southern sea garfish. Fishing is conducted mainly on subtidal reef, seagrass and sand habitats. In 2014/15 there were 105 licences of which 61 were active (Steer and Tsolos, 2016).

The total statewide revenue of the Charter Boat Fishery was between $3.6 and $5.9 million between 2005/06 and 2015/16, and was about $4.1 million in 2015/16 (EconSearch 2017i).

Catch and value in 2014/15 continued on the same downward trends as observed prior to the full implementation of sanctuary zones on 1 October 2014 (Figure 261). These observations are consistent with predictions of change (Table 71). Charter fisheries are inherently driven by clientele. In 2014/15 the South Australian Charter fishery saw the lowest participation rate over the sector's eight year history, specifically there was a 36 per cent decline over the past four years. Trend in overall catch will also be dictated by the number of active clients. There has also been a corresponding reduction in total catch over the past four years consistent with the declining clientele (Steer and Tsolos, 2016).

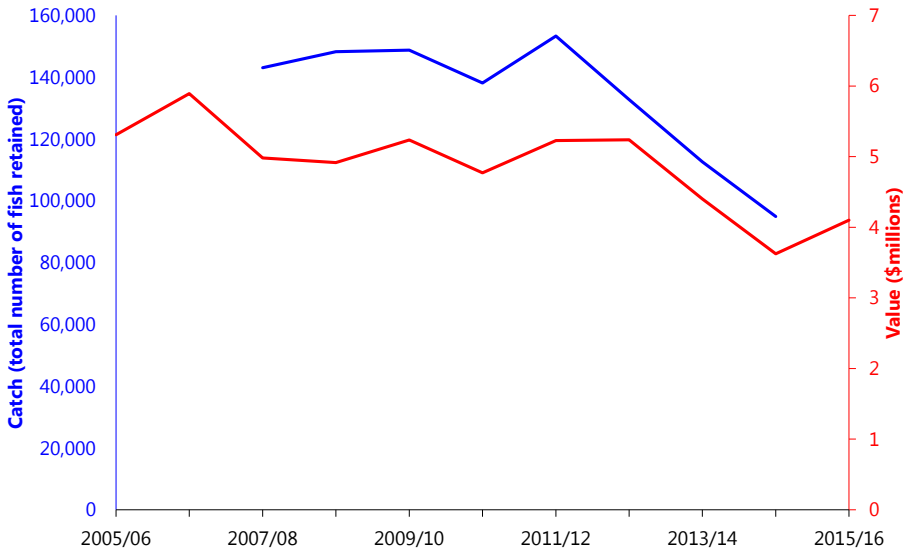


Figure 261. Catch and value of catch for the Charter Boat Fishery. Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Steer and Tsolos (2016), EconSearch (2017i). Note that data for catch are unavailable for 2005/06 and 2006/07, and data for catch was unavailable for 2015/16 at the time of report preparation.

Commonwealth Shark Fishery

The Gillnet, Hook and Trap Sector of the Southern and Eastern Scalefish and Shark Fishery operates in waters offshore from Victoria, Tasmania and South Australia. The fishery is managed by the Australian Government but a permit from the Government of South Australia is required to fish in South Australian coastal waters (AFMA 2014). The sector has historically targeted gummy and school shark using hooks or gillnets, but in recent years the sector has been managed to rebuild the school shark stock. Byproduct species include elephant fish and sawsharks (Georgeson et al. 2014). Fishing is conducted mainly on subtidal reef and sand habitats. There are currently 61 tradeable shark gillnet statutory fishing rights, of which 40 are active (Georgeson et al. 2014, Patterson et al. 2015, 2016). Primary ports include Adelaide and Port Lincoln. There were about 638 tonnes of gummy shark caught off western Eyre Peninsula (from Kangaroo Island to Point Fowler) between 2006 and 2008 (Goldsworthy et al. 2010), but fishing effort is now concentrated off Victoria as a result of spatial closures to reduce the bycatch of Australian sea lions and common dolphins (Georgeson et al. 2014, Patterson et al. 2015, 2016). The primary markets for the fishery are in Sydney and Melbourne (Georgeson et al. 2014).

The Australian Bureau of Agricultural and Resource Economics and Sciences produces annual reports on the catch, value and status of Commonwealth fisheries (Georgeson et al. 2014, Patterson et al. 2015, 2016). The catch and value of the Gillnet, Hook and Trap Sector between 2002/03 and 2014/15 were between 1500 and 2200 tonnes and between $15 million and $25 million Georgeson et al. 2014, Patterson et al. 2015, 2016).

Since the implementation of fishing restrictions in sanctuary zones in 2014, catch and value have continued on the same variable long-term trends (Figure 262). These observations are consistent with predictions of change (Table 71).

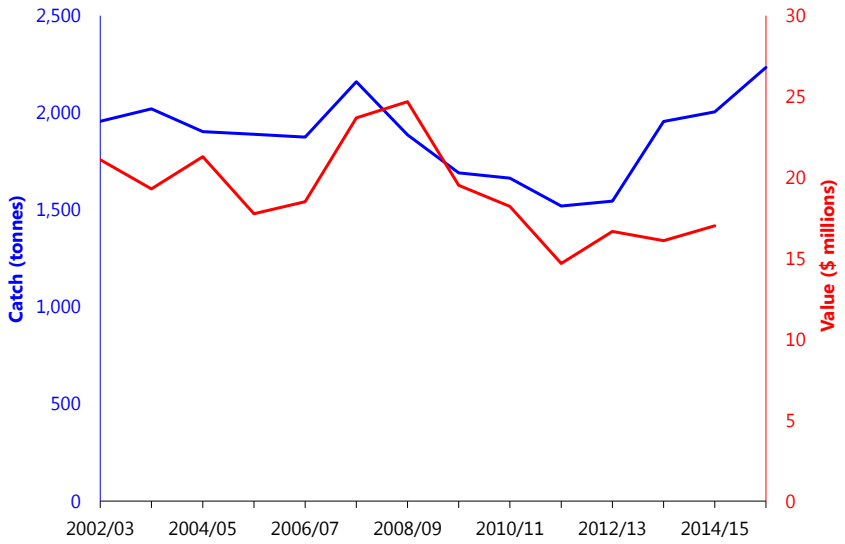


Figure 262. Catch and value of catch for the Shark Gillnet and Shark Hook sectors Value of catch has been adjusted to real terms (2015/16 dollars) using the consumer price index for Adelaide. Note marine park management plans were authorised in November 2012 and sanctuary zones became fully operational on 1 October 2014. Source: Georgeson et al. 2014, Patterson et al. 2015, 2016. Data for value in 2015/16 was unavailable at the time of publishing the Status Report.

11.2 Key findings of socio-economic monitoring

This section has summarised the socio-economic monitoring data and ongoing trends available at the time of report preparation. In all of the socio-economic indicators monitored, the observed trends post-marine parks were consistent with predictions of maintaining or improving the pre-marine parks trend. Based on the socio-economic indicators that were tracked, there was no evidence of a negative regional impact that correlates with the time of implementation of marine park management plans. Some of the key findings to date are:

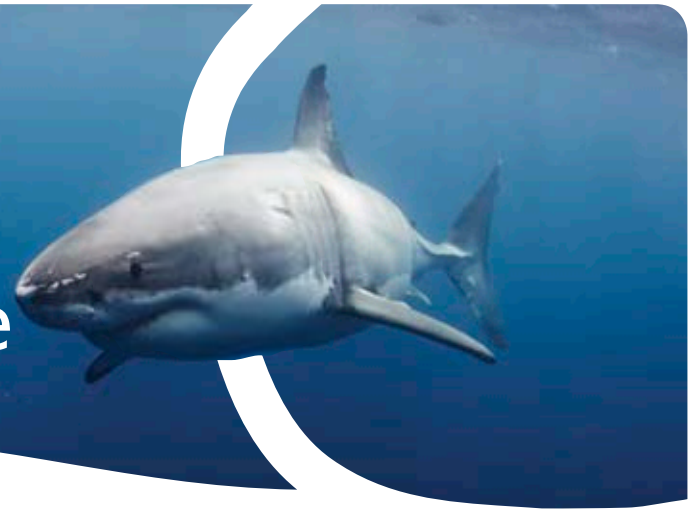
- The price of local fish has remained stable, commercial fisheries have maintained their catch and value, recreational fishing participation rates have remained stable, and regional house prices have continued to increase.
- Industries such as aquaculture and shipping, which were accommodated through the marine parks planning process and zoning arrangements, have continued to operate unaffected by marine parks.
- Public support for marine parks to protect marine plants and animals has remained high over a 10-year period since 2006 with support at 91 per cent in 2017. The number of people who, in general, are not in favour of marine parks to protect marine plants and animals has reduced from ten to three per cent since 2015.
- There is only a small percentage of the public that believe that marine parks have had a negative impact on local businesses where they reside or visit (<9 per cent of all respondents in 2017) or on their rate of participation in recreational activities including fishing (<6 per cent of all respondents in 2017).
- Since 2014, four new nature-based tourism operators have commenced operations inside marine parks, the shark cage diving industry has continued to grow at the Neptune Islands Marine Park.
- There has been an increase in protection for European cultural heritage sites (shipwrecks) through their inclusion in sanctuary zones.

11.3 Case studies 10–11

Case study 10. White sharks in the Neptune Islands Sanctuary Zone

Case study 11. Fish prices

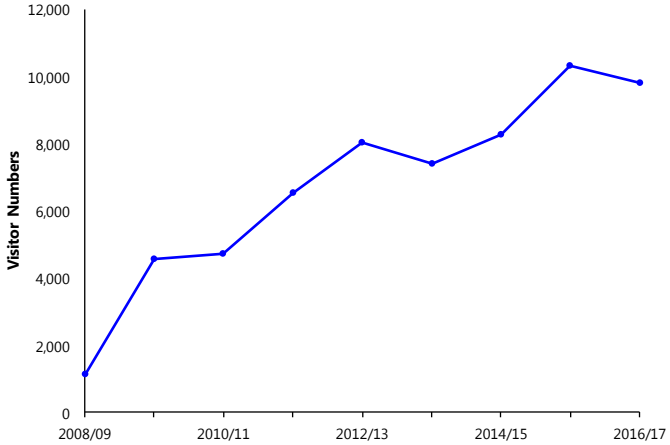
Case study 10: White sharks in the Neptune Islands Sanctuary Zone



Background

The Neptune Islands, which lie about 60 km south of Port Lincoln on Eyre Peninsula, South Australia, is a known aggregation site for the endangered and protected white shark (*Carcharodon carcharius*). White shark cage diving has taken place at the Neptune Islands since the late 1970s. The South Australian government permits three commercial shark cage diving tour operators that are permitted to utilise the Neptune Islands.

In 2009 the Neptune Islands were included within the Neptune Islands Group (Ron and Valerie Taylor) Marine Park (NIGMP). The North Neptune Islands Sanctuary Zone (NNISZ) which surrounds North Neptune Island was proclaimed in November 2012 with full protection commencing on 1 October 2014 when fishing restrictions commenced. Importantly these restrictions have prevented commercial shark fishing within the NISZ which can result in accidental capture of white sharks.



