# Sanctuary Zones Regional Impact Assessment Statement: Ceduna, Kangaroo Island and Port Wakefield

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# Abbreviations and Glossary

| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| DEWNR | Department of Environment, Water and Natural Resources |
| CPUE | Catch per unit effort (a measure of productivity in commercial fisheries) |
| FTE | Full-time equivalent (a measure of job impact expressed in terms of hours worked by full-time workers) |
| GSP | Gross State Product (a measure of the total market value of all goods and services produced in the state) |
| MFA | Marine Fishing Area (spatial administrative unit for recording fisheries data) |
| MP | Marine Park |
| MSF | Marine scalefish fishery |
| PIRSA | Department of Primary Industries and Regions, South Australia |
| SACES | South Australian Centre for Economic Studies |
| SALM | Small Area Labour Markets |
| SARDI | South Australian Research and Development Institute |
| SAU | Spatial Assessment Unit |
| SZ | Sanctuary zone |
| TACC | Total allowable commercial catch |

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# Executive Summary

## Background

The following Regional Impact Assessment Statement (RIAS) summarises the results of an investigation into the economic, social and environmental impacts of marine park sanctuary zones (SZ) on the South Australian communities of Ceduna, Kangaroo Island and Port Wakefield. The aim of the RIAS is to "identify the actual negative and positive impacts of the sanctuary zones on these communities" and assess "effects on employment, existing businesses, capital investment, average income, local population and future development potential" (State Government statement, October 2014). The South Australian Centre for Economic Studies (SACES) is a joint research unit between the University of Adelaide and Flinders University. As a partner of the Goyder Institute for Water Research, SACES was engaged by the Goyder Institute as independent experts to undertake the RIAS.

Management plans for the State's 19 marine parks were adopted in 2012. As part of the subsequent final management plans for marine parks, zoning for 83 SZs covering about 6 per cent of the state's waters was established. Provisions relating to the prohibition of commercial and recreational fishing in the SZs came into effect on 1 October 2014.

In addition to providing habitat protection, SZs are designed to have long-term benefits for a range of species in terms of changes in size and/or abundance (Bailey et al. 2012a) that may have positive socio-economic impacts. However, in the short term there are valid concerns that there may be some socio-economic impacts for commercial and recreational fishers and regional communities due to the loss of fishing grounds and displacement of fishing effort. In response to this concern, the State Government pledged to complete a RIAS by 1 October 2015 for three regions – Ceduna, Kangaroo Island and Port Wakefield.

## Methodology and Limitations

The RIAS was undertaken using a mixed methods approach involving analysis of existing economic and social indicators, including commercial fisheries data; economic modelling to estimate broader flow-on economic impacts for the regions; consultations with regional stakeholders; and conduct of a community survey to gauge community attitudes.

Drawing conclusions regarding the impact of SZs on the three study regions is a difficult task given the short time frame for preparing the RIAS and therefore limited availability of data and trends. Many of the economic and social indicators relevant to assessing impacts are not yet available for the post-SZ period (e.g. population, taxable income, building approvals etc.). Such data would provide a useful counterpoint to the subjective, varied feedback that one may obtain from consultations. Moreover, even where data is available for the post SZ period, the volatile nature of certain data series at the regional level can mean short term movements reflect statistical noise rather than a response to a particular policy.

One of the most significant limitations for the RIAS was the availability of catch and effort data for commercial fisheries. The bulk of data was only available for the first 4 months since the introduction of SZs, i.e. October 2014 to January 2015, while confidentiality restrictions in the *Fisheries Management Act 2007* prevent the release of data where there is a risk of individuals being identified. Data that were consistent with the confidentiality requirements of section 124 of the *Fisheries Management Act 2007* were supplied for assessment as part of the RIAS process. However, some of the data requested were deemed confidential. PIRSA sent letters to current and former licence holders seeking consent from individuals to release confidential data. In total 12 per cent of fishers approved the release of confidential data for the RIAS, which compromised many of the small data sets. There was unanimous feedback from those fishers that the timeframe was insufficient to assess the impact of SZs on

commercial fisheries. Key fishing periods for certain fisheries (e.g. marine scalefish off Port Wakefield) would not be captured by the available data. Others noted that the impacts of SZs would take several years to fully emerge. On this basis there is a clear need that data for the respective commercial fisheries (abalone, rock lobster, marine scalefish and charter boat) for the three study regions and state be reviewed at least 12 months after the implementation of the SZs. Even then several years of data may be required to account for natural inter-annual variation.

Given the focus of the RIAS on small groups of individuals in regional areas and the limited period for which data was available, the confidentiality restrictions pertaining to commercial fisheries data have actively prevented the researchers from assessing regional impacts as well as independently confirming the feedback provided by fishers and other stakeholders in certain circumstances.

## Community Survey

Results from the community survey indicate that support for marine parks to protect plants and animals remains high (79 per cent state-wide, 87 per cent in Adelaide, and in the four regions ranged from a low of 65 per cent in Port Lincoln to a high of 84 per cent in Port Wakefield). Support for marine parks in a respondent's local area and areas where they visit was consistently lower than general support across all six sample groups, indicating a 'not in my back yard' phenomenon.

The majority of participants across all six sample groups believed that the marine environment is under pressure from human activity. Over-fishing was believed to be the greatest threat by all six sample groups (range from 46 to 59 per cent), while commercial fishing, pollution, recreational fishing/boating and population increase were also identified as threats by around 20 to 30 per cent of respondents

## General Issues

A number of issues were identified during the consultations that applied generally across the regions.

Many stakeholders claimed that recreational fishers believe that they cannot fish inside marine parks, and that this has led to a decline in recreational fishing activity. While available data on participation in recreational fishing is quite limited, the survey of community attitudes indicates no decline in participation in recreational fishing in the short term (state-wide results from the 2015 survey indicate that 27 per cent of respondents fished in the marine environment at least monthly, up from 21 per cent in 2013). The survey also indicates that while community understanding of the exact arrangements for fishing in marine parks is mixed, there was a high awareness of the existence of SZs or 'areas' in marine parks where no fishing is allowed (80 per cent). However, understanding of exactly where SZs were located was much lower (37 per cent).

Several commercial fishers commented that previous fisheries management arrangements – e.g. quotas, seasonal restrictions, size limits etc. – meant fisheries were sustainably managed and SZs were consequently not required. Such perceptions represent a misunderstanding of the purpose of marine parks and SZs, which is to protect and enhance marine biodiversity. In this sense SZs are designed to protect the marine environment from a range of potential threats, including population growth, pollution, development, climate change etc.

Commercial fishers are generally concerned about the sustainability of remaining fishing grounds due to a perception of increased effort within a smaller remaining area. One reason for this view is a belief of insufficient effort being bought out due to licences with latent effort (i.e. high inactivity) being targeted. However, licences were targeted based on actual effort over recent years. A related issue in this respect may be that spatial fishing patterns for those commercial fishing licences that were surrendered do not correspond well with the catch displaced by SZs given the voluntary nature of the buyback process. While efforts were made to target the buyout of licences toward those areas most affected by displaced catch/effort for certain fisheries (e.g. Upper Gulf St Vincent Marine Park: marine scalefish and

Encounter Marine Park: charter boat fishery), the high mobility of fishers in some regions may mean that bought out effort is soon replaced.

Another reason for believing insufficient effort was removed was a view from fishers that SZs were more productive than non-SZ areas, and insufficient effort was bought out given the methodology of estimating displaced catch based on the area of SZs overlapping with marine fishing areas and the assumption of fishing effort being evenly distributed within these areas. To the extent fishing effort is not evenly distributed then displaced catch may well be under- or even overestimated. In the absence of finer level spatial data the approach adopted for estimating displaced catch is reasonable. Such data does exist for rock lobster and indicates no significant difference in productivity between SZs and non-SZ areas, either for the Northern Zone rock lobster fishery or study regions. Nonetheless, it remains a possibility that displaced catch has been underestimated for certain fisheries and regions. Assessing whether catch outside the SZs is sustainable is ultimately outside SACES's area of expertise and more time and data will be required to make any such assessments.

One mechanism through which SZs potentially affect commercial fisheries is by reducing fishers' flexibility in terms of responding to certain weather conditions. Fishers stated they would move into particular SZs depending on certain weather conditions (e.g. Clinton Wetlands SZ and Cape du Couedic SZ). As a consequence, some fishers said they may be encouraged, or forced, to operate in rougher conditions than they otherwise would, which could have safety implications.

Several commercial fishers reported recreational fishers illegally fishing within SZs (e.g. Clinton Wetlands SZ, Sponge Gardens SZ). In addition, the potential for poaching of abalone was also identified as a significant concern in Kangaroo Island and Ceduna. A degree of illegal fishing in SZs is to be expected in the short term as fishers adjust to the recently introduced zoning for marine parks.

Full cost recovery applies to management of commercial fisheries with costs recovered from fishers through licence fees. Fishers raised equity concerns regarding the potential for licence fees to increase as State Government costs are being spread over a smaller numbers of licences and a smaller catch after the buyout of licences and reduction in fishing area. This view is a legitimate equity concern to the extent that the buyout has been driven by environmental objectives. It is possible there may be offsetting impacts to the extent there is any shift in the level of market prices associated with a reduction in overall industry supply.

Another equity concern related to potential reductions in the market value of commercial licences from the potential negative impacts of SZs. Older fishers nearing retirement are particularly vulnerable in this respect as they use the market value of their licences as a form of retirement savings. Some are reluctant to exit the industry due to concerns about their ability to find alternative employment and the lack of transferability of their skills. Insufficient time has passed to be able to assess impacts on the market value of licences. While the market value of fishery licences will provide a guide toward any potential negative impacts it may be difficult to directly attribute any such impacts to SZs given the influence of other market and environmental factors. There may also be quite disparate experiences across fishery sectors and regions as preliminary state level data indicates an increase in the total value of catch for some fisheries for the initial months with SZs.

A number of economic development opportunities or projects were identified during the consultations in the regions. These were typically not related or only tangentially related to SZs. Readers are referred to the respective community consultation summaries in the report for further information.

## Regional Impacts

In terms of regional economic and social impacts from SZs, two main areas of potential impact were identified: marine scalefish fishery (MSF) fishers at Port Wakefield and upper Gulf St Vincent more

broadly in respect of Clinton Wetlands SZ, and MSF net fishers at Kingscote on Kangaroo Island in relation to the Bay of Shoals SZ. The impacts to date relate to small groups of individuals in both regions and rests significantly on feedback obtained through the community consultations. As such feedback is potentially subjective and may be skewed towards those experiencing negative impacts there is a need to independently confirm such feedback through analysis of the commercial fisheries data administered by Primary Industries and Regions SA (PIRSA). Although it is difficult to make direct comparisons, it would appear that the economic impacts to date are less significant than forecast in the previous RIAS.

***Port Wakefield***

Several MSF fishers in upper Gulf St Vincent and at Port Wakefield provided evidence of reduced incomes while one fishing family has moved away from the region (incurring significant relocation costs). PIRSA logbook catch data indicates that total commercial catch in the region for 7 key MSF species for which non-confidential data was available – i.e. KGW hauling net, snapper long line and garfish, calamari, yellowfin whiting, Australian salmon and Australian herring hauling net – for the first 4 months with SZs was down 5.9 per cent compared to the corresponding period a year earlier. (As the decline was concentrated in Australian herring, the relative change in terms of value is likely to have been relatively smaller.) This decline follows relatively larger falls for the corresponding period in 2013/14 (-14 per cent) and 2012/13 (-45 per cent), while catch for the most recent SZ period was above (14 per cent) the catch recorded for the corresponding period in 2009/10. These results suggest that other non-SZ related medium term factors may also have contributed to the recent decline while natural temporal variation can also not be discounted.

The concentration of fishers in the upper Gulf St Vincent region would generally make any potential impacts more noticeable. They would also be compounded by cumulative impacts over time as other fishing areas have been removed by previous management changes, reducing flexibility in terms of alternative fishing areas. These impacts include closure of commercial fishing areas off southern Yorke Peninsula which came into effect in 2005 and an apparent recent increase in the number of days for which the Proof & Experimental Establishment (Army Base) range temporary buffer zone is in effect in addition to the permanent exclusion zone. Commercial fishers also noted increased conflict with recreational fishers. In this respect submissions from a couple of recreational fishers were received noting concern about the concentration or activities of commercial fishers in the upper Gulf St Vincent region. More generally, indicators for the broader Wakefield Regional Council region indicate some deterioration in economic conditions over the past year, although other broader economic factors are probably more significant in this development.

As a coastal town located adjacent the Clinton Wetlands SZ with a small population and below average incomes, Port Wakefield is relatively vulnerable to any potential short term negative impacts from SZs. Existing tourism activity in the region appears quite limited which suggests that potential for longer term future eco-tourism development in relation to SZs may face significant barriers.

Port Wakefield / upper Gulf St Vincent was the only one of the three selected regions for which the data indicates that the value of landed catch has fallen since the introduction of SZs. The value of catch for 4 key species in the region – garfish, King George whiting, snapper and calamari – is projected to fall by $100,000 in 2014/15.[1] This reduction is estimated to have total economic impact equivalent to a loss of 0.6 full-time equivalent jobs and $75,000 in gross value added (the reduction in FTE may be realised through reduced hours worked by more than one person). While the estimated impacts are relatively small, they are based on quite limited data in terms of both species and time and may not properly capture impacts on the peak fishing season for fishers in the region. The results should therefore be considered preliminary. The preliminary estimate of impact is less than that projected in the RIAS undertaken before the SZs were introduced. It should also be noted that current preliminary data cannot

[1] Value of catch for other marine scalefish was not available.

be used to assess whether there appears to be a causal relationship between the change in volume of catch and the SZs, particularly given the significant reductions in catch that occurred from 2010/11 to 2013/14.

### *Kangaroo Island*

On the basis of qualitative feedback obtained short-term economic and social impacts for Kangaroo Island appear most evident for two MSF net fishers at Kingscote who have reported a loss of fishing area with the introduction of the Bay of Shoals SZ directly north of Kingscote. These fishers stated they predominantly fished in the Bay of Shoals and Western Cove which provide sheltered conditions. Their ability to shift fishing effort to other regions is apparently curtailed by the more exposed and rougher conditions in other areas of the island and the lack of accessibility to other coastal areas due to lack of boat ramps and access roads. A reduction in catch for these fishers has been identified as a factor, among others such as health and lifestyle factors, contributing to the decision of a local seafood takeaway store to shut down their retail operation and instead focus on their intermittent wholesale operations. Unfortunately, without access to catch data for the MSF net fishers due to confidentiality restrictions we are unable to independently verify the extent to which the Bay of Shoals SZ may have contributed to a reduction in MSF catch and thus contributed to the closure of the store. While the loss of employment associated with the closure of the seafood retail store and potential future non-viability of the local net fishers may represent relatively minor impacts from a broader regional economic perspective, there are possibly important social impacts for the local community in terms of a seafood takeaway store no longer being available and reduced supply of affordable fish species to local residents. In addition, a separate tourism operator noted reduced availability of local seafood as a consequence of changes implemented by the takeaway/wholesale operator, indicating a loss of complementary tourism services. We recommend that the impact of the Bay of Shoals SZ on affected fishers be investigated by SARDI who have access to the individual licence data.

Looking at other fisheries on Kangaroo Island, rock lobster fishers appear to have been unaffected in the short term with PIRSA logbook catch data indicating that catch rates for the initial months with SZs showed an improvement compared to the corresponding period a year earlier and with an increase in average prices revenue is estimated to have increased. Furthermore, fishers for the broader Northern Zone rock lobster fishery have been able to land their TACC. Kangaroo Island rock lobster fishers reported potential negative impacts in terms of increased fuel usage due to travelling further distances. We have been unable to verify this advice based on the data available to us.

All abalone fishers operating in the Central Zone have experienced a reduction in quota (for which they have been financially compensated) due to no voluntary surrender of displaced effort coming forward. The area now occupied by Cape du Couedic SZ has been identified by fishers as a highly productive source for abalone and therefore a significant loss. The PIRSA commercial logbook catch data for abalone fishers was highly restricted due to confidentiality. The limited data made available by those fishers that waived confidentiality indicates that catch for the initial months with SZs was in the range recorded over recent years. Further analysis based on a greater duration of experience with SZs and data for all fishers is required to properly assess impacts on abalone fishers.

Those charter boat operators on Kangaroo Island that were consulted were minimally affected by SZs. Consultations suggest that negative impacts may have been more prominent for charter boat fishers (and MSF fishers) operating out of Cape Jervis, but further research and consultations are required to confirm this.

### *Ceduna*

Impacts for Ceduna appear limited. Commercial fishing activity in relation to abalone, rock lobster and charter boat fishing is relatively limited in the region. On the basis of broader economic indicators the region has performed better than the state average over the past year, which would partly reflect

stimulus associated with resources exploration activity. While local community representatives raised concerns about a reduction in regional spending due to reduced visitation by abalone fishers, PIRSA port of landing data indicates that a declining trend in visitation to Ceduna by abalone fishers preceded the introduction of SZs. This earlier decline would reflect that the total allowable commercial catch (TACC) for the Western Zone abalone fishery has been steadily reduced over recent years as production has fallen back to long run average levels, while management changes introduced from 1 January 2014 to provide fishers with greater flexibility in terms of where they can fish has been a more recent contributing factor. Mixed impacts have been observed for individual MSF species. This pattern combined with the relatively low level of effort in the region and limited period for which data was available points to a need for more comprehensive data in order to properly assess impacts. The relative remoteness of Ceduna would be a significant barrier to unlocking any future potential ecotourism benefits related to SZs.

## Recommendations

As the above discussion has highlighted, the short time frame for preparing the RIAS and various data limitations, including reliance on qualitative information obtained through consultations, points to a need for subsequent and/or ongoing analysis of socio-economic and environmental indicators to properly assess regional impacts of SZs. DEWNR will be tracking various economic, social and environmental indicators as part of its marine park monitoring framework. To assist with the development of the monitoring framework we provide advice regarding those economic and social indicators that would be most appropriate to track, along with gaps and related issues (we have excluded environmental indicators as such considerations are outside our area of expertise and well within the domain of the Department).

As much of the negative economic impacts in the short term relate to commercial fisheries it is recommended that those commercial fishing indicators considered in the RIAS continued to be monitored. Relevant indicators in this respect would include:

- logbook catch data in respect of catch rates, catch and effort;
- Catch Disposal Records data on the number of landings and catch landed by port for abalone and rock lobster fishers; and
- port of landing data for MSF fishers, although we note that this data is much more narrow in scope (and therefore useful) compared to the Catch Disposals Records recorded for other fisheries.

In considering the logbook catch data, confidentiality restrictions significantly hamper the ability to verify impacts in some regional circumstances. A clear example of this in the current RIAS was MSF net fishers affected by the Bay of Shoals SZ. It is recommended that DEWNR consult with PIRSA and related stakeholders to determine whether there are any potential options that could be pursued to support monitoring public policy initiatives.

Another area worth exploring is whether any analysis can be conducted in respect of GPS data for rock lobster fishers to determine whether they are travelling longer distances since the introduction of SZs.

Given the equity issues identified by fishers and concerns about impacts on incomes it is recommended that information in relation to:

- average real incomes for commercial licence holders;
- licence fees as a proportion of the gross value of production, and
- market value of commercial fishery licences

be monitored to identify any significant impacts that may be related to SZs. Such State level data is published as part of PIRSA's *Economic Indicators* series for various commercial fisheries but are not yet available for financial years with SZs in place.

In considering the above indicators in relation to commercial fisheries it is important to remember that various factors may affect outcomes, including broader economic factors (exchange rates, demand, input costs etc.), changes in species abundance, as well as natural temporal and spatial variation. It may consequently be difficult to attribute any impact specifically to SZs.

A number of indicators have been considered in the RIAS that provide insight into broader regional economic and social trends. These indicators include regional estimates of employment and unemployment, population, building approvals, average taxable incomes, house prices and tourist visitation and expenditure. Such regional characteristics are influenced by a wide variety of complex economic, social and environmental factors, of which SZs would play a very small role. It will therefore be virtually impossible to attribute any shift in these indicators directly to SZs. As a consequence we would place a low priority on tracking such indicators.

DEWNR's survey in relation to community attitudes towards marine parks should be maintained, in part to monitor trends in participation in recreational fishing over time given the general lack of available data in respect of recreational fishing. Another key indicator to monitor from the community survey will be the extent to which regular fishers know where SZs are located in their local area or fishing region as this will provide insight into the effectiveness of community education efforts. Related to this, as part of its compliance monitoring activities DEWNR should monitor the number of breaches in respect of people caught illegally fishing in SZs. The relative number of breaches should decline over time as fishers become more familiar with the exact location of SZs. Any failure to see a decline or significant increase in the number of breaches would point to a need for increased community education efforts and/or compliance monitoring.

Given the feedback from regional stakeholders regarding potential misconceptions held by recreational fishers, it may be worth considering additional research with recreational fishers to further explore their understanding of the marine parks policy. Such research may potentially be accommodated through the existing community attitudes survey.

# 1. Introduction

The following Regional Impact Assessment Statement (RIAS) summarises the results of an investigation into the economic, social and environmental impacts of marine park sanctuary zones (SZ) on the South Australian communities of Ceduna, Kangaroo Island and Port Wakefield. The RIAS process is applied to any decision by a South Australian Government department, agency or statutory body that results in a 'significant change' in the 'standard or level of services provided to an affected regional community' (PIRSA, 2014). This policy is intended to ensure that regional impacts are taken into account as part of the design, implementation and review phases of the public policy process. The RIAS should give consideration toward the positive and negative impacts of any proposed change, and take a triple bottom line perspective, considering economic, social and community, environmental and equity factors.

The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department of Environment, Water and Natural Resources, CSIRO, Flinders University, the University of Adelaide and the University of South Australia. The Goyder Institute enhances the South Australian Government's capacity to develop and deliver science-based policy solutions in water management. It brings together the best scientists and researchers across Australia to provide expert and independent scientific advice to inform good government water policy and identify future threats and opportunities to water security.

The South Australian Centre for Economic Studies (SACES) is a joint research unit of the University of Adelaide and the Flinders University and is thus a partner of the Goyder Institute for Water Research. SACES were engaged by the Goyder Institute to undertake the regional impact assessment in terms of employment, gross regional product and household incomes resulting from changes in fishing production following the implementation of the sanctuary zones. Supporting data and information were provided by DEWNR and PIRSA-SARDI to complement the other socio-economic data collected by SACES to undertake this analysis

SACES was responsible for assessing economic and social impacts, reviewing the methodology, report preparation and making recommendations. DEWNR has provided assistance with procuring various data, including fisheries data, summarising relevant environmental data from the marine parks monitoring program, and providing other contextual and background information where appropriate. DEWNR's work was supported by contributions from Primary Industries and Regions SA – Fisheries and Aquaculture and Regions SA.

The remainder of the report is organised as follows:

- Section 2 summarises background information to the report.
- Section 3 describes the approach and methodology for the RIAS, including stakeholders with interests in the nominated regions and data limitations.
- Section 4 summarises the outcomes of a survey of community attitudes towards the marine environment and marine parks.
- Sections 5, 6 and 7 summarise the analysis of economic and social indicators for each of the regions, including stakeholder consultations and analysis of commercial fisheries data: Ceduna (Section 5), Kangaroo Island (Section 6), and Port Wakefield (Section 7).
- Section 8 summarises economic and social indicators as well as commercial fisheries data that pertain to the state as a whole or broader region level.
- Section 9 is a summary of conclusions and recommendations.

# 2. Background

## 2.1 Establishment of Marine Parks and Sanctuary Zones

The South Australian Government developed the South Australian Representative System of Marine Protected Areas (SARSMPA) as part of the National Representative System of Marine Protected Areas (NRSMPA). A network of 19 marine parks was established in 2009 in an effort to "protect and conserve marine biological diversity and marine habitats" while allowing ecologically sustainable development and use of marine resources – refer Figure 2.1.[2] The marine parks cover an area of 26,655km$^2$, which is equivalent to 44 per cent of South Australia's State waters (DEWNR, 2012).

In 2012, management plans for the 19 marine parks were adopted. These management plans establish zoning for each park which provides for a range of different activities, depending on the conservation outcome required in each location.

In accordance with the *Marine Parks Act 2007,* four types of marine parks zones exist which differ in their levels of protection and permitted uses:

- general managed use zone – an area that may be managed to provide protection for habitats and biodiversity within a marine park, while permitting ecologically sustainable development and use;
- habitat protection zone – an area that may be managed to provide protection for habitats and biodiversity within a marine park, while allowing activities and uses that do not harm habitats or the functioning of ecosystems;
- SZ – an area that 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; and
- restricted access zone – a zone primarily established so that an area may be managed by limiting access to the area.

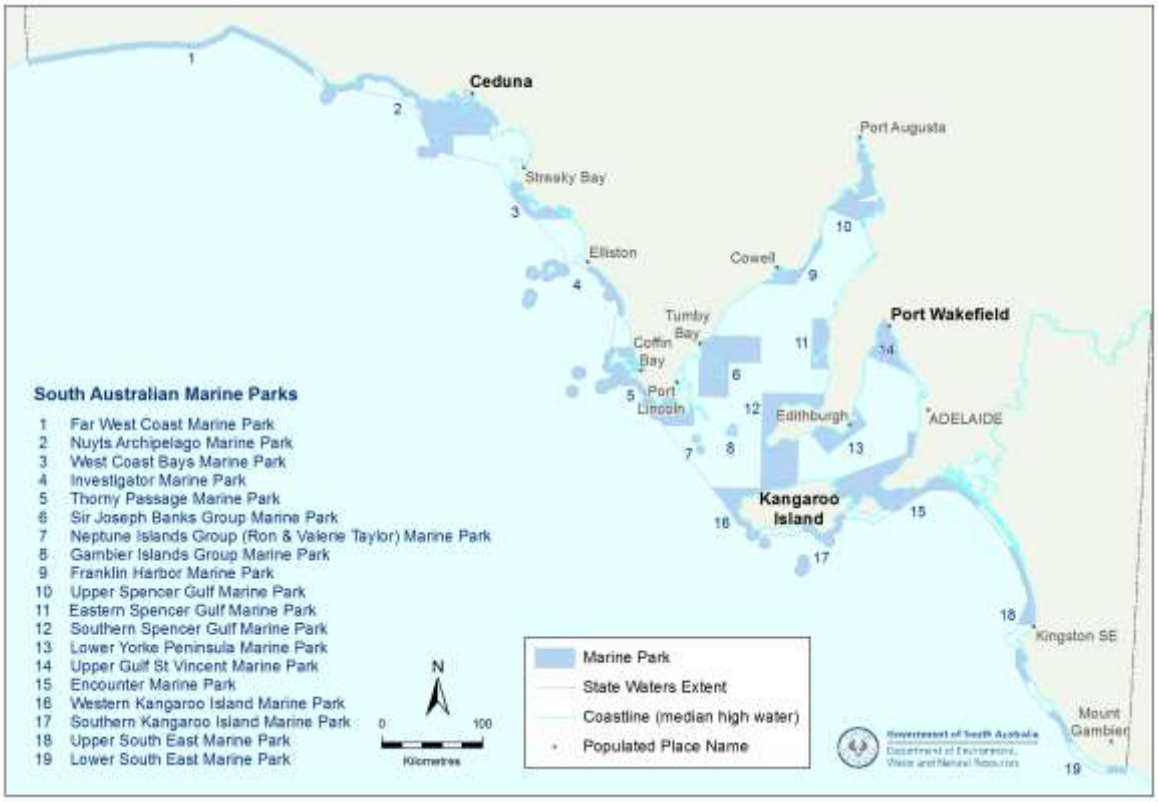
Different types of Special Purpose Area (SPA), which allow selected activities that would not otherwise be allowed in the zone (such as shore-based recreational line fishing, transhipment, or harbor activities), are also designated in some of the parks.

One of the critical tasks in developing the new management arrangements was to establish SZs in each of the marine parks. These "no-take" zones are intended to provide long-term protection for marine ecosystems and biodiversity while permitting low impact activities, such as swimming, diving and boating.

SZs provide protection for habitats that in turn support various species and ecosystems. It is expected that the spatial extent and condition of these habitats will be maintained inside SZs and that this will have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). In addition, it is expected that some of the habitat-associated fishes and invertebrates will change in size and/or abundance following protection from fishing inside SZs and that this may in turn drive ecosystem changes (Bailey et al. 2012a). It is too early for any measurable ecological changes to have occurred within SZs since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014).

[2] *Marine Parks Act 2007* (SA)

**Figure 2.1: Map of South Australia showing the state-wide network of 19 marine parks and the three regions included in the Regional Impact Assessment Statement.**




Thirteen marine park local advisory groups (MPLAGs) were established across South Australia in late 2009 in order to ensure that local community feedback was incorporated into the management planning process for marine parks.[3] Following deliberations and further community consultations all MPLAGs provided final advice to the Government on their preferred zoning scenarios in May 2011.

While MPLAGs were providing advice on marine park zoning, input was also sought from peak stakeholder groups from the conservation, business, resources industry, local councils, shipping and port operators, aquaculture, tourism, indigenous, and recreational and commercial fishing sectors.

The South Australian Government released draft management plans for each of the marine parks in the network on 26 August 2012. An eight-week period of public consultation subsequently followed. In addition to canvassing submissions, DEWNR conducted briefings for stakeholder and interest groups and held information days. Following consideration of community and stakeholder feedback, final management plans for marine parks were released by the State Government in November 2012.

As part of the final management plans for marine parks, zoning for 83 SZs covering 6 per cent of the state's waters was established. Provisions relating to commercial and recreational fishing in the SZs – principally in terms of prohibiting the removal and harm of plants, animals and marine products – were phased in, taking effect from 1 October 2014.

In the short term, prohibition on fishing in SZs would have potential negative impacts on commercial and recreational fishers. Fishers would lose access to potentially productive fishing grounds, which could result in a reduction in catch if areas outside the SZs are less productive. To the extent that this is the case they may incur higher input costs (e.g. fuel, labour) if they are forced to fish for longer periods or travel further distances.

[3] The 13 MPLAGs were in addition to the existing Great Australian Bight Consultative Committee.

In the longer term, increases in biomass within SZs could potentially provide positive spill-over effects to surrounding areas, including fishers. Nonetheless, efforts to minimise impacts on fishers were embedded as part of the marine park design process with 'consideration to the full diversity of marine uses: e.g. commercial and recreational fishing' being one of the 14 design principles.[4] In addition, the State Government made a commitment that the negative impacts of SZs would amount to no more than 5 per cent of the gross value of production for the state's commercial fishing industry.

In order to minimise the risk that fishing effort displaced from the SZs would place greater pressure on the marine environment outside SZs, the displaced fishing effort was estimated and removed through a voluntary catch/effort reduction scheme funded by the State Government. For all fisheries targeted through the scheme, more fishing effort or catch was removed than was estimated as being displaced (refer section 2.3).

Given the uncertainty of implementing such a new initiative, concern arose within fishing and regional communities regarding the economic impact of SZs. Prior to the full implementation of management plans and SZ restrictions from 1 October 2014, an amendment Bill to the *Marine Parks Act 2007* was proposed to abolish 12 of the SZs. However, the Bill was defeated and in response to community concerns, the State Government pledged to complete a Regional Impact Assessment Statement (RIAS) by 1 October 2015 for three regions – Ceduna, Port Wakefield and Kangaroo Island (Figure 2.1) (Brock, 2014).

The RIAS was required to be consistent with State Government Policy and Guidelines for a RIAS and attempt to "identify the actual negative and positive impacts of the SZs on these communities and will include an assessment of effects on employment, existing businesses, capital investment, average income, local population and future development potential" (State Government statement, October 2014).

The preparation of the RIAS was overseen by a State Government Marine Parks Regional Impacts Working Group that included members from the Department of Environment, Water and Natural Resources (DEWNR), PIRSA – Fisheries and Aquaculture, PIRSA – Regions, and Department of State Development – Investment Trade and Strategic Projects.

The South Australian Centre for Economic Studies (SACES) was engaged by the Goyder Institute for Water Research to undertake the socio-economic analyses and to prepare the RIAS. DEWNR provided general input on marine parks and environmental impacts, and also assisted with the environmental components of the RIAS.