Research and monitoring

Since 2012, about 32 research permits for 10 different projects have been granted for white shark research within the NISZ under the NPWS Act and/or MP Act. Research in the NISZ 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.

Monitoring of the shark cage tourism industry also occurs to track the number of visitors, and calculate benefits to the local community in terms of jobs created and economic contribution. Visitor numbers have steadily increased, with the rise continuing after the full implementation of the North Neptune Island Sanctuary Zone in October 2014 (see graph). In 2016/17 the total number of visitors was 9807. Estimates from the Regional Industry Structure and Employment (RisE) model value the shark cage industry at A$12.8 million annually and 80 FTE jobs in the region.

Apps and Huveneers (2016) undertook some social research on the shark cage diving at the NIGMP. One outcome was that nature-based tourism such as shark cage diving is an effective means of educating the public about the marine animals that live in marine parks and sanctuary zones.

Management plan strategies

Activities associated with white sharks have addressed multiple strategies of the NIGMP management plan:

Strategies addressed										
1	4	5	6	7	8	10	11	12	13	15
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Strategies 1 and 4: The NIGMP management plan is being implemented through the marine parks program and a permitting system is in place to manage shark cage diving and research activities.

A white shark with acoustic tag attached. Photo credit Andrew Fox

Strategies 5, 6 and 7: Shark cage diving is actively promoted by DEWNR. Cage diving participants are provided with information on marine parks and marine biodiversity that has been supplied by DEWNR.

Strategies 8, 10, 11, 13 and 15: White shark tourism operators have collaborated with various government agencies and universities in research activities, further increasing our knowledge of biodiversity within the NIGMP, and assisting with the MER Program. The presence of tourism operators in the NISZ also engages them in the monitoring of marine parks from a compliance perspective, as the high presence of tour operators (with a maximum of 260 days visitation per year) is likely to be a deterrent to illegal activities.

Strategy 12: Results of the MER Program have been released in the publically-available NIGPMP baseline report (Bryars et al. 2016g) and in this Status Report.

Ecological outcomes

Specific evaluation questions addressed:

✓ Have sanctuary zones maintained or enhanced biodiversity and habitats?

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

The presence of tour operators at the NNISZ provides a compliance presence for illegal fishing activities which should help to ensure predicted ecological outcomes for the sanctuary zone are realised. For example, it is hoped that rock lobster populations have responded positively within the zone due to the removal of commercial fishing, as has been observed in the Cape du Couedic Sanctuary Zone on Kangaroo Island since October 2014 (see Case study 8).

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

✓ Has tourism changed due to marine park management plans?

The North Neptune Islands Sanctuary Zone 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 NIGMP 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.

References

Apps K and Huveneers C (2016) Assessing the knowledge, social values and stewardship of white shark cage-diving participants within the Sanctuary Zone of the Neptune Island group (Ron and Valerie Taylor) Marine Park. Final Report to the Department of Environment, Water and Natural Resources

Bryars, S., Brook, J., Meakin, C., McSkimming, C., Eglinton, Y., Morcom, R., Wright, A. and Page, B. (2016g), *Baseline and predicted changes for the Neptune Islands Group (Ron and Valerie Taylor) Marine Park*, DEWNR Technical report 2016/17, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Rogers, P. J., Huveneers, C and Beckmann, C.L. (2014). Monitoring residency of white sharks (Carcharodon carcharias in relation to the cage-diving industry in the Neptune Islands Group Marine Park. Report to the Department of Environment, Water and Natural Resources, South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI publication No. F2014/000801-1. SARDI Research Report Series No. 818. 69pp.

Shark cage diving in the North Neptune Islands Sanctuary Zone

Case study 11: Fish prices

Background

Marine park outer boundaries were proclaimed in November 2012 and fully implemented on 1 October 2014 when fishing restrictions inside sanctuary zones commenced, including the prohibition of commercial fishing. In order to minimise potential impacts on commercial fishers, the South Australian marine parks network zoning aimed to avoid key fishing grounds, and displaced fishing effort or catch was removed through the Commercial Fisheries Voluntary Catch/Effort Reduction Program (CFVCERP, refer Assessment 2b). Nonetheless, there have been ongoing concerns from the fishing industry that sanctuary zones would result in decreased availability of fish, and in turn increased fish prices for consumers (see article insert from The Sunday Mail, 30 August 2015).

For locally-caught and locally-sold marine scalefish, such as King George whiting which are available to local consumers, it was expected that total catches would be maintained, despite the loss of some fishing grounds through sanctuary zones, and the reduction in the number of fishing licences through the CFVCERP (Bryars et al. 2017b). For southern rock lobster and abalone there will be a small loss of product due to the CFVCERP and reduced quotas, however most of this product is exported overseas. The catches and prices of other species such as prawns, blue crabs and sardines are not expected to be affected by marine parks, as those fisheries did not require any adjustment through the CFVCERP (Bryars et al. 2017b).

To test whether the price of locally-caught and locally-sold marine scalefish might have increased since implementation of sanctuary zones on 1 October 2014, a monitoring study was initiated in June 2014 prior to implementation and continued for three years after that time.

This case study highlights the key findings of the fish price monitoring study, the links with the marine park management plan strategies, and the socio-economic outcomes as a result of the marine park management plans.

Fish price monitoring

Retail prices of six popular species of locally-caught fish have been recorded at three major fish processor outlets in the Adelaide Central Market since June 2014. Prices have been recorded approximately weekly, generally on a Friday or before major dates (e.g. Christmas) when product is readily available. Both whole and fillet prices (when available) were recorded for King George whiting (KGW), snapper, garfish, yellowfin whiting (YFW), snook, and calamary (whole price only). Data were not collected during the autumn of 2016. Data were adjusted for the effect of the Consumer Price Index as per recommendation from the South Australian Centre for Economic Studies. Six datasets were analysed because they had good data coverage across the time series and across the three stores; KGW fillet, garfish fillet, YFW fillet, snapper whole, snook whole and calamary whole.

As the long-term trend of fish prices shows seasonal patterns of variation (see graph page 416), it is most appropriate to compare the winter 2014 pre-sanctuary zone baseline mean value with subsequent winter mean values; these data show no indication that fish prices have increased since full implementation of sanctuary zones, with the average price across the six species being the same in winter 2016 and winter 2017 as it was in winter 2014 (see graph below). Based upon the ABS fish and other seafood price index, a gradual increase in the price of fish over time might be expected by consumers (see Bryars et al. 2017b) but this has not been observed in the retail outlets of the Adelaide Central Markets. The long-term trends in prices varied between individual species but overall there has been no increase in price (refer socio-economic assessment in the Report page 374).

■ Whiting $66kg
■ Snapper $60kg
■ Garfish $55kg
■ Flathead $55kg

THERE'S A CATCH: Samtaxx Bros Seafood sales assistant Eilish Millard, 18, with a platter of iconic SA fish including King George whiting, flathead, garfish, snapper, squid and tommies. Picture: TRISH WATKINSON

Price of fish is off the scale

NIGEL AUSTIN
ROXANNE WILSON

CONSUMERS already paying sky-high prices for popular fish species will find it harder to get iconic local fish because of the

Bart Butson, named Primary Producer of the Year at the SA Seafood Industry Awards on Friday night, said marine parks

"I've had to sell two fishing boats. No visitors come to the Port Wakefield to see the marine park, there is no tourism or

Marine Fishers Association executive officer Nathan Bicknell said garfish catches were down 50 tonnes statewide.

Management plan strategies

The fish price monitoring study has addressed two strategies that apply across the 19 management plans:

Strategies addressed	
10	**12**
✓	✓

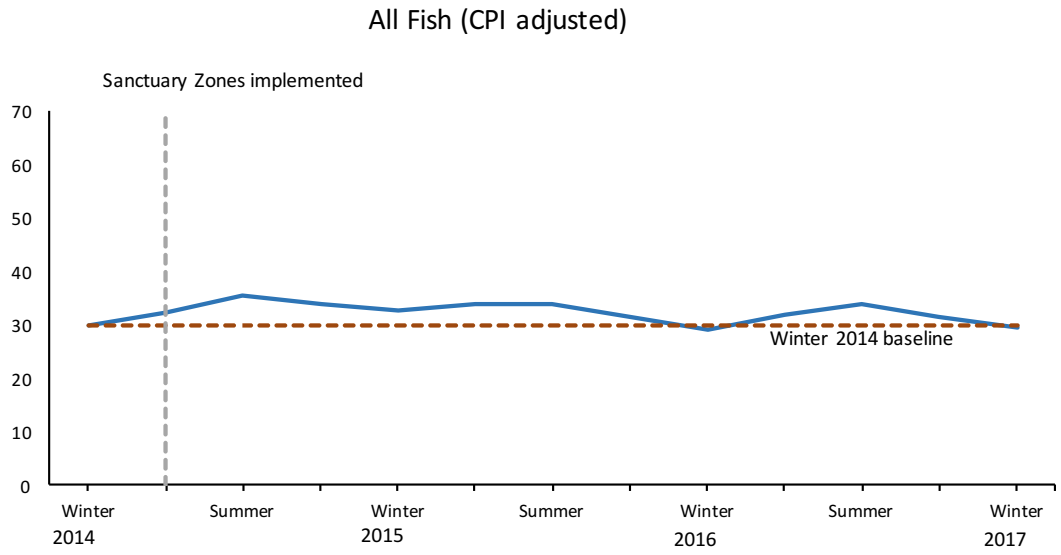
Strategies 10 and 12: The fish price monitoring study was undertaken as part of the marine parks MER Program as identified in the MER Plan. The results support the predictions of change for the 19 management plans, i.e. that there would be no change. The outcomes of the study are being made publically available in the current Status Report and will be used to inform whether it is necessary to continue monitoring fish prices as part of the MER Program beyond 2017.

Socio-economic outcomes

Specific evaluation questions addressed:

✓ Have local businesses and communities changed due to marine park management plans?

Prices of locally-caught and sold marine scalefish species can be influenced by several external factors including product supply and demand, weather conditions, and interstate imports. Sanctuary zones prevent commercial fishing and therefore fishers would naturally have needed to adjust their spatial fishing patterns to some degree. However, the total catch of marine scalefish in the two years since sanctuary zones were implemented (2014/15, 2015/16) is comparable to the previous two years (2012/13, 2013/14) (see Fowler et al. 2016), and overall there is no evidence from the fish price monitoring study that local consumers are paying more for locally caught fish in 2017 than they were prior to the full implementation of marine parks on 1 October 2014.



References

Bryars, S., Brook, J., Meakin, C., McSkimming,C., Eglinton, Y., Morcom, R., Wright, A and Page, B. (2017b). Baseline and predicted changes for the South Australian Marine Parks Network. Department of Environment, Water and Natural Resources (DEWNR). Technical report 2017/06.

Fowler, AJ, McGarvey, R, Steer, MA and Feenstra, JE (2016). The South Australian Marine Scalefish Fishery – Fishery statistics for 1983/84 to 2015/16. Report to PIRSA Fisheries and Aquaculture. South Australia Research and Development Institute PIRSA.

Fresh whole snapper in the markets

12 Conclusion

This Status Report marks a critical milestone in the South Australian marine parks program.

The Report documents the activities undertaken, and early ecological and socio-economic outcomes observed, after five years of implementation of the 19 marine park management plans since 2012.

The marine parks program has undertaken a substantial amount of activity between 2012 and 2017, including:

- Underwater Visual Census (UVC) monitoring has been undertaken in 11 Sanctuary Zones (SZ) across 7 marine parks with a total of 120 surveys.
- Baited Remote Underwater Video Systems (BRUVS) monitoring commenced in 2014 and has been undertaken in 18 SZs across 10 marine parks with a total of 496 surveys.
- Inventory mapping has been completed for 18 Sanctuary Zones and partially completed for another two.
- Since 2014/2015, $240,300 has been approved to fund 12 research partnership projects with universities.
- A total of 160 permits have been issued since the marine park management plans were implemented, 94 of these were for research.
- 26 citizen science projects have been undertaken involving approximately 500 community members.
- 71 marine park school education events reaching over 23, 000 students at 17 schools have taken place since 2012/13.
- An extensive recreational fishing education program has circulated over 300,000 copies of the Recreational Fishing Guide. Around 10,000 South Australian recreational fishing guide apps are downloaded annually providing access to information on the locations of sanctuary zones.
- 107 marine park zoning signs were placed across the state at popular locations such as beach entry points and boat ramps to help maximise voluntary compliance.
- A total of 7299 shore, boat and aerial compliance patrols have been conducted since November 2014 when sanctuary zones were fully implemented. As of 30 June 2017, there have been 678 incidents identified, and 34 education letters, 385 warnings and 9 expiation notices issued.
- Interviewed over 2000 people in annual phone surveys to gauge public support for and perceptions of marine parks in South Australia.
- 133 visits to the Adelaide Central Markets to collect fish price data between June 2014 and August 2017
- The Marine Parks team have given almost 130 oral presentations promoting marine parks to over 6000 community members.
- Since 2014/15 there has been over 120 marine-park related community events reaching over 77,000 people.
- Implemented the largest marine biodiversity monitoring program in the state's history.
- Completed the first major marine biodiversity expedition to the states iconic offshore islands since 2008.

The marine parks were designed principally for the conservation and protection of marine biodiversity and habitats. Key findings of the ecological monitoring to date are:

- The Marine Parks ecological monitoring program has established an extensive dataset of biological indicators across seven of the eight marine bioregions and in 16 of the 19 marine parks.
- Sanctuary zones have captured the biodiversity on offer in the marine park network as demonstrated by the similarity in the suite of species, their distribution and abundances between sites inside Sanctuary Zones and associated comparison sites.
- Mapping of the seafloor is continuing to add to our knowledge base by cataloguing benthic habitats contained in the marine park network
- The ecological sampling program implemented is rigorous and capable of detecting meaningful biological changes and therefore appropriate for assessing the long term effectiveness of the marine park network.
- Preliminary trends indicate that marine parks are maintaining biodiversity and ecosystem function.

- Offshore Islands are critical components of the marine park network. They are biodiversity hotspots and contain mostly intact plant and animal communities making them important reference sites.
- Sponge Gardens Sanctuary Zone is an important refuge for vulnerable, site attached iconic fish species such as blue groper, harlequin fish and blue devil.
- In general insufficient time has passed since marine park implementation for changes in size, abundance and diversity of biota to be detected. An exception to this were the results from the rock lobster study at Cape du Couedic Sanctuary Zone which were consistent with predictions of change that lobsters will increase in size and abundance when fishing pressure is removed.

The marine parks were designed to minimise potential negative impacts on marine industries such as fishing, shipping and aquaculture, and to result in positive socio-economic benefits by providing opportunities for education, public appreciation and nature-based tourism.

In all of the socio-economic indicators that were monitored, the observed trends post-marine parks were consistent with predictions of maintaining or improving the pre-marine parks trend. Based on the socio-economic indicators that were tracked, there was no evidence of a negative regional impact that correlates with the time of implementation of marine park management plans. Key findings of the socio-economic monitoring to date are:

- The price of local fish has remained stable, commercial fisheries have maintained their catch and value, recreational fishing participation rates have remained stable, and regional house prices have continued to increase.
- Industries such as aquaculture and shipping, which were accommodated through the marine parks planning process and zoning arrangements, have continued to operate unaffected by marine parks.
- Public support for marine parks to protect marine plants and animals has remained high over a 10-year period since 2006 with support at 91 per cent in 2017. The number of people who, in general, are not in favour of marine parks to protect marine plants and animals has reduced from ten to three per cent since 2015.
- There is only a small percentage of the public that believe that marine parks have had a negative impact on local businesses where they reside or visit (<9 per cent of all respondents in 2017) or on their rate of participation in recreational activities including fishing (<6 per cent of all respondents in 2017).
- Since 2014, four new nature-based tourism operators have commenced operations inside marine parks, the shark cage diving industry has continued to grow at the Neptune Islands Marine Park.
- There has been an increase in protection for European cultural heritage sites (shipwrecks) through their inclusion in sanctuary zones.

Information relating to the marine parks ecological values, socio-economic values, and the underpinning monitoring and evaluation approach have been documented in this Status Report and are now publicly available. The marine parks program is supported by a comprehensive, rigorous and effective MER program. The findings of this report highlight that the marine parks program is on track to meet its statutory obligations through the implementation of activities aligned with the strategies of the management plans. The program is currently observing the predicted outcomes expected from effective implementation of these strategies.

The Report will be used to develop recommendations that guide the direction of the marine parks program over the next five years leading up to the legislated 10-year review of the management plans by 2022.

13 Appendices

A. Key consultation steps in the history of South Australia's marine parks program

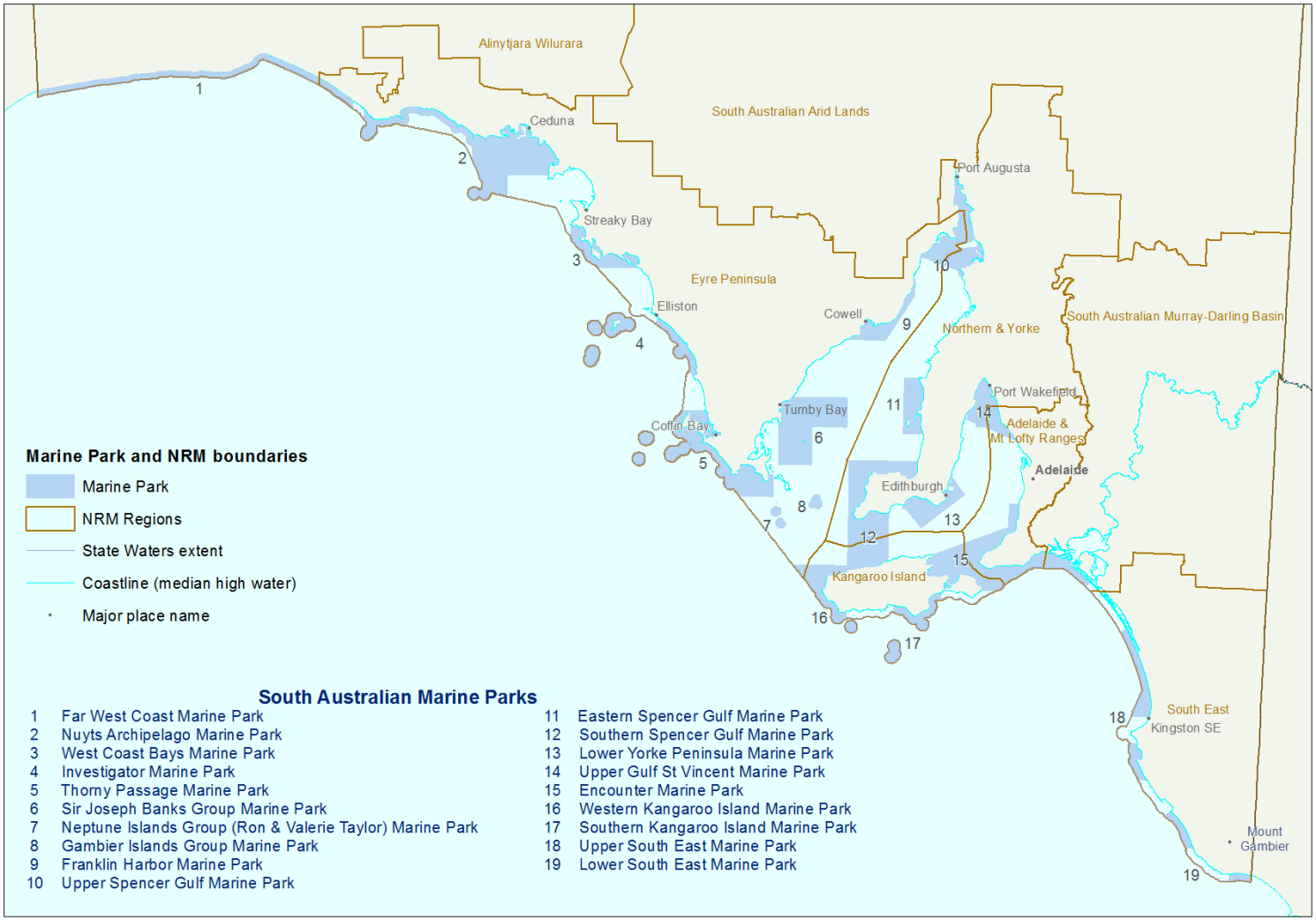
Year	Initiative	Description of consultation process
2001/02	Liberal Government policy - "Marine Protected Areas – A Shared Vision"	Statewide consultation on draft document early in 2002. 23 public meetings/information sessions engaging approximately 1600 people.
2003/04	Labor Government policy – "Blueprint for the South Australian Representative System of Marine Protected Areas"	"Blueprint" developed as an outcome of the above consultation process, with further consultation with key stakeholders and across all relevant Government agencies.
2005	Encounter Marine Park Draft Zoning Plan. (Pilot process to develop and test key concepts for state-wide network)	Draft zoning plan (2005) released for three months public consultation with 427 submissions received from 498 respondents. Local consultation - targeted at Fleurieu Peninsula, Kangaroo Island and Adelaide. 15 public information days. 48 stakeholder meetings. Public feedback significantly informed the development of subsequent steps such as the Draft Bill and Local Advisory Groups (below).
2006-07	Marine Parks Bill 2006	Draft Bill developed following extensive consultation with key stakeholders and across government. Statewide consultation (three months) on Draft Bill. 16 regional public meetings/information sessions conducted. 112 submissions were received from 162 respondents. Numerous adjustments made as a result of public input and through the Parliamentary process. *Marine Parks Act 2007* was assented to on 29 November 2007.
2009	Outer Boundaries of South Australia's Marine Parks Network	Statewide consultation on outer boundaries with 2,357 submissions received from 3,295 respondents. 56 public information days across the state. About 4,800 people directly engaged; Three regional Pilot Working Groups established to advise on outer boundary design in key areas. Multi-sectoral representation. At least three rounds of meetings each.