## 2.2 Previous Estimates of Potential Impacts

Estimates of the regional economic impact of marine park zoning were previously modelled by EconSearch (2014). The direct and indirect (i.e. flow on) economic impacts of displaced commercial fishing effort/catch were estimated using an input output modelling approach.[5] Estimates of historical effort or catch displaced by the marine parks were adjusted based on actual catch or effort removed as part of the voluntary buyback scheme (EconSearch 2014). As the economic impact of removed fishing catch/effort will be partially offset by some fishers remaining in the region and transitioning to alternative industries or retirement, a survey of those fishers who surrendered their licences was conducted to gain insight into such offsetting impacts.

Estimates of the gross value of displaced catch for these marine parks as used by EconSearch for the economic modelling are presented in Table 2.1. Displaced catch for those marine parks relevant to

[4] Marine Park Design Principles, Available: http://www.environment.sa.gov.au/files/4f746e50-69c0-4ca5-a389-9e2500c88481/design.pdf [accessed 9 August 2015].

[5] See section 3.2 for general details regarding input output modelling.

Ceduna was estimated at $0.95 million for Nuyts Archipelago MP and $0.06 million for Far West Coast MP. The displaced catch for Nuyts Archipelago MP was the largest among the 19 marine parks established in South Australia. Displaced catch for the Upper Gulf St Vincent MP which affects Port Wakefield was estimated at approximately $0.6 million and composed almost exclusively of reduced marine scalefish catch/effort. Impacts for Kangaroo Island relate to several marine parks. Estimated displaced catch and effort for these marines parks were approximately $0.8 in respect of Western Kangaroo Island MP, $0.1 million for Southern Kangaroo Island MP, and $0.3 million for Encounter MP. Impacts in respect of the latter relate largely to marine scalefish and charter boat activity and would be experienced in large part by fishers located on the Fleurieu Peninsula.

In terms of total state impacts, the gross value of total displaced catch or effort across all marine parks was estimated at $5.6 million, which is equivalent to approximately 2.0 per cent of the total value of production. In terms of impacts across fisheries, the value of displaced catch/effort was highest for charter boat fishery (5.8 per cent) and marine scalefish (4.7 per cent), while at the other end of the scale impacts were smallest for prawns (0.1 per cent) and blue crab (0.2 per cent).

The subsequent direct and flow on economic impacts for the individual marine parks as estimated by EconSearch (2014) are summarised in Table 2.2. It is important to note that the regional economic impact analysis was conducted on a marine park by marine park basis rather than region by region basis, with custom regions being defined for each marine park. As certain marine parks stretch across various regional communities, the regional definitions adopted by EconSearch do not necessarily match those in scope of the current RIAS, or do not include regions that may be potentially affected. For example, Encounter MP located around the Fleurieu Peninsula stretches across to the eastern shores of Kangaroo Island. While zoning for Encounter MP would have some impact on Kangaroo Island, the majority of impact would be expected to fall on fishers located in the Fleurieu Peninsula and The Coorong. As a consequence EconSearch expressed impacts for Encounter MP for the Fleurieu and Coorong 'impact region'. Allocation of local government areas (LGA) and statistical local areas (SLA) to specific marine parks (MP) that are relevant to the current RIAS was as follows:

- Far West Coast MP and Nuyts Archipelago MP – Ceduna (DC) and Unincorp. West Coast SLA;
- Upper Gulf St Vincent MP – Wakefield (DC);
- Encounter MP – Yankalilla (DC), Victor Harbor (C), Alexandrina – Coastal (SLA), Onkaparinga – South Coast (SLA), Onkaparinga – North Coast (SLA) and The Coorong (DC); and
- Western Kangaroo Island MP and Southern Kangaroo Island MP – Kangaroo Island (DC).

Looking first at state-wide impacts for all marine parks, marine park zoning was estimated to have an estimated loss on an annual ongoing basis of $8.2 million in Gross State Product (GSP), $5.0 million in terms of household income, and approximately 80 full-time equivalent (FTE) jobs. These estimated losses were equivalent to 0.01 per cent of their respective aggregate totals, indicating a relatively minor impact on the state economy.

**Table 2.1 Gross Value of Displaced Catch or Effort by Select Marine Parks ($'000)**

| Marine Park Number and Name | Sardines | Prawns | Abalone | Rock Lobster | Marine Scalefish | Blue Crab | Charter Boat | Total |
|---|---|---|---|---|---|---|---|---|
| 1. Far West Coast | 0 | 0 | 0 | 62 | 0 | 0 | 0 | 63 |
| 2. Nuyts Archipelago | 0 | 0 | 519 | 310 | 116 | 0 | 4 | 949 |
| 14. Upper Gulf St Vincent | 0 | 0 | 0 | 0 | 571 | 1 | 0 | 572 |
| 15. Encounter | 0 | 22 | 19 | 39 | 126 | 0 | 125 | 330 |
| 16. Western Kangaroo Island | 45 | 0 | 222 | 470 | 3 | 0 | 19 | 759 |
| 17. Southern Kangaroo Island | 0 | 0 | 16 | 125 | 0 | 0 | 0 | 142 |
| South Australia - all marine parks | | | | | | | | |
| Displaced catch | 342 | 59 | 1,164 | 2,544 | 1,182 | 8 | 252 | 5,550 |
| Total catch | 17,692 | 44,007 | 41,349 | 139,489 | 25,051 | 4,599 | 4,363 | 279,616 |
| Displaced catch as % of total | 1.9 | 0.1 | 2.8 | 1.8 | 4.7 | 0.2 | 5.8 | 2.0 |

**Source:** EconSearch (2014).

**Table 2.2 Estimated Regional Economic Impacts**

| Marine Park Number and Name | Employment | | Household income | | Gross State Product | |
|---|---|---|---|---|---|---|
| | FTE jobs | % region total | $m | % region total | $m | % region total |
| 1. Far West Coast[(a)] | 0 | -0.03 | -0.04 | -0.05 | -0.07 | 0.0 |
| 2. Nuyts Archipelago [(a)] | -8 | -0.4 | -0.61 | -0.7 | -1.02 | -0.6 |
| 14. Upper Gulf St Vincent[(b)] | -13 | -0.3 | -0.32 | -0.2 | -0.53 | -0.1 |
| 15. Encounter[(c)] | -6 | -0.02 | -0.19 | -0.01 | -0.29 | -0.01 |
| 16. Western Kangaroo Island[(d)] | -6 | -0.2 | -0.54 | -0.6 | -0.82 | -0.5 |
| 17. Southern Kangaroo Island[(d)] | -1 | -0.0 | -0.08 | -0.1 | -0.13 | -0.1 |
| South Australia | -80 | -0.0 | -4.95 | -0.0 | -8.19 | -0.0 |

**Note:** (a) Region defined as Ceduna (DC) and Unincorp West Coast Statistical Local Area (SLA).
(b) Region defined as Wakefield (DC).
(c) Region defined as Yankalilla (DC), Victor Harbor (C), Alexandrina – Coastal (SLA), Onkaparinga – South Coast (SLA), Onkaparinga – North Coast (SLA) and The Coorong (DC).
(d) Region defined as Kangaroo Island (DC).
**Source:** EconSearch (2014).

Turning to economic impacts for individual marine parks and their respective regions, the impact of zoning for Far West Coast MP was estimated to be relatively minor with an annual economic loss of approximately $0.07 million in GSP and less than 1 FTE job estimated for Ceduna (DC) and Unincorporated West Coast. The impact for these regions due to zoning for Nuyts Archipelago MP was larger at $1.0 million in GSP (0.6 per cent of the region total) and 8 FTE jobs (0.4 per cent).

The impact of zoning for Upper Gulf St Vincent MP was estimated at $0.5 million in GSP and 13 FTE jobs for Wakefield (DC). These estimated impacts were equivalent to 0.1 per cent and 0.3 per cent of the respective region totals. While the impacts were expressed for Wakefield (DC), the impacts could also be felt by communities located on Yorke Peninsula.

The ongoing annual impact of zoning for the two marine parks that directly affect Kangaroo Island DC – Western Kangaroo Island MP and South Kangaroo Island MP – was estimated at $1 million in GSP (0.7 per cent) and 7 FTE jobs (0.2 per cent). These impacts were largely accounted by the Western Kangaroo Island Marine Park (refer Table 2.2) and displaced catch in respect of rock lobster and abalone.

The impact of zoning for Encounter MP was estimated at an annual ongoing loss of $0.3 million in GSP and 6 FTE jobs. These impacts are equivalent to 0.01 per cent and 0.02 per cent of the respective region totals for the Fleurieu and Coorong region. In reality some proportion of the estimated economic loss would potentially be experienced by fishers located on Kangaroo Island.

Like all economic modelling processes, it is important to note that the estimates derived by EconSearch need to be interpreted with caution given inherent limitations associated with economic modelling. For instance, input output models assume that changes in the usage of intermediate and primary inputs in response to a change in final demand occur instantaneously, whereas in reality such impacts will be realised over a period of time. For example, a supplier that is expected to shut down in response to a reduction in demand for their output may struggle on for a number of years before actually doing so. Related to this, input output models do not take account of any potential compensatory price changes that may result as a consequence of changes in demand and supply. Other limitations of input output models are discussed in more detail in section 3.4.

Ideally one would be able to update the modelling conducted by EconSearch and compare the results with those predicted. In reality this is not possible for a couple reasons. Firstly, the previous modelling was based on annual data and without access to a complete year of data operating with SZs it is not yet possible to produce comparable estimates. Secondly, and more significantly, EconSearch estimates

related only to the value of estimated catch displaced by SZs. The limited modelling we have conducted focuses on the change in the total value of catch landed which would include impacts related to displaced effort and catch but also other factors such as changes in prices and natural temporal and spatial variation in catch and effort due to factors not related to displaced effort.

## 2.3 Buyback of Licences and Quotas

Commercial fishing effort displaced by SZs was managed through a voluntary buyback scheme that provided financial compensation for the surrender of licences. The removal of displaced commercial catch from these fisheries was intended to ensure that future catches from these fisheries remain sustainable and did not place additional pressure on the remaining fishing grounds after the marine park SZs took effect on 1 October 2014. The scheme operated in the first instance on a voluntary basis with compulsory acquisition as a last resort. The following section briefly summarises the reductions in effort achieved as part of the buyback program for the various fisheries at the broad fishery management region level.

In terms of the Western Zone abalone fishery, approximately 1 per cent of the average historical catch of blacklip abalone and 1.5 per cent of the greenlip catch in Western Zone A was estimated to have come from SZs, while 27.7 per cent of the combined blacklip-greenlip catch for Western Zone B was estimated to have come from SZs (PIRSA 2013). A target reduction of 61 greenlip quota units and 21 blacklip quota units were sought through the buyback scheme, with the voluntary surrender of 1 licence with 48 greenlip and 44 blacklip quota units being achieved (Table 2.3). While less greenlip and more blacklip was removed than originally targeted, the abalone industry, PIRSA and SARDI agreed that the "outcome is appropriate and can be managed to avoid impacts in the fishery in the future" (DEWNR *pers. comm*. 19 February 2015).

For the Central Zone abalone fishery it was estimated that 1.2 per cent of greenlip and 11 per cent of blacklip catch were derived from SZs (Ward et al 2012). A target reduction of 34 greenlip quota units and 4 blacklip quota units were sought through the buyback scheme (Table 2.3). No voluntary surrender of Central Zone abalone fishery licences was forthcoming and the targeted reduction was subsequently shared evenly between the existing licence holders with a reduction of 62.1 greenlip and 10.4 blacklip units achieved. Thus more catch than required was removed through this process.

**Table 2.3 Abalone Fishery: Historical Total Effort, Estimated Effort Displaced by Sanctuary Zones and Effort Removed, Western Zone and Central Zone**

| | Greenlip | Blacklip | Licences |
|---|---|---|---|
| **Western Zone** | | | |
| Buyback target (quota units) | 61.0 | 21.0 | na |
| Buyback reduction achieved (quota units) | 48.0 | 44.0 | 1 |
| **Central Zone** | | | |
| Buyback target | 34 | 4 | na |
| Buyback reduction achieved[(a)] | 62.1 | 10.4 | - [(a)] |

**Note:** (a) No licences were bought out. As a consequence the reduction was shared equally across all licence holders.
**Source:** PIRSA (2013) and DEWNR, pers. comm. February 2015

Approximately 5.7 per cent of the average historical catch in the Northern Zone rock lobster fishery was estimated as being taken from SZs (PIRSA 2013). A target reduction of 3563 quota units – equivalent to about 225 pots – was sought. Four licences were surrendered, leading to the removal of 3,955 quota units or approximately 256 pots (Table 2.4). Thus more catch than required was removed through the buyback scheme.

**Table 2.4 Rock Lobster Fishery: Historical Total Effort, Estimated Effort Displaced by Sanctuary Zones and Effort Removed, Northern Zone and Southern Zone[a]**

| | Quota units | Pots | Licences |
|---|---|---|---|
| **Northern Zone** | | | |
| Buyback target | 3,563 | 225 | na |
| Buyback reduction achieved | 3,955 | 256 | 4 |

**Note:** (a) All RIAS study regions are located in the Northern Zone.
**Source:** PIRSA (2013) and DEWNR, pers. comm. February 2015

The marine scalefish fishery is managed at a state level. The estimated historical catch and effort within SZs was estimated to be 3.1 per cent (863 days) for the handline fishery, 3.9 per cent (225 days) for the longline fishery, 9.8 per cent (701 days) for the haul net fishery, and 3.1 per cent (672 days) across other gear types – refer Table 2.5. A total of 12 licences were voluntarily surrendered, involving historical effort of 904 handline fishing days, 296 longline fishing days, 794 haulnet fishing days, and 820 other gear effort days. Thus more effort than required was removed through the buyback scheme.

**Table 2.5 Marine Scalefish Fishery: Historical Total Effort, Estimated Effort Displaced by Sanctuary Zones and Effort Removed, South Australia**

| | Handline effort (fisher days) | Longline effort (fisher days) | Haulnet effort (fisher days) | Other gear effort (fisher days) | Licences |
|---|---|---|---|---|---|
| Historical 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 |

**Note:** (a) Average for the period 1990/91 to 2011/12.
(b) Average for the period 2006/07 to 2011/12.
**Source:** Ward et al (2012), PIRSA (2013) and DEWNR, pers. comm. February 2015

The charter boat fishery is also managed at a state level. Approximately 5.2 per cent of the average historical charter boat fishery effort was estimated to be in SZs (PIRSA 2013). A target reduction of 1,136 customer days was sought. A total of 3 licences were surrendered involving average historical effort of 1,197 customer days (Table 2.6). Thus more effort than required was removed through the buyback scheme.

**Table 2.6 Charter Boat Fishery: Historical Total Effort, Estimated Effort Displaced by Sanctuary Zones and Effort Removed, South Australia**

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

**Source:** Ward et al (2012), PIRSA (2013) and DEWNR, pers. comm. February 2015.

In summary, the entire estimated displacement of catch/effort for the Northern Zone rock lobster, Western Zone abalone, Central Zone abalone, marine scalefish and charter fisheries was successfully acquired through the SA Marine Parks – Commercial Fisheries Voluntary Catch/Effort Reduction Program. More catch/effort than required was surrendered in all fisheries, adding to the precautionary nature of the outcome achieved.

# 3. Method

## 3.1 Choice of Regions

The focus of the RIAS was on investigating potential negative and positive socio-economic and environmental impacts in respect of three regions around which some of the SZs that were targeted as part of the Parliamentary Bill were located: Ceduna, Port Wakefield and Kangaroo Island. The following section briefly summarises the nature of each region including the administrative boundaries that have been adopted for the assessment.

### 3.1.1 Ceduna

One marine park is situated adjacent to Ceduna; the Nuyts Archipelago Marine Park (NAMP). The NAMP is the largest marine park in South Australia (refer Figure 3.1 and A.1 in Appendix A), covering 3,998 square kilometres. The NAMP extends from Nuyts Reef in the west to Point Brown in the east and includes the islands of the Nuyts Archipelago. The NAMP includes 9 SZs (~9 per cent of the total park area), 8 Habitat Protection Zones (HPZs) (47 per cent) and 5 General Managed Use Zones (GMUZs) (45 per cent, Figure A.1). The Nuyts Reef and St Francis Isles SZs were included in the 2014 Amendment Bill. The NAMP accommodates various marine industries including shipping, commercial fishing, and aquaculture. A Special Purpose Area (SPA) for harbor activities is situated in Thevenard, which is adjacent to Ceduna, and 2 SPAs for transhipment are located adjacent to the Isles of St Francis and off Point Fowler. The port of Thevenard lies outside the park boundary. Two SPAs that allow shore-based recreational line fishing are located at Nuyts Reef SZ and Barlows Beach SZ (Figure A.1).

The NAMP is adjacent to a remote and sparsely populated area of the State, which is dominated by agricultural land, vacant land and conservation areas. The 2 largest population centres are Ceduna and Smoky Bay. The NAMP is adjacent to numerous land conservation areas (Figure A.1) including Fowlers Bay Conservation Park, Isles of St Francis Conservation Park, Sinclair Island Conservation Park, Nuyts Archipelago Conservation Park, Nuyts Reef Conservation Park, Wittelbee Conservation Park, Laura Bay Conservation Park, Chadinga Conservation Reserve and Point Bell Conservation Park and the Nuyts Archipelago Wilderness Protection Area.

Of the 9 SZs in the region, two in particular have raised concern among local stakeholders and are a focus of the RIAS: Nuyts Reef SZ and Isles of St Francis SZ (Figure 3.1).

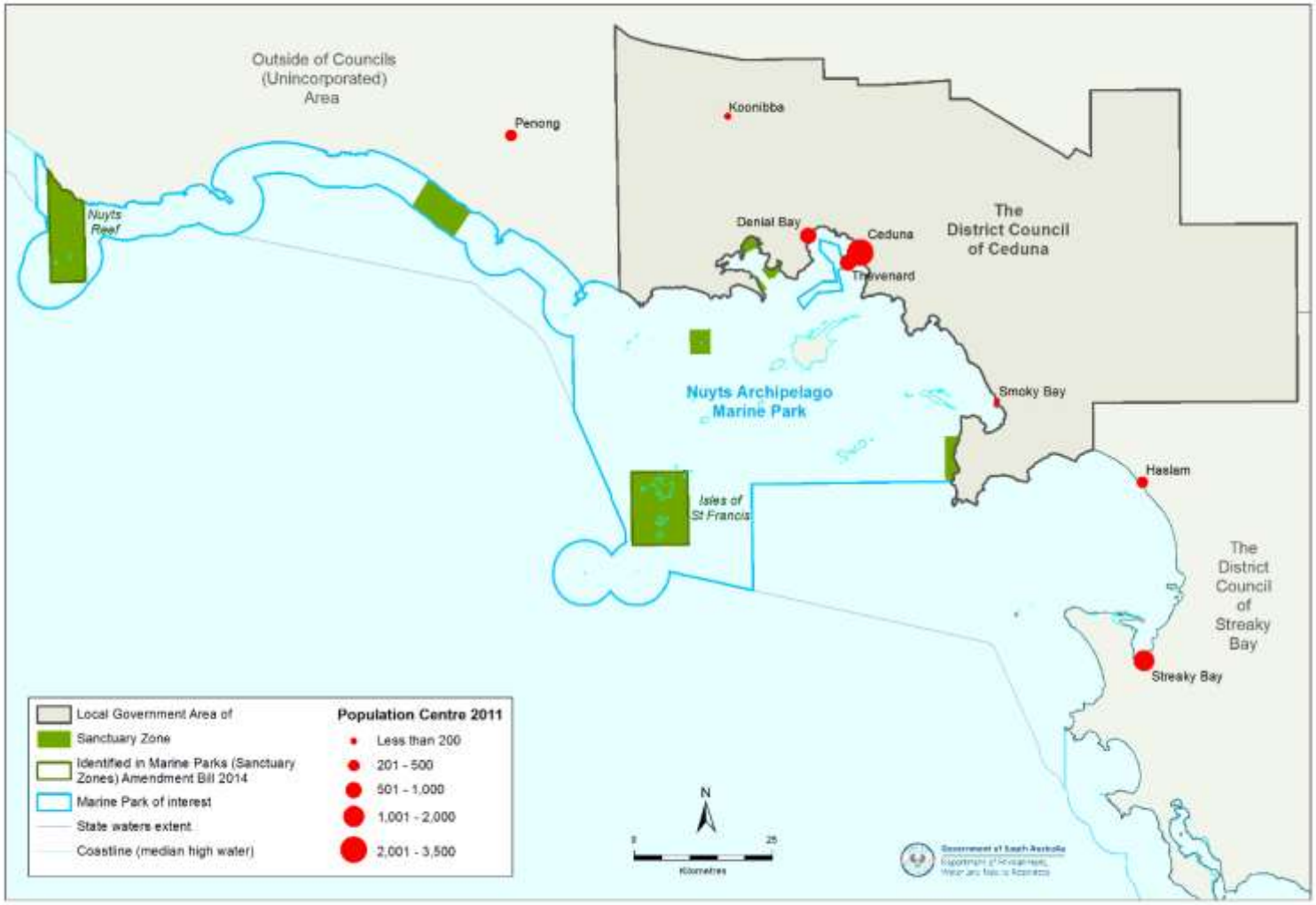
For the purposes of the economic and social analysis we have adopted the Ceduna local government area as the study region for the RIAS – refer Figure 3.1.

### 3.1.2 Kangaroo Island

Four marine parks are situated adjacent to Kangaroo Island: the Southern Spencer Gulf Marine Park, the Western Kangaroo Island Marine Park, the Southern Kangaroo Island Marine Park, and the Encounter Marine Park (refer Figure 3.2).

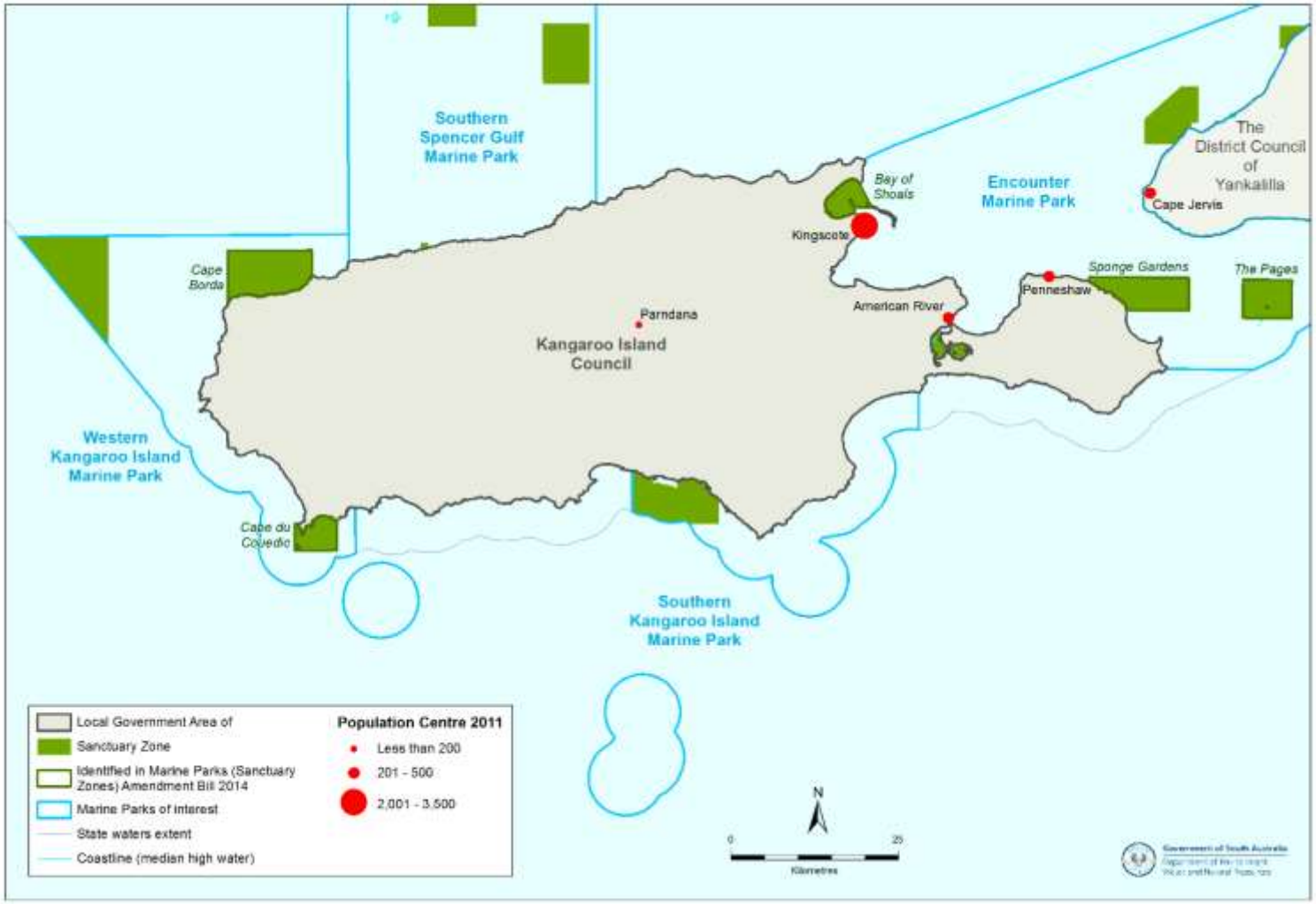
The Southern Spencer Gulf Marine Park (SSGMP) covers 2,972 square kilometres and extends around the eastern tip of Yorke Peninsula and across to the central north coast of Kangaroo Island. The SSGMP includes 3 SZs (~5 per cent of the total park area), 3 HPZs (53 per cent), 3 GMUZs (43 per cent) and 3 RAZs (less than 1 per cent). Two of the SZs are of geographical relevance to Kangaroo Island: Orcades Bank SZ and Waterfall Creek SZ (Figure A.2) but neither was included in the 2014 Amendment Bill. The part of the SSGMP that abuts Kangaroo Island is adjacent to mainly agricultural and conservation lands, including the Western River Wilderness Area. The SSGMP accommodates various marine industries including commercial fishing, charter boat operators and tourism.

**Figure 3.1 Ceduna Local Government Area and Sanctuary Zones. The Nuyts Reef and Isles of St Francis Sanctuary Zones were included in the 2014 Amendment Bill**




**Source:** DEWNR.
**Source:** DEWNR (2015).

**Figure 3.2 Kangaroo Island Local Government Area and Sanctuary Zones. The Cape Borda, Cape du Couedic, Bay of Shoals, Sponge Gardens, and The Pages Sanctuary Zones were included in the 2014 Amendment Bill**




**Source:** DEWNR.

The Western Kangaroo Island Marine Park (WKIMP) covers an area of 1,020 square kilometres and encompasses the western end of the island between Cape Forbin and Sanderson Bay. The WKIMP also includes Lipson Reef. The WKIMP includes 3 SZs (21 per cent of the total park area) and 2 HPZs (79 per cent, Figure A.3). The Cape Borda and Cape du Couedic SZs were included in the 2014 Amendment Bill. The WKIMP is located adjacent to a sparsely populated region dominated by conservation parks (Figure A.3). The WKIMP is located adjacent to the Flinders Chase National Park and partially overlays the Ravine des Casoars and Cape Torrens Wilderness Protection Areas. The WKIMP accommodates various marine industries including commercial fishing, charter boat operators and tourism.

The Southern Kangaroo Island Marine Park (SKIMP) covers an area of 673 square kilometres and covers the south eastern portion of the island from D'Estrees Bay to the western end of the Seal Bay Conservation Park (Figure A.4). The SKIMP also includes North Rock, Young Rocks and South West Rock. The SKIMP includes 1 SZ (11 per cent of the total park area), 2 HPZs (88 per cent) and 1 Restricted Access Zone (RAZ) (about 1 per cent, Figure A.4). The Seal Bay SZ was not included in the 2014 Amendment Bill. The SKIMP is located adjacent to a sparsely populated region dominated by agricultural lands and conservation parks, namely the Cape Gantheaume Wilderness Protection Area and Seal Bay Conservation Park. The SKIMP accommodates various marine industries including commercial fishing and tourism.

The Encounter Marine Park (EMP) covers approximately 3,119 square kilometres and encompasses waters off southern metropolitan Adelaide, the Fleurieu Peninsula, Kangaroo Island and extends past the Murray Mouth to the Coorong coast. At its western boundary, the EMP includes all waters of Backstairs Passage and the eastern shores of Kangaroo Island. The EMP includes 11 SZs (~9 per cent of the total park area), 7 HPZs (61 per cent), 7 GMUZs (30 per cent) and 1 RAZ (less than 1 per cent, Figure A.5). The Bay of Shoals, Sponge Gardens and The Pages SZs were included in the 2014 Amendment Bill. There are 6 SPAs for harbor activities in the EMP, with 3 of these situated adjacent to Kangaroo Island: Kingscote, American River and Penneshaw. A SPA for underwater cable or pipeline is situated between Cape Jervis and Kangaroo Island.

The part of the EMP that abuts Kangaroo Island is adjacent to mainly agricultural, residential and conservation areas (Figure A.5). The largest population centres are Kingscote and Penneshaw. The EMP partially or completely overlays a number of other protected areas adjacent to Kangaroo Island, including Beatrice Islet, Busby Islet, Cape Willoughby, Baudin, Lashmar, Pelican Lagoon, and the Pages Islands Conservation Parks; and Granite Island Recreation Park. The EMP also borders Nepean Bay Conservation Park. The EMP accommodates various marine industries including shipping, charter boat operators, aquaculture, tourism and commercial fishing.

SZs surrounding Kangaroo Island that are of particular note to the RIAS are Cape Borda SZ, Cape du Couedic SZ, Bay of Shoals SZ, Sponge Gardens SZ, and The Pages SZ.

For the purposes of the economic and social analysis we have adopted the Kangaroo Island local government area as the study region for the RIAS – refer Figure 3.2. Some fishers located outside the region at Cape Jervis were consulted as part of the study as they are known to fish along the Kangaroo Island coastline.

### 3.1.3 Port Wakefield

One marine park is situated adjacent to Port Wakefield: the Upper Gulf St Vincent Marine Park (UGSVMP). The UGSVMP covers 950 square kilometres and lies north of a line from Parara Point to the northern end of Port Gawler Beach. The UGSVMP includes 4 SZs (14 per cent of the total park area), 1 HPZ (74 per cent), 2 GMUZs (about 3 per cent) and 1 RAZ (~9 per cent, Figure A.6). The Clinton Wetlands SZ was included in the 2014 Amendment Bill. A SPA that allows shoreline fishing is

located adjacent to Port Arthur in the Clinton Wetlands SZ. There are two SPAs for harbour activity; one is situated adjacent to Port Wakefield and includes the Clinton Wetlands SZ, and the other is adjacent to Ardrossan (Figure A.6). The Port at Ardrossan lies outside the park boundary.

The UGSVMP is adjacent to agricultural lands and a number of small coastal towns. The largest population centres are Port Wakefield and Ardrossan. A defence force area lies adjacent to the RAZ which has historically been a restricted area (firing range). The marine park partially overlays parts of Wills Creek Conservation Park and Clinton Conservation Park.

The main SZ of concern in the Port Wakefield region is the Clinton Wetlands SZ which is located west of the town in the top end of Gulf St Vincent – refer Figure 3.3.

For the purposes of the economic and social data analysis we have adopted the Wakefield local government area as the study region for the RIAS – refer Figure 3.3. This region may be considered a little large given that the economic and social impacts are expected to be concentrated on the Town of Port Wakefield. This regional definition has been adopted as existing economic and social data is typically not available at lower spatial resolutions. While consultations were focused on Port Wakefield, fishers from surrounding areas including Yorke Peninsula were also considered as they too would be affected by the relevant SZs.