		Public feedback contributed to amendments to the outer boundaries of seven marine parks.
Late 2009 to May 2011	Phase 1 – Early community engagement in management planning for South Australia's marine parks network	Early engagement with communities across the state to gather local advice for the development of draft management plans with zoning. 13 Marine Park Local Advisory Groups (MPLAGs) established across the state, plus the (existing) Great Australian Bight Consultative Committee (GABCC). 67 public MPLAG and GABCC meetings facilitated. Numerous informal workshops and meetings. Peak stakeholders were invited to provide early advice on their preferred zoning for marine parks. Multiple public information days held in Adelaide and regional centres. Final MPLAG advice displayed on marine parks website and at the Adelaide Boat Show. Information gathered assisted the Government to develop draft marine park zoning aimed at minimising impacts on existing recreational and commercial users while achieving conservation aims.

B. Program logic immediate (5-year) outcomes

1. The *Marine Parks Act 2007* and supporting Regulations are effectively administered and implemented.
2. Advice on activities and uses within and adjacent to the marine park provided to Government, stakeholders and community.
3. Permit Regulations implemented and any permits issued support achievement of management plan objectives.
4. Enhanced or maintained recruitment of marine species in sanctuary zones.
5. Reduced disturbance in marine life and habitats in sanctuary zones.
6. Reduced impacts of nutrients, sediments and pollutants, from all sources, on marine parks.
7. Relevant development plans consistent with marine park management plans.
8. Fisheries not impacted by more than 5% GVP (completed 2014).
9. Opportunities for sustainable nature-based tourism in marine parks created and promoted.
10. Implementation of marine parks supported through education.
11 Increased awareness and understanding of marine parks among South Australian community.
12. Increased positive media.
13. Improved understanding of sanctuary zones and their habitats.
14. Opportunities for local and Aboriginal community monitoring projects created.
15. MER Program developed and implemented.
16. Partnerships with community and stakeholder involvement to implement the MER Program fostered and opportunities for community and stakeholder involvement incorporated.
17. Outcomes of research and the MER Program are made publicly available and informed decision-making and periodic review of management plans.
18. Integrity of knowledge frameworks that underpin predicted outcomes assessed through priority research and fostered partnership.
19. Media and other opportunities used to promote marine park performance.
20. Findings and resources shared with community.
21 Monitoring plan, based on conceptual models and baseline report, implemented.
22. Compliance strategy implemented.
23. Measures to address serious or repeat non-compliance established.
24. Appropriate enforcement options used at priority sites for priority issues.
25. Success of permit system increased.
26. Understanding of the values of marine environment and marine parks encouraged.
27. Apps, maps and GPS coordinates improved.
28. Number of trained wardens increased.
29. Compliance is supported by an across Government collaboration.
30. Compliance and enforcement activities reviewed and improved.
31. Sanctuary zones are monitored beyond effort and incident and intelligence recording explored.

C. State map – Marine park and NRM boundaries



D. Spatial reporting units relevant to the South Australian Marine Parks monitoring, evaluation and reporting program

Local Government Areas

Marine park boundaries and the overlap with selected local government areas of South Australia that lie adjacent or near to the coast. Note that the numerous local government areas in the Adelaide region are not shown.

Statistical Areas Level 2

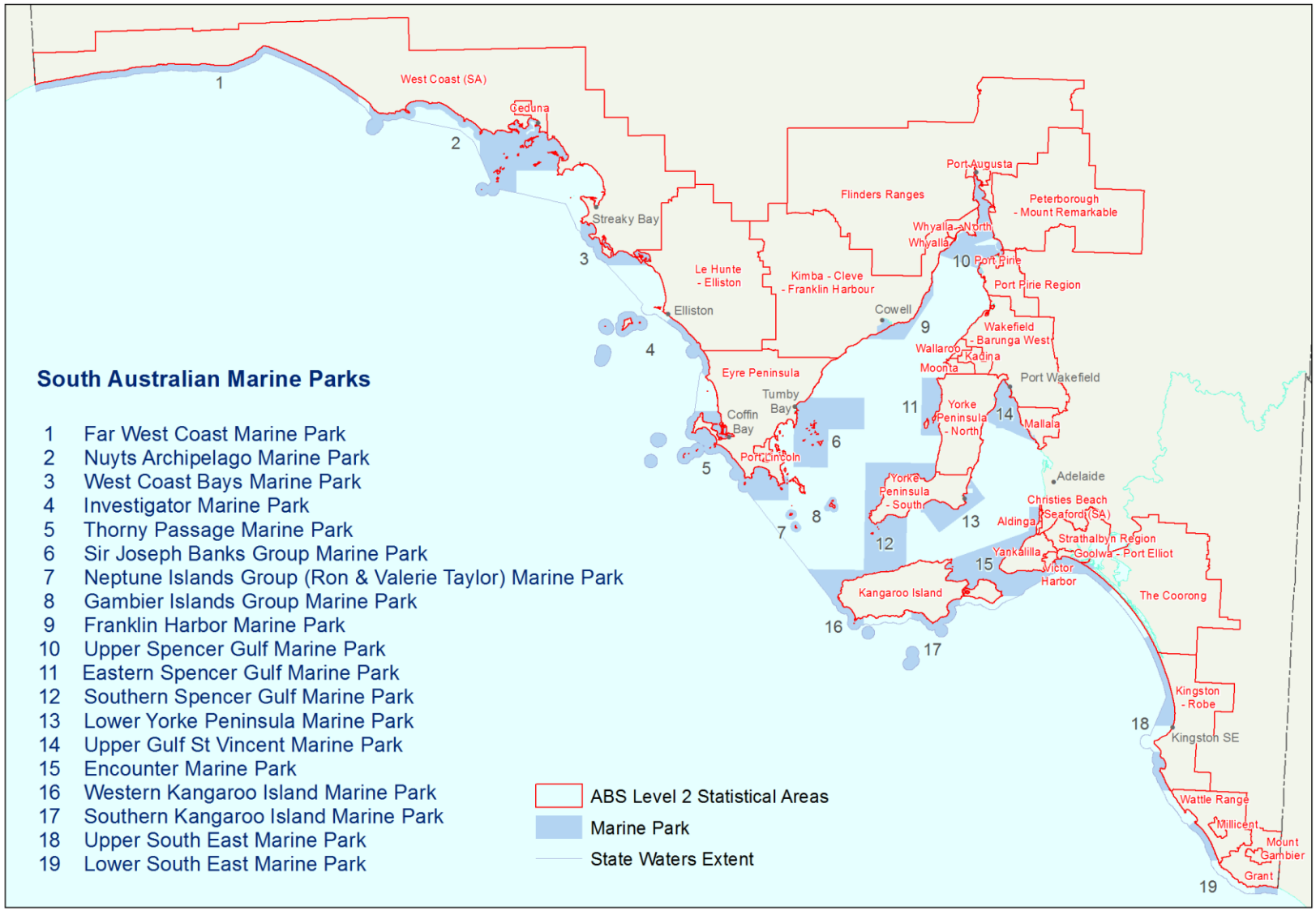
Marine park boundaries and the overlap with selected Statistical Areas Level 2 (SA2s), as defined by the Australian Bureau of Statistics (ABS) as part of its Australian Statistical Geography Standard (ABS 2011b), that lie adjacent or near to the coast.

Tourism regions

Marine park boundaries and the overlap with tourism regions, as defined by the Australian Bureau of Statistics (ABS)

Local Government Areas Marine park boundaries and the overlap with selected local government areas of South Australia that lie adjacent or near to the coast. Note that the numerous local government areas in the Adelaide region are not shown.

Statistical Areas Level 2 Marine park boundaries and the overlap with selected Statistical Areas Level 2 (SA2s), as defined by the Australian Bureau of Statistics (ABS) as part of its Australian Statistical Geography Standard (ABS 2011b), that lie adjacent or near to the coast



Tourism regions Marine park boundaries and the overlap with tourism regions, as defined by the Australian Bureau of Statistics (ABS)

E. Citizen science project assessment template

EXAMPLE: Project Assessment Template for Marine Park Citizen Science – RLS

STEP 1: Project Brief

Identify your project; style; aim; and, alignment with Key Evaluation Questions

Description	**Project name**	**Reef Life Survey (RLS)** **Supporting RLS divers to help assess the effectiveness of MP Sanctuary Zones**
	Style of project *(underline)*	• **Contributory** (citizens collect data for scientists) • *Collaborative (scientists involve citizens in creation and running of projects)* • ***Co-created*** *(citizens and scientists work together to create and run projects – often initiated by citizens)*
	Project aim	To recruit and train a group of volunteer divers in the RLS method that can support the existing DEWNR Marine Park ecological monitoring program by: 1) Increasing the number of sites surveyed each year in the sub tidal reef monitoring program to provide greater information and improving evaluation of the Marine Parks program. 2) Improving stewardship and fostering public appreciation, education and understanding of SA's Marine Park network
	KEQ Alignment ***Identify which of these key evaluation questions align with your project*** ***(underline)***	1. To what extent has the legislated comprehensive, adequate, representative (CAR) system protected and conserved marine biological diversity and marine habitats. 2. To what extent have the marine parks strategies contributed to the maintenance of ecological processes in the Marine Parks? 3. To what extent have marine parks strategies contributed to enabling marine environments to adapt to impacts of climate change? ***4. To what extent have the marine parks strategies contributed to the ecologically sustainable development and use of the marine environment*** 5. To what extent have the marine parks strategies contributed to providing opportunities for public appreciation, education understanding and enjoyment of marine environments? **6. *To what extent have the marine parks strategies contributed to the protection and conservation of features of natural and cultural heritage significance? (Stewardship and Compliance)***

STEP 2: Project alignment with key Citizen Science Components and program deliverables

	Outcome categories	Importance 1=LOW 2=MEDIUM 3=HIGH	Description
Desired outcomes	**Research**	3=HIGH	Subtidal reefs are one of the key "ecological values" identified for monitoring by the SA Marine Parks MER program. A number of targeted species (e.g., lobsters, blue throat wrasse) associated with these systems have increased in size and abundance with protection from fishing in several other marine parks worldwide (Barrett et al 2009. Monitoring the response of species dependant on subtidal reefs using the Reef Life Survey Method will provide critical information upon which to assess the effectiveness of SZ's. Surveying by diving, while effective, is expensive and time consuming meaning that under the current proposed MP Performance Program it will only be possible to survey reef sites every four years Establishing and supporting a group of volunteer divers trained in the RLS method will greatly improve the Marine Park subtidal reef monitoring program by: 1) Increasing the frequency of surveys – some sites could be surveyed annually thus providing greater temporal resolution. 2) Improving the spatial coverage – the current reef program is limited to a set number of sites assessed at the 5 m depth contour, thus the spatial resolution could be improved by targeting different depths or locations. 3) Contributing to an existing international program – RLS has thousands of sites worldwide and integration of SA datasets will allow the interpretation of local MP effects within the context of large scale trends in physical drivers such as climate change and oceanic patterns (e.g. ENSO). 4) Providing a pool of trained divers to potentially help with core DEWNR monitoring expeditions**.**
	Education	2=MEDIUM	The benefits of MPA's can be challenging to promote to the broader community because it is often difficult to "see" these benefits first hand. Supporting RLS trained divers to undertake monitoring targeted at SZ will expose them directly to the how ecological communities can respond to protection from fishing. This experience will establish a pool of advocates that can help promote the benefits of MP to the wider community via their own networks of friends and family. Participation in the monitoring program and witnessing first-hand the changes in SZ's will lend legitimacy to this group and improve the effectiveness of their advocacy.