## 3.2 Approach

The RIAS takes a triple bottom line approach, assessing negative and positive impacts in relation to the following (PIRSA 2014):

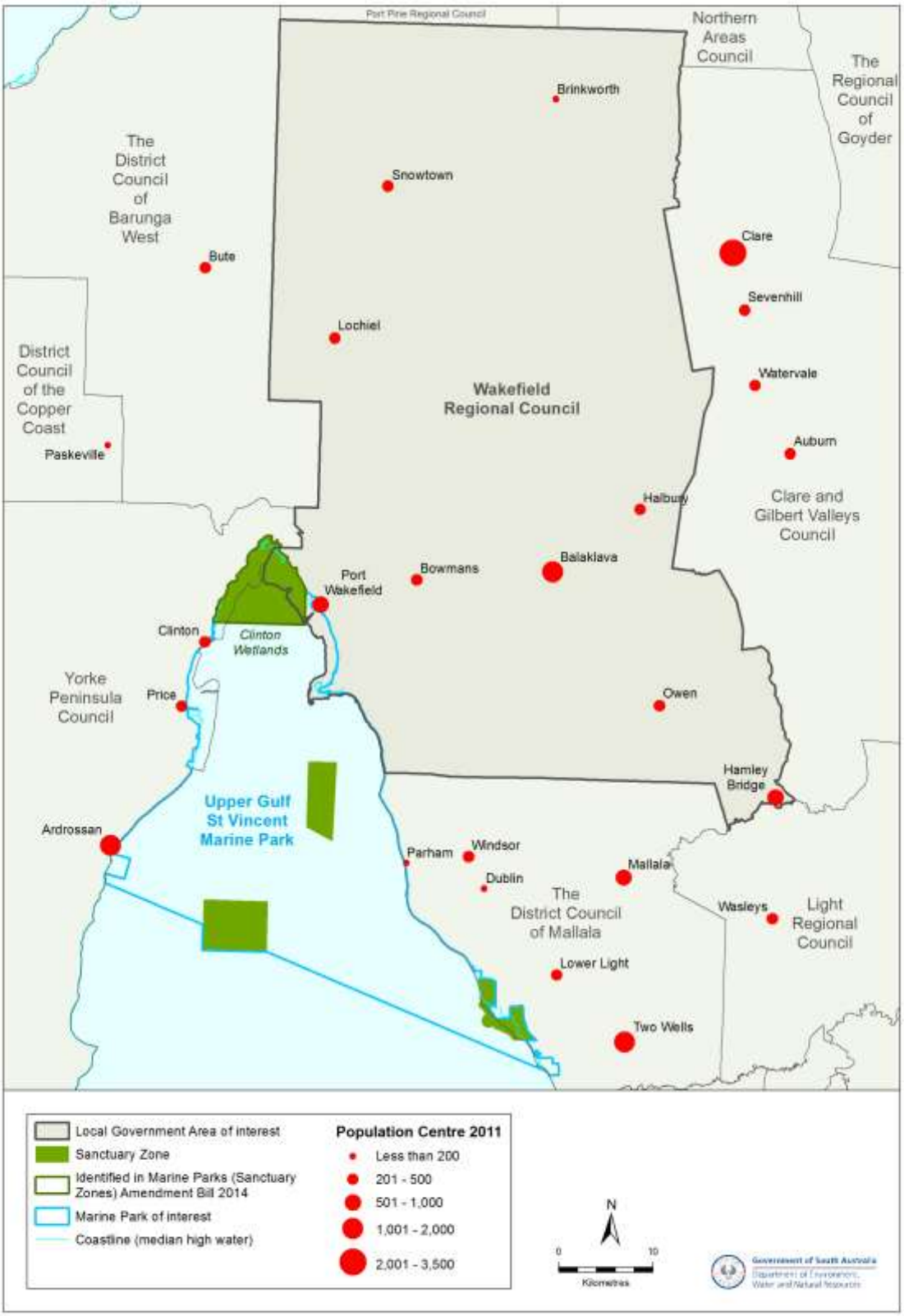
- economic factors – e.g. jobs and job creation, business, investment, population, infrastructure, average income , future development potential etc.;
- social factors – demographic and socio-economic characteristics of the region, changes in access to public facilities and services, identification of any social groups that may be advantaged or disadvantaged, how people's way of life may be affected.
- environmental factors – key environmental impacts and flow on effects, such as changes in biodiversity, water quality energy use, pollution etc.
- equity factors – relating to how the policy is 'consistent with the objective of ensuring that all people should have a reasonable equity in accessing education, health, justice, services and facilities – irrespective of where they live'.

RIAS's are generally conducted prior to the implementation of a policy change or proposal. In the current situation the RIAS has also been conducted soon after the policy change, in large part to assess whether there have been any larger than expected short term economic impacts.

The Regional Impact Assessment Statement was undertaken using a mixed methods approach and comprised the following 5 broad tasks:

- compiling, assessing and interpreting existing regional data in relation to various economic and social indicators (e.g. fishing effort and catch, population, unemployment, house prices etc.);
- economic modelling to estimate the broader flow-on economic impacts for those regions that have experienced a reduction in the value of catch landed in the region;
- consultations with regional stakeholders to identify impacts and other relevant economic, social and environmental issues (refer section 3.3.2);
- conduct of a community survey to gauge community attitudes towards SZs; and
- preparation of the RIAS including formulating recommendations for Government in relation to conduct of future RIASs and the impact of the SZs.

**Figure 3.3 Wakefield Regional Council Local Government Area and Sanctuary Zones. The Clinton Wetlands Sanctuary Zone was included in the 2014 Amendment Bill**




**Source:** DEWNR.

Details regarding each of these tasks are discussed in more detail below, including in respect of data limitations (see section 3.4), and/or in subsequent sections of the report.

Given the relatively short time frame for preparing the RIAS, existing published data sources were relied upon to monitor impacts in relation to the above factors. In certain cases existing regional indicators do not exist for the above factors, meaning one must rely on partial indicators to gain insight into potential economic and social impacts.

It is important to note that the potential future negative and positive impacts of SZs are not distributed similarly though time. Negative impacts in terms of displaced catch and any potential negative productivity impacts for remaining fishers are expected to be most prominent in the short term, while in the longer term positive impacts in terms of improvements in marine habitat and the abundance and size of marine species – and therefore related potential socio-economic benefits (e.g. ecotourism, spill over benefits to fishers etc.) – are expected to arise. Given this temporal distribution of impacts and that community concern has focused on potential negative economic outcomes due to impacts on commercial fisheries, greater focus has been applied to assessing any short term negative economic impacts on regional communities. The long-term environmental impacts, and consequential economic and social benefits, are also subject to greater uncertainty in terms of their timing and magnitude. At present post-SZ data on environmental attributes is not available, however this report details the monitoring program that has been put in place to assess changes to environmental attributes over the medium to long term.

**Economic Modelling of Commercial Fishing Impacts**

In assessing the economic impact of the marine parks and SZs, both as a whole and for specific regions, the change in the volume of catch since their commencement is not relevant. Instead the questions of interest are whether or not gross revenues for fishing businesses fell, and whether the cost of production has increased (and, in the latter case, whether the spending on "imported" inputs production has increased). It should be noted that the reductions in catch arising from the voluntary buy-back of licenses (and buy back of quotas for those species/regions in which voluntary buybacks of licenses did not reduce the quota sufficiently) are part of the economic impact of the SZs, as this was an impact mitigation measure implemented as part of the SZ policy.

Ideally the economic impact modelling would have included the boost to the regional asset base produced by the buy-back of licenses, however data were not available on the place of residence of the owners of the licenses bought back. To the extent that owners of licenses bought back live in any of the three regions that are in scope for this assessment, then the economic impact modelling is likely to overstate the costs of the policy to the region.

Commercial fisheries data collected by the PIRSA in respect of landed weighted average price data and regional catch was used to estimate the change in the value of landed catch for each region. Analysis of the results showed that only Port Wakefield had experienced a decline in the value of catch landed for the limited period for which data was available. On this basis economic modelling of the direct and flow-on economic impacts was only conducted for Port Wakefield. It is important to note that the limited period of data available (only four months of catch data since the introduction of the SZs for most species), together with the significant variations that occur in terms of the catch in particular Marine Fishing Areas, means that we cannot assess the extent to which any changes in catch are causally related to the introduction of the SZs.

The economic impacts were modelled using an input output modelling approach. They were modelled using the detailed (78 industry sector) Input Output table for the relevant SA Government region developed for the Department of Premier and Cabinet, modified to adjust for actual and projected changes in the compensation of employees by sector. In the case of Port Wakefield this is the table for

the SA government region 'Yorke and Mid-North'[6] (see Rippin and Morison (2013) for details of the data sources drawn on in developing the table).

An input-output table describes the linkages between sectors of the economy based on their patterns of purchase and supply. For each of the sectors in the economy (e.g. accommodation, cafes and restaurants; food and beverages manufacturing) it details the inputs the sector uses (to produce output in the case of producing sectors; for consumption in the case of "consumer" sectors), and what sectors it sells its output to.

The intuition of the input-output approach is best illustrated by example. Suppose a fisherman spends $1,000 on maintenance and repairs for their boat. The boatyard will then use the $1,000 to purchase inputs from "primary" and "intermediate" suppliers. "Primary" suppliers are employees, providers of capital, indirect taxation, and "imports" from suppliers of goods and services located outside of the region. Primary income payments are therefore labour compensation (wages), profits to owners, indirect taxes (net of subsidies) and imports. The boatyard will also purchase inputs (e.g., parts, materials, tools etc.) from intermediate suppliers in the region which, by and large, are other business. Payments to those business enterprises then flow to their own primary incomes and intermediate suppliers. And this process carries on repeatedly, with ultimately all of the payments flowing to primary incomes. The input-output table lets us trace through, and aggregate, this chain of impacts.

The employment to output ratios in each of the IO tables were adjusted to allow for increases in actual wage costs by broad sector from 2006/07 to 2015. This involves discounting the published multipliers by just under 14 per cent on average. The discounting factor is based on the average rate of labour cost inflation by broad industry in Australia over this period (ABS, 2015).

The modified input-output tables are then transformed to derive input-output multipliers (see Box 3.1) for expenditures in Port Wakefield in 2014/15.

The multipliers were then combined with the estimated change in the gross value of production to estimate the direct and indirect impacts of change in the value of catch on the local economy, in terms of the change in employment and gross regional product.

**Box 3.1 Input-output multipliers**

An increase in the output of one industry will (at least in gross terms) lead to increased outputs in other sectors due to the purchases for intermediate inputs to production, and the spending of capital and labour income locally. A multiplier measures the total change across the entire regional economy arising from a unit change in the final demand for the output of an industry (the initial "shock" to the model). Multipliers can be calculated for a range for economic variables, such as individual and business income, gross value added, and employment, according to one's interest.

In some cases the interest in the model results will be restricted to Type I impacts, also known as the production impact. This is the impact of the initial expenditure traced through the chain of intermediate good usage for the relevant industry sectors. However, no allowance is made for the expenditure of primary incomes (e.g. increases in local wage and capital income arising from the change in production). The total impact of an output change is derived from the production and consumption impacts (Type II impacts). The consumption impact arises when primary factors − e.g. households in receipt of wage income − spend the incomes that they receive.

[6] This region comprises to local government areas of Yorke Peninsula (DC), Wakefield (DC) Clare and Gilbert Valleys (DC), Goyder (DC), Copper Coast (DC), Barunga West (DC), Northern Areas (DC) Port Pirie City and Districts, Mount Remarkable (DC), Peterborough (DC) and Orroroo/Carrieton (DC).

## 3.3 Stakeholders

### 3.3.1 Stakeholders Affected

In the short term, the stakeholders that would be most affected by SZs would be those who would be directly impacted by the prohibition on removal of fauna in these areas, namely commercial and recreational fishers. Of these commercial fishers are the most directly impacted given efforts to buy out commercial fishing effort displaced by the SZs and the reliance of these individuals on access to fish stocks for their livelihood. Given the potential direct economic impact on commercial fishers their families are also natural stakeholders.

Any impact on commercial fishers will have potential ripple effects on downstream suppliers such as seafood processors, wholesalers, retailers, restaurants, as well as potential impacts on input suppliers to commercial fishers, e.g. fuel retailers, boat maintenance, bait suppliers etc.

Commercial fishing activities are undertaken throughout coastal South Australia and are a key industry sector in certain regional areas. To the extent SZs have an economic impact on commercial fisheries this will have implications for regional communities. Thus regional communities, whether represented by local officials and/or other regional representative groups, may be considered affected stakeholders.

Various public sector organisations have direct or indirect responsibilities in respect of SZs. For instance, DEWNR is directly responsible for managing the marine parks while PIRSA is responsible for managing the commercial and recreational fisheries that have been directly affected. From a regional perspective Natural Resources Management Boards play an important role in managing environmental resources and have responsibilities for delivering programs and projects on behalf of DEWNR.

In the longer term SZs are expected to lead to improvements in the quality and resilience of marine ecosystems. Such improvements may lead to benefits in terms of increased ecotourism and associated non-extractive recreational activities (e.g. diving). However, any such benefits are not expected to emerge for a numbers of years meaning there are unlikely to be any material impacts on tourism operators given the short duration in which SZs have been in place. Finally, the broader South Australian community may be considered an affected stakeholder to the extent that individuals value the conservation and sustainable use of the marine environment.

### 3.3.2 Stakeholders Consulted

Stakeholder consultations primarily focused on commercial fishers in the three regions given they would potentially be most directly impacted in the short term. Industry representatives from the four main fisheries were in the first instance contacted to identify individual fishers in the respective regions. These fisheries included:

- Surveyed Charter Boat Owners and Operators Association;
- Central Zone Abalone Fishery;
- Northern Zone Rock Lobster Fisherman's Association; and
- Marine Fishers Association.

Each of the industry representatives identified relevant fishers in the regions. Key fishers in each region played an important role in identifying other potential fishers and organising group meetings. Group discussions with commercial fishers were subsequently held in each of the three regions. These meetings were supplemented with face to face meetings or telephone interviews with individual fishers. Other fishers were also approached via email and/or telephone to provide feedback. This approach enabled fishers to voluntarily provide qualitative and quantitative feedback in respect of impacts to date. As such an approach has a high risk of providing subjective feedback, PIRSA logbook catch data which

records catch and effort for all commercial fishers was analysed to obtain an objective perspective in respect of changes in fishing catch and effort.

Broader region feedback was sought by consulting local officials in each of the regions, primarily the local Mayors and councillors. Feedback was also sought or received from Economic Development Boards and Natural Resources Management Boards in the respective regions.

Some key businesses outside the commercial fishing sector that may be potentially affected were also consulted, either directly or indirectly (e.g. SeaLink in respect of Kangaroo Island, caravan park in respect of Port Wakefield and Ceduna).

Finally, members of the broader community were also invited to make submissions in relation to the RIAS via email.

## 3.4 Data Limitations

The RIAS suffers from some significant limitations most of which are of a consequence of the short timeframe imposed for the study. The RIAS is required to be finalised within 12 months of the 1 October 2014 commencement date of SZ management plans. The available timeframe for data collection, analysis and report writing is even more compressed when one takes into account the need for government and peer review processes.

To the extent that the RIAS is required to investigate "effects on employment, existing businesses, capital investment, average income, local population" etc., there are in principle high quality data available in respect of some of these aspects from various existing sources. However, compilation of such data often involves significant lags relative to the study period such that they would not be published prior to the completion of the RIAS. Notable examples in this respect include Australian Bureau of Statistics (ABS) estimates of resident population growth and Australian Taxation Office (ATO) data on average taxable incomes.

The short time frame is particularly problematic when it comes to assessing impacts on commercial fishing patterns. Good quality data in respect of commercial fishing effort and catch is collected by the PIRSA, principally through the South Australian Research and Development Institute (SARDI). However, given the short time frame and lags associated with data processing and quality assurance, SARDI was only able to provide data for the first 4 months of commercial fishing with SZ restrictions in place (i.e. up to January 2015). Given the seasonal nature of certain fisheries the limited available data provides little to no insight into impacts on these fishers. For example, marine scalefish fishers in the Port Wakefield region noted that their main harvesting period is winter (i.e. June to August) which is outside the period covered by the SARDI data. Natural inter-annual variability across fisheries also limits the usefulness of the limited temporal data available.

A further significant limitation in respect of the commercial fisheries data is that confidentiality restrictions in the *Fisheries Management Act 2007* prevent the release of data where there is a risk of individuals being identified – refer Box 3.2 for more detail. Data that were consistent with the confidentiality requirements of section 124 of the *Fisheries Management Act 2007* were supplied for assessment as part of the RIAS process. However, some of the data requested were deemed confidential. PIRSA sent letters to current and former license holders seeking consent from individuals to release confidential data. In total 12 per cent of fishers approved the release of confidential data for the RIAS, which compromised many of the small data sets.Given the focus of the RIAS on small groups of individuals in regional areas and the limited period for which data was available, the restrictions have actively prevented the researchers from assessing regional impacts as well as independently confirming the feedback provided by fishers and other stakeholders in certain circumstances.

The short timeframe for the analysis is understandable given the desire to identify any significant short term negative impacts of SZs. In the absence of complete fisheries administrative data we have undertaken consultations in the regions with fishers and other stakeholders in order to identify evidence of any such impacts. This approach will have its own limitations. Most significantly, given the voluntary nature of the consultation process there is a risk that feedback will be skewed to those individuals who have experienced negative impacts, whether they are due or perceived to be due to SZs. In this respect official data on fishing effort and catch provides an important double check of actual impacts given its more comprehensive nature relative to qualitative and quantitative information provided by individual fishers and other stakeholders.

**Box 3.2 – Confidentiality Restrictions in Respect of Fisheries Data**

The *Fisheries Management Act 2007* includes restrictions that are intended to protect the commercial confidentiality of individuals or organisations operating in commercial fisheries. With a number of exceptions, Section 124(1) of the act states that "a person engaged or formerly engaged in the administration of this Act or the repealed Act must not divulge or communicate information obtained (whether by that person or otherwise) in the course of official duties…". Furthermore, this subsection "does not prevent disclosure of statistical or other data that could not reasonably be expected to lead to the identification of any person to whom it relates" (Section 124(2)). As part of the RIAS process, PIRSA sent letters to current and former license holders seeking approval from individuals to consent to the release their data. In total 12 per cent of fishers approved the release of data for the RIAS, which compromised many of the small data sets.

As part of commercial fisheries management arrangements commercial fishers are required to maintain logbooks which provide a record of their catch and effort by species. The logbooks are submitted to SARDI Aquatic Sciences with the data then entered into a database. The confidentiality restrictions in the Act place a limit on what statistical information SARDI can publish or pass along to other researchers. In order to preserve confidentiality, SARDI only publishes data where 5 or more fishers are represented. The likelihood of encountering such confidentiality issues in the data naturally increases when one focuses on smaller spatial areas and/or shorter time periods, which is the case in the current RIAS.

### Limitations of Input Output Modelling

There are some important limitations associated with input-output models that should be considered when interpreting the results of the input-output analysis.

Most importantly, the results of input-output models represent the ***gross*** impacts in the absence of capacity constraints. In reality, except in economic downturns where there is substantial unused labour and capital, anything that boosts one form of economic activity is likely to increase wages and returns to capital to attract the additional resources it needs, this in turn leads to reduced economic activity in other sectors or regions. At the national level, the net impact of any new project on employment is likely to only be a small fraction of the gross impact when the national economy is close to full employment, with the benefits coming through increased wages and increased returns to capital. At the regional level (particularly for small regions) net impacts can be much closer to gross impacts as labour and capital can be drawn in from surrounding regions, and there can be existing unemployed labour and capital.

Secondly, in the absence of a better alternative, the South Australian input-output tables are based on data that would only approximate the actual pattern of linkages between industries in the regional economies being modelled. No input-output data is available for the specific regions. Instead, in developing the regional I-O table the ABS's Australian Input Output table was modified to reflect the local distribution of economic activity and therefore likely consumption of intermediate inputs to production from suppliers in the region, and conversely, likely "leakages" out of the region for goods and services purchased from suppliers outside the region − using a technique called locational quotients.

And the Australian level input-output table on which the local tables are based is now rather dated. Local data is also used to increase the accuracy of the model in some cases, including updating coefficients for wage shares, gross operating surplus and household and government expenditures using national accounts data. South Australian specific tourism data and data on the value of agricultural production were also used to increase the accuracy of the model (Rippin and Morison, 2013).

Thirdly, an input-output analysis assumes that the industrial structure of the pre-existing regional economy remains unchanged as a result of the new project. This will not necessarily be the case as the structure of the regional economy can change to take advantage of the opportunities arising from the new project.

Finally, in interpreting the modelling impact on employment it should be noted that the estimates of the model effectively represents an increase in estimated hours worked which has been converted to full-time equivalent positions. In many cases the modelled impact (to the extent that the net impact matches the gross impact) will occur through increases (decreases) in the hours worked by existing employees rather than the creation (loss) of new positions.

# 4. Community Survey

## 4.1 Methods

Regular (about annual) phone surveys of the general public have been commissioned by DEWNR since 2006 to gauge community support and perceptions on a range of factors related to the marine environment and marine parks in South Australia. In February 2015 a phone survey was conducted by an independent company (Squares Holes Pty Ltd) with questions modified since the 2013 survey and four regions targeted with extra survey effort: Ceduna Local Government Area (LGA), Port Wakefield LGA, Kangaroo Island LGA and Port Lincoln LGA. A total of 909 telephone interviews with adult South Australians were conducted (13 to 25 February 2015). Household contact details were randomly generated using an electronic White pages product. Data from the interviews were collated, checked and summarised in table format and supplied to DEWNR and SACES.

The full survey included coastal regions across SA, but for the purposes of the RIAS, data are presented for six sample groups: the State (n=909 interviews), Adelaide metropolitan area (n=301), Ceduna LGA (n=101), Port Wakefield LGA (n=101), Kangaroo Island LGA (n=100) and Port Lincoln LGA (n=101). Responses to the eight questions deemed most relevant to the RIAS are presented here.

## 4.2 Results

Demographics of the survey respondents were: Age (years) = 18–39 (8 per cent), 40–54 (22 per cent), 55–64 (23 per cent) and over 64 (48 per cent); Gender = Male (44 per cent) and Female (56 per cent). Thus the survey was biased towards older people.

Support for marine parks to protect plants and animals in general was 79 per cent state-wide, 87 per cent in Adelaide, and in the four regions ranged from a low of 65 per cent in Port Lincoln to a high of 84 per cent in Port Wakefield – refer Figure 4.1. Support for marine parks in their local area and areas where they visit was consistently lower than general support across all six sample groups. Support for marine parks in their local area was 67 per cent State-wide, 75 per cent in Adelaide, and in the four regions ranged from a low of 52 per cent in Kangaroo Island to a high of 66 per cent in Port Wakefield. Community attitudes towards marine parks in South Australia have remained relatively constant since 2006, with between 79 and 95 per cent support for marine parks in general, but less so for marine parks in their local area, ranging from 58 per cent to 79 per cent (DEWNR unpublished data).

Participation rates in fishing, snorkelling/diving, boating and general recreation use varied considerably between the six sample groups and was likely related to the geography of the sample groups and population centres – refer Table 4.1. For example, fishing and boating had higher participation rates in Ceduna, Kangaroo Island and Port Lincoln where most of the population is located near the coast. The participation rates of the Port Wakefield group were more similar to the Adelaide group; this may have some bearing on the responses to the other questions.

**Figure 4.1: Are you in favour of marine parks to protect marine plants and animals?**

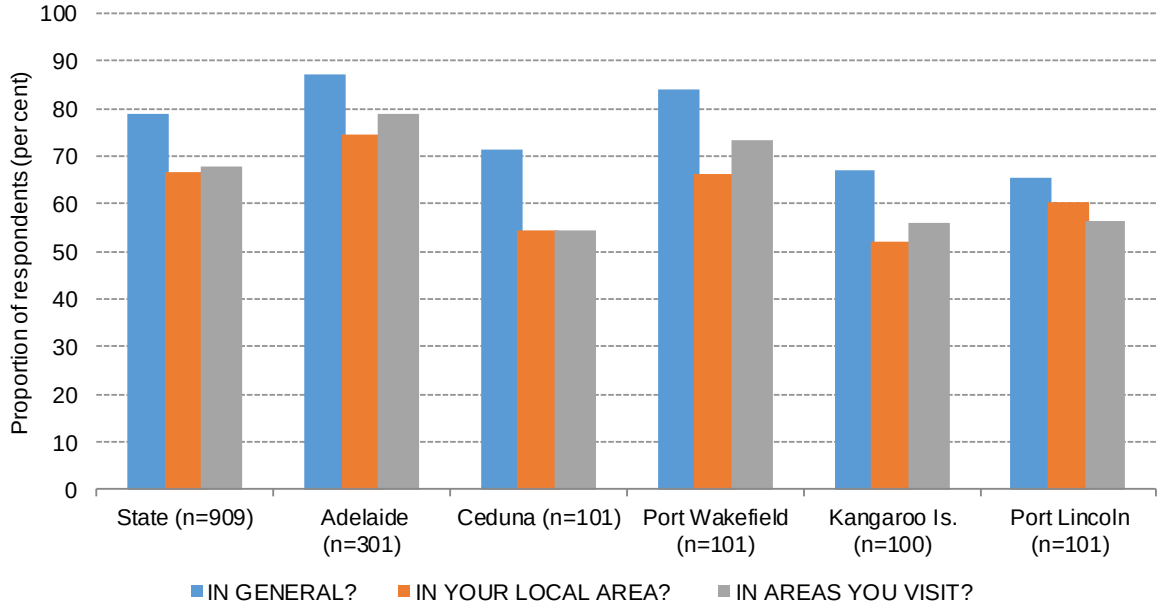



**Table 4.1: Participation in Recreational Activities, Proportion of Respondents by Region**

| | State (n=909) | Adelaide (n=301) | Ceduna (n=101 | Port Wakefield (n=101) | Kangaroo Island (n=100) | Port Lincoln (n=101) |
|---|---|---|---|---|---|---|
| **Fishing** | | | | | | |
| At least monthly | 27.0 | 13.3 | 49.5 | 16.9 | 45.0 | 37.7 |
| Less often | 27.8 | 24.2 | 28.7 | 37.6 | 20.0 | 37.5 |
| Never | 45.3 | 62.5 | 21.8 | 45.5 | 35.0 | 24.8 |
| **Snorkelling/diving** | | | | | | |
| At least monthly | 4.1 | 2.3 | 7.0 | 1.0 | 7.0 | 4.0 |
| Less often | 13.6 | 10.3 | 12.9 | 13.9 | 25.0 | 19.8 |
| Never | 82.4 | 87.4 | 80.2 | 85.1 | 68.0 | 76.2 |
| **Boating** | | | | | | |
| At least monthly | 23.1 | 8.6 | 47.4 | 10.9 | 37.0 | 31.7 |
| Less often | 24.8 | 21.6 | 26.8 | 28.7 | 26.0 | 36.6 |
| Never | 52.1 | 69.8 | 25.7 | 60.4 | 37.0 | 31.7 |
| **General recreation** | | | | | | |
| At least monthly | 54.0 | 45.9 | 64.4 | 26.7 | 66.0 | 62.5 |
| Less often | 26.9 | 30.0 | 18.9 | 45.5 | 19.0 | 22.8 |
| Never | 19.3 | 24.3 | 16.8 | 27.7 | 15.0 | 14.9 |

The majority of participants across all six sample groups believed that the marine environment is under pressure from human activity – refer Figure 4.2. This belief was at 74 per cent state-wide, 83 per cent in Adelaide, and in the four regions ranged from a low of 62 per cent in Ceduna to a high of 74 per cent in Port Wakefield.

Of those participants that believed the marine environment is under pressure, over-fishing was believed to be the greatest threat by all six sample groups (range from 46 to 59 per cent) – refer Figure 4.3. Commercial fishing, pollution, recreational fishing/boating and population increase were also identified as threats by around 20 to 30 per cent of respondents. Interestingly, commercial fishing was identified by a relatively larger proportion of respondents in Kangaroo Island as contributing to pressure on the marine environment than recreational fishing (33 per cent compared to 24 per cent), whereas the opposite was true in the case of Ceduna (17 per cent compared to 25 per cent).

**Figure 4.2: Do you think the marine environment is under pressure from human activity?**

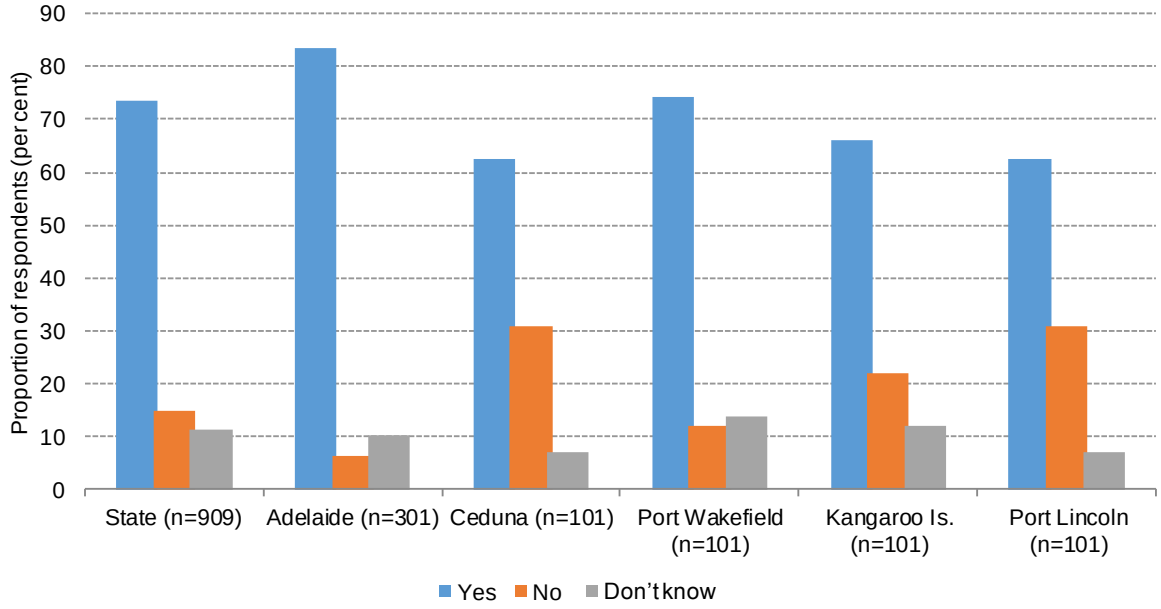
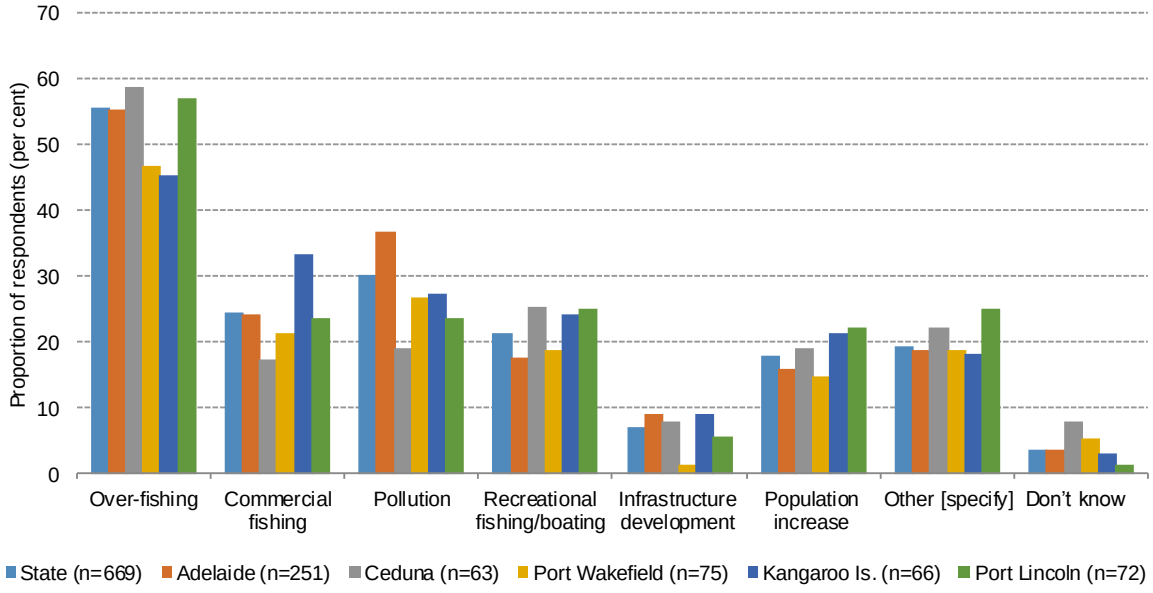
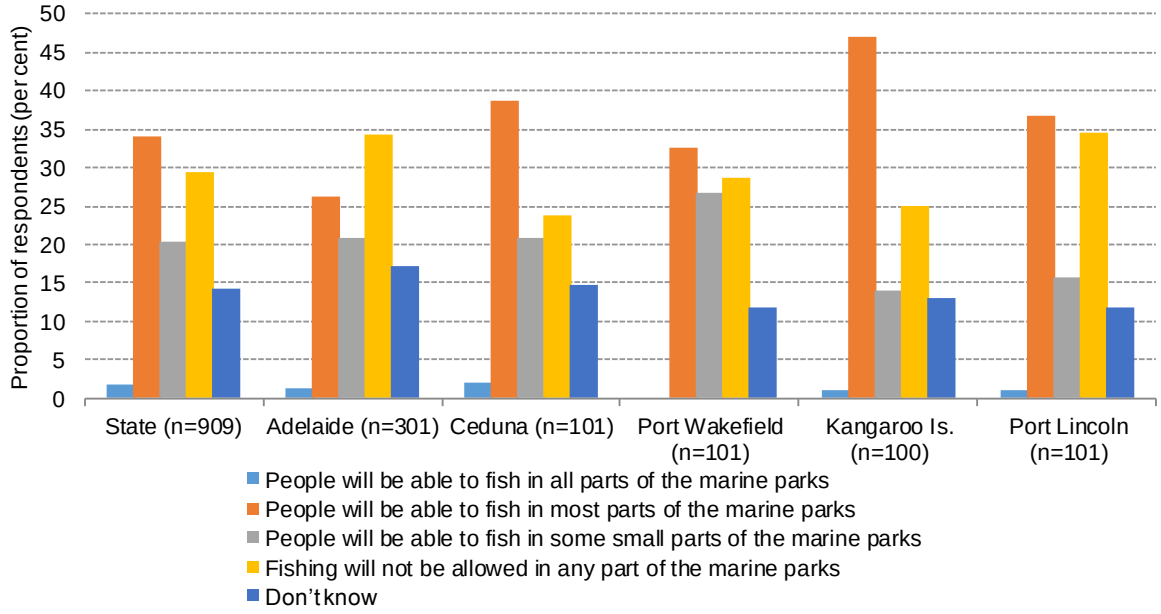



**Figure 4.3: Why do you think that the marine environment is under pressure?**




Respondents understanding of spatial fishing restrictions in marine parks was varied, but with more respondents across all sample groups (except Kangaroo Island) believing that, rather than fishing being allowed in most parts of the marine parks (which is correct), fishing will either be allowed in some small parts of the marine parks or that fishing will not be allowed in any part of the marine parks – refer Figure 4.4. Clearly there is still a community misperception about spatial restrictions on fishing within marine parks. This confirms what respondents in the regions stated in the consultations with SACES.

**Figure 4.4: Which of the following best describes your understanding of fishing in marine parks?**




The majority of respondents (76 to 93 per cent across all sample groups) knew of the existence of SZs where fishing is not allowed – refer Figure 4.5. However, far fewer (19 to 65 per cent) actually knew where the SZs were – refer Figure 4.6. Very few respondents (generally less than 10 per cent) felt that they had changed their frequency of participation in fishing, snorkelling/diving, boating, or general recreation use since the introduction of SZs.

**Figure 4.5: Are you aware that some areas in marine parks are 'no-fishing' or SZs where fishing is not allowed?**

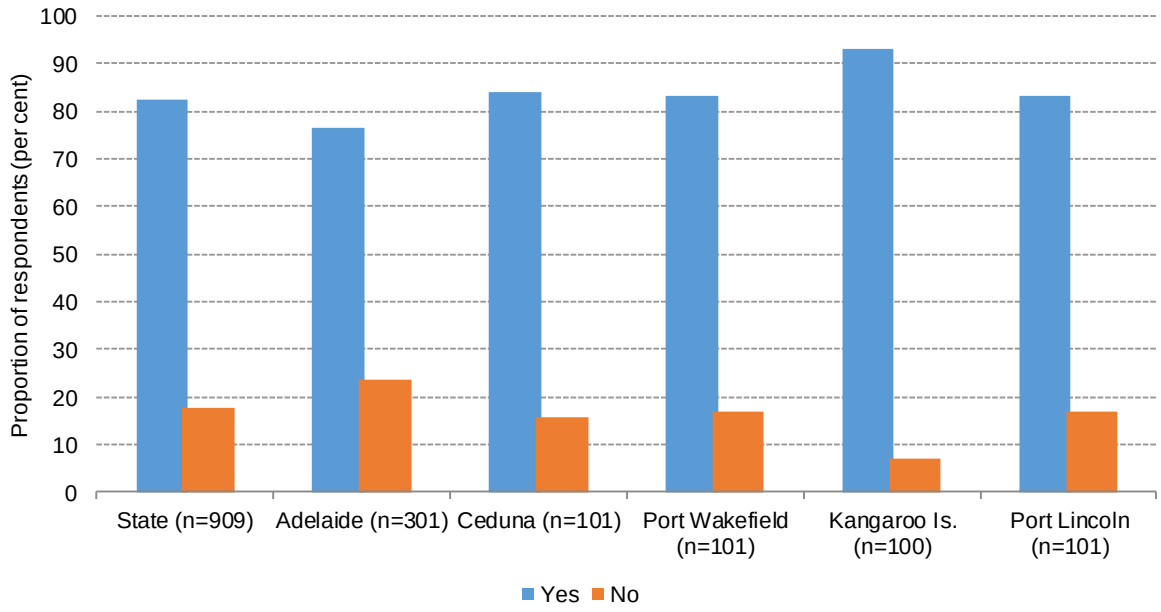
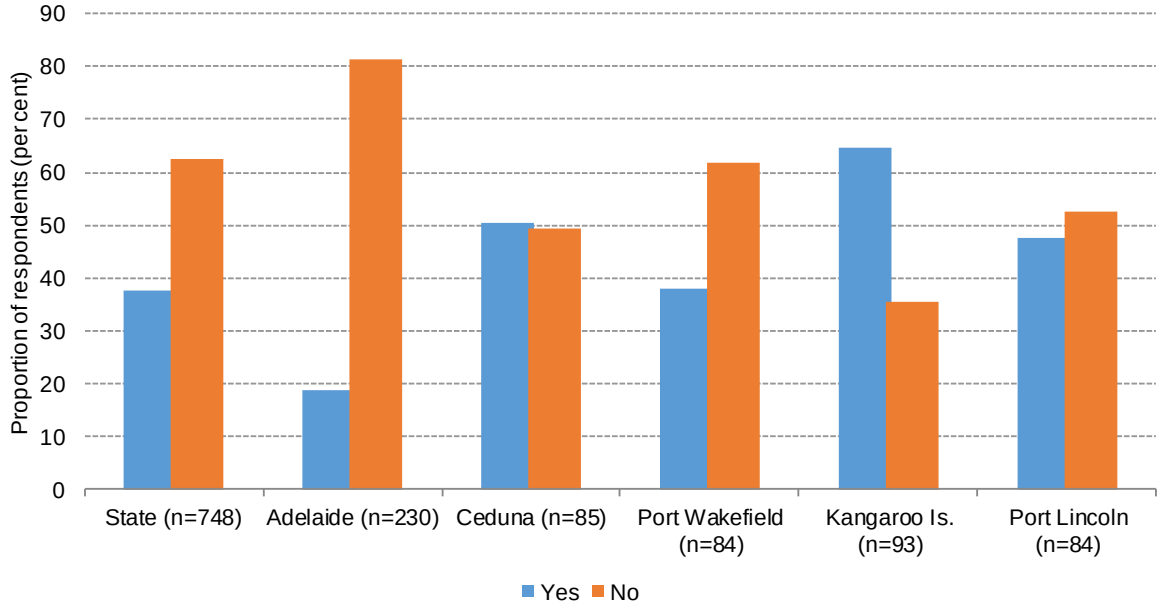


**Figure 4.6: Do you know where the SZs are in your local area or areas where you visit?**




## Participation in recreational fishing over time

Community consultations indicated a general concern that an incorrect perception that fishing was not allowed in marine parks was discouraging recreational fishers from visiting local regions since the introduction of zoning. In this respect the previous RIAS noted that:

> *"… the actual placement of sanctuary zones is unlikely to place real restriction on recreational fishing. However, the perception that recreational fishing opportunities will be restricted by implementing 'no-take' areas is real…".* (EconSearch, 2012. p.30)

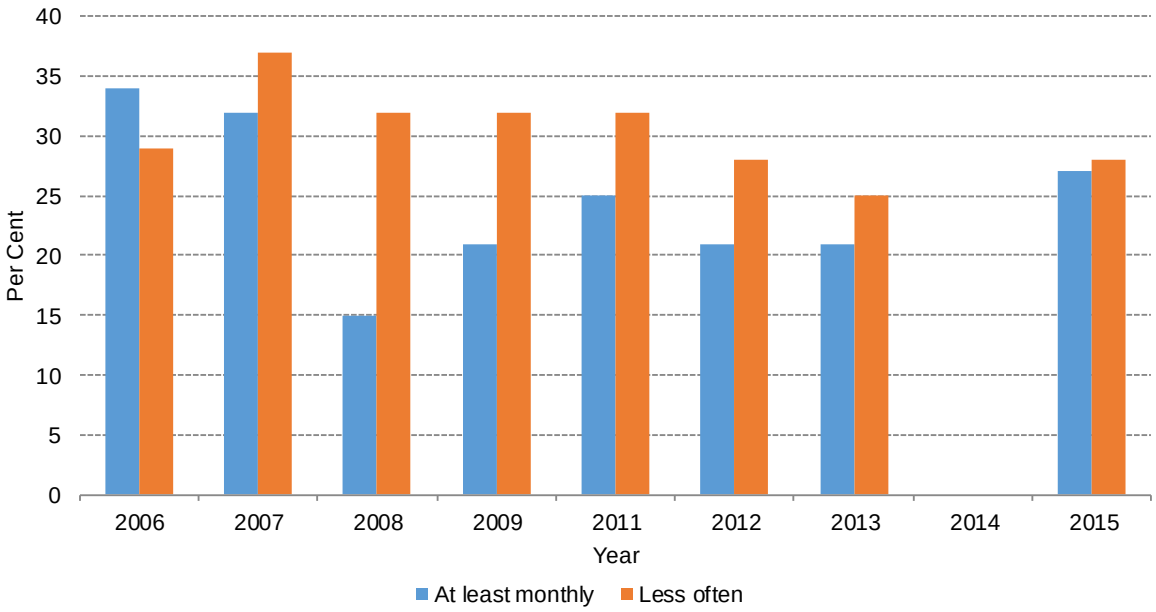
There are very few data sources available on participation in recreational fishing in South Australia. However, the regular community surveys conducted by DEWNR provide some insight into trends in participation over time. In addition, PIRSA are currently finalizing a statewide survey of recreational fishers which will update participation rates for the 2000/01 national and 2007/08 statewide recreational surveys previously undertaken in South Australia.

Figure 4.7 shows the proportion of respondents across the state that participated in fishing in the marine environment at least monthly or less often than monthly since 2006. The portion of respondents from the 2015 survey indicating that they participated in recreational fishing at least monthly (27 per cent) was higher relative to the proportion doing so in 2013 (21 per cent) and in fact at its highest level since 2008. Similarly, the proportion participating in fishing less often was in line with those reporting such level of activity in 2012 and 2013 (no survey was conducted in 2014). Higher participation for 2015 would in part reflect that relatively greater sampling effort was carried out in the RIAS regions where participation in fishing would be expected to be higher. However, adjusting for the change in sampling mix between metropolitan and non-metropolitan areas participation in recreational fishing at least monthly still remained relatively higher in 2015 (24 per cent) compared to recent years. Hence, the results of the community survey provide no evidence of a decline in participation in recreational fishing over the last couple years.

One would expect that aggregate recreational fishing effort may increase over time given population growth. As a consequence there may be a potential increase in competition with commercial fishers over time. While such an impact would occur whether or not SZs were introduced, the reduction in available fishing area with SZs may bring forward any such impact. In a worst case scenario increasing recreational fishing effort over time could adversely affect commercial fishers. Such changes are generally factored into stock assessments and can be managed through changes to recreational fishing

management arrangements. In addition, final marine park zoning arrangements were deliberately designed to minimise impacts on recreational fishers.

**Figure 4.7: Participation in fishing in the marine environment over time, South Australia[(a)]**




**Note:** (a) Survey was not conducted in the same month each year and may therefore exhibit some seasonal variation. Two surveys were conducted in 2009; results shown are for March 2009. The 2015 state-wide result is influenced by the additional survey effort in the RIAS regions; when the data set is adjusted for better comparison with previous years (i.e. to have the same proportional survey effort in Adelaide versus regional areas), fishing "at least monthly" is reduced slightly to 24 per cent in 2015.

# 5. Ceduna

The following section examines various economic and social indicators for Ceduna District Council to gain insight into the potential short term economic and social impact of SZs. In some cases data sources are not yet available for the post SZ period and are consequently presented for baseline purposes to assist any future analysis. Initial catch and effort data for relevant commercial marine fisheries in the Ceduna region are also considered.

### Summary – Ceduna

- The small population of Ceduna DC and relatively large indigenous population would generally make the region relatively sensitive to economic shocks.
- Approximately 1 per cent of the working population were employed in industry sectors that could be potentially affected by SZs.
- There is no evidence of a deterioration in general employment conditions since the introduction of SZs. In fact, employment appeared to rise while unemployment fell. The improvement would reflect non-SZ related factors such as activity related to oil and gas exploration in the region.
- The Ceduna housing market has exhibited comparative strength over the past year with median house prices rising solidly and home sales outperforming regional trends.
- Population data is not yet available for the post-SZ period. Population growth for Ceduna has improved over recent years, which can probably be attributed to resources sector activity in the region over recent years.
- Ceduna DC is not currently a significant tourism destination in South Australia with the region accounting for approximately 1 per cent of international and domestic overnight visitors on average over the 4 years to 2013.
- Council fees collected in respect of boat ramps at Ceduna and Thevenard rose by 5.2 per cent in 2014/15 following falls over the previous two financial years. This result suggests that SZs did not adversely affected activity through boat ramps.
- Analysis of impacts on the various commercial fisheries in the Ceduna region were compromised by confidentiality restrictions associated with the short time period for which data was available (4 months) and the low level of existing commercial fishing effort in the region.
- Ceduna is not a significant area of operation for abalone fishers in the Western Zone. While local community representatives raised concerns about a reduction in regional spending due to reduced visitation by abalone fishers, port of landing data indicates a declining trend in visitation to Ceduna by abalone fishers preceded introduction of SZs. This earlier decline would reflect that the total allowable commercial catch (TACC) for the Western Zone abalone fishery has been steadily reduced over recent years as production has fallen back to long run average levels, while management changes introduced from 1 January 2014 to provide fishers with greater flexibility in terms of where they can fish has been a more recent contributing factor.
- Rock lobster data was only sporadically available due to confidentiality restrictions, indicating that catch in the region is relatively small. Data for commercial fishers who waivered confidentiality restrictions indicate that there was no effort or catch recorded off Ceduna for the first three months of the first season with SZs. These fishers also recorded no catch or effort for the corresponding period in select earlier years, indicating a relatively low level of effort in the region and emphasising the need for more comprehensive data in terms of fishers and time.
- While there are only limited observations available, SARDI research pot data for rock lobster suggests there is no significant difference in the productivity of SZs relative to non-SZ areas.
- Initial results for catch of select commercial marine scalefish species under SZs was quite mixed. Targeted handline catch of King George whiting was actually up strongly (35 per cent) for the first 4 months with SZs compared to the corresponding period a year earlier. In contrast, there was a significant decline in handline and longline catch of snapper (-14 per cent) despite an increase in effort, although catch rates were not unusual compared with those recorded in previous years. There was also a significant decline in gummy shark catch (-20 per cent) which did reflect a fall in catch rates below recent historical levels. Unfortunately analysis of impacts on other MSF species was prevented by limited data availability which would be partly related to low effort levels, which emphasises the need for a longer period of data in order to assess the impacts of SZs on MSF catch in the Ceduna region.
- Ceduna is not a significant area for charter boat operation.
- The estimated value of catch for King George Whiting, snapper and southern calamari for the four month period October to January 2014/15 was up $50,000 relative to the corresponding period a year earlier.

- Community consultations raised concerns about a reduction in visitation by recreational anglers due to incorrect perceptions regarding fishing in marine parks. Unfortunately there is no data available to confirm such views.
- In respect of a planned investment by the trawler industry to enable unloading at the Port of Thevenard that has been placed on hold, Council advised that zoning had reduced the number of operators able to commit and thus the amount it can sustainably borrow. However, we understand that other factors may have played a role in this decision and thus cannot substantiate the exact role played by SZs.

## 5.1 Socio-economic Indicators

### 5.1.1 Socio-economic Profile

Key socio-economic indicators for the District Council (DC) of Ceduna are summarised in Table 5.1.

As at the 30th of June 2014 Ceduna DC has an estimated resident population (ERP) of 3,696 persons (preliminary estimate). Major settlements include the town of Ceduna which accounted for approximately 65 per cent of the council area's population at the time of the 2011 Census, Thevenard (17 per cent), Denial Bay (14 per cent), Smoky Bay and the Indigenous township of Koonibba. A small population makes Ceduna DC sensitive to economic, social and environmental shocks.

In comparison to South Australia the youth dependency ratio for Ceduna DC is higher (18 per cent compared to 21 per cent) and the aged dependency ratio is lower (17 per cent compared to 13 per cent). The difference is influenced by the younger age profile and lower life expectancy of Indigenous persons within the Ceduna DC area. At the 2011 Census approximately one quarter of Ceduna's population identified as Indigenous. The median age of Indigenous persons was 24 years, compared with 37 years for all persons. Despite the large variation in youth and aged population, the total dependency ratio for Ceduna DC was similar to South Australia's at approximately 34 per cent.

A closer examination of the working age population of Ceduna DC reveals 24 per cent of persons were aged in the 15 to 34 years age bracket, similar to the South Australian proportion of 26 per cent. The similarity is influenced by the Indigenous age profile. By Indigenous and non-indigenous status the corresponding proportions for Ceduna DC are 33 per cent and 21 per cent respectively.[7] For the non-indigenous population Ceduna's age structure is similar to other regional areas in terms of there being a noticeably smaller cohort of persons aged 15 to 34 years, which reflects that persons from this age group are more likely to migrate to larger centres in search of education and employment opportunities.

Estimates of the labour force show Ceduna DC had an unemployment rate of 6.7 per cent as of the March quarter of 2015, in line with the South Australian unemployment rate at the time. Unemployment for the state has risen significantly since this time while developments for Ceduna DC are unknown.

According to Census 2011 data median incomes for Ceduna DC were in line or higher than the state average, with a median weekly personal income and household income of $585 and $1,048 respectively, compared to $534 and $1,034 for South Australia. However, taxation data indicates that mean salary and wage income for Ceduna in 2012/13 was 16 per cent below the state average. A significantly lower mean salary and wage income for Ceduna points to significant uneven income distribution for the region, which would in part reflect the greater socio-economic disadvantage of Indigenous persons.

Looking at the economy there were 430 businesses (includes 10 unclassified businesses) operating in Ceduna DC as of the 30th of June 2012, representing 0.3 per cent of all businesses in South Australia. The local economy is highly geared toward primary industries with 40 per cent of businesses in Ceduna

[7] For the population breakdown by indigenous status, see ABS, Basic Community Profile, Cat no. 2001.0, Table B07.

DC operating in the 'agriculture, forestry and fishing' sector compared to 13 per cent of South Australian businesses.

In 2013/14 Gross Regional Product (GRP) of Ceduna DC was $194 million. Economic activity in Ceduna DC is therefore a small fraction of South Australia's total production, accounting for 0.2 per cent of South Australia's 2013/14 Gross State Product (GSP).

**Table 5.1: Key Socio-Economic Indicators for Ceduna DC**

| Indicator | Period | Ceduna DC | South Australia |
|---|---|---|---|
| Total Population (persons) | 30 June 2014 | 3,696 | 1,685,714 |
| Population density (persons/km$^2$) | 30 June 2014 | 0.7 | 1.7 |
| Average household size (persons) | 2011 (Census) | 2.5 | 2.4 |
| Population age structure | | | |
| 0 to 14 years | 30 June 2013 | 20.9 | 17.7 |
| 15 to 64 years | 30 June 2013 | 66.3 | 65.6 |
| 65 years and over | 30 June 2013 | 12.8 | 16.7 |
| Population of key localities | | | |
| Ceduna (persons) | 2011 (Census) | 2,289 | - |
| Thevenard (persons) | 2011 (Census) | 581 | - |
| Denial Bay (persons) | 2011 (Census) | 501 | - |
| Total (Ceduna DC) | 2011 (Census) | 3,480 | - |
| Labour market | | | |
| Unemployment Rate[(a)] | Mar. Qtr. 2015 | 6.7 | 6.7 |
| Unemployed (persons)[(a)] | Mar. Qtr. 2015 | 126 | 57,500 |
| Labour force (persons)[(a)] | Mar. Qtr. 2015 | 1,873 | 859,500 |
| Incomes | | | |
| Median personal income ($/week) | 2011 | 585 | 534 |
| Median total household income ($/week) | 2011 | 1,048 | 1,044 |
| Mean taxable income/loss ($/individual) | 2012/13 | 44,222 | 50,025 |
| Mean salary or wages ($/individual) | 2012/13 | 41,664 | 49,760 |
| Government Support Payments | | | |
| Newstart Allowance recipients (No.) | Dec. Qtr. 2014 | 222 | 64,757 |
| Age Pension recipients (No.) | Dec. Qtr. 2014 | 370 | 209,156 |
| Businesses | | | |
| Number of businesses[(b)] | 2012 | 430 | 145,911 |
| % in agriculture, forestry, fishing | 2012 | 40.2 | 13 |
| % in mining | 2012 | 0.9 | 0.4 |
| % in manufacturing | 2012 | 2.8 | 4.4 |
| % in electricity, gas, water & waste services | 2012 | 0.9 | 0.4 |
| % in construction | 2012 | 12.6 | 14.8 |
| % in services | 2012 | 40.2 | 65 |
| Building Approvals | | | |
| Number of houses approved | 2013/14 | 14 | 8,296 |
| Value of residential buildings approved ($m) | 2013/14 | 3.1 | 2,680 |
| Tourism | | | |
| Visitors ('000 persons)[(c)] | 2013 | 61.8 | 16,624 |
| Visitor nights ('000) | 2013 | 170.1 | 29,963 |
| Visitor expenditure ($m)[(c)] | 2013 | 21.8 | 5,096 |
| Number of tourism businesses[(d)] | 2013 | 60 | 17,231 |
| Gross Regional/State Product ($m) | 2013/14 | 194 | 89,898 |

**Note:** (a) Smoothed series.
(b) Percentages do not add up to 100 per cent due to unclassified businesses.
(c) Excludes domestic day visitors – data not published.
(d) Estimate of businesses for South Australia as at 30th June 2013.

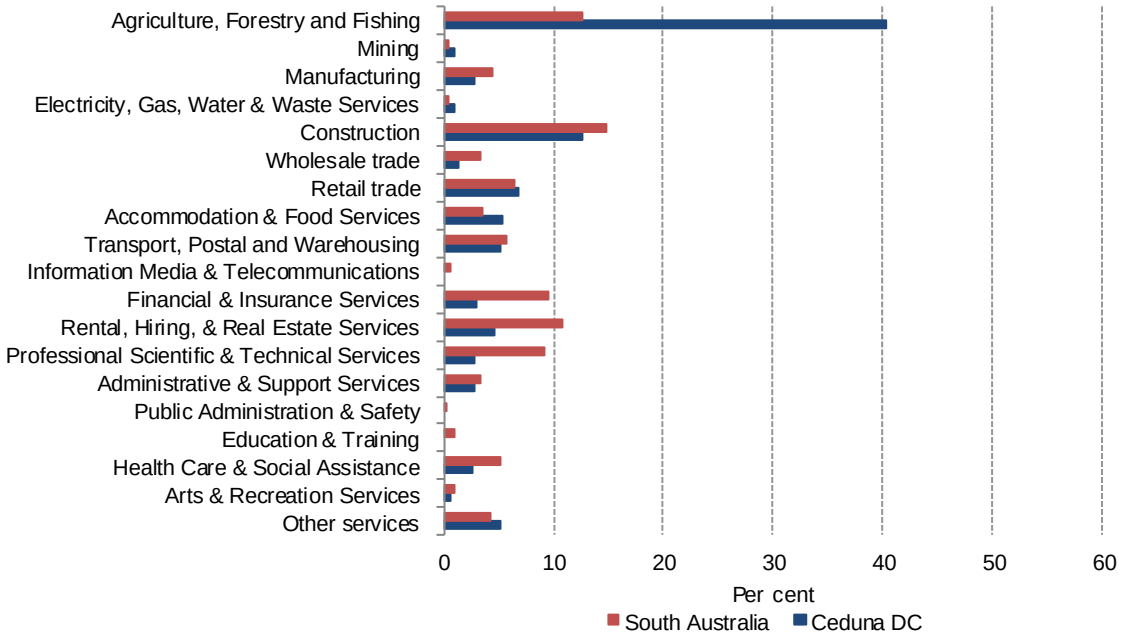
**Source:** ABS, Regional Population growth, Cat. No. 3218.0; ABS.Stat; ABS, *Census of Population and Housing*, 2011; Department of Employment, *Small Area Labour Markets Data*. Tourism Research Australia, *Tourism in Local Government Areas*, 2013. Australian Taxation Office, *Taxation Statistics*, *2012/13*. .id the Population Experts, National economic indicators for local government areas, 2013/14, Tourism Businesses in Australia, June 2010 to June 2013, Travel by Australians: December 2013 quarterly results of the National Visitor Survey.

### 5.1.2 Economic Structure

The economic base of Ceduna DC is highly skewed toward primary industries, particularly agriculture – refer Figure 5.1. Firms in the broadly defined 'agriculture, forestry and fishing' sector accounted for 41 per cent of businesses operating in Ceduna DC as at 2012, substantially larger than the share of South Australian businesses in this sector (13 per cent). The only other sector in which Ceduna DC had a moderately larger share of businesses relative to South Australia in 2012 was 'accommodation and food services' (5.3 per cent compared with 3.6 per cent).

In terms of businesses underrepresented in Ceduna DC, the proportion of businesses providing 'professional, scientific and technical services' and 'financial and insurance services' is approximately three times smaller compared with South Australia.

**Figure 5.1: Businesses by Industry**
**Ceduna DC and South Australia - per cent of total businesses by industry, 2012**




**Note:** Total excludes 10 unclassified businesses.
**Source:** National Regional Profile, 2008 to 2012, Cat No. 1379.0.55.001

The relatively large number of businesses in 'agriculture, forestry and fishing' suggests that the Ceduna DC economy may be vulnerable to adverse economic effects caused by the introduction of the SZs to the extent that businesses are concentrated in the fishing industry. Unfortunately, finer level data for businesses by industry is not published by the ABS so it is not possible to verify the extent of any economic impact based upon business data. As an alternative, insight into the extent of economic activity in fisheries can be derived from employment data.

Census employment data indicates that there were 10 people (0.7 per cent of total employment) employed in the 'fishing, hunting and trapping' sub-sector in Ceduna in 2011 (Table 5.2). There were no persons employed in the 'seafood processing' sector. However, people were employed in related sectors such as 'aquaculture' (65 persons), 'fish and seafood wholesaling' (8 persons) and 'fresh meat, fish and poultry retailing' (6 persons).

Based on the Census data, approximately 1.2 per cent of the Ceduna DC workforce could be potentially directly impacted by the introduction of SZ management plans (based on all persons employed in fishing, hunting and trapping, seafood processing, and fish and seafood wholesaling).

**Table 5.2: Employed Persons by Industry**
**Ceduna DC and South Australia (Place of Work) – 2011**

| | Ceduna (DC) | | South Australia | |
|---|---|---|---|---|
| | Persons | Per cent | Persons | Per cent |
| Agriculture, Forestry and Fishing[(a)] | 211 | 13.8 | 27,675 | 3.8 |
| *Agriculture* | *130* | 8.5 | *24,060* | 3.3 |
| *Aquaculture* | *65* | 4.3 | *652* | 0.1 |
| *Forestry and Logging* | *0* | 0.0 | *497* | 0.1 |
| *Fishing, Hunting and Trapping* | *10* | 0.7 | *837* | 0.1 |
| *Agriculture, Forestry and Fishing Support Services* | *6* | 0.4 | *1,529* | 0.2 |
| Mining | 24 | 1.6 | 9,205 | 1.3 |
| Manufacturing | 23 | 1.5 | 76,386 | 10.6 |
| Electricity, Gas, Water and Waste Services | 11 | 0.7 | 9,832 | 1.4 |
| Construction | 93 | 6.1 | 53,574 | 7.4 |
| Wholesale Trade | 45 | 2.9 | 25,427 | 3.5 |
| Retail Trade | 167 | 10.9 | 81,845 | 11.4 |
| Accommodation and Food Services | 125 | 8.2 | 45,110 | 6.3 |
| Transport, Postal and Warehousing | 115 | 7.5 | 29,762 | 4.1 |
| Information Media and Telecommunications | 4 | 0.3 | 10,480 | 1.5 |
| Financial and Insurance Services | 18 | 1.2 | 21,903 | 3.0 |
| Rental, Hiring and Real Estate Services | 18 | 1.2 | 9,354 | 1.3 |
| Professional, Scientific and Technical Services | 34 | 2.2 | 40,133 | 5.6 |
| Administrative and Support Services | 52 | 3.4 | 24,696 | 3.4 |
| Public Administration and Safety | 125 | 8.2 | 51,712 | 7.2 |
| Education and Training | 149 | 9.8 | 58,201 | 8.1 |
| Health Care and Social Assistance | 226 | 14.8 | 99,275 | 13.8 |
| Arts and Recreation Services | 10 | 0.7 | 9,202 | 1.3 |
| Other Services | 66 | 4.3 | 28,499 | 4.0 |
| Inadequately described | 12 | 0.8 | 6,513 | 0.9 |
| Not stated | 0 | 0.0 | 440 | 0.1 |
| **Total** | **1,525** | **100.0** | **719,224** | **100.0** |

**Note:** (a) Total includes agriculture, forestry and fishing not further defined.
**Source:** ABS, 2011 Census of Population and Housing.

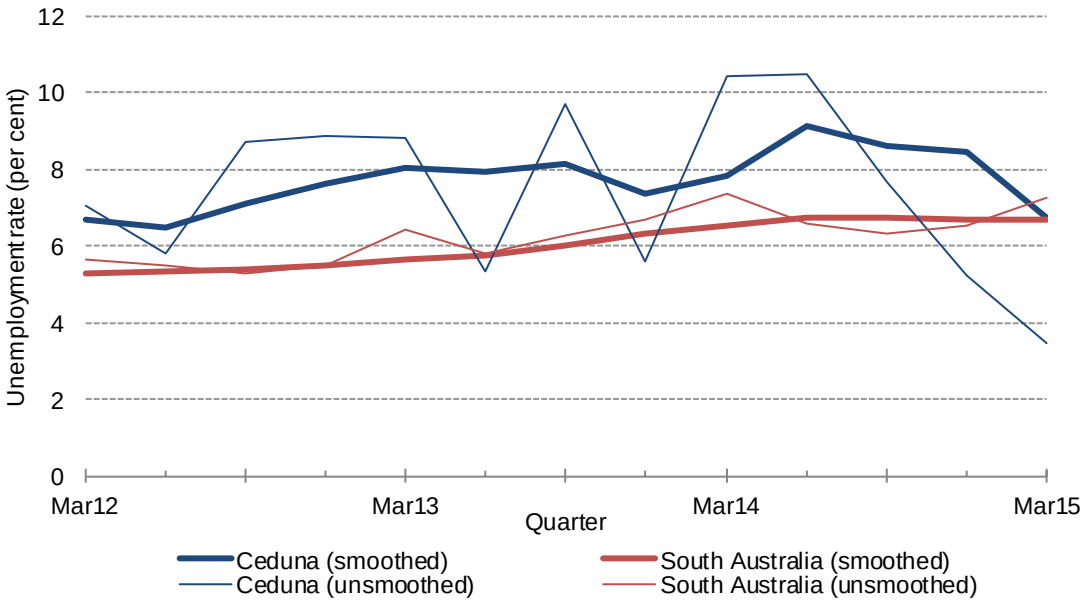
### 5.1.3 Economic and Social Indicators

The following section summarises various indicators that provide insight into recent economic and social developments in Ceduna DC. While the emphasis is placed on developments since the SZ management plans were introduced from 1st October 2014, data for some indicators in the post SZ period had not been published at the time of writing. Such indicators are included in the following analysis for baseline purposes to inform any subsequent analyses and obtain context of recent economic and social developments in the region.