			Other opportunities exists for more targeted activities to improve education outcomes. The RLS program has an active website that is regularly updated that could communicate results associated with the SA volunteer group to a wider audience. Integration with existing community dive groups such as Reef Watch could improve extension opportunities. Activities and outputs of the group will also be updated on the SA MP website. The development of U/W cameras with HD video means that there is potential to capture good quality stills and video that could be hosted on a range of other social media platforms.
	Engagement	1=LOW	Generally the RLS program has attracted small participation rates as the diving skill and training levels required are quite high. However, there is potential to increase this number by providing greater support to trained divers. Traditionally, divers are trained in RLS and then left to their own devices to provide survey data to the program which has meant that only the extremely motivated ones actively participate. Access to dive sites has been identified as one of the major barriers to participation uptake. It is planned to increase participation rates by providing greater support to the volunteer group in the form of: 1) An annual training trip to attract new divers and provide a refresher for existing ones 2) An annual survey trip with a suitable charter vessel to take divers to designated sites 3) Assistance in collating and managing the data collected. 4) A formal recognition system to reward achievements associated with number of transects surveyed etc. 5) Integrating with existing volunteer dive programs such as Reef Watch. Over a 4 year period this project would aim to train around 50 divers in the RLS method and create a community of skilled divers actively contribute annual monitoring data on subtidal reefs to the Marine PPP program.

STEP 3: PROJECT ANALYSIS (for existing or new projects)

Other considerations

Scale and complexity

Is the project local, regional, state, national, international?

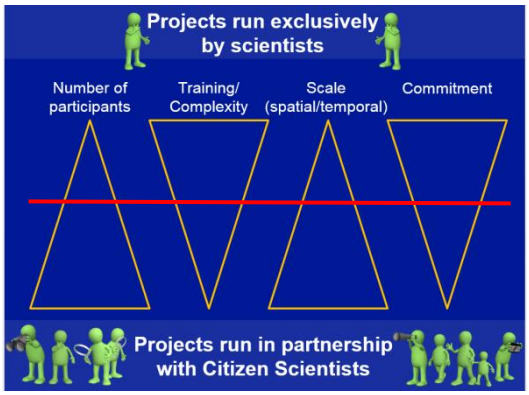
Existing international scale program

Generally conducted at local; regional; state scales

Place a horizontal line where the project best fits this model

Focused programs – more complexity less people – higher

Large scale - low complexity, little training, lots of people = lower



Logistics

Identify potential difficulties, e.g. weather, method

Organised events affected by weather

Access to sites can be expensive if covering charter boat costs

High level of training and skill may restrict participation numbers

Reasonable level of coordination required to manage group in terms of logistics, training, data management;

Agency commitment

Is the commitment short or long term? How many years?

Long term – 10 year commitment from DEWNR

Citizen Scientist commitment

Is the commitment short or long term? How many years?

5 years to allow critical mass of divers to develop

Similar projects

Identify any existing projects that might achieve the desired outcomes

None

Data management

Identify how data will be collected, entered, stored and analysed

Volunteers collect and enter data in a template provided by University of Tasmania (UTAS) via the Reef Life Survey Foundation. The data then goes through a series of validation and data cleaning processes and is ultimately housed in a database managed by UTAS. DEWNR and UTAS are currently updating their data sharing agreements to create a data sharing arrangement that exports data directly and

	regularly into the Biological Database of SA form which DEWNR Marine Park scientists can access and analyse.
	Communication & feedback *Identify how results will be communicated?* RLS Website; DEWNR website; Reefwatch website. Scientific papers; Reports Provide results/reports to divers as part of the project outcomes
	Costs *Identify costs* First year setup costs $35,000 0.10 FTE DEWNR support officer $12,500 Vessel Charter $12,500Accommodation $ 3,000 Consumables (tank fills/slates etc) $ 5,000 Extension (website, promotion) $ 2,000 In subsequent years costs would drop to $25-30,000/year as initial setup overheads are reduced

F. Risk assessment for Scientific Research Permit applications

This risk assessment has been developed to assist with the assessment of Marine Park Scientific Research applications by Marine Parks Performance program staff. Research permits are required for any professional or commercial research undertaken in a Restricted Access or Sanctuary zone (Marine Park (Zoning) Regulations 8 and 9). A permit is also required for research in a Habitat Protection zone that involves the removal or disturbance of, or harm to plants and animals (dead or alive) associated with the seafloor (Marine Park (Zoning) Regulations 2012, Regulation 7(3,f)).

Permit applications are first assessed by the Marine Parks Protection Team, and may be processed without needing any technical advice from Performance. Applications that require further assessment by Performance include proposals to:

- take specimens that results in the death or removal of the plant or animal,
- cause direct or indirect damage to habitats, or
- attract, catch or trap animals (e.g. berley, take samples, mark, tag, or attach trackers).

The risk assessment considers the proposed research activity in the context of whether allowing it to take place will compromise the achievement of the Marine Park zone objectives.

SA Marine Park zone objectives

RAZ	a restricted access zone – being a zone primarily established so that an area may be managed by limiting access to the area
SZ	a sanctuary zone – 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
HPZ	a 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
GMUZ	a general managed use zone – being a zone 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

Risk assessment

1. Likelihood: each permit application should be assessed in terms of the likelihood that the activity would impact on the achievement of MPA objectives (as defined for the MPA zone under consideration) – scaled from 1 to 5
2. Consequence: the consequence of each activity be defined (at the various likelihood levels) scaled from 0 to 5.

Risk is then defined as Likelihood X Consequence.

Likelihood

Likelihood is assessed on the scale 1 (rare) to 5 (almost certain) using the following scoring system.

Likelihood	Description
1	Rare. Unlikely during the next 25 years - Negligible – Probability very small, close to zero.
2	Unlikely. May arise once in ten years to 25 years - Unlikely but not negligible – Probability low but noticeably greater than zero.
3	Possible. May arise once in ten years - Less likely than not but still appreciable – Probability less than 50% but still quite high.
4	Likely. May arise about once per year - As likely as not – 50/50 chance.
5	Almost certain. Could occur several times per year - More likely than not – Probability greater than 50%.

Consequence

Consequence is assessed using a set of consequence tables (see below) which broadly score the consequence of the outcome using the following scale. Consequence tables adapted from Campbell and Gallagher (2007).

Consequence	Description
1	Insignificant
2	Minor
3	Moderate
4	Major
5	Significant

Consequence class	1 - Insignificant	2 - Minor	3 - Moderate	4 - Major	5 - Significant
Species impact	No expected impact	Populations are stable or increasing	Potential loss of individuals and genetic diversity; potential decline in sub-population	Limited information on population status; loss of individuals, genetic diversity and sub-populations is expected; potential for localised extinction.	High likelihood of localised extinction or no information on population status.
Habitat impact	No significant change to habitat type; < 1% of area is impacted	Localised effects on habitat type; < 10% are impacted (for seagrass <5% areal change); recovery in days/weeks	Moderate changes to habitat type; <20% reduction in population abundance (for seagrass <10% areal change); recovery months to years	Limited information available on the identity and distribution of habitat types; major changes to habitat type; <30% are impacted; recovery years to decades	No information available on the identity and distribution of habitat types; impact >30% of areal extent; recovery decades to centuries
Biodiversity impact (non-commercial, non-habit-forming and unprotected species)	Reductions in species richness and/or composition are not readily detectable (<10% variation); recovery expected in days, no change in species richness or composition	Reductions in species richness and/or composition are <20%; recovery expected in days to months, no loss of species populations, no local extinctions	Reductions in species richness and/or composition are <30%; recovery expected in years to decades, loss of at least one species, local extinction events	Limited information on distribution of species; reductions in species richness and/or composition are <70%; recovery expected in centuries; loss of several populations; multiple local extinctions; one regional extinction	No information on distribution of species available' reductions in species richness and/or composition are >70%; recovery not expected; loss of multiple species causing significant local extinctions; global extinction of at least one species
Water quality impact	Evidence for reduced WQ within the diffusion zone but not beyond	Key parameters reaching WQ standards; no measurable changes to communities	WQ changes causing impacts on communities of a small spatial and temporal scale; slight sediment or biota contamination but no measurable impact to communities	WQ changes causing impacts on communities of a small spatial and long temporal OR a wide spatial and short temporal scale; moderate contamination to sediments and/or biota with observable impacts	Significant and persistent changes in WQ with clear evidence of impacts on pelagic and benthic communities over a wide spatial and long temporal scales. Heavy long term contamination in sediment and biota.

Risk ratings

For the purposes of assessing Marine Park scientific research permit applications, the following threshold risk ratings are used.

Risk ratings		Consequence rating				
		1	2	3	4	5
Likelihood	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

<=2	Permitted (RAZ & SZ)	A low risk rating indicates that the research, provided that it is carried out in accordance with the conditions of the permit, has an acceptable risk to the objectives of a sanctuary zone or a restricted access zone.
<=7	Permitted (SZ)	A moderate risk rating indicates that the research, provided that it is carried out in accordance with the conditions of the permit, has an acceptable risk to the objective of a sanctuary zone but not a restricted access zone.
<=12	Permitted (HPZ)	A high risk indicates that the research poses an unacceptable risk to the objectives of both sanctuary zones and restricted access zones. It may be permissible in a habitat protection zone so long as it doesn't damage the seafloor.
<=25	Not permitted	A very high risk indicates that the research poses an unacceptable risk to marine park objectives and should not be conducted within the boundaries of a marine park.