#### Labour Force

According to smoothed estimates from the Department of Employment's Small Area Labour Markets data, Ceduna DC's rate of unemployment in the March quarter of 2015 was 6.7 per cent (Figure 5.2), equal to South Australia's 6.7 per cent rate of unemployment at the time. Over the longer term Ceduna DC's unemployment rate has remained consistently higher than South Australia's and displays greater quarterly volatility. Since the March quarter of 2012 unemployment in Ceduna DC has trended upward before declining sharply in the March quarter of 2015, while South Australia's unemployment rate has risen by 1.4 per cent.

**Figure 5.2: Unemployment Rate**
**Ceduna DC and South Australia – Smoothed and Unsmoothed Series**



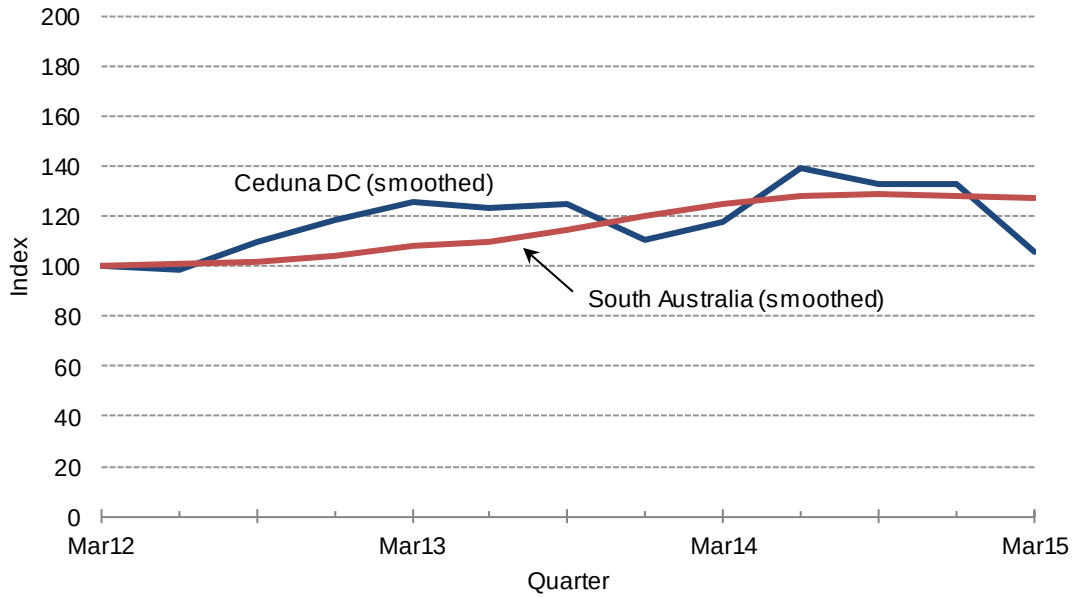

**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

Looking at developments since 1st October 2014, the 'unsmoothed' unemployment rate fell by 2.5 per cent in the December quarter of 2014 to 5.2 per cent, down from 7.7 per cent. The unsmoothed unemployment rate then fell a further 1.7 per cent in the March quarter of 2015. Based upon unsmoothed estimates the unemployment rate has fallen significantly since the introduction of SZs. Given the inherent volatility of unsmoothed estimates smoothed estimates are considered a more accurate and reliable indicator of underlying trends.

Smoothed estimates reveal the rate of unemployment for the March quarter of 2015 fell by 1.7 per cent, a smaller fall than indicated by the unsmoothed estimates. The decline in the unemployment for the December quarter 2014 was also smaller (down 0.1 per cent) as a consequence of higher unemployment in early 2014. Based on current labour market data it appears that the introduction of SZs have had no significant impact on broader labour market conditions. In fact unemployment has fallen since the introduction of marine parks, which would reflect that commercial fishing is a relatively small sector of the Ceduna DC economy, that any negative unemployment impacts may take time to emerge, and, most significantly, other economic factors have been more prominent in respect of labour market performance. For instance, oil and gas exploration activity has increased significantly in the region over recent years. Furthermore, given the inherent volatility of the data a longer period of data would be desirable to confirm recent developments in labour market conditions.

Smoothed data indicate there were approximately 126 unemployed persons in Ceduna DC as of the March quarter of 2015. Since the June quarter of 2014 unemployment has trended downwards – refer Figure 5.3. The lack of any rise in unemployment compares with an estimated economic loss associated with zoning for Nuyts Archipelago MP of 8 full-time equivalent jobs (EconSearch 2014).

**Figure 5.3: Index of Unemployed Persons**
**Ceduna DC and South Australia – Base: March Qtr 2012 = 100**

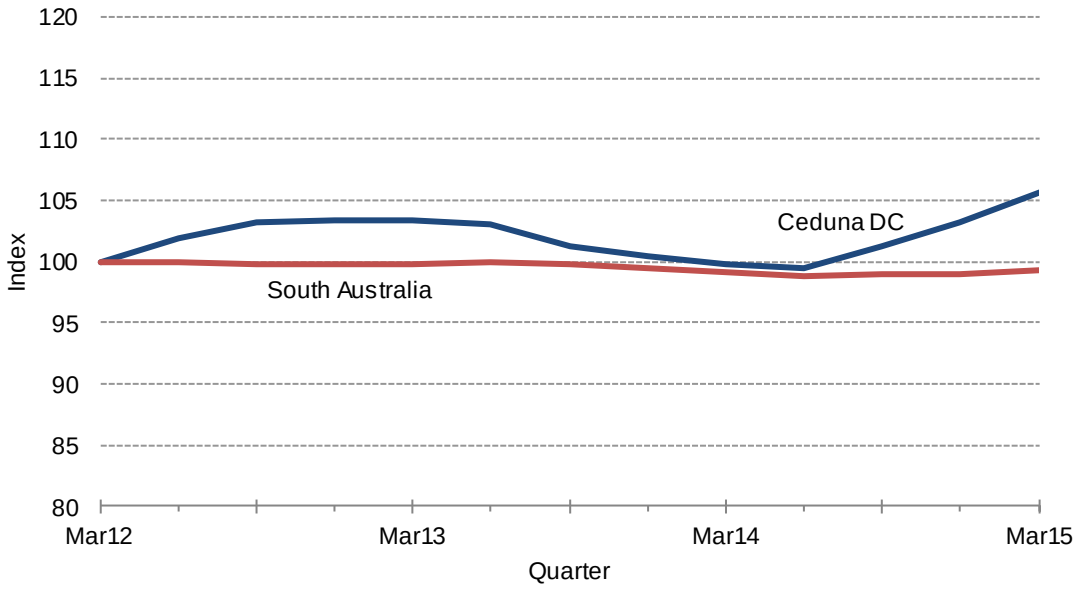



**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

There were 1,747 employed persons in Ceduna DC as of the March quarter of 2015. The level of employment was 5.9 per cent higher compared to the March quarter of 2014 – refer Figure 5.4. This result is impressive compared to the South Australia's performance over this period whereby employment rose by 0.2 per cent.

The combination of rising employment exceeding the fall in unemployment levels indicates that the recent decline in the unemployment rate for Ceduna DC is not a consequence of falling labour market participation which can sometimes mask actual labour market health.

**Figure 5.4: Index of Employed Persons**
**Ceduna DC and South Australia – Base: March Qtr 2012 = 100**

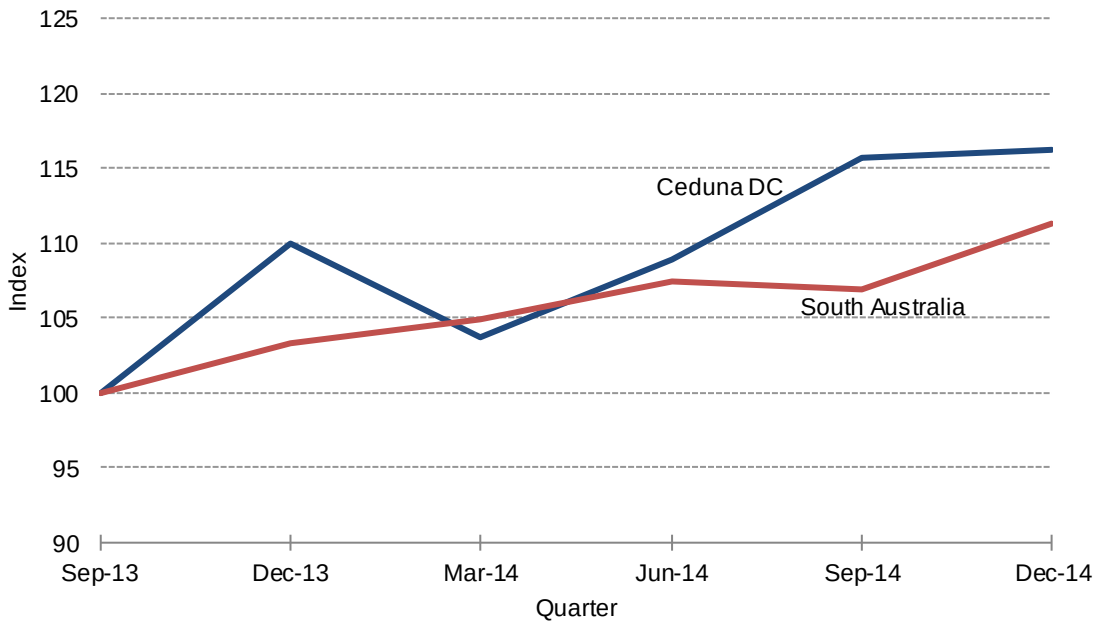



**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

### Newstart Allowance recipients

Government income support payments related to unemployment provide insights into labour market trends. Figure 5.5 shows the index for Newstart Allowance recipients for Ceduna DC and South Australia over six quarters to December 2014. As at the December 2014 quarter there were 222 persons in Ceduna DC receiving a Newstart Allowance, a small increase of 0.5 per cent – equivalent to just 1 additional recipient – over the September 2014 figure. It would be expected for the number persons receiving an unemployment government support benefit over the quarter to remain unchanged if the number of persons unemployed remains unchanged. The Newstart Allowance data is consistent with the smoothed Small Area Labour Markets (SALM) data which indicated that the level of unemployment remained stable in the December quarter 2014, i.e. the first quarter with SZs. However, the volatile unsmoothed SALM estimates did suggest a decline in unemployment for the December quarter 2014.

**Figure 5.5: Index of Newstart Allowance recipients**
**Ceduna DC and South Australia – Base: September Qtr 2013 = 100**




**Source:** data.gov.au - DSS Payment Demographic Data.

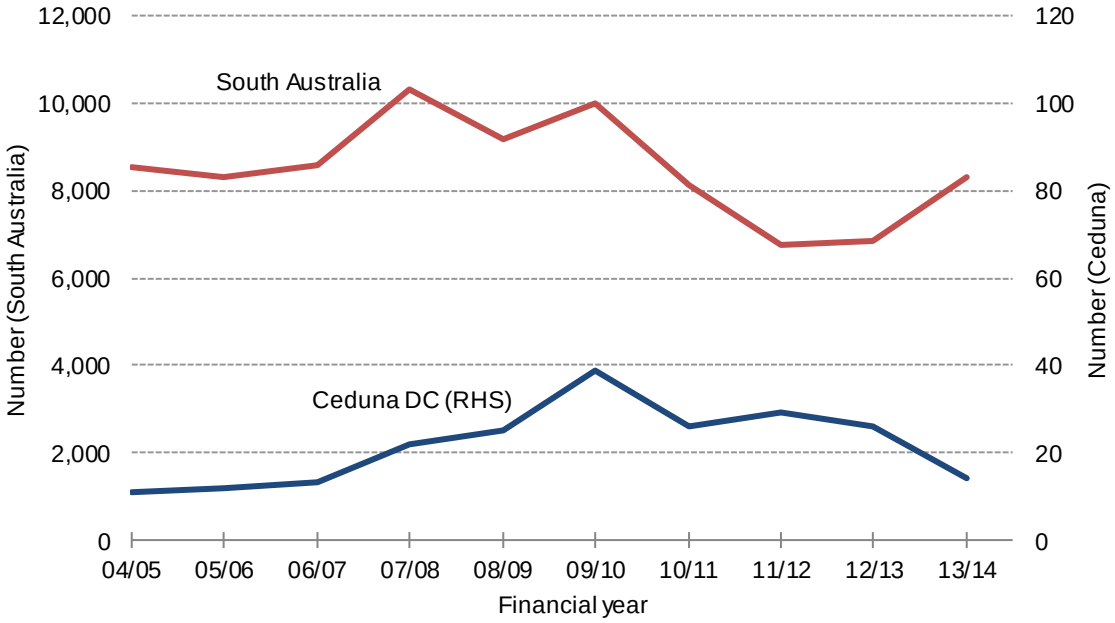
At the small area market level the proportional increase in the number of persons receiving Newstart Allowance in Ceduna DC for the December quarter 2014 was smaller compared with South Australia (1.7 per cent compared to 4.2 per cent). While the Newstart Allowance data suggest no significant initial impact on unemployment in Ceduna DC with the introduction of SZs, data for a longer time period are ideally required to gain insight into underlying trends.

## Building Approvals

Building approvals data, which are one of the higher quality sources of regional economic activity, were scheduled to be published for the first financial year with SZs (2014/15) just prior to delivery of the final RIAS. For baseline purposes recent trends in building approvals in the lead up to the introduction of SZs are briefly reviewed here.

Figure 5.6 shows the annual number of new home approvals for Ceduna DC and South Australia for the decade to 2013/14. The main point of difference to note is an upward surge in new housing approvals in South Australia in 2013/14 compared with a downturn in Ceduna DC. The relatively better performance for South Australian in 2013/14 may reflect some natural recovery as house approvals for the State fell more deeply relative to Ceduna in the post Global Financial Crisis period.

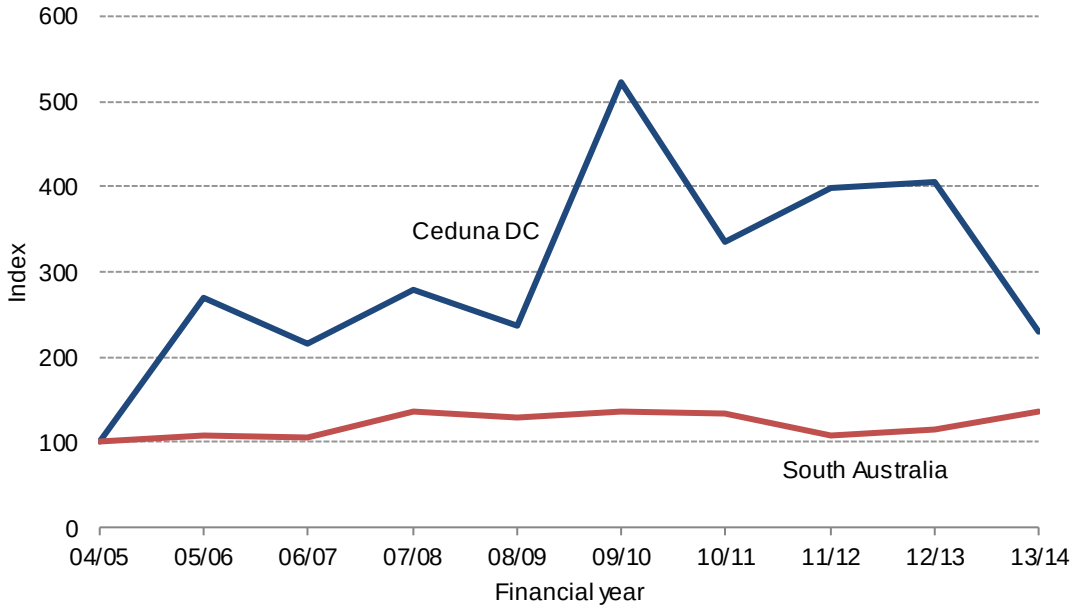
**Figure 5.6: New Houses**
**Ceduna DC and South Australia – Number**




**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

The value of residential building approved in Ceduna DC follows a similar pattern to the number of home approvals – refer to Figure 5.7. Total residential building approvals for Ceduna DC (new houses + new other residential building + alterations and additions) for 2013/14 were valued at $3.1 million, down 44 per cent from 2012/13. In comparison, the value of residential building approvals for South Australia rose by 20 per cent in 2013/14.

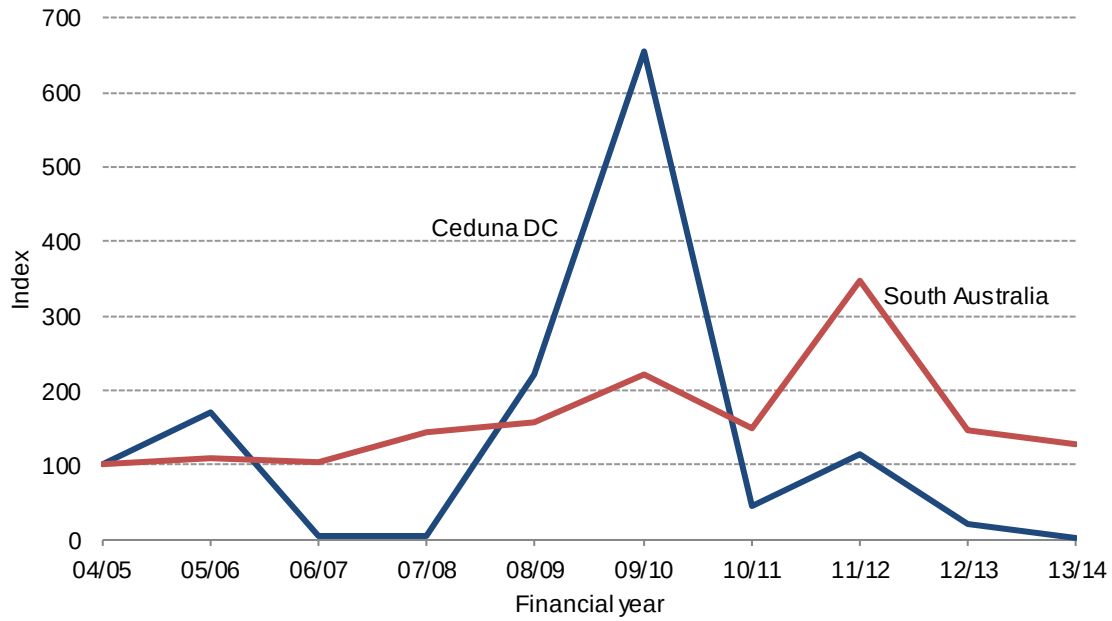
**Figure 5.7: Index of Value of Residential Building**
**Ceduna DC and South Australia – Base: 2004/05 = 100**




**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0.

As Figure 5.8 shows, approvals of non-residential building across Ceduna DC are more volatile compared with South Australia. Readers should keep in mind this type of volatility is a characteristic of smaller regional economies and sharp declines of approvals over the previous year does not imply there is an economic contraction. Non-residential building approvals in Ceduna DC for the 2013/14 financial year were valued at $0.06 million, the lowest value recorded over the past ten financial years and well below the 2012/13 figure of $932 million (down 81 per cent). In comparison, approvals of non-residential buildings for South Australia in 2013/14 were down 12 per cent.

**Figure 5.8: Index of Value of Non-residential Building**
**Ceduna DC and South Australia – Base: 2004-05 = 100**



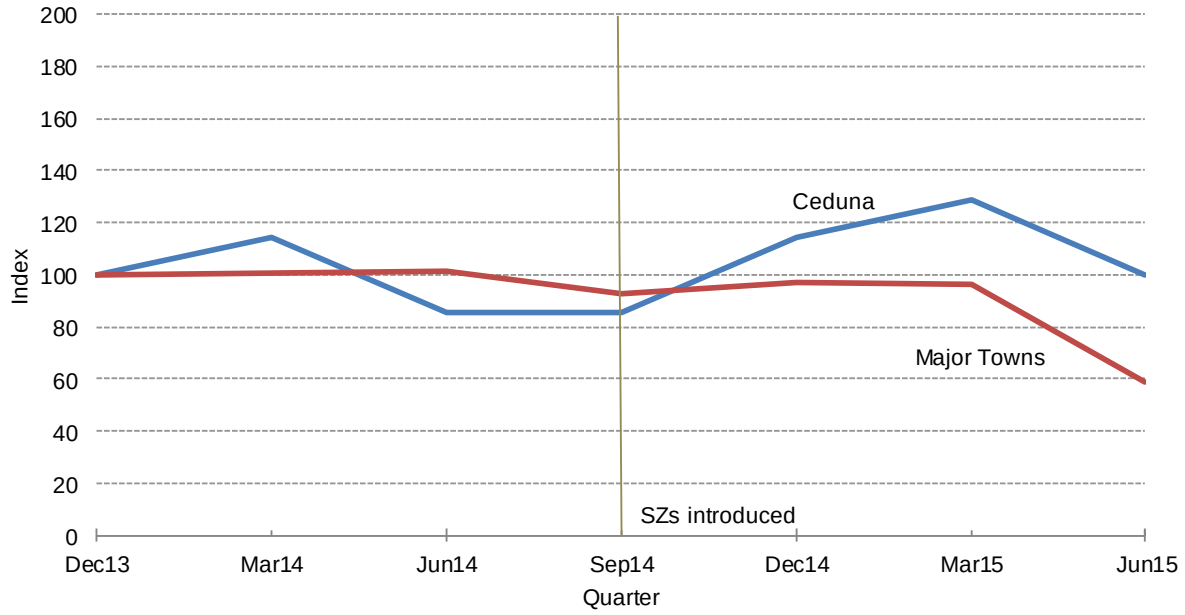

**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0.

## House Prices

The number of recent quarterly house sales for Ceduna DC and other major towns in South Australia are illustrated in Figure 5.9. The number of house sales in Ceduna rose solidly in each of the first two quarters under SZs, i.e. December quarter 2014 and March quarter 2015. However, the recent improvement was from a low base as house sales in Ceduna have steadily fallen over recent years. A total of 28 houses were sold in 2014, which is 44 per cent or 22 houses lower compared to total house sales in 2011 (in comparison, sales for major towns rose by 27 per cent over this period). As such, while total sales for the 6 months to March 2015 were up 13 per cent compared to the corresponding period a year earlier, this percentage increase represents only two houses.

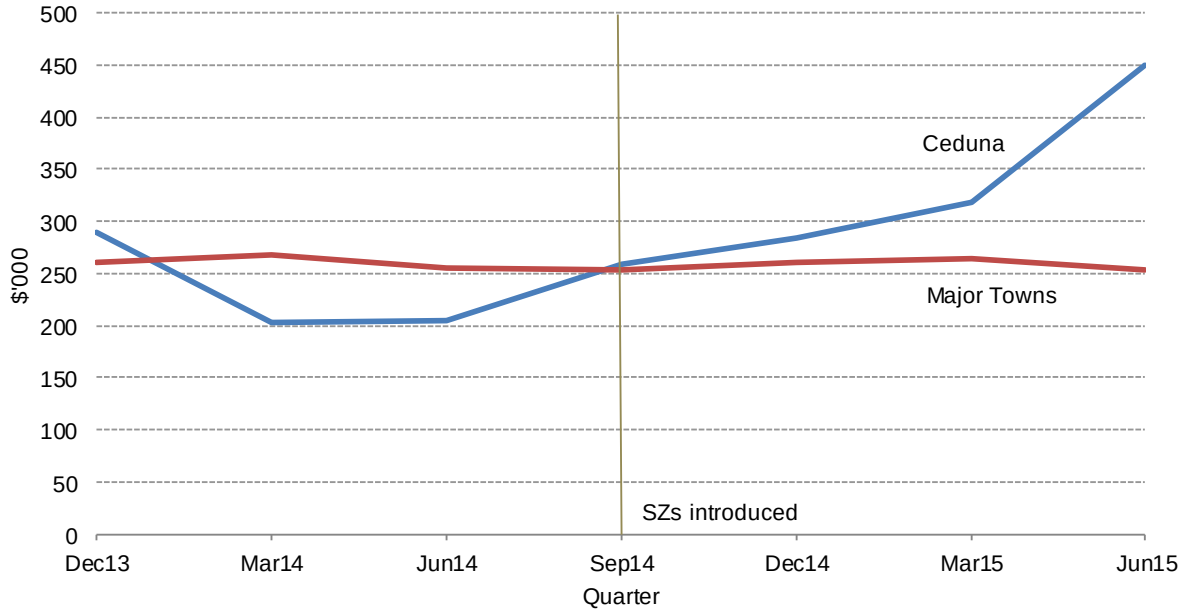
Trends in median house prices are probably a more relevant indicator of the potential economic impact of SZs as one would expect that house prices would decline in the event that economic conditions deteriorate in a region. In this respect the previous RIAS concluded that marine parks were unlikely to cause a decline in beachfront property prices given trends in property prices observed elsewhere in Australia where marine parks have been introduced (EconSearch 2012). Figure 5.10 shows that median house prices in Ceduna have risen steadily since the June quarter 2014 – i.e. several months before the introduction of SZs. The median house price in the June quarter 2015 was up 120 per cent compared to a year earlier, while the average house price was up 50 per cent. These price rises probably greatly overstate the underlying strength of the local housing market given the preliminary nature of the June quarter data and potential for changes in the composition of house sales in a relatively small housing market. Nonetheless, the available data does not indicate any negative impact on house prices associated with the introduction of SZs.

**Figure 5.9: Index of the Number of House Sales**
**Ceduna and Major Towns[(a)] – Base: December Qtr 2013 = 100**




**Note:** (a) Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

**Figure 5.10: Median House Prices**
**Ceduna and Major Towns[(a)] – $'000**




**Note:** (a) Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

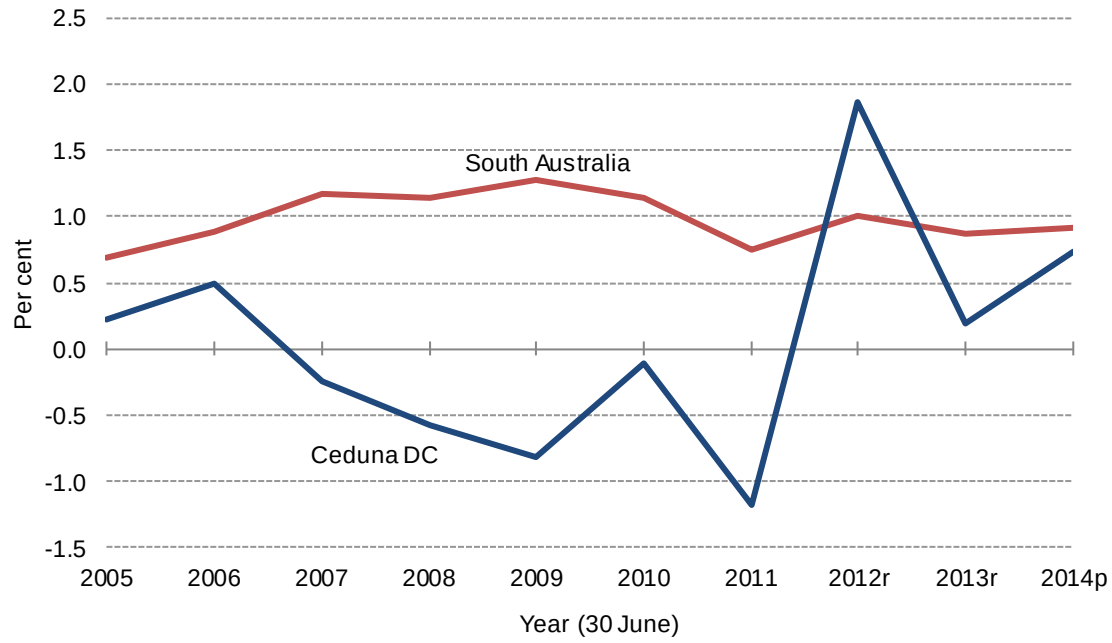
## Population Growth

Population trends have significant implications for economic activity, demand for services and infrastructure. Population estimates are only produced on an annual basis (for the 30th of June) and new population estimates for the post SZ period will not be available until 30 March 2016.

Ceduna DC's estimated resident population (ERP) at the end of 2013/14 was 0.7 per cent higher compared to a year earlier. This rise was marginally smaller that estimated growth in the total South Australian population over this period (0.9 per cent). As Figure 5.11 shows annual population growth in Ceduna DC has consistently been below South Australia's annual growth rate (except for 2011/12), is

more volatile and has experienced periods of decline over a prolonged period. It would be expected any adverse impacts from marine parks may cause some people to leave the area in search of new opportunities (a fall in ERP or weaker population growth) would show up in population statistics of later years.

**Figure 5.11: Population Growth**
**Ceduna DC and South Australia - Annual per cent change**



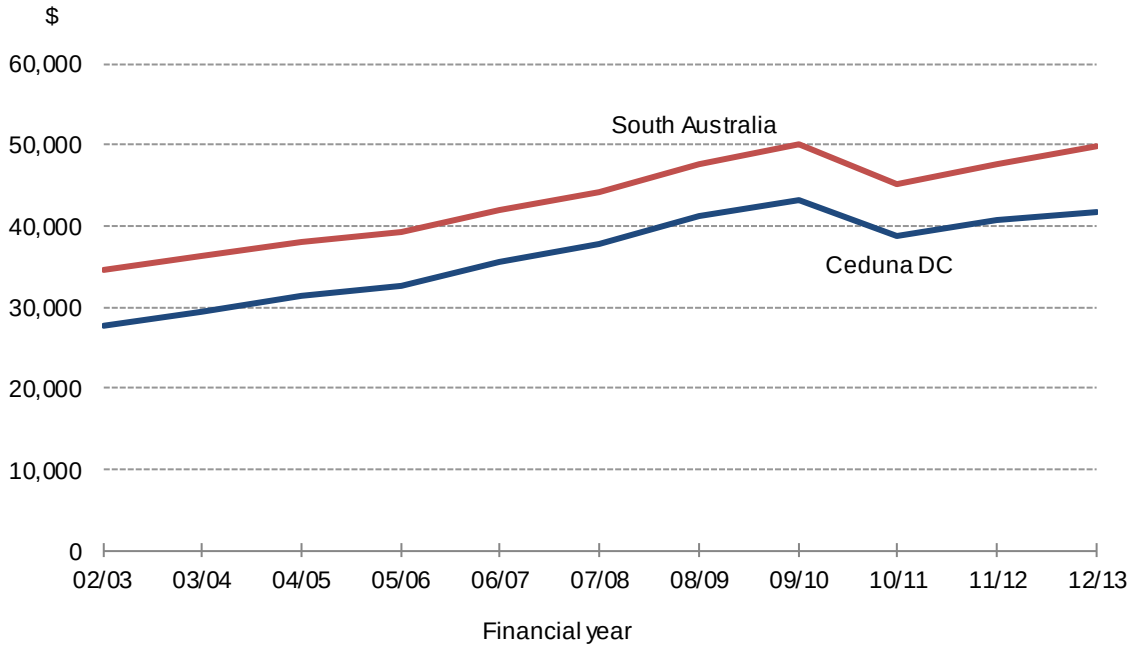

**Note:** r = revised, p = preliminary, see explanatory notes for further information regarding estimating resident population.
**Source:** ABS, Regional population growth, Australia, Table 4. Estimated Resident Population, Local Government Areas, South Australia, Cat no. 3218.0

## Wage and Salary Incomes

As previously mentioned Australian Taxation Office (ATO) taxation statistics for average incomes at a regional level outside Census data for the current financial year will not become available for a couple of years. In the absence of such data feedback from fishers must be relied upon (refer to section 5.4) as well as other indirect indicators to gain insight into potential impacts on average incomes.

Latest data indicate that the average annual salary or wage income for Ceduna DC was $41,664 in 2012/13. Average income for Ceduna was 16 per cent ($8,096) below the South Australian average annual income of $49,760. Historically, average incomes in Ceduna DC have been consistently lower than for South Australia – refer Figure 5.12. Despite this, they have closely tracked movements in average incomes for South Australia, including a fall in 2010/11 in response to the Global Financial Crisis (GFC). More recently, Ceduna recorded a smaller increase in average incomes in 2012/13 compared to the state (2.1 per cent compared to 4.7 per cent). Ceduna DC's lower annual salary and wage income compared with South Australia implies that residents in the former are likely to face greater difficulties adjusting and adapting to an economic downturn.

**Figure 5.12: Average Annual Salary or Wage Income Ceduna DC and South Australia – 2002/03 to 2012/13**




**Source:** Australian Taxation Office, Research and Statistics: https://www.ato.gov.au/About-ATO/Research-and-statistics/Taxation-statistics/

## Exports by Port

The Port of Thevenard is located in Ceduna DC, situated approximately 3km from the centre of Ceduna. Thevenard 392m long jetty is capable of handling bulk cargo and berthing ships 180m in length with a beam of 28m. Port operations are managed by Flinders Ports which record and track monthly bulk and break-bulk container cargo throughput by volume.[8] Major cargoes handled through the port are all bulk agricultural commodities and natural resources, i.e. grain, gypsum, mineral sands and salt – there are no major fishing or seafood exports handled through the port. Nonetheless, it is worth briefly considering trends in major commodities through the port as they may provide insight into local economic developments separate from SZs that may have an effect on other socio-economic indicators.

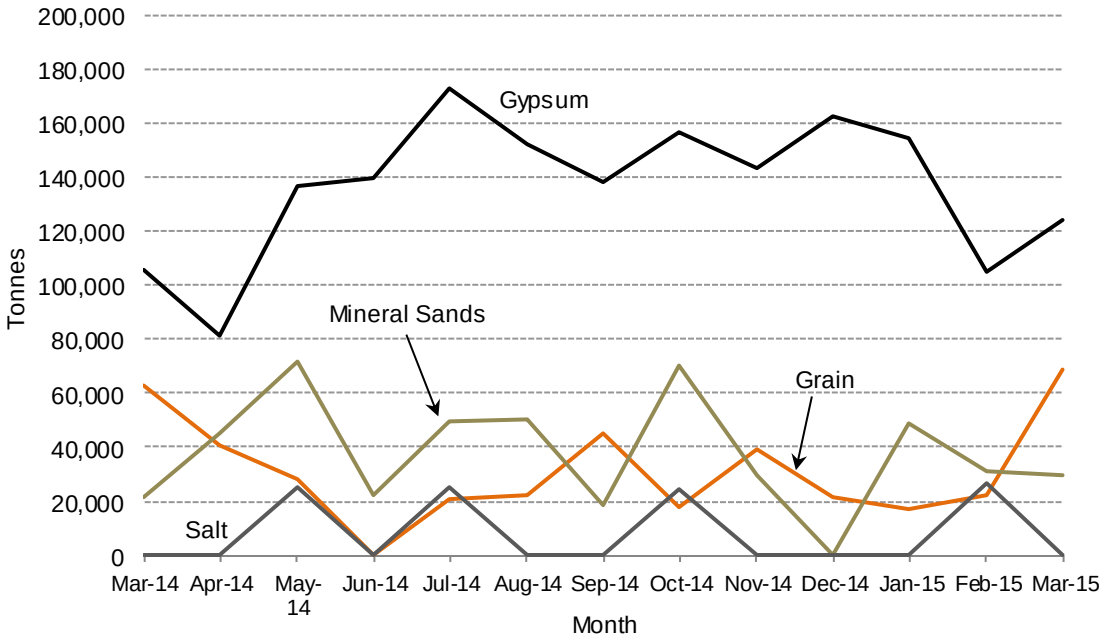
Figure 5.13 shows estimates of the volume of select bulk cargo exports through the Port of Thevenard for the 12 months to March 2015. Mining commodities in the form of gypsum and mineral sands are key sources of activity for the port. Grain is another key export commodity with exports tending to peak around the harvest period early in the calendar year. Allowing for such seasonal variations, there were no notable developments in export activity for the commodities during the period considered.

## Government Support Payments – Aged Pension Recipients

An index of the number of Aged Pension recipients for Ceduna DC and South Australia is shown in Figure 5.14. As at December 2014 quarter there were 370 persons in Ceduna DC receiving an aged pension, an increase of 7.9 per cent (an additional 27 recipients) over the December 2013 figure. By comparison the number of persons in receipt of the Aged Pension across South Australia rose by 2.8 per cent (an additional 5,676 recipients) over this period.

[8] Bulk cargo is shipped in loose condition and of a homogenous nature e.g., grains, coal, iron ore, etc., Break bulk cargoes are carried in ships which are shown on separate Bills of Lading which provide details of the shipped merchandise and gives title of the shipment to a specified party.

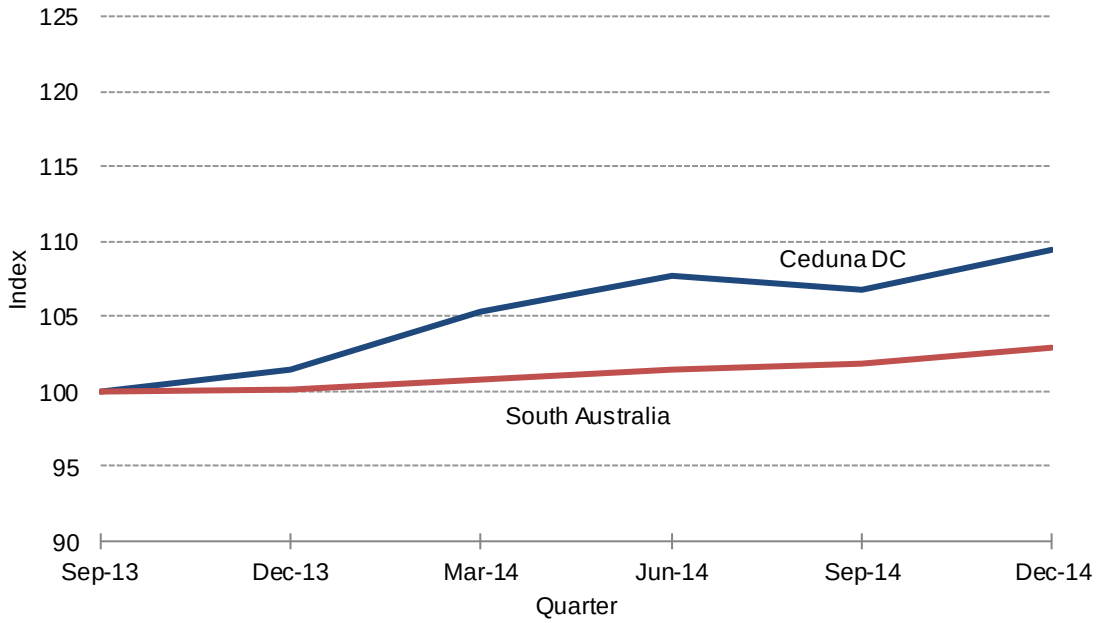
**Figure 5.13: Bulk Cargo Exports**
**Port Thevenard, Ceduna DC – monthly, tonnes**




**Source:** Flinders Ports, monthly trade statistics, weblink: http://www.flindersports.com.au/portstatistics2.html

Between the September and December quarters of 2014 the number of persons receiving an aged pension in Ceduna DC rose by 9 persons or 2.5 per cent. The comparable figure for South Australia was a rise of 1.0 per cent. Ceduna has exhibited a pattern of faster growth in the number of aged pension recipients over recent years (Figure 5.14). It is consequently difficult to separate this longer term trend from any impact from SZs in terms of encouraging retirement.

**Figure 5.14: Index of Aged Pension Recipients**
**Ceduna DC and South Australia – Base: September Qtr 2013 = 100**




**Source:** data.gov.au - DSS Payment Demographic Data

## Tourism

Data at the local government area level for the period after 1 October 2014 had not been published at the time of compiling the RIAS. The following analysis of tourism data is provided for baseline purposes but also to gain insight into the relative importance of tourism to the local economy.

In 2013 Ceduna DC had 61,800 visitors comprised primarily of 57,000 domestic overnight visitors and 4,800 international visitors (Table 5.3).[9] The number of international visitors to Ceduna in 2013 was equivalent to 1.3 per cent of total international visitors to South Australia. Meanwhile, Ceduna's share of total visitor nights stayed in South Australia by domestic residents was less than 1 per cent. Thus Ceduna accounts for a minimal share of tourism activity in South Australia. The relatively remote location of the region represents a significant barrier to growing tourism.

**Table 5.3: Tourist visitor expenditure and accommodation, Ceduna DC, 2013**

| Visitors to Ceduna DC[a] | International | Domestic overnight | Domestic day | Total |
|---|---|---|---|---|
| Visitors ('000) | 4.8 | 57.0 | np | np |
| Visitor nights ('000) | 11.4 | 158.7 | - | 170.1 |
| Average stay (nights) | 2.4 | 2.8 | - | 2.8 |
| Spend ($m) | 0.5 | 21.3 | np | np |
| Average spend per trip ($) | 107.1 | 373.5 | np | np |
| Average spend per night ($) | 45.0 | 134.0 | - | 128.1 |
| Average spend (commercial accommodation) per night ($) | 61.5 | 150.6 | - | 149.1 |
| **Reason (visitors '000)** | | | | |
| Holiday | 4.4 | 21.0 | np | np |
| Visit friends or relatives | np | np | np | np |
| Other | np | np | np | np |
| **Travel party (visitors '000)** | | | | |
| Unaccompanied | 2.2 | np | - | np |
| Couple | np | 18.5 | - | np |
| Friend/relatives travelling together | np | 20.3 | - | np |
| **Accommodation (nights '000)** | | | | |
| Hotel or similar | np | np | - | np |
| Home of friend or relative | np | np | - | np |
| Commercial camping/caravan park | np | np | - | np |
| Backpacker | np | np | - | np |
| Other accommodation | np | np | - | np |

**Note:** (a) Four year averages to 2013.
np = not published due to unreliable estimate.
- = not available.

**Source:** Tourism Research Australia, Tourism in Local Government Areas, 2013.

Domestic overnight visitors to Ceduna had a total expenditure of $21.3 million and international visitors had expenditure of $0.5 million in 2013, giving a total spend of $21.8 million in 2013. The estimated loss in annual expenditure of $155,000 per annum from reduced visitation from abalone fishers to the region as advised through the consultations (see section 5.4) is equivalent to 0.7 per cent of domestic overnight visitor expenditure. We believe that the advised loss is a significant overestimate and mostly driven by non-SZ related factors (refer section 5.2.1). Nonetheless, even if such a loss were realised it would not be considered significant from a broader regional economic perspective.

[9] Total tourist visitation is higher when domestic day visitors are included but the estimated figure for domestic day visitors to Ceduna DC is considered too unreliable to be published. Given Ceduna DC's remoteness and distance from major population centres it is likely the number of domestic day visitors is less than domestic overnight visitors as is the case for remote Local Government Areas located along the Nullarbor in Western Australia e.g., Kalgoorlie/Boulder.

The effect of the SZs on tourism expenditure depends on offsetting effects, including the extent to which individuals may be attracted by potential ecotourism experiences versus those that may be discouraged by reduced access to fishing locations. The latter will be most immediately felt while the former will take longer to emerge and are more highly uncertain, depending in part on potential ecosystem improvements facilitated by SZs that will take years to emerge.

There were five providers of hotels/motel/resort/guest accommodation services across Ceduna DC in the June quarter of 2014 (Table 5.4).

**Table 5.4: Tourist Accommodation: Hotels, Motels and Serviced Apartments Ceduna DC and South Australia – June quarter 2014**

| Accommodation statistics | Ceduna | South Australia |
|---|---|---|
| Establishments (no.) | 5 | 261 |
| Rooms (no.) | 197 | 12,766 |
| Bed spaces (no.) | 522 | 34,576 |
| Room nights occupied (no.) | 6,888 | 685,237 |
| Room nights available (no.) | 17,927 | 1,161,216 |
| Room occupancy rate (per cent) | 38 | 59 |
| Guest nights occupied (no.) | 9,502 | 1,089,360 |
| Guest nights available (per cent) | 47,502 | 3,145,196 |
| Bed occupancy rate (days) | 20 | 35 |
| Takings from accommodation ($) | 829,978 | 96,840,409 |
| Average takings per room night occupied ($) | 121 | 141 |
| Average takings per room night available ($) | 46 | 83 |

**Source:** Tourist Accommodation, South Australia, 2013-14, ABS Cat no. 8635.0.

As at 2013 there were 60 tourism related businesses operating in the Ceduna DC area, of which 43 employed more than one person (Table 5.5).

**Table 5.5: Tourism businesses, number, type, 2013**

| Category | Total |
|---|---|
| Non-employing | 17 |
| 1 to 4 employees | 16 |
| 5 to 19 employees | 21 |
| 20 or more employees | 6 |
| **Total** | **60** |

**Source:** Tourism Research Australia, Tourism in Local Government Areas, 2013.

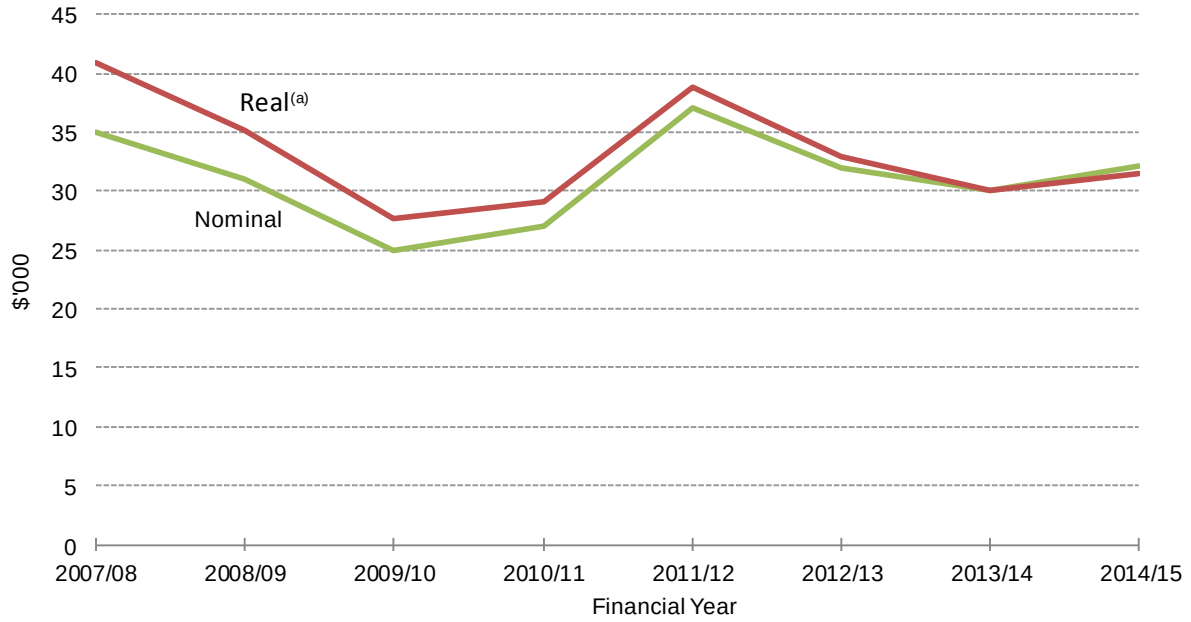
## Boat Ramp Fees and Usage

Vehicles launching from council boat ramps in Ceduna and at Thevenard are required to display a permit. Data on boat ramp fees is consequently a useful partial indicator of visitation to the region by commercial and recreational fishers, as well as other recreational and other users.

Figure 5.15 shows total boat ramp fees collected by the Ceduna council over the last 7 financial years in nominal and real terms. Total boat ramp fees rose by 5.2 per cent in real terms in 2014/15. This rise followed falls over the previous two financial years. Thus boat ramp fee data does not indicate any decline in activity at boat ramps in Ceduna since the introduction of SZs.

In considering the boat ramp fee data it is important to remember that it is not a perfect indicator of activity since it relates to fees rather than the number of launches or arrivals. Furthermore, recreational fishers can purchase permits for various time periods (e.g. daily, weekly, monthly etc.), and the extent to which fishers purchase permits for longer time periods (e.g. quarterly or annually rather than daily or weekly), then ramp fees will be less likely to be correlated with launch activity.

**Figure 5.15: Boat Ramp Fees by Financial Year**
**Ceduna DC – $'000**




**Note:** (a) Base year = 2013/14. Deflated by the Consumer Price Index (CPI) – weighted average for eight capital cities. CPI estimate for 2014/15 is based on the change in the average CPI for the first 3 quarters of the year relative to the corresponding period a year earlier.
**Source:** District Council of Ceduna, *Annual Report* (various) and unpublished data.

## 5.2 Commercial Fisheries

As part of management arrangements that are administered by SARDI, commercial fishers are required to record their catch and fishing effort in logbooks. Data is recorded for various spatial units which provide insight into regional trends in fishing effort and catch. In order to identify any developments in respect of commercial fishing since the introduction of SZs, data for spatial assessment units relevant to Ceduna was sourced from SARDI.

### 5.2.1 Abalone Fishery

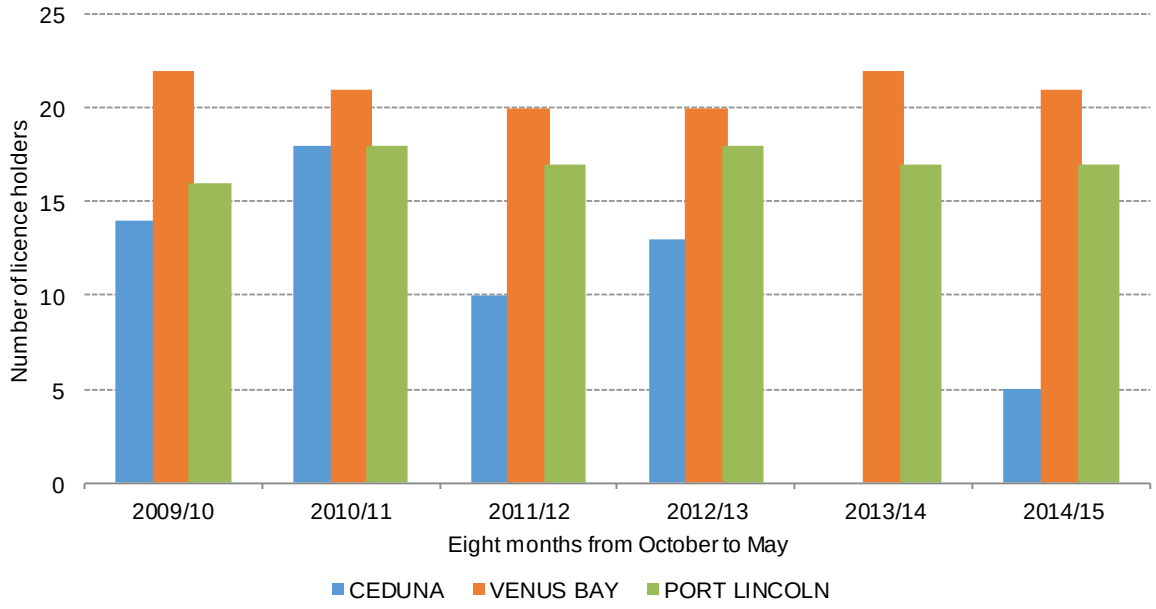
SARDI logbook data in relation to abalone catch and effort was requested in respect of the three Spatial Assessment Units (SAUs) that surround Ceduna and stretch all the way to the Western Australian border (i.e. Franklin Islands, North Nuyts Archipelago, South Nuyts Archipelago D'Entrecasteaux Reef) – refer Figure D.1 in Appendix D. Unfortunately a majority of the monthly catch data for the four SAUs was confidential due to the small number of fishers operating in these spatial areas. In fact, there was no non-confidentialised monthly data for the four units as a whole since March 2013. The lack of data in part reflects a low level of abalone fishing effort in the region. For instance, over the year to January 2015 there was no recorded effort across any of the four SAUs for 6 of the 12 months.

Data on abalone catch for the four months to January 2015 (the only data available for the period with SZs) for the four regions as a whole was also confidentialised. No catch and effort was recorded for the corresponding period in the previous two years which reflects that abalone is not usually fished in the summer period. Monthly data indicates that the only abalone fishing effort in respect of the most recent period was for Blacklip in December 2014 in the far western D'Entrecasteaux Reef spatial unit. Limited licence data for those fishers who signed a confidentiality release form indicates that only 2 days of effort were recorded in respect of D'Entrecasteaux Reef for December, resulting in a below average daily Blacklip catch.

Ports of landing data derived from the Catch Disposals Records data held by PIRSA provide an alternative and more up to date source of information on abalone catch in the region. Landing data for the eight month period from October to May inclusive over recent years by region for Western Zone abalone is presented in respect of the number of licence holders (Figure 5.16), number of landings

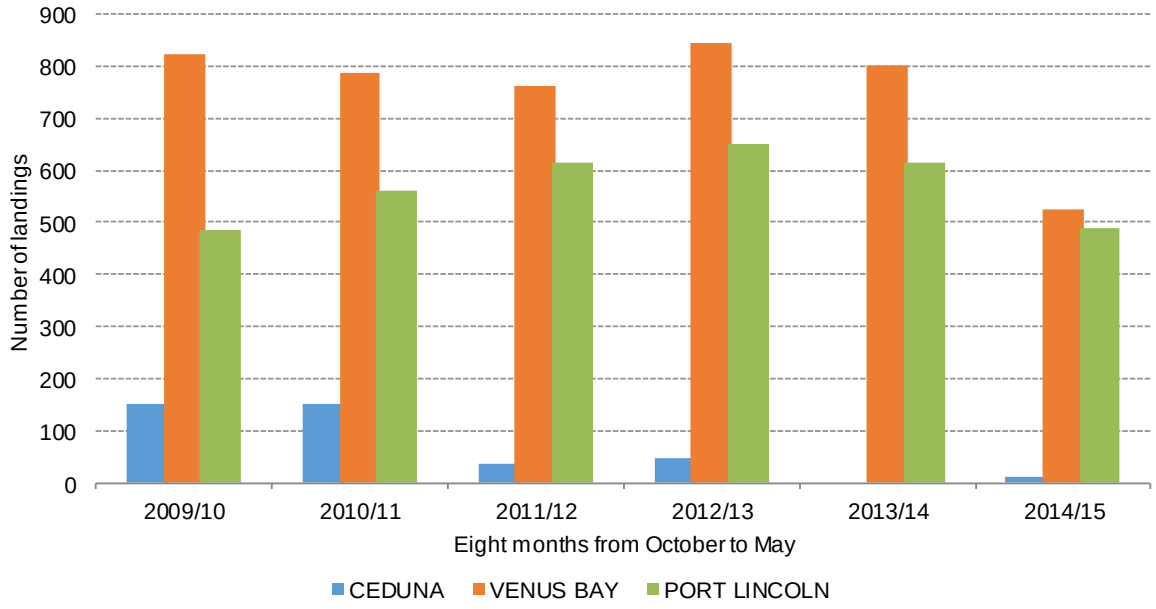
(Figure 5.17) and kilograms caught (Figure 5.18). The allocation of ports to regions is summarised in Appendix I.

**Figure 5.16: Catch Disposal Records: Number of Licence Holders Western Zone Abalone by Zone – 8 months to May[a]**



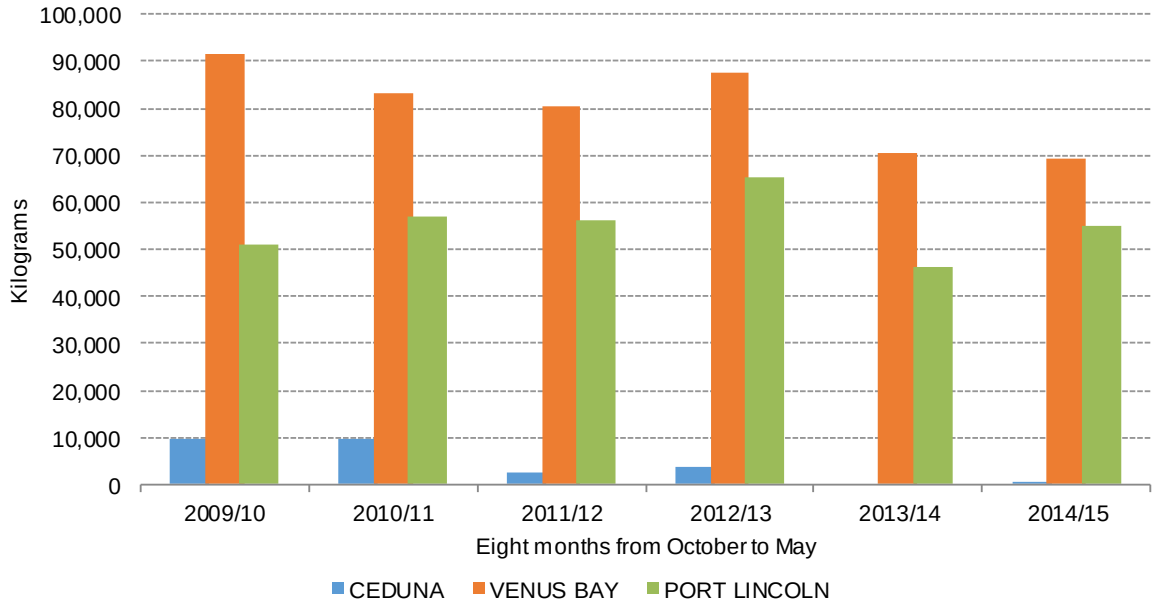

**Note:** a Data not shown for Ceduna in 2013/14 due to confidentiality restrictions.
**Source:** PIRSA, Catch Disposal Records, unpublished data.

**Figure 5.17: Catch Disposal Records: Number of Landings Western Zone Abalone by Zone – 8 months to May[a]**




**Note:** a Data not shown for Ceduna in 2013/14 due to confidentiality restrictions.
**Source:** PIRSA, Catch Disposal Records, unpublished data.

**Figure 5.18: Catch Disposal Records: Kilograms Caught Western Zone Abalone by Zone – 8 months to May[a]**




**Note:** a Data not shown for Ceduna in 2013/14 due to confidentiality restrictions.
**Source:** PIRSA, Catch Disposal Records, unpublished data.

The port of landing data indicates that a decline in abalone fishing activity in Ceduna predates the introduction of SZs. While 5 licence holders recorded landings at ports in Ceduna during the first eight months operating with SZs in 2014/15, data for the corresponding period a year earlier was not available due to less than 5 fishers reporting landings for the period. The earlier decline would reflect that the total allowable commercial catch (TACC) for the Western Zone abalone fishery has been steadily reduced over recent years as production has fallen back to long run average levels (for example, the combined greenlip and blacklip TACC for Region B was reduced from 13.8 tonnes in 2010 to 6.9 tonnes in 2012). Another factor contributing to the decline more recently is the merging of the two management zones for the Western Zone from 1 January 2014, which as expected has encouraged abalone fishers to shift activity to other regions. Moreover, prior to this management change the number of landings and catch for Ceduna showed some downward trend (Figure 5.17 and 5.18).

The other main observation from the port of landing data is that Ceduna accounts for only a small proportion of total abalone catch in the Western Zone. For those years considered in Figure 5.18 with the exception of 2013/14, ports in Ceduna accounted for only 3.7 per cent of abalone catch landed.

In summary, Ceduna has become a less significant area of operation for abalone fishers in the Western Zone over recent years. There has been some decline in abalone activity over recent years in response to management changes prior to the introduction of SZs. The recent decline follows a downward trend in catch and landings over previous years which suggest that other non-SZ factors are important.

### 5.2.2 Rock Lobster Fishery

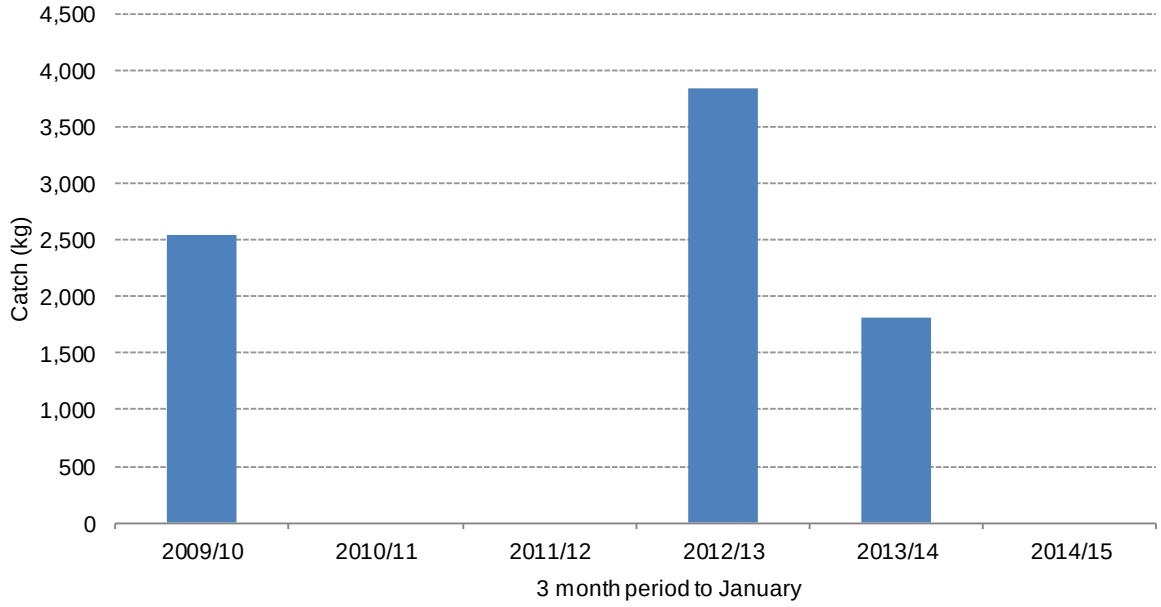
Rock lobster logbook data in respect of three MFAs that surround Ceduna (i.e. 7, 8 and 9) – refer to Figure D.2 in Appendix D – were supplied by SARDI.[10] As a majority of the recent data for these zones was confidential, it was not possible to gain any insight into developments since the introduction of SZs. The lack of available data points to limited activity in the region over recent years. Indeed, the most recent non-confidential data available for the 4 month period to May 2013 indicates that the three spatial areas accounted for 2.3 per cent of the total catch for the Northern Zone during this time.

10 Marine fishing areas are the spatial units used by SARDI to record catch and effort reported by commercial fishers in logbooks.

It is worth noting that no rock lobster fishing effort has been recorded in the MFA located immediately adjacent Ceduna (MFA 9) since 2004/05.

Some limited regional rock lobster PIRSA logbook data was made available through commercial fishers who signed a confidentiality release form. Figure 5.19 shows the total catch by weight for these fishers for the 3 month period to January for the 2014/15 and earlier seasons. No catch or effort was recorded in the 3 MFAs near Ceduna for the 3 months to January 2015. The absence of effort followed modest catches over the previous two financial years, while no catch or effort was recorded for the corresponding periods in 2010/11 and 2011/12, including for the seasons as a whole. These results indicate that rock lobster fishing effort in the region is naturally sporadic and relatively small (environmental data presented in Appendix F points to minimal reef habitat for rock lobster in the region). This historical pattern combined with the relatively small catch in the region emphasises the need for a longer period of data to assess commercial fishing impacts.