G. List of fished and site-attached fish species

Species name	Common name	Fished	Site attached
Acanthaluteres brownii	Spinytail leatherjacket	Yes	No
Acanthaluteres spilomelanurus	Bridled leatherjacket	Yes	No
Arripis georgianus	Australian herring	Yes	No
Arripis truttaceus	Western Australian salmon	Yes	No
Cheilodactylus nigripes	Magpie perch	Yes	No
Dactylophora nigricans	Dusky morwong	Yes	No
Girella zebra	Zebrafish	Yes	No
Haletta semifasciata	Blue weed whiting	Yes	No
Heterodontus portusjacksoni	Port Jackson shark	Yes	No
Hypoplectrodes nigroruber	Banded sea perch	Yes	No
Meuschenia hippocrepis	Horseshoe leatherjacket	Yes	No
Myliobatis australis	Eagle ray	Yes	No
Nemadactylus valenciennesi	Blue morwong	Yes	No
Neosebastes scorpaenoides	Common Gurnard perch	Yes	No
Notolabrus parilus	Brownspotted wrasse	Yes	No
Omegophora armilla	Ringed toadfish	Yes	No
Parequula melbournensis	Southern silverbelly	Yes	No
Pelates octolineatus	Striped trumpeter	Yes	No
Pentaceropsis recurvirostris	Longsnout boarfish	Yes	No
Phyllopteryx taeniolatus	Weedy seadragon	Yes	No
Platycephalus speculator	Southern bluespotted flathead	Yes	No
Pseudocaranx wrighti	Skipjack trevally	Yes	No
Sardinops neopilchardus	Australian pilchard	Yes	No
Scobinichthys granulatus	Rough leatherjacket	Yes	No
Sillago schomburgkii	Yellowfin whiting	Yes	No
Sphyraena novaehollandiae	Snook	Yes	No
Thamnaconus degeni	Degens leatherjacket	Yes	No
Tilodon sexfasciatus	Moonlighter	Yes	No
Torquigener pleurogramma	Toadfish	Yes	No
Upeneichthys vlamingii	Red mullet	Yes	No
Urolophus cruciatus	Banded stingaree	Yes	No
Urolophus orarius	Coastal stingaree	Yes	No
Urolophus spp.	Stingaree	Yes	No
Centroberyx gerrardi	Bight redfish	Yes	Yes
Centroberyx lineatus	Swallowtail	Yes	Yes
Kyphosus sydneyanus	Silver drummer	Yes	Yes
Pagrus auratus	Snapper	Yes	Yes
Portunus pelagicus	Blue swimmer crab	Yes	Yes
Pseudocaranx georgianus	Silver trevally	Yes	Yes
Pseudocaranx sp	Trevally	Yes	Yes
Pseudocaranx spp.	Trevally	Yes	Yes
Scorpis aequipinnis	Sea sweep	Yes	Yes

Sepia apama	Giant cuttlefish	Yes	Yes
Sepioteuthis australis	Southern calamary	Yes	Yes
Sepioteuthis spp.	Reef squid	Yes	Yes
Sillaginodes punctatus	King George whiting	Yes	Yes
Achoerodus gouldii	Western blue groper	Yes	Yes
Notolabrus tetricus	Bluethroat wrasse	Yes	Yes
Othos dentex	Harlequin fish	Yes	Yes
Paraplesiops meleagris	Southern blue devil	Yes	Yes
Phycodurus eques	Leafy seadragon	Yes	Yes
Neoodax balteatus	Weedy whiting	No	Yes
Parapercis haackei	Wavy grubfish	No	Yes
Siphamia cephalotes	Woods siphonfish	No	Yes
Pempheris multiradiata	Common bullseye	No	Yes
Trachinops noarlungae	Noarlunga hulafish	No	Yes

14 Glossary

Act (the) — In this document, refers to the *Marine Parks Act 2007*

Adaptive management — A management approach often used in natural resource management where there is little information and/or a lot of complexity, and there is a need to implement some management changes sooner rather than later. The approach is to use the best available information for the first actions, implement the changes, monitor the outcomes, investigate the assumptions, and regularly evaluate and review the actions required. Consideration must be given to the temporal and spatial scale of monitoring and the evaluation processes appropriate to the ecosystem being managed.

AMLR — Adelaide and Mount Lofty Ranges

Biodiversity — The number and variety of organisms found within a specified geographic region. (2) The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Biomass — The amount of living matter in a given habitat, expressed either as the weight of organisms per unit area or as the volume of organisms per unit volume of habitat.

Browsing Herbivore — An animal that feeds on fleshly plants.

BRUVS — Baited Remote Underwater Video Stations

Carnivore — An animal that eats a diet consisting mainly of meat.

DEWNR — Department of Environment, Water and Natural Resources (Government of South Australia)

Diversity — The distribution and abundance of different kinds of plant and animal species and communities in a specified area.

DPTI — Department of Planning, Transport and Infrastructure (Government of South Australia)

Ecosystem resilience — Refers to the capacity of an ecosystem to recover from disturbance or withstand ongoing pressures.

Ecosystem services — Are the many and varied benefits that humans freely gain from the natural environment and from properly-functioning ecosystems.

EP — Eyre Peninsula

EPA — Environment Protection Authority (Government of South Australia)

GMUZ — general managed use zone

HPZ — habitat protection zone

Invertivore — An animal that feeds on invertebrates

KEQ — key evaluation question

KI — Kangaroo Island

LGA — Local Government Area

MER — Monitoring, evaluation and reporting

MER Framework— Refers to the strategic document Monitoring, Evaluation and Reporting Framework – Marine Parks Program. The document, outlines the key steps required to deliver the MER Program including the six evaluation questions. These questions provide the basis for the statutory review of the management plans and were developed from the six Objects of the Marine Parks Act 2007.

MER Plan — Refers to the monitoring, evaluation and reporting plan. A critical component of the MER Program is the MER Plan which outlines the 'why, what, where, and when' of key information to be collected, evaluated and

reported. The MER Plan should be used to guide ongoing implementation plans for the MER Program and encourage further partnerships and collaborations.

MER Program — Refers to monitoring, evaluation and reporting program. The Marine Parks monitoring, evaluation and reporting program has been implemented to measure the effectiveness of each management plan in achieving the objects of the Marine Parks Act 2007.

NRM — Natural Resource Management

NY or N&Y — Northern and Yorke

Omnivore — An animal that includes both plants and animals in its normal diet.

PIRSA — Primary Industries and Regions South Australia (Government of South Australia)

Planktivore — An aquatic organism that feeds on planktonic food, including zooplankton and phytoplankton

RAZ — restricted access zone

SAPOL — South Australian Police (Government of South Australia)

SARDI — South Australian Research and Development Institute

Scraping Herbivore — An animal that removes algae, sediment and other material by closely cropping or scraping the reef surface.

SE — South East

SEQ — specific evaluation question

SAMDB — South Australian Murray-Darling Basin

SPA — special purpose area

SZ — sanctuary zone

Trophic cascade — An ecological phenomenon triggered by the addition or removal of top predators and involving reciprocal changes in the relative populations of predator and prey through a food chain**.**

Trophic level — A trophic level is the group of organisms within an ecosystem which occupy the same level in a food chain.

UVC — underwater visual cenusus

15 References

ABS (Australian Bureau of Statistics) 2011a, Technical Paper Socio-Economic Indexes for Areas (SEIFA), cat. no. 2033.0.55.001, viewed August 2017, http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/22CEDA8038AF7A0DCA257B3B00116E34/$File/2033.0.55.001%20seifa%202011%20technical%20paper.pdf

ABS 2011b, *Australian Statistical Geography Standard (ASGS): Volume 1 – Main Structure and Greater Capital City Statistical Areas, July 2011*, viewed August 2017, http://abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.001July%202011?OpenDocument

ABS 2017a, Regional Population Growth, Australia, Population Estimates by Local Government Area (ASGS 2016), 2006 to 2016, cat. no. 3218.0, viewed June 2017, http://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0/

ABS 2017b, Counts of Australian Businesses, including Entries and Exits, June 2012 to June 2016, cat. no. 8165.0, viewed June 2017, http://www.abs.gov.au/ausstats/abs@.nsf/products/514D970AA18B6DE0CA2577FF0011E061?OpenDocument

ABS 2017c, Building Approvals and Value, Australia, cat. no. 8731.0 (and previous issues), viewed August 2017, http://www.abs.gov.au/ausstats/abs@.nsf/mf/8731.0

ABS 2017d, Consumer Price Index, Australia. TABLE 11. CPI: Group, Sub-group and Expenditure Class, Index Numbers by Capital City, cat. no. 6401.0, viewed June 2017, http://www.abs.gov.au/ausstats/abs@.nsf/mf/6401.0

AMLR NRM 2013, Adelaide and Mount Lofty Ranges Natural Resources Management Plan Volume 1 – Part 1, Strategic Plan, 2014-15 to 2023-24. AMLR NRM, South Australia.

Apps, K and Huveneers, C 2016 *Assessing the knowledge, social values and stewardship of white shark cage-diving participants within the Sanctuary Zone of the Neptune Island group (Ron and Valerie Taylor) Marine Park*. Final Report to the Department of Environment, Water and Natural Resources.

ATO (Australian Taxation Office) 2015. Taxation statistics 2012–13, viewed November 2015, https://www.ato.gov.au/printfriendly.aspx?url=/About-ATO/Research-and-statistics/In-detail/Tax-statistics/Taxation-statistics-2012-13/

Bailey, H, Bryars, S, Spoehr, J, Morison, J, Brook, J, Barnett, K, Hordacre, A, Kirkman, H & Rippin, L 2012, *Marine Park Regional Impact Statements Main Report*. A report prepared for Department of Environment, Water and Natural Resources by EconSearch in association with the Australian Workplace Innovation and Social Research Centre, Dr Hugh Kirkman, Dr Simon Bryars and James Brook. 2 August 2012, Adelaide.

Bates, A.E, Barrett, N.S, Stuart-Smith, R.D, Holbrook, N.J, Thompson, P.A & Edgar G.J 2014, Resilience and signatures of tropicalization in protected reef fish communities. *Nature Climate Change* 4: 62–67.

Baum, J.K & Worm, B 2009, Cascading top-down effects of changing oceanic predator abundances. J *Animal Ecology* 78(4): 699–714.

Beckmann, C.L & Hooper, G.E 2016, *Status of the West Coast Prawn* Penaeus (Melicertus) latisulcatus *Fishery 2015*. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000772-8. SARDI Research Report Series No. 906. 33pp.

Beckmann, CL & Hooper, GE 2015, *Blue Crab (Portunus armatus) Fishery 2013/14*. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000729-11. SARDI Research Report Series No. 837. 70 pp.

Beckmann, C.L, Noell C.J & Hooper, G.E 2015, *Status of the Gulf St Vincent Prawn* Penaeus (Melicertus) latisulcatus *Fishery in 2014/15*. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/00174-4. SARDI Research Report Series No. 870. 25 pp.

Berkeley, S, Chapman, C & Sogard, S.M 2004, Maternal age as a determinant of larval growth and survival in a marine fish, *Sebastes melanops*. *Ecology* 85, 1258–1264. doi:10.1890/03-0706

Boyce, D.G, Frank, K.T, Worm, B & Leggett, W.C 2015, Spatial patterns and predictors of trophic control in marine ecosystems. *Ecological Letters* 18(10):1001–1011.

Bryars, S 2013, *Monitoring fishes and invertebrates inside South Australia's marine parks network: a scoping document for establishing baselines and guiding an ongoing monitoring program*. Report to the Marine Parks Monitoring, Evaluation and Reporting Program within the Department of Environment, Water and Natural Resources. Dr Simon Richard Bryars, Adelaide.