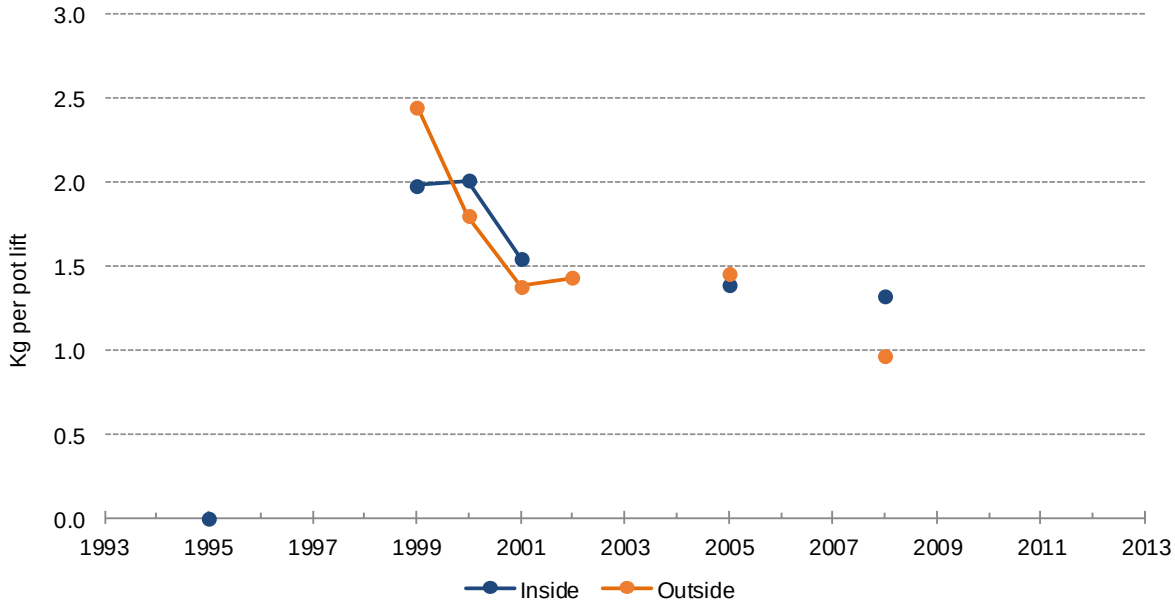
**Figure 5.19: Rock lobster Catch for Non-confidentialised Limited Licence Data MFAs 7,8 and 9 (West Coast) – 3 months to January**




**Source:** PIRSA, logbook catch and effort, unpublished data.

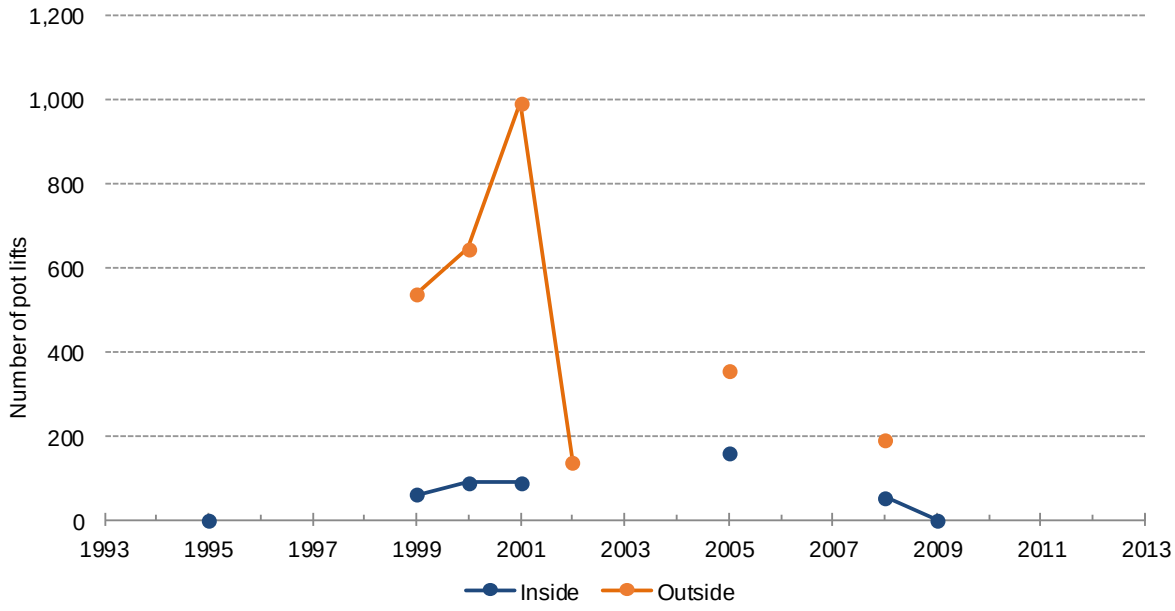
SARDI's rock lobster research pot program provides fine level spatial data that affords an opportunity to confidently assess catch and effort for SZs relative to non-SZ areas. There is only limited catch rate data available for those MFAs off Ceduna in the Nuyts marine park due to confidentiality restrictions. The available observations indicate that CPUE inside and outside SZs in Nuyts have generally been quite similar, indicating no significant difference in productivity between SZs and non-SZs (Figure 5.20). Only in 2008 was the CPUE higher inside SZs. As expected given the relatively small area covered by SZs, the research pot data indicates that the majority of fishing effort has been concentrated outside SZs (Figure 5.21). For the limited data available, the share of total pot lifts in the season attributable to SZs has ranged from a low of 8.3 per cent in 2001 to a high of 31 per cent in 2005. No pot lifts were recorded within SZs in 2009 – the most recent period for which non-confidential data was available.

**Figure 5.20: Rock Lobster Catch Per Unit Effort (kg per pot lift) Inside and Outside Sanctuary Zones Nuyts Marine Park (MFAs 7, 8 and 9) – Research Pots, Season[a]**




**Note:** a Data not shown for other years due to confidentiality restrictions.
**Source:** SARDI, unpublished data.

**Figure 5.21: Number of Pot Lifts Inside and Outside Sanctuary Zones Nuyts Marine Park (MFAs 7, 8 and 9) – Research Pots, Season[a]**




**Note:** a Data not shown for other years due to confidentiality restrictions.
**Source:** SARDI, unpublished data.

### 5.2.3 Marine Scalefish Fishery

Logbook catch and effort data in relation to 5 of the most common MSF species caught off Ceduna waters was provided by PIRSA in respect of Marine Fishing Areas 7, 8 and 9. Data in relation to the catch, effort and catch per unit effort for these species for the 4 months to January 2015 and corresponding period in earlier years are presented in Table 5.6.

**Table 5.6: Catch and Effort for Select MSF Species by Gear Type**
**MFAs 7, 8 and 9 (West Coast) – 4 month period beginning October[a]**

| Period (4 months beginning October) | King George Whiting Hand line | Snapper Hand line | Snapper Long line | Snapper Total | Calamari Targeted jig[b] | Bronze Whaler Long line | Gummy Shark Long line |
|---|---|---|---|---|---|---|---|
| **Catch (kg)** | | | | | | | |
| 2009/10 | 7,196 | 1,316 | 2,626 | 3,942 | conf. | 9,796 | 1,651 |
| 2010/11 | 10,375 | 448 | 3,759 | 4,207 | conf. | 6,235 | 3,539 |
| 2011/12 | 6,171 | 831 | 2,950 | 3,781 | 723 | conf. | 5,911 |
| 2012/13 | 7,854 | 600 | 2,124 | 2,724 | 101 | 2,963 | 6,761 |
| 2013/14 | 7,144 | 543 | 2,689 | 3,233 | 27 | conf. | 4,419 |
| 2014/15 | 9,635 | 413 | 2,357 | 2,770 | 172 | conf. | 3,553 |
| **Effort (days)** | | | | | | | |
| 2009/10 | 476 | 37 | 98 | 135 | conf. | 81 | 44 |
| 2010/11 | 714 | 28 | 78 | 106 | conf. | 46 | 65 |
| 2011/12 | 466 | 37 | 101 | 138 | 21 | conf. | 139 |
| 2012/13 | 527 | 34 | 83 | 117 | 11 | 37 | 187 |
| 2013/14 | 511 | 16 | 69 | 85 | 11 | conf. | 116 |
| 2014/15 | 657 | 24 | 75 | 99 | 27 | conf. | 113 |
| **CPUE (kg per day)** | | | | | | | |
| 2009/10 | 15.1 | 35.6 | 26.8 | 29.2 | conf. | 120.9 | 37.5 |
| 2010/11 | 14.5 | 16.0 | 48.2 | 39.7 | conf. | 135.5 | 54.4 |
| 2011/12 | 13.2 | 22.5 | 29.2 | 27.4 | 34.4 | conf. | 42.5 |
| 2012/13 | 14.9 | 17.6 | 25.6 | 23.3 | 9.2 | 80.1 | 36.2 |
| 2013/14 | 14.0 | 34.0 | 39.0 | 38.0 | 2.5 | conf. | 38.1 |
| 2014/15 | 14.7 | 17.2 | 31.4 | 28.0 | 6.4 | conf. | 31.4 |

**Note:** (a) Data relates to "targeted" fishing effort only, i.e. excludes any non-targeted catch in the region (e.g. due to by-catch).
(b) Refers to Marine Fishing Area 9 only.
.. Denotes no targeted effort.

**Source:** PIRSA, logbook catch and effort, unpublished data.

Catch of King George whiting was up strongly in the immediate SZ period. Total catch for the 4 months commencing October 2014 (9.6 tonnes) was 35 per cent higher compared to the corresponding period a year earlier. Catch for these months were actually at their highest level since 2010. The improvement in KGW catch for the immediate SZ period was driven by an increase in fishing effort (up 29 per cent), although there was also a modest improvement in catch per unit effort, from 14.0 to 14.7 kg per day. The vast majority of KGW catch is in MFA 9, the area immediately adjacent Ceduna.

In contrast, the combined targeted hand line and long line catch for snapper was down significantly in the immediate SZ period (-14 per cent) despite a significant increase in fishing effort (up 16 per cent). The decline in part appears to reflect a spike in yields in the 2013/14 period; CPUE in 2013/14 was significantly higher compared to the previous 2 years and the recent SZ period. Total snapper catch for the 2014 SZ period was actually marginally above the catch achieved in the corresponding period in 2012/13, while the CPUE was significantly higher (28.0 kg per day compared to 23.3 kg per day). Thus there have been significant shifts in CPUE for snapper for the 4 month period over recent years, which combined with the short period of available data makes it difficult to determine whether the most recent result reflects the impact of SZs or other seasonal factors.

Total catch for gummy shark in the initial SZ period was down 20 per cent compared to the previous year. The decline was mainly brought about by a decline in yield; CPUE fell from 38.1 kg per day in the 2013/14 period to 31.4 kg per day in 2014/15. In fact, the CPUE for the SZ period was the lowest for the period shown in Table 5.6. While the latter could signify a possible impact from SZs, data for a longer time period is required to properly assess the impact and account for other potential factors such as inter- and intra-annual variation.

The only other species for which non-confidential data was available was calamari targeted jig catch in respect of MFA 9. Summer catch for this species is very small and consequently highly variable. For example, while total catch for the first 4 months with SZs was more than five times higher than a year earlier, the catch was equivalent to only about one quarter of the catch recorded in the corresponding period in 2011.

The only other species for which there was targeted catch data was Bronze Whaler. Unfortunately total catch data for the SZ period was not available due to confidentiality restrictions, while none of these fishers signed the confidentiality waiver form that would have allowed SARDI to provide the data. The limited data available would suggest that catch has fallen over recent years given the higher catches recorded in 2009 and 2010 and increased frequency of confidential data more recently.

### 5.2.4 Charter Boat Fishery

No useable data in relation to charter boat overall catch and effort in respect of the 3 MFAs selected for Ceduna were available due to confidentiality restrictions. This outcome reflects that charter boat effort in the region is quite limited at present.

Partly owing to the limited charter boat effort in the region, the data for those charter boat fishers that signed the confidentiality release form indicates minimal activity. For the first 4 months with SZs there were no trips undertaken for this group, which compares with only 1 trip for the corresponding period in each of the previous two years. For the fisher(s) who made available their data, the MFAs selected for Ceduna were clearly not an important area of operation.

## 5.3 Evidence for Economic Impact

There are a number of limitations to assessing the impact of marine sanctuary zones on the value of catch by Ceduna based fishers, largely related to the short time period for which data is available since the introduction of the SZs and limitations in the catch data. For a full discussion, see section 3.4.

As value of landed catch data is not available on a regional basis, regional estimate have been imputed by combining regional catch data with state-wide average landed price for each fishery.

### *Landed catch – Ceduna*

Available data on the landed catch in Ceduna is quite limited due to confidentiality restrictions.

PIRSA port of landing data on the rock lobster catch in Ceduna is not available for this study due to confidentiality restrictions, and port of landing data for abalone is not available for the 2013/14 season. In the latter case, the catch for abalone is substantially lower in the period October 2014 to May 2015 than in the same period of 2012/13, however the fall in catch appears to have (at least largely) pre-dated the introduction of SZs with the number of license holders landing catch at Ceduna falling from 13 in 2012/13 to less than 5 in 2013/14. It is assumed that this fall relates to the merger of the two sub-zones of the western zone abalone fishery and recent reductions in TACC.

Data on the marine scalefish fishery (from SARDI, covering the period up to January 2015) has better availability, with catch data for at least some of the MFAs adjacent to Ceduna available for three of the four species for which price data is available (Table 5.7). It is important to note that as the analysis is based on MFAs it will be an imperfect guide as to regional impacts, as fishing in a MFA is not restricted to boats operating out of the nearest region. For example, some of the catch in MFAs 7, 8 and 9 is likely to be from boats based in other regions such as the Eyre Peninsula. Confidentiality restrictions also mean that for some scalefish catch data may only reflect one or two of the possible catch techniques (e.g. data for King George Whiting for Kangaroo Island only includes catch by targeted handline). Whether this will result in changes being under- or over-estimated is not known.

These data show significant increases in catch for King George Whiting and southern calamari (albeit off a low base in in 2013/14 for calamari) and a fall in catch for snapper.

**Table 5.7: Landed catch MFAs adjacent to Ceduna, October to January, 2012/13 to 2014/15**

| | 2012/13 (kg) | 2013/14 (kg) | 2014/15 (kg) | Change 2013/14 to 2014/15 No. | Per cent |
|---|---|---|---|---|---|
| Garfish - MFAs 7,8 & 9 | n/a | n/a | n/a | | |
| King George Whiting - MFAs 7,8 & 9[(a)] | 7,854.0 | 7,144.0 | 9,634.0 | 2,491.0 | 34.9 |
| Snapper - MFAs 7,8 & 9 | 2,723.8 | 3,232.7 | 2,769.8 | -462.9 | -14.3 |
| Southern calamari - MFA 9 only[(a)] | 101.0 | 27.0 | 172.0 | 145.0 | 537.0 |

**Note:** (a) Targeted handline only.
**Source:** SARDI.

### *Landed value of catch*

Data on the total monthly landed value of catch for key fisheries is available from PIRSA/SARDI. As with other SARDI data, this was only available up to January 2015 for this study. Estimates of average prices received have been calculated by dividing the value of landed catch by the volume of catch for that period.

The weighted average landed price of rock lobster was over 16 per cent higher in the period October to January 2014/15 compared to the same period in the previous year. The timing of the SARDI data may mean that the average value of catch for the season is slightly overstated as prices in January tend to be higher than in other months and January prices will have a higher weight in data from October to January than in November to May. However as this difference appears relatively consistent between years this should not distort the year to year comparisons too much.

Average landed prices for blacklip abalone were broadly stable in the period October 2014 to January 2015 compared to the same period in the previous financial year, as were prices for King George Whiting and snapper. The average landed prices for Garfish were higher in the period October 2014 to

January 2015 than over the same time period in the previous year. The average price of southern calamari was down over this period compared to the previous year.

The net impact of the changes and price and quantity for the West Coast (excluding Rock Lobster and Abalone, for which data was not available) was an increase in the value of catch of over $50,000 for the period October to January 2014/15 compared to the same period in the previous year. This increase was driven by the strong increase in the value of the King George whiting catch (Table 5.8).

**Table 5.8: Value of landed catch, Ceduna, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| Rock lobster | CONF | CONF | n/a | n/a |
| Abalone | CONF | 19.8 | n/a | n/a |
| King George Whiting | 151.8 | 206.5 | 54.6 | 36.0 |
| Snapper | 29.1 | 25.2 | -3.9 | -13.3 |
| Southern Calamari | 0.3 | 1.8 | 1.5 | 480.5 |
| Total[(a)] | 181.2 | 233.5 | 52.3 | 28.8 |

**Note:** (a) Abalone is excluded from the total for 2014/15 as data is not available for the abalone fishery for 2013/14.
**Source:** SARDI, PIRSA.

## 5.4 Consultations

The Executive Director of SACES visited the communities of Ceduna, Streaky Bay, Elliston and Port Lincoln from 23rd to 25th March 2015 to discuss marine parks and SZs. Meetings were held with elected members and office holders of the councils of Ceduna and Port Lincoln, local business people including fishing/boat hire, tourism and eco-tourism, commercial fishing, accommodation, retail and professional business services. Written submissions were also received from the District Council of Ceduna and Regional Development Australia Whyalla and Eyre Peninsula Inc. (i.e. the regional economic development board).

### Discussion

Perceived impact to date on industry sectors is variable depending on who one talks to. This only reinforces the need for hard data to assess the effectiveness of the policy over time.

The boat charter/fishing charter sector provided evidence of a decline in patronage with one Ceduna operator indicating a decline in charter operations from 192 (in 2007, well before the current policy) to 24 by June 2014. In addition fuel costs as a principal operating cost had increased due to having to travel further off-shore. On the other hand the eco-tourism boat experience has continued to grow at about 40 per cent year-on-year for a decade with a strong trend underpinning eco-tourism which, it was felt, marine parks will add further support to (Port Lincoln stakeholders). Marine parks are not the catalyst for growth but it is felt that they will provide further support to growth provided the marketing of the parks reinforces tourism and other features of the region.

It was felt that tourism activity had suffered in the short term due to reduced visitation by recreational anglers. The local mayor advised that "as a consequence of some negative perceptions of marine park SZs these numbers have reduced to an unknown extent". The Council was trying to offset this loss through starting a native species wildlife park within the township.

Professional fishers and others say they have witnessed some displacement effects whereby long-line fishers/trawlers from Kangaroo Island, Spencer Gulf and Port Lincoln are travelling up to Ceduna whereas previously they did not do so. The argument is that the resource is under greater pressure than before SZs. Displacement effects were reported by the abalone industry who no longer travel as a

group, for a stay of one to two weeks to dive at Ceduna. Suppliers of provisions, fuel and the local caravan park all confirmed the loss of sales/patronage.

The District Council of Ceduna advised that "as a consequence of the new SZs at the St. Francis Isles and the Nuyts group the abalone fishers no longer have a western zone quota and no longer need to come to Ceduna" (A Suter 2015, *pers. comm.*, 5 February). The loss was estimated at $154,000 per annum based on 22 quota holdings at $7,000 per visit. SACES notes that any reduction in abalone fishers coming to Ceduna would in part reflect other related fishery management changes related to SZs. The Western Zone abalone fishery was previously separated into two zones (A and B). From 1st January 2014 the two regions were merged into one, providing abalone fishers in the broader region with increased flexibility in terms of adapting to the loss of fishing grounds with the introduction of SZs. Moreover, as discussed in section 5.2.1, TACC for the region has been reduced over recent years prior to the introduction of SZs.

One potential implication here is that abalone industry suggested that the new exclusion zones effectively provided opportunities for abalone poachers and for rock lobster poachers where it was no longer viable to "work up the coast", due to no go zones, so that some areas were unprotected and unsupervised.

In late May 2015 one marine scalefish fisher advised that the harm done to their catch by species as a consequence of SZs ranged from a loss of 20 per cent (shark species) to 65 per cent (Wrasse, jackets and sweep). The reductions were largely attributable to the St. Francis SZ which "represents a very small percentage of the block in area but includes most of the fishing area within this block". The approach of calculating the catch displaced by the SZs was considered to be deeply "flawed".

There was no evidence provided of any sector making new or additional investments in any activity as a result of SZs or marine parks more broadly.

We are uncertain as to the full story – that planned investment by the trawler industry to enable unloading at the Port of Thevenard has been put on hold, that the port is at full operating capacity loading gypsum and salt, that as trawlers could not unload at Thevenard they now travel to Port Adelaide. We are aware that the local RDA has been working with the industry to develop an off-loading facility at Thevenard. Council advised that "after the new zoning the number of operators able to commit to using the Port of Thevenard and thus amount that Council can sustainably borrow has reduced to a level which leaves a $3 million deficit" (A Suter 2015, *pers. comm.*, 5 February). It was felt that without any financial assistance from the State Government the proposed facility would be unlikely to proceed, leading to the loss of potential and existing economic benefits.

The abalone industry has reduced from 23 to 22 licence holders. The reduction in catch has reduced exports to USA but overall there has been minor impact on the processing industry, exports and employment. The direct impacts on each of the 22 licence holders has been mitigated to an extent by the buy-out of this one licence.

The question was put – is there likely to be more pressure on fish stock in non-SZs. In short the answer was yes, with current displacement effects observed for trawlers and abalone/rock lobster although all agree that protecting breeding areas is a good thing to do representing an investment in the future. However, there is a strong view that regulation was already in place with:

a) restricted number of licence holders;

b) quota allocation; plus

c) self-regulation/observance of sustainable practices,

so on balance some suggest that not much will change with the introduction of marine parks and SZs. There were clear statements in all locations visited that expert local knowledge was not taken into

account in the discussions and ultimate policy settings of marine parks SZs and this is a major source of dissatisfaction with the process and the ultimate decision.

This is an important perspective which is shared not just within the fishing industry/diving industry but by a wide range of other stakeholders. That is to say, the previous system of industry management (and self-regulation) plus licencing and quotas was not proven to have failed and there is a view that there has been far too much politicisation and legislation for so little that has been achieved in regard to SZs and marine parks. There is a perception that the marine park issue has been seen as keeping people out rather than management and engagement of marine parks.

The abalone industry reiterated the case of Ceduna which was a protected area, subject to licence and quotas which has been taken out of available areas "effectively opening up the whole coastline to poachers rather than people who cared for the area".

The charter fishing industry is a 'potential loser' – it cannot fish in some traditional areas and will have to travel further out to sea, resulting in high operating costs; there are some who have lost money on purchase of charter business that are now in decline and where the cost of the fishing licence does not reflect prospective earning capacity. The eco-tourism sector of the charter boat industry is expected to continue to grow.

DEWNR have had marine scientists/researchers taking baseline mapping of stock, representative samples of breeding zones to enable comparisons over time, within 'no take zones' and 'take zones'. Local DEWNR staff felt that there had been little local negative feedback.

As a consequence of the impact of the SZs the District Council of Ceduna advised that "lending institutions which used to accept fishing licenses as a form of security will no longer do so" (A Suter 2015, *pers. comm.*, 5 February). There was a concern that this effect would deter new entrants from entering the industry while reductions in the value of fishery licences would have a negative impact on the superannuation of retiring fishers. In its written submission, RDA Whyalla & Eyre Peninsula Inc. advised that the commercial value of fishing licences had "declined by an estimated 40%". However, there had been very few sales due largely "to uncertainties about the future commercial sustainability of fishing enterprises".

RDA Whyalla & Eyre Peninsula Inc. identified various concerns in respect of the buyout of commercial fisher licences. For instance, the rock lobster industry was concerned that the initial voluntary amount was insufficient and that "vendors received market price only and no compensation for business closure". For commercial fishers remaining in the industry there were concerns about the potential impact on licence fees. As PIRSA is required to cover its management costs from licence fees, a reduction in the number of fishers would lead to an increase in licence fees for remaining licence holders.

**Summary of issues**

- respondents felt there is confusion within the general public about whether you can fish in a marine park and that this is having an adverse impact on tourism, accommodation, recreational side of fishing;
- much stronger marketing of marine parks, the benefits of tourism and the potential to link to other features of the region was supported including that this would help address "negative perceptions";
- some respondents indicated that DEWNR had not gone to GPS producers and provided co-ordinates, others suggested it took a considerable time to get co-ordinates, still others said the data had been provided (including by mobile phone app) so it appears there is a degree of

confusion among fishers on what DEWNR has actually done. We note that DEWNR has made maps and coordinates in respect of the marine parks available online in various formats;[11]

- Victoria is said to have marine parks which are the actual SZ without large buffer zone. Comment stemmed from the point that each State is responsible for the marine coast out to three nautical miles, Commonwealth for next 200 nautical miles with point being, was it possible to have better harmonisation?
- there is a strong feeling that the commercial fishing industry had set in place self-regulation to achieve a sustainable industry over the last 30 years and this has not been given due recognition in the debate on marine parks;
- a general concern about the possibility for poachers in the "no catch zones" which may warrant a response;
- far too much activity (discussion/legislation) for so little that has been achieved. The system of licensing and quotas was effective, much more so than marine parks;
- it will be essential to the evaluation to obtain the best quantitative data possible in the time available, particularly on abalone catch, rock lobster and non-tuna fishing as little in the way of data was provided to SACES; and
- most discussants considered the evaluation should at least extend out to a full year to properly be able to assess impacts of the new SZs.

## 5.5 Environmental Impact

SZs provide protection for habitats that in turn support various species and ecosystems. Maintenance of these habitats is expected to have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). Such benefits may include changes in the size and/or abundance of particular species. It is too early for any measurable ecological changes to have occurred within SZs of the Nuyts Archipelago Marine Park (NAMP) since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program together with preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Ceduna region are presented in Appendix F.

[11] See www.environment.sa.gov.au/marineparks/maps-and-coordinates

# 6. Kangaroo Island

The following section examines various economic and social indicators for Kangaroo Island District Council to gain insight into the potential short term economic and social impact of SZs. In some cases data sources are not yet available for the post SZ period and are consequently presented for baseline purposes to assist any future analysis. Initial catch and effort data for relevant commercial marine fisheries surrounding Kangaroo Island are also considered.

### Summary – Kangaroo Island

- The small population of Kangaroo Island DC, relative lower average income and relatively greater isolation due to its separation from the mainland would generally make the region more susceptible to economic, social or environmental shocks.
- The Kangaroo Island economy is heavily geared toward primary industries, particularly agriculture, and is characterised by small operators
- Approximately 1 per cent of the working population were employed in industry sectors that could be potentially affected by SZs.
- Unemployment has risen since 1 October 2014 with Small Area Labour Markets (SALM) data indicating a significant increase in unemployment since the September quarter 2014. However, the SALM data is inherently volatile and more quarterly data are ideally required to confirm if the increase in unemployment has been sustained. Nonetheless, the data is consistent with feedback received during the consultations indicating a loss of jobs, appears broadly in line with previous economic estimates of the economic impact of SZs, while broader economic weakness would also be a driving factor as evidenced by the deterioration in state labour market conditions in 2015.
- There appears to be no significant change in median house prices for Kangaroo Island since the introduction of SZs. While house sales have shown some decline, this may reflects sales returning to more sustainable levels after sales spiked in the lead up to the introduction of SZs.
- Kangaroo Island DC is a significant tourism destination for international visitors to South Australia with the region accounting for approximately 9 per cent of international visitors over the 4 years to 2013. The region has some comparative advantage in terms of established tourism infrastructure to take advantage of any future increase in tourism associated with SZs. However, exploiting such potential benefits may require investments into complementary infrastructure (e.g. access roads, mobile communications, boat ramps etc.) to fully exploit them.
- SeaLink advised no noticeable effects had been noticed on its ferry services or on passenger numbers for coach tours since the introduction of SZs.
- Data for abalone commercial fishers was not available due to confidentiality restrictions. For those commercial fishers that released their data from confidentiality restrictions, total abalone catch for the first 4 months under SZs was down 14 per cent compared to the corresponding period a year earlier, but up strongly compared to catch in 2011 and 2012 (due to increased effort). There was a very large decline in catch of blacklip (down 71 per cent) due to a substantial decline in effort, whereas there was a solid increase in greenlip catch (up 14 per cent). Catch rates for both species showed no adverse effects for the initial period with SZs. However, given the short period covered by the data, limited number of licences represented and potential for natural temporal and spatial variation, it is not possible to draw conclusions regarding the impact of SZs on abalone fishers to date.
- PIRSA logbook data indicates that total rock lobster catch off Kangaroo Island for the first 3 months of the first season with SZs was 6.7 per cent higher compared to a year earlier. The improvement was brought about by an increase in effort (up 2.4 per cent in terms of pot lifts) and catch rate (up 4.2 per cent). More up to date port of landing data from PIRSA indicates that there was no change in the number of licence holders landing at Kangaroo Island ports for the first whole season operating with SZs compared to a year earlier. There was also no change in the number of landings while the catch landed was 7.7 per cent higher.
- SARDI research pot data indicates that rock lobster catch rates inside and outside SZs have closely tracked one another over the past two decades, indicating that productivity for SZs as a whole was no different than for non-SZ areas. This data consequently does not support the view made by some rock lobster fishers that SZs are more productive than non-SZ areas.
- Analysis of impacts on the marine scalefish fishery was significantly curtailed by the high degree of confidentiality in the data supplied. Sector level data was only available for targeted handline King George whiting catch and targeted jig calamari catch. Catch for both species for the first 4 months with SZs was up compared to the corresponding period a year earlier (by 2.1 per cent and 1.2 per cent respectively). These

increases were driven by increases in effort with catch rates falling slightly. While the latter could be interpreted as suggesting that SZs have pushed fishers into less productive areas, catch rates were normal by recent historical standards.

- In contrast, those marine scalefish fishers that waivered confidentiality reported declines in catch of King George whiting and calamari. That these fishers reported opposite experiences to the broader sectoral trends suggests some selection bias for the de-confidentialised data towards fishers who have experienced most difficulty. These fishers also reported a large decline in catch of Australian salmon although similarly low catches have been recorded in earlier years. On the other hand, the fishers reported small increases in catch of snapper and garfish and a large rise in hauling net catch of Australian herring.
- The main concern identified during community consultations related to the impact of Bay of Shoals SZ on a couple net fishers located at Kingscote. They advised their ability to shift effort to other regions of Kangaroo Island was curtailed by rougher conditions and a lack of accessibility. It was advised that a reduction in catch by these fishers was a factor, among others such as health and lifestyle factors, contributing to the decision of a local seafood takeaway store to shut down their retail operation and focus on their wholesale operation. Unfortunately, without access to catch data for the MSF net fishers due to confidentiality restrictions we are unable to independently verify the extent to which the Bay of Shoals SZ may have contributed to a reduction in MSF catch and thus closure of the retail operation.
- Charter boat effort around Kangaroo Island under the first four months with SZs was down 4.9 per cent relative to the corresponding period the previous year in terms of trips undertaken. In contrast, there was an improvement in catch with the total number of fish retained up 6.3 per cent. The decline in effort appears to be broadly in line with the estimated amount of charter boat fishery effort displaced by SZs and which was removed through the buyback scheme.
- Based on the limited data available, the estimated value of combined catch landed for rock lobster, abalone, King George whiting and southern calamari for the four month period October to January 2014/15 was up strongly relative to the corresponding period a year earlier due to a very large (almost $1.6 million) increase in the estimated value of rock lobster.
- Local fishers consulted expressed similar concerns to those from other regions, such as equity implications due to increases in licence fees with a reduced number of fishers; potential under-estimation of displaced catch; safety concerns with operating in more exposed areas more often; and local knowledge not being reflected more greatly in final zoning.

## 6.1 Socio-economic Indicators

### 6.1.1 Socio-economic Profile

Key socio-economic indicators for Kangaroo Island DC are summarised in Table 6.1.

As at 30 June 2014 the estimated resident population of Kangaroo Island was 4,583 persons (preliminary estimate). Thus the island has a relatively small population, which may make the community more susceptible to economic, social or environmental shocks. Such susceptibility would be accentuated by the relatively greater isolation of the island given its separation from the mainland.

Kingscote, located in the north east of Kangaroo Island, is the main township on the island. It accounted for approximately 40 per cent of the island's population at the 2011 Census. Other key localities include Penneshaw (6.2 per cent) and American River (4.9 per cent).

Although Kangaroo Island has a similar youth dependency ratio compared to the state as a whole (17.9 per cent compared to 17.7 per cent), its aged dependency ratio is relatively higher (19.7 per cent c.f. 16.7 per cent). As a consequence the total dependency ratio for Kangaroo island in 2013 (38 per cent) was higher compared to South Australia as a whole (34 per cent).

Looking more closely at the working age population, Kangaroo Island has significantly lower representation among younger adult age groups. For instance, persons aged 15 to 34 years accounted for 18 per cent of the Kangaroo Island population in 2011 compared to 26 per cent of the total South Australian population. This outcome is typical of regional populations as further education and employment opportunities encourage younger adults to migrate to metropolitan areas.