Bryars, S, Page, B, Waycott, M, Brock, D and Wright, A 2017a, *South Australian Marine Parks Monitoring, Evaluation and Reporting Plan*, DEWNR Technical report 2017/05, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, B 2017b, *Baseline and predicted changes for the South Australian Marine Parks Network,* DEWNR Technical report 2017/06, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016a, Baseline report and predicted changes for the Far West Coast Marine Park, DEWNR Technical report 2016/11, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016b, Baseline report and predicted changes for the Nuyts Archipelago Marine Park, DEWNR Technical report 2016/12, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016c, Baseline report and predicted changes for the West Coast Bays Marine Park, DEWNR Technical report 2016/13, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016d, Baseline report and predicted changes for the Investigator Marine Park, DEWNR Technical report 2016/14, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016e, Baseline report and predicted changes for the Thorny Passage Marine Park, DEWNR Technical report 2016/15, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016f, Baseline report and predicted changes for the Sir Joseph Banks Group Marine Park, DEWNR Technical report 2016/16, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016g, Baseline report and predicted changes for the Neptune Islands Group Marine Park, DEWNR Technical report 2016/17, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016h, Baseline report and predicted changes for the Gambier Islands Group Marine Park, DEWNR Technical report 2016/18, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016i, Baseline report and predicted changes for the Franklin Harbor Marine Park, DEWNR Technical report 2016/19, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016j, Baseline report and predicted changes for the Upper Spencer Gulf Marine Park, DEWNR Technical report 2016/20, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016k, Baseline report and predicted changes for the Eastern Spencer Gulf Marine Park, DEWNR Technical report 2016/21, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016l, Baseline report and predicted changes for the Southern Spencer Gulf Marine Park, DEWNR Technical report 2016/22, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016m, Baseline report and predicted changes for the Lower Yorke Peninsula Marine Park, DEWNR Technical report 2016/23, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016n, Baseline report and predicted changes for the Upper Gulf St Vincent Marine Park, DEWNR Technical report 2016/24, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016o, Baseline report and predicted changes for the Encounter Marine Park, DEWNR Technical report 2016/25, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016p, Baseline report and predicted changes for the Western Kangaroo Island Marine Park, DEWNR Technical report 2016/26, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016q, Baseline report and predicted changes for the Upper Gulf St Vincent Marine Park, DEWNR Technical report 2016/27, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016r, Baseline report and predicted changes for the Upper South East Marine Park, DEWNR Technical report 2016/28, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Bryars, S, Brook, J, Meakin, C, McSkimming, C, Eglinton, Y, Morcom, R, Wright, A and Page, 2016s, Baseline report and predicted changes for the Lower South East Marine Park, DEWNR Technical report 2016/29, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Carr, M.H, Neigel, J.E, Estes, J.A, Andelman, S, Warner, R.R & Largier 2003, Comparing Marine and Terrestrial Ecosystems: Implications for the Design of Coastal Marine Reserves, *Ecological Applications* Vol. 13, No. 1, Supplement: The Science of Marine Reserves, pp. S90-S107

Casini, M, Hjelma, J, Molinerob, J.C, Lo¨ vgrena, J, Cardinalea, M, Bartolinoc, V, Belgranoa, A & Kornilovsd, G 2009, Trophic cascades promote threshold-like shifts in pelagic marine ecosystems, *PNAS*, vol. 106, no. 1, pp. 197–202.

Christiansen F, Rojano-Doñate L, Madsen P.T and Bejder L 2016, Noise Levels of Multi-Rotor Unmanned Aerial Vehicles with Implications for Potential Underwater Impacts on Marine Mammals.

Clarke B, Thurstan R, Yates K 2016, *An investigation into the socio-cultural dimension of determining MPA effectiveness.* Report prepared for Department of Environment, Water and Natural Resources, Adelaide.

Clarke, K. R 1993, Non-parametric multivariate analyses of changes in commmunity structure, *Austral Ecology*, vol. 18, no. 1, pp. 117-143.

Clarke, K.R & Warwick, R.M 2001, *Change in Marine Communities: An approach to Statistical Analysis and Interpretation*. Plymouth Marine Laboratory, Plymouth.

Coast Protection Board 2016, Coast Protection Board policy document revised 29 July 2016, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Coast Protection Strategic Plan 2012-2017, http://www.environment.sa.gov.au/files/sharedassets/public/coasts/coast-protection-board-strategic-plan-2012-2017-plan.pdf

Connell, S & Gillanders, B 2007. *Marine Ecology*. 1st ed. Melbourne, Victoria: Oxford University Press

Department of Employment 2017, Labour Force, Australia, viewed June 2017, 6202.0 - Labour Force, Australia, Dec 2016, Department of Employment, Australian Government.

DEH 2008, *Design principles guiding the development of South Australia's marine park boundaries.* Coast and Marine Conservation Branch, Department for Environment and Heritage, South Australia.

DEH 2009, *Marine Habitats in the Adelaide and Mount Lofty Ranges NRM Region.* Final Report to the Adelaide and Mount Lofty Ranges Natural Resources Management Board for the program: Facilitate Coast, Marine and Estuarine Planning and Management by Establishing Regional Baselines. Prepared by the Department for Environment and Heritage, Coast and Marine Conservation Branch.

Delean, S 2017, *Detecting changes in biodiversity indicators in South Australias Marine Parks: Encounter Marine Park*. Report to the Department of Environment, Water and Natural Resources, The University of Adelaide, In review.

DEWNR 2012, *Finalising Management Plans for South Australia's Marine Parks Network – a summary of consultation steps and amendments to draft management plans* 2012

DEWNR 2017a, EGIS data: DCDB Valuations, viewed June 2015, http://location.sa.gov.au/lms/Reports/ReportMetadata.aspx?p_no=1218&pu=y&pa=dewnr. Department of Environment, Water and Natural Resources, Adelaide.

DEWNR 2015i, EGIS data: Shipwrecks, http://location.sa.gov.au/lms/Reports/ReportMetadata.aspx?p_no=637&pu=y&pa=dpti. Department of Environment, Water and Natural Resources, Adelaide, South Australia.

Dixon, C 2011b, Western King Prawn *Melicertus latisulcatus*, individual species assessment, in GT Pecl, Z Doubleday, T Ward, S Clarke, J Day, C Dixon, S Frusher, P Gibbs, A Hobday, N Hutchinson, S Jennings, K Jones, X Li, D Spooner & R Stoklosa (eds), *Risk Assessment of Impacts of Climate Change for Key Marine Species in South Eastern Australia*, Fisheries Research and Development Corporation, Project 2009/070.

Dixon, C.D, Hooper, G.E & Burch, P 2012, *Gulf St Vincent Prawn, Penaeus (Melicertus) latisulcatus, Fishery 2010/11*. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000782-5. SARDI Research Report Series No. 631. 112 pp

DPTI 2017a, Boat Registrations, viewed June 2017, https://data.sa.gov.au/dataset/boat-registrations. Department of Planning, Transport and Infrastructure. Adelaide.

DPTI 2017b, *Boat Licence Statistics*, viewed June 2017, https://data.sa.gov.au/dataset/boat-licence-statistics. Department of Planning, Transport and Infrastructure. Adelaide.

Duffy, J.E, Amaral-Zettler, L.A, Fautin, D.G, Paulay, G, Rynearson, T.A, Sosik, H.M & Stachowicz, J.J 2013. Envisioning a marine biodiversity observation network. *BioScience* 63: 350–361.

Econsearch 2014, *Economic Impact of Zoning in SA Marine Parks on Commercial Fishing*, A report to Department of Environment and Natural Resources. Adelaide.

Econsearch 2016, *The Economic Impact of Aquaculture on the South Australian State and Regional Economies, 2014/15*, A report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017a, *Economic Indicators for the South Australian Northern Zone Rock Lobster Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017b, *Economic Indicators for the South Australian Southern Zone Rock Lobster Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017c, *Economic Indicators for the South Australian Abalone Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017d, *Economic Indicators for the Spencer Gulf Prawn Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017e, *Economic Indicators for the Gulf St Vincent Prawn Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017f, *Economic Indicators for the South Australian Blue Crab Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017g, *Economic Indicators for the South Australian Sardine Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017h, *Economic Indicators for the South Australian Marine Scalefish Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Econsearch 2017i, *Economic Indicators for the South Australian Charter Boat Fishery 2015/16*, Report to PIRSA Fisheries and Aquaculture. Adelaide.

Edgar, G.J, Barrett, N.S & Stuart-Smith, R.D 2009, Exploited reefs protected from fishing transform over decades into conservation features otherwise absent from seascapes, *Ecological Applications*, vol. 19, no. 8, pp. 1967–74.

Edgar, G.J, Stuart-Smith, R.D, Willis, T.J, Kininmonth, S, Baker, S.C, Banks, S, Barrett, N.S, Becerro, M.A, Bernard, A.T, Berkhout, J, Buxton, C.D, Campbell, S.J, Cooper, A.T, Davey, M, Edgar, S.C, Försterra, G, Galván, D.E, Irigoyen, A.J, Kushner, D.J, Moura, R, Parnell, P.E, Shears, N.T, Soler, G, Strain, E.M, Thomson, R.J 2014, Global conservation outcomes depend on marine protected areas with five key features, *Nature*, vol. 506, pp. 216-220.

Edgar, G.J, Barrett, N.S, & Stuart-Smith, R.D 2009, Exploited reefs protected from fishing transform over decades into conservation features otherwise absent from seascapes, *Ecological Applications*, vol. 19, no. 8, pp. 1967–1974.

Edgar, G.J, Barrett, N, Brook, J, McDonald, B & Bloomfield, A 2006, *Ecosystem monitoring inside and outside proposed sanctuary zones within the Encounter marine park – 2005 baseline surveys*. Tasmanian Aquaculture and Fisheries Institute, Internal Report, 36 pp.

EP NRM 2017, Strategic Plan for the Eyre Peninsula Natural Resources Management Region – 2017-2027. Natural Resources Eyre Peninsula, South Australia.

Estes, J.A & Palmisano, J.F 1974, Sea otters: Their role in structuring nearshore communities. *Science*, 185: 1058-1060.

Flinders Ports 2017, Annual Summary Report, viewed June 2017, http://www.flindersports.com.au/portstatistics3.html

Fowler, A.J, McGarvey, R, Steer, M.A & Feenstra, J.E 2016, *Fishery Statistics for the South Australian Marine Scalefish Fishery: 1983/84 - 2015/16*. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000565-11. SARDI Research Report Series No. 935. 48pp.

Fowler, A.J, Huveneers, C, & Lloyd, M.T 2017, Insights into movement behaviour of snapper (*Chrysophrys auratus*, Sparidae) from a large acoustic array. *Marine and Freshwater Research*, 68, 1438-1453.

Georgeson, L, Stobutzki, I & Curtotti, R (eds) 2014, *Fishery status reports 2013–14,* Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Giri, K & Hall, K 2015, *South Australian Recreational Fishing Survey*. Fisheries Victoria Internal Report Series No. 62, Melbourne.

Goldsworthy, S.D, Page, B, Shaughnessy, P.D & Linnane, A 2010, *Mitigating Seal Interactions in the SRLF and the Gillnet Sector SESSF in South Australia*. Report to the Fisheries Research and Development Institute. South Australian Research and Development Institute (Aquatic Sciences), Adelaide, SARDI Publication No. F2009/000613-1. SARDI Research Report Series No. 405.

Government of South Australia 2013, SA Marine Parks: Commercial Fisheries Voluntary Catch/Effort Reduction Program, 13 pp, Adelaide.

Government of South Australia 2011, Displaced Commercial Fishing: Policy Framework: Government of South Australia, April 2011, 3 pp, Adelaide.

Government of South Australia 2009, Summary of whole of Government marine parks policy commitments. Government of South Australia, 10 pp. Adelaide.

Goyder Institute for Water Research 2016, *Workshop to Inform the Development of the South Australian Marine Park Monitoring, Evaluation and Reporting Plan,* Goyder Institute for Water Research Technical Report Series No. 16/11, Adelaide.

Grosholz, E 2002, Ecological and evolutionary consequences of coastal invasions. *Trends in Ecology & Evolution* 17: 22–27.

Hughes, P.H, Bellwood, D.R, Folke, C, Steneck, R.S & Wilson, J 2005, New paradigms for supporting the resilience of marine ecosystems. *Trends in Ecology and Evolution* 20:380-386.

.id community 2017, Economic indicators notes, viewed August 2017, http://economy.id.com.au/adelaide/gross-regional-product

IMCRA (Interim Marine and Coastal Regionalisation for Australia) Technical Group 1998, *Interim Marine and Coastal Regionalisation for Australia: an ecosystem-based classification for marine and coastal environments*. Version 3.3. Environment Australia, Commonwealth Department of the Environment, Canberra.

James, R.J & Fairweather P.G 1995, Comparison of rapid methods for sampling the Pipi, *Donax deltoids* (Bivalvia, Donacidae), on sandy ocean beaches. *Marine & Freshwater Research* 46:1093-1099.

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

Jones, G.K & Doonan, A 2005, *2000-01 National Recreational and Indigenous Fishing Survey*, South Australian Fisheries Management Series, Primary Industries and Resources SA, Government of South Australia, Paper no. 46, pp. 100.

KI NRM 2017, Kangaroo Island Natural Resources Management Plan 2017-2027. Natural Resources Kangaroo Island, South Australia.

Knight, M.A & Tsolos, A 2012, *South Australian Wild Fisheries Information and Statistics Report 2010/11*, South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2008/000804-4. SARDI Research Report Series No. 612. 57 pp.

Kosturjak, A, Whetton, S, O'Neil, M and Trevithick, M, 2015, *Sanctuary Zones Regional Impact Assessment Statement: Ceduna, Kangaroo Island and Port Wakefield*. Goyder Institute for Water Research Technical Report Series No. 15/43, Adelaide.

Linnane, A, McGarvey, R, Feenstra, J & Graske, D 2017a, Northern Zone Rock Lobster Fishery 2015/16. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000320-11. SARDI Research Report Series No. 954. 78pp

Linnane, A, McGarvey, R, Feenstra, J, & Hawthorne, P 2017b, Southern Zone Rock Lobster (*Jasus edwardsii*) Fishery Status Report 2015/16. Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000715-10. SARDI Research Report Series No. 928. 17pp.

Markiewicz and Patrick 2016. *Developing Monitoring and Evaluation Frameworks*, SAGE Publications, California.

Mayfield, S & Ferguson, G 2015, *Status of the Central Zone Greenlip* (Haliotis laevigata) *and Blacklip Abalone* (H. rubra) *Fisheries in 2014*. Report for PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000611-6. SARDI Research Report Series No. 869. 18 pp.

Mcleay, L, McGarvey, R, Linnane, A, Feenstra, J & Hawthorne, P 2017, *Rock Lobster survey of the Western Kangaroo Island Marine Park – Cape du Couedic (Sanctuary Zone 3).* Report to Department of Environment, Water and Natural Resources. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000282-1. SARDI Research Report Series No. 962. 38 pp.

Miller D, Brock D, Holland S & Colella D 2017 *(in Prep),* Marine habitat mapping in SA's Marine Parks: Methods, application and data management. DEWNR Technical note, Government of South Australia, Department of Environment, Water and Natural Resources, Adelaide.

National Economics and .id 2017, *National Economic Indicators Series*, Data Notes, viewed June 2017, http://economic-indicators.id.com.au/?es=9&StateId=4

Noell, C.J & Hooper, G.E 2015, *Spencer Gulf Prawn Penaeus (Melicertus) latisulcatus Fishery 2013/14*. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000770-8. SARDI Research Report Series No. 843. 68 pp.

Patterson, H, Noriega, R, Georgeson, L, Stobutzki, I & Curtotti, R 2016, *Fishery status reports 2016*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 3.0.

Patterson, H, Georgeson, L, Stobutzki, I & Curtotti, R (ed) 2015, *Fishery status reports 2015,* Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Perrings, C 2002, Biological invasions in aquatic systems: The economic problem. *Bulletin of Marine Science* 70: 541–552.

PIRSA 2007, *Discussion paper supporting the Aquaculture (Zones—Smoky Bay) Policy 2007*. Primary Industries and Resources South Australia, Adelaide. 45 pp.

PIRSA 2011, *PIRSA policy position regarding redistribution of displaced commercial fishing - marine parks.* Primary Industries and Resources South Australia, Adelaide.

PIRSA 2009, *Ecologically Sustainable Development (ESD) Risk Assessment of the South Australian Abalone Fishery,* Primary Industries and Resources South Australia, 81 pp.

PIRSA 2013, *Management Plan for the South Australian Commercial Marine Scalefish Fishery,* Primary Industries and Regions South Australia, Adelaide. South Australian Fisheries Management Series, paper no. 59. pp. 141.

PIRSA 2014, *Ecological Assessment of the South Australian Sardine Fishery*. Ressessment report prepared for the Department of the Environment, for the purposes of part 13 and 13(a) of the *Environment Protection and Biodiversity Conservation Act 1999*. Primary Industries and Regions South Australia, Adelaide.

PIRSA 2017. *Fisheries Public Register,* viewed June 2017 https://egate.pir.sa.gov.au/fishreg/new/html/FishPubRegMenu/menuDisplay#here, Primary Industries and Regions South Australia. Adelaide.

Rogers, P.J, Huveneers, C & Beckmann, C.L 2014, *Monitoring residency of white sharks (Carcharodon carcharias in relation to the cage-diving industry in the Neptune Islands Group Marine Park*. Report to the Department of Environment, Water and Natural Resources, South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI publication No. F2014/000801-1. SARDI Research Report Series No. 818. 69pp.

SATC 2017, Infographic: Value of Shark Cage Diving in South Australia, viewed August 2017

http://tourism.sa.gov.au/news-and-media/news/2016/nov/23/infographic-value-of-shark-cage-diving-in-south-australia

Sato, T & Suzuki, N 2010, Female size as a determinant of larval size, weight and survival period in the coconut crab, *Birgus latro*. *Journal of Crustacean Biology*. 30, 624–628. doi:10.1651/10-3279.1

Scholz G, von Baumgarten P, Wilson H, Wright A and Bryars S 2017, *Monitoring, Evaluation and Reporting framework for Marine Parks Program,* DEWNR Technical note 2017/06, Government of South Australia, through the Department of Environment, Water and Natural Resources, Adelaide.

Soler, G.A, Edgar, G.J, Thomson, R.J, Kininmonth, S, Campbell, S.J, Dawson, T.P, Barrett, N.S, Bernard, A.T.F, Galván, D.E, Willis, T.J, Alexander, T.J & Stuart-Smith, R.D 2015, Reef fishes at all trophic levels respond positively to effective marine protected areas. *PLoS ONE* 10(10): e0140270. doi:10.1371/journal.pone.0140270.

Steer, M.A. and Tsolos, A 2016, *South Australian Charter Boat Fishery 2014/15*. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000847-4. SARDI Research Report Series No. 932. 40pp.

Stobart, B, Mayfield, S & Dent, J 2015a, *Assessment of the Western Zone Blacklip Abalone* (Haliotis rubra) *Fishery in 2014*. Fishery Stock Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication F2015/000407-1. SARDI Research Report Series No. 864. 68 pp.

Stobart, B, Mayfield, S & Dent J 2015b, *Status of the Western Zone Greenlip Abalone (*Haliotis laevigata*) Fishery in 2014*. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2014/000361-2. SARDI Research Report Series No. 865. 14 pp.

Stuart-Smith, R.D, Edgar, G.J, Barrett, N.S, Bates, A.E, Baker, S.C, Bax, N.J, Becerro, M.A, Blanchard, J.L, Brock, D.J, Clark, G.F, Davis, T.R, Day, P.B, Duffy, J.D, Holmes, T.H, Howe, S, Jordan, A, Kininmonth, S, Knott, N.A, Lefcheck, J.S, Ling, S.D, Parr, A, Strain, E, Sweatman, H & Thomson, R 2017, Assessing National biodiversity trends for rocky and coral reefs through the integration of citizen science monitoring programs, *BioScience* Vol. 67 No. 2.

Stuart-Smith, R.D, Edgar, G.J, Barrett, N.S, Kininmonth, S & Bates, A.E 2015, 2015 Thermal biases and vulnerabilities to warming in the world's marine fauna, *Nature* doi:10.1038/nature16144.

Sydney Marine Park 2017, viewed September 2017, http://www.sydneymarinepark.org.au/benefits-of-marine-parks.html

Thomas, C & Hughes, V 2016, South Australia's experience: establishing a network of nineteen marine parks, in Fitzsimmons, J & Wescott, G (eds), *Big, Bold and Blue: Lessons from Australia's Marine Protected Areas*, CSIRO Publishing, Part 2, Chapter 8, Pp 139-152.

Tsolos, A 2013, *South Australian Charter Boat Fishery Report 2012,* Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide, SARDI Publication No. F2007/000847-3. SARDI Research Report Series No. 686. 45 pp.

Tourism Research Australia 2017a, *Tourism Regional Profiles, Eyre Peninsula South Australia*, Australian Government, Austrade, viewed June 2017, http://tra.gov.au/Tourism_Region_Profiles/Region_profiles/index.html#

Tourism Research Australia 2017b, *Tourism Regional Profiles, Yorke Peninsula South Australia*, Australian Government, Austrade, viewed June 2017, http://tra.gov.au/Tourism_Region_Profiles/Region_profiles/index.html#

Tourism Research Australia 2017c, *Tourism Regional Profiles, Fleurieu Peninsula South Australia*, Australian Government, Austrade, viewed June 2017, http://tra.gov.au/Tourism_Region_Profiles/Region_profiles/index.html#

Tourism Research Australia 2017d, *Tourism Regional Profiles, Kangaroo Island South Australia*, Australian Government, Austrade, viewed June 2017, http://tra.gov.au/Tourism_Region_Profiles/Region_profiles/index.html#

Tourism Research Australia 2017e, *Tourism Regional Profiles, Limetone Coast South Australia*, Australian Government, Austrade, viewed June 2017, http://tra.gov.au/Tourism_Region_Profiles/Region_profiles/index.html#

Ward, T.M, Whitten, A.R & Ivey, A.R 2015, *South Australian Sardine* (Sardinops sagax*) Fishery: Stock Assessment Report 20152*. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000765-5. SARDI Research Report Series No. 877. 103 pp.

Ward, T.M, Burch, P, Gorman, D & Begg, G.A 2012, *Estimates of historical commercial fishery catches/effort in final sanctuary and habitat protection zones in South Australia's Marine Parks*. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000307-8. SARDI Research Report Series No. 670. 77pp.

WWF 2017, Marine problems: Tourism & coastal development viewed August 2017 http://wwf.panda.org/about_our_earth/blue_planet/problems/tourism/

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