Turning to the labour force, the unemployment rate for Kangaroo Island was relatively lower compared to South Australia in the March quarter 2015 (5.3 per cent c.f. 6.7 per cent). While at first glance a lower unemployment rate may suggest a relatively healthy labour market in Kangaroo Island, it could reflect that more mobile younger adults have migrated to other regions such as Adelaide to seek employment opportunities. However, the unemployment rate for Kangaroo Island was also relatively lower compared to the non-metropolitan average for South Australia (6.8 per cent), which suggests above average labour market conditions.

**Table 6.1: Key Socio-Economic Indicators for Kangaroo Island DC**

| Indicator | Period | Kangaroo Island | South Australia |
|---|---|---|---|
| Total Population (persons) | 30 June 2014 | 4,583 | 1,685,714 |
| Population density (persons/km$^2$) | 30 June 2014 | 1.0 | 1.7 |
| Average household size (persons) | 2011 (Census) | 2.2 | 2.4 |
| Population age structure | | | |
| 0 to 14 years | 30 June 2013 | 17.9 | 17.7 |
| 15 to 64 years | 30 June 2013 | 62.4 | 65.6 |
| 65 years and over | 30 June 2013 | 19.7 | 16.7 |
| Population of key localities | | | |
| Kingscote (persons) | 2011 (Census) | 1,763 | - |
| Penneshaw (persons) | 2011 (Census) | 276 | - |
| American River (persons) | 2011 (Census) | 216 | - |
| Total (Kangaroo Island) | 2011 (Census) | 4,417 | - |
| Labour market | | | |
| Unemployment Rate[a] | Mar. Qtr. 2014 | 5.3 | 6.7 |
| Unemployed (persons)[a] | Mar. Qtr. 2014 | 135 | 57,500 |
| Labour force (persons)[a] | Mar. Qtr. 2014 | 2,537 | 859,500 |
| Incomes | | | |
| Median personal income ($/week) | 2011 | 489 | 534 |
| Median total household income ($/week) | 2011 | 834 | 1,044 |
| Mean taxable income/loss ($/individual) | 2012/13 | 35,157 | 50,025 |
| Mean salary or wages ($/individual) | 2012/13 | 36,373 | 49,760 |
| Government Support Payments | | | |
| Newstart Allowance recipients (No.) | Dec. Qtr. 2014 | 175 | 64,757 |
| Age Pension recipients (No.) | Dec. Qtr. 2014 | 572 | 209,156 |
| Businesses[b] | | | |
| Number of businesses | 2012 | 702 | 145,911 |
| % in agriculture, forestry, fishing | 2012 | 44 | 13 |
| % in mining | 2012 | 0.4 | 0.4 |
| % in manufacturing | 2012 | 2.8 | 4.4 |
| % in electricity, gas, water & waste services | 2012 | 0.6 | 0.4 |
| % in construction | 2012 | 12.1 | 14.8 |
| % in services | 2012 | 38 | 65 |
| Building Approvals | | | |
| Number of houses approved | 2013/14 | 41 | 8,296 |
| Value of residential buildings approved ($m) | 2013/14 | 9.8 | 2,680,226 |
| Tourism | | | |
| Visitors ('000 persons) | 2013 | 179.5 | 16,624 |
| Visitor nights ('000) | 2013 | 486.2 | 29,963 |
| Visitor expenditure ($m) | 2013 | 93.6 | 5,096 |
| Number of tourism businesses[c] | 2013 | 107 | 17,231 |
| Gross Regional/State Product ($m) | 2013/14 | 228 | 89,898 |

**Note:** a Smoothed series.
b Percentages do not add up to 100 per cent due to unclassified businesses.
c Estimates of businesses for SA as at 30th June 2013.

**Source:** ABS, Regional Population growth, Cat. No. 3218.0; ABS.Stat; ABS, *Census of Population and Housing*, 2011; Department of Employment, *Small Area Labour Markets Data*. Tourism Research Australia, *Tourism in Local Government Areas*, 2013 and Tourism Businesses in Australia, June 2010 to June 2013, Travel by Australians: December 2013 quarterly results of the National Visitor Survey. Australian Taxation Office, *Taxation Statistics*, *2012/13*. .id the Population Experts, *National economic indicators for local government areas*, 2013/14.

Average incomes for Kangaroo Island are relatively lower compared to the state average. For instance, the median household total weekly income at the time of the 2011 Census was $834, some 20 per cent below the state average of $1,044. More recent taxation statistics paint a similar picture. The average wages and salary income for Kangaroo Island in 2012/13 was $36,373 per individual, some 27 per cent below the state average of $49,760. Relatively lower median incomes imply that the region will be more sensitive to any negative or positive economic shocks.

Turning to the economy, there were 702 businesses (including 11 unclassified) operating in Kangaroo Island DC as at 30 June 2012, equivalent to 0.5 per cent of all businesses in South Australia.

In 2013/14 Gross Regional Product (GRP) of Kangaroo Island DC was $228 million. Economic activity in Kangaroo Island is therefore a small fraction of South Australia's total output, accounting for a 0.3 per cent share of South Australia's 2013/14 Gross State Product (GSP).

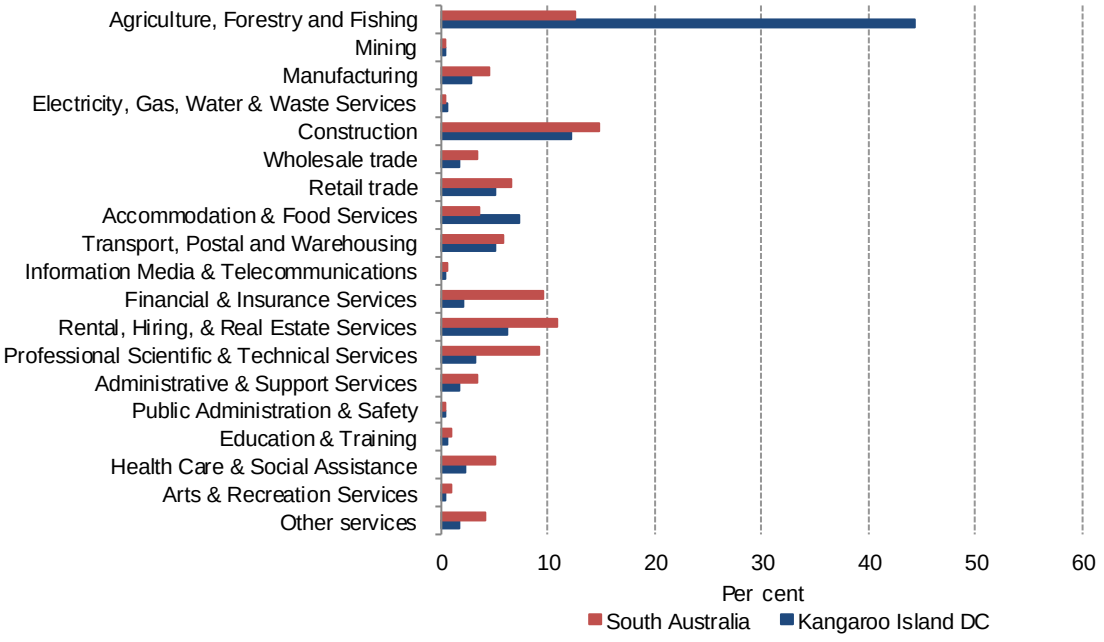
### 6.1.2 Economic Structure

The Kangaroo Island economy is heavily weighted toward primary industries. As Figure 6.1 shows, businesses involved in 'agriculture, forestry and fishing' accounted for 45 per cent of businesses operating on Kangaroo Island as at 2012, well above the corresponding South Australian figure of 13 per cent.

Kangaroo Island also has a relatively larger share of businesses in 'accommodation & food services', which would reflect the importance of tourism to the local economy. The significance of primary industries is complementary to accommodation and food services since provision of locally grown produce is an important element of the local visitor experience.

In terms of sectors that were underrepresented on Kangaroo Island, the proportion of businesses providing 'professional, scientific and technical services' and 'financial and insurance services' were approximately three times smaller and five times smaller respectively than in South Australia.

**Figure 6.1: Businesses by industry**
**Kangaroo Island DC and South Australia - per cent of total businesses by industry, 2012**




**Note:** Total excludes 11 unclassified businesses.
**Source:** National Regional Profile, 2008 to 2012, Cat No. 1379.0.55.001

The relatively large number of businesses in 'agriculture, forestry and fishing' suggest that the Kangaroo Island economy may be particularly exposed to any potential negative impacts associated with SZs to the extent that businesses are concentrated in fishing. Unfortunately the published ABS data does not provide more fine-level industry detail of businesses by industry. In the absence of such data one can obtain a better idea for concentration in fishing by considering Census data on employment by industry which is summarised in Table 6.2.

**Table 6.2: Employed Persons by Industry Kangaroo Island and South Australia (Place of Work) – 2011**

| | Kangaroo Island | | South Australia | |
|---|---|---|---|---|
| | Persons | Per Cent | Persons | Per Cent |
| Agriculture, Forestry and Fishing[(a)] | 407 | 21.5 | 27,675 | 3.8 |
| Agriculture | 358 | 18.9 | 24,060 | 3.3 |
| Aquaculture | 30 | 1.6 | 652 | 0.1 |
| Forestry and Logging | 0 | 0.0 | 497 | 0.1 |
| Fishing, Hunting and Trapping | 13 | 0.7 | 837 | 0.1 |
| Agriculture, Forestry and Fishing Support Services | 6 | 0.3 | 1,529 | 0.2 |
| Mining | 3 | 0.2 | 9,205 | 1.3 |
| Manufacturing | 61 | 3.2 | 76,386 | 10.6 |
| Electricity, Gas, Water and Waste Services | 19 | 1.0 | 9,832 | 1.4 |
| Construction | 95 | 5.0 | 53,574 | 7.4 |
| Wholesale Trade | 66 | 3.5 | 25,427 | 3.5 |
| Retail Trade | 215 | 11.4 | 81,845 | 11.4 |
| Accommodation and Food Services | 246 | 13.0 | 45,110 | 6.3 |
| Transport, Postal and Warehousing | 107 | 5.7 | 29,762 | 4.1 |
| Information Media and Telecommunications | 10 | 0.5 | 10,480 | 1.5 |
| Financial and Insurance Services | 13 | 0.7 | 21,903 | 3.0 |
| Rental, Hiring and Real Estate Services | 18 | 1.0 | 9,354 | 1.3 |
| Professional, Scientific and Technical Services | 51 | 2.7 | 40,133 | 5.6 |
| Administrative and Support Services | 67 | 3.5 | 24,696 | 3.4 |
| Public Administration and Safety | 131 | 6.9 | 51,712 | 7.2 |
| Education and Training | 119 | 6.3 | 58,201 | 8.1 |
| Health Care and Social Assistance | 165 | 8.7 | 99,275 | 13.8 |
| Arts and Recreation Services | 34 | 1.8 | 9,202 | 1.3 |
| Other Services | 55 | 2.9 | 28,499 | 4.0 |
| Inadequately described | 11 | 0.6 | 6,513 | 0.9 |
| Not stated | 0 | 0.0 | 440 | 0.1 |
| Total | 1,893 | 100.0 | 719,224 | 100.0 |

**Note:** (a) Total includes agriculture, forestry and fishing not further defined.
**Source:** ABS, 2011 Census of Population and Housing.

Approximately 22 per cent of employed persons in Kangaroo Island in 2011 were employed in 'agriculture, forestry and fishing', which is significantly less than the share of businesses operating in the sector (45 per cent). This large discrepancy indicates that agricultural businesses on the island are typically small operations with few if no employees (i.e. pure owner operated businesses).

Looking more closely at more fine level industry data, the majority of people employed in 'agriculture, forestry and fishing' in Kangaroo Island in 2011 were employed in agriculture (88 per cent). In terms of fishing related industries, 30 people (1.6 per cent of total employment) were employed in 'aquaculture', while 13 people (0.7 per cent) were employed in 'fishing, hunting and trapping'. Most of the people in the latter are probably employed in fishing as disaggregated data indicates that 4 people were employed in 'fishing', 0 were identified in respect of 'hunting and trapping', while 9 people could not be allocated to either sector due to a lack of information (i.e. not further defined).

Census data suggests that 'seafood processing' is not a significant activity on Kangaroo Island with only approximately 5 people (0.3 per cent of total employment) employed in this sector in 2011.[12] This is probably an underestimate as people engaged in seafood processing may be classified to other sectors such as 'aquaculture' (30 persons), 'fish and seafood wholesaling' (4 persons), and 'fresh meat, fish and poultry retailing' (11 persons).

In summary, taking a narrow but realistic view, Census data suggests that 1.1 per cent of the Kangaroo Island workforce may work in industry sectors that could potentially be directly affected by SZ management plans (i.e. 'fishing, hunting and trapping', 'seafood processing', and 'fish and seafood wholesaling').

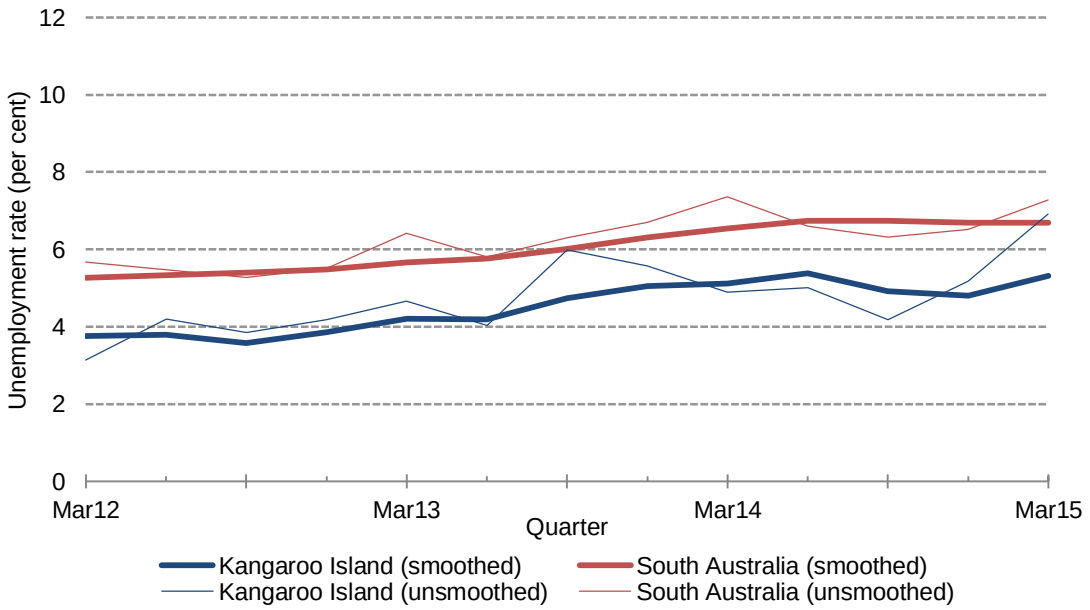
### 6.1.3 Economic and Social Indicators

The following section summarises various indicators that provide insight into recent economic and social developments in Kangaroo Island. While the emphasis is placed on developments since the SZ management plans were introduced from 1 October 2014, data for some indicators in the post SZ period had not been published at the time of writing. Such indicators are included in the following analysis for baseline purposes to inform any subsequent analyses and obtain the context of recent economic and social developments in the region.

#### Labour Force

According to smoothed estimates from the Department of Employments Small Area Labour Markets data, Kangaroo Island's rate of unemployment in the March quarter of 2015 was 5.3 per cent (see Figure 6.2), well below South Australia's 6.7 per cent rate of unemployment. Labour market trends for Kangaroo Island have mirrored state trends over the last two years with unemployment rising modestly. Between the March quarters of 2013 and 2015 Kangaroo Island's rate of unemployment rose by 1.1 per cent, while South Australia's unemployment rate rose by 1.0 per cent.

**Figure 6.2: Unemployment Rate**
**Kangaroo Island DC South Australia – Smoothed and Unsmoothed Series**




**Source:** Department of Employment, Small Area Labour Markets - December Quarter 2014.

[12] The number of people reported by Census data should not be taken too literally as the ABS slightly randomises small numbers in an effort to preserve confidentiality.

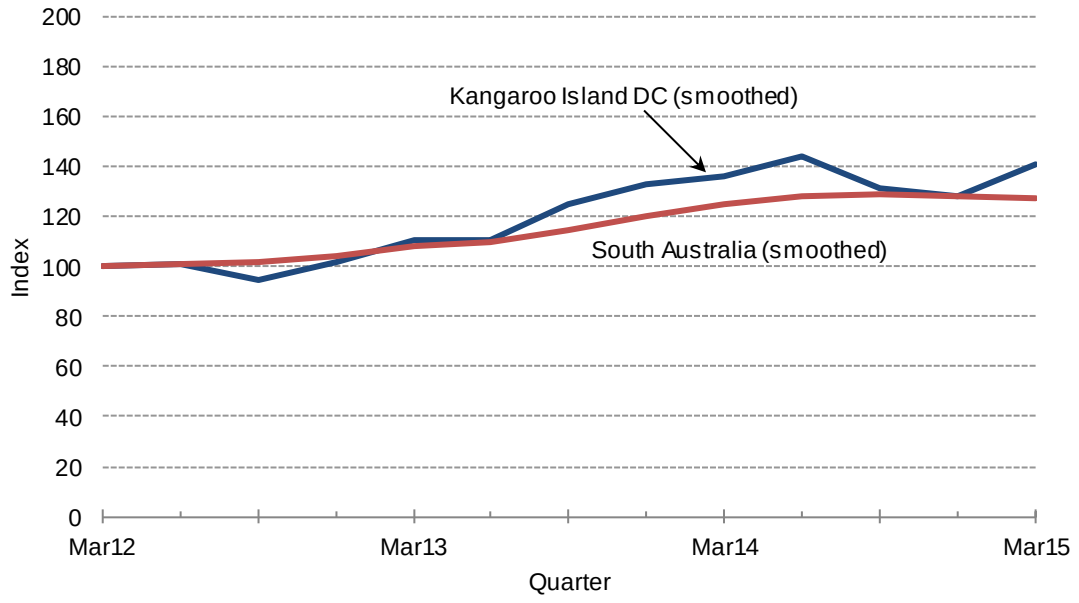
Unsmoothed estimates of unemployment indicate that the rise in the smoothed unemployment rate over the past year reflects a significant increase in unemployment since 1st October 2014. The 'unsmoothed' unemployment rate rose by 2.7 per cent between the September quarter 2014 and the March quarter 2015, from 4.2 per cent to 6.9 per cent. This rise suggests that the introduction of SZs is correlated with an increase in unemployment in the region. However, the 'unsmoothed' unemployment data are notoriously volatile. In addition, the South Australian economy has experienced a significant increase in unemployment since the March quarter 2015 which combined with advice received during community consultations also suggests that broader economic factors have played a role.

Ideally one would want several more quarters of labour force data to determine whether the unemployment rate has changed significantly since the introduction of the SZs. However, we note that the community consultations indicated the loss of several jobs as well as exit of commercial fishers.

There were 135 unemployed persons in Kangaroo Island as of the March quarter of 2015. Unemployment trended upwards between June 2013 and June 2014, before improving over the next two quarters (see Figure 6.3). Between the September quarter of 2014 and March quarter of 2015 the number of unemployed rose by 9 persons in smoothed terms and 66 persons in unsmoothed terms. Unsmoothed estimates probably exaggerate the recent increase in actual unemployment in Kangaroo Island. In any event, the SALM data indicates a rise in unemployment since the introduction of SZs.

Although not directly comparable, the rise in smoothed unemployment is broadly in line with the previously modelled estimates of the negative economic impacts of SZs. The previous RIAS estimated that zoning of Western Kangaroo Island MP and South Kangaroo Island MP would lead to an ongoing annual loss of 7 FTE jobs for Kangaroo Island (EconSearch 2012) – refer section 2.2. The Encounter MP was estimated to involve a loss of 6 FTE jobs (EconSearch 2012). While impacts for Encounter MP were modelled in respect of the Fleurieu Peninsula and The Coorong, some negative impact would also be expected for Kangaroo Island.

**Figure 6.3: Index of Unemployed Persons**
**Kangaroo Island DC and South Australia – Smoothed Series, Base: December Qtr 2011 = 100**




**Source:** Department of Employment, Small Area Labour Markets - December Quarter 2014.

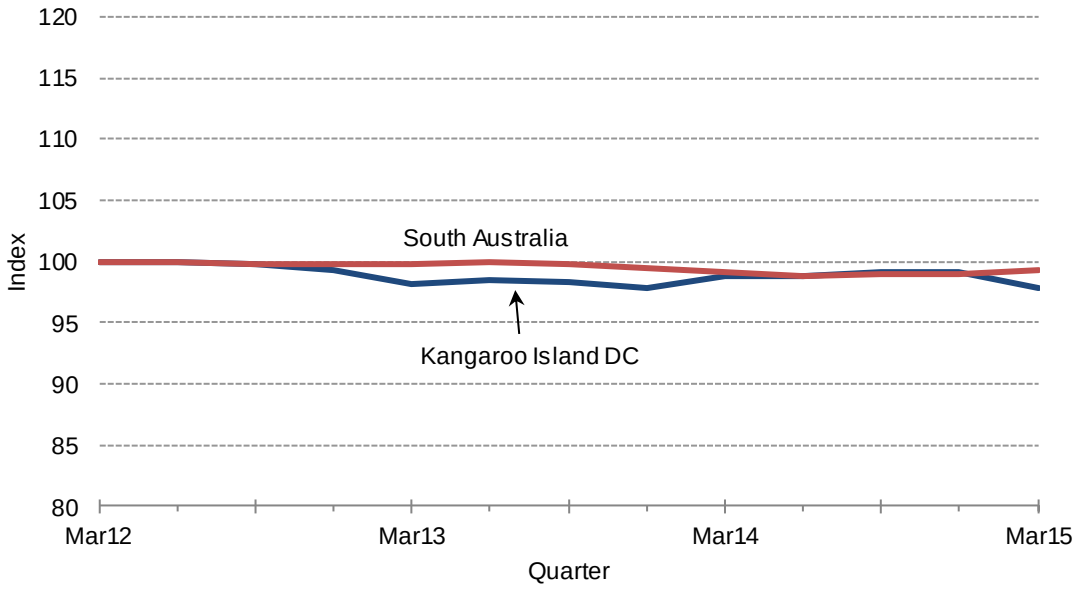
There were 2,402 employed persons in Kangaroo Island as of the March quarter of 2015. Smoothed data indicates that employment for Kangaroo Island fell by 0.9 per cent or 23 persons between the March quarter 2014 and March quarter 2015 (Figure 6.4). In comparison, employment for South Australia rose by 0.2 per cent over this period.

### Newstart Allowance Recipients

Movements in government income support payments related to unemployment also provide insight into regional labour market trends. Figure 6.5 shows the index of Newstart Allowance recipients for Kangaroo Island DC and South Australia over the six quarters to December 2014.

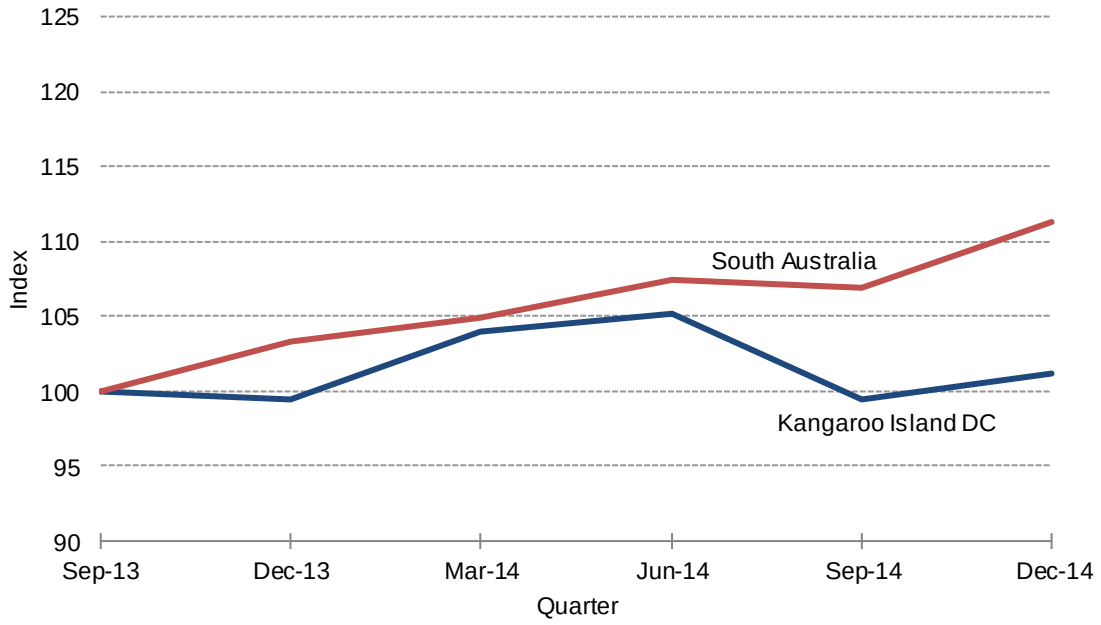
As at the December 2014 quarter there were 175 persons in Kangaroo Island DC receiving a Newstart Allowance, an increase of 1.7 per cent (an additional 3 recipients) over the September 2014 figure. The Newstart Allowance data is therefore consistent with the Small Area Labour Markets Data in terms of indicating an increase in unemployment since the introduction of SZs, which is to be expected since data on Newstart Allowance recipients are an input to the SALM estimates. However, the proportional increase in Newstart Allowance recipients in Kangaroo Island for the December quarter 2014 was relatively smaller compared to the rise in recipients at the State level (1.7 per cent compared to 4.2 per cent). Thus the recent deterioration in unemployment for Kangaroo Island was actually less severe than for the state as a whole, at least according to the income support payments data.

**Figure 6.4: Index of Employed Persons**
**Kangaroo Island DC and South Australia – Smoothed Series, Base: December Qtr 2011 = 100**




**Source:** Department of Employment, Small Area Labour Markets - December Quarter 2014.

**Figure 6.5: Index of Newstart Allowance Recipients**
**Kangaroo Island DC and South Australia – Base: September 2013 = 100**




**Source:** data.gov.au - DSS Payment Demographic Data.

## Building Approvals

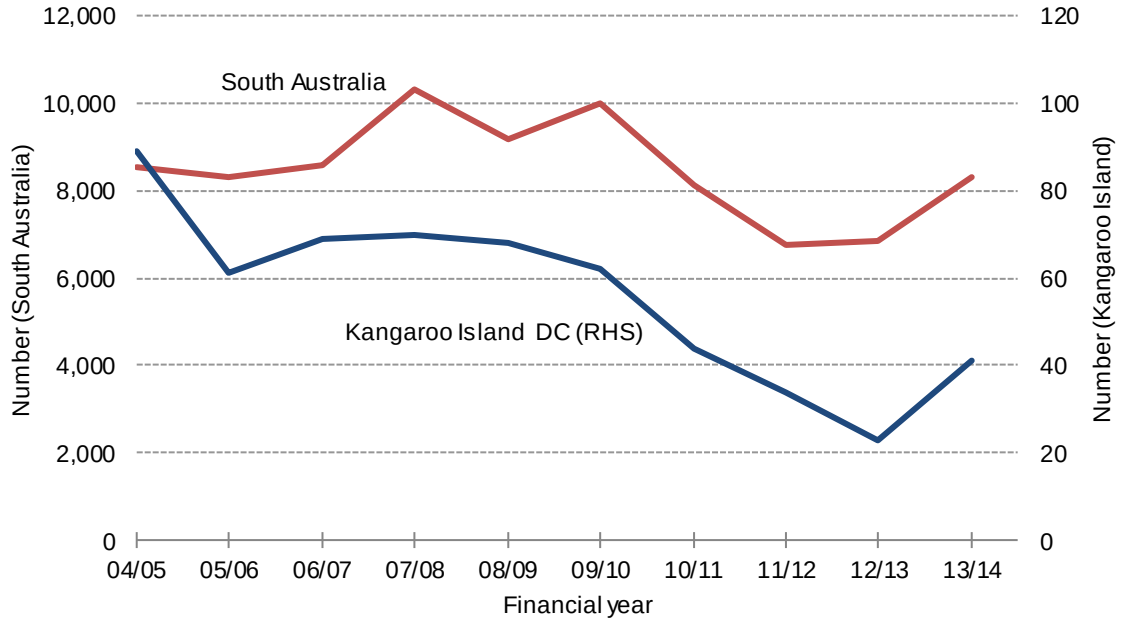
Building approvals data, which are one of the higher quality sources of regional economic activity, were scheduled to be published for the first financial year with SZs (2014/15) just prior to delivery of the RIAS. For baseline purposes recent trends in building approvals in the lead up to the introduction of SZs are briefly reviewed here.

Figure 6.6 shows the annual number of new home approvals for Kangaroo Island and South Australia for the decade to 2013/14. House approvals for Kangaroo Island declined steadily after the 2009 Global Financial Crisis, reaching a trough in 2012/13 before rebounding in 2013/14. A similar pattern is evident for South Australia, which indicates that broader economic conditions have been a driving factor behind housing trends. Building approval for construction of 41 new houses was made on Kangaroo Island in 2013/14 compared with 23 approvals for new houses in 2012/13 – the lowest home approvals in the past ten years.

The value of residential building approved in Kangaroo Island has followed a similar pattern to the number of home approvals (refer to Figure 6.7). Total residential building approvals for Kangaroo Island (new houses + new other residential building + alterations and additions) for 2013/14 were valued at $9.8 million, up 54 per cent from 2012/13. In comparison, the value of residential building approvals for South Australia rose 20 per cent in 2013/14.

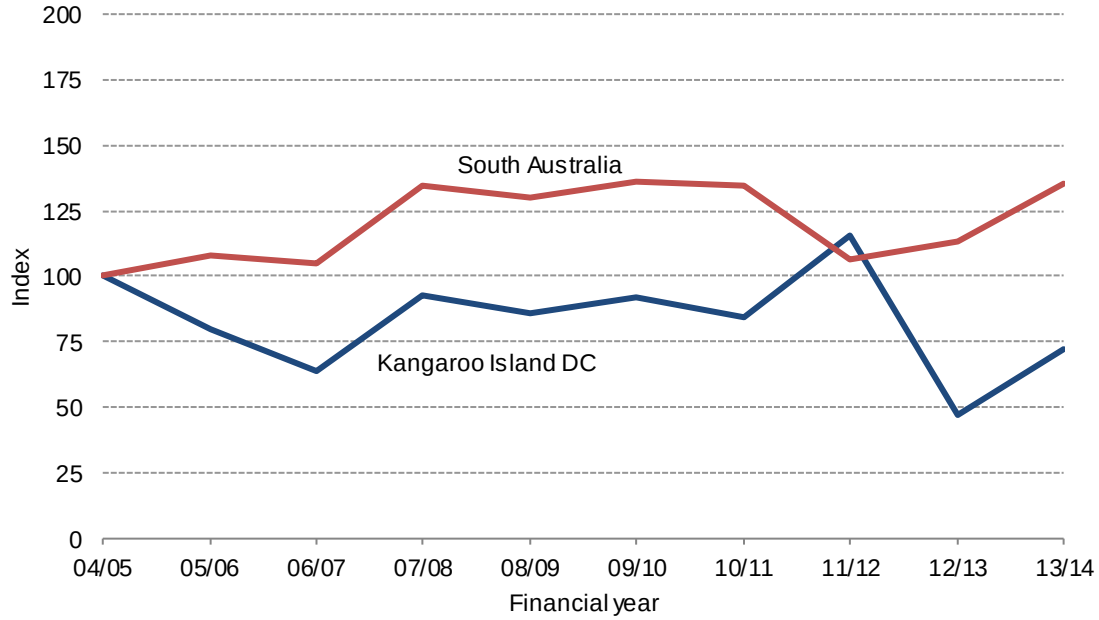
Approvals of non-residential building tend to be relatively volatile at the regional level and Kangaroo Island exhibits such a pattern – refer Figure 6.8. Non-residential building approvals in Kangaroo Island for 2013/14 were valued at $5.6 million, down 14 per cent from 2012/13. In comparison, South Australia's non-residential building approvals fell by 12 per cent in 2013/14, indicating that the decline for Kangaroo Island was only marginally worse compared to the state pattern.

**Figure 6.6: New House Building Approvals**
**Kangaroo Island DC and South Australia – Number**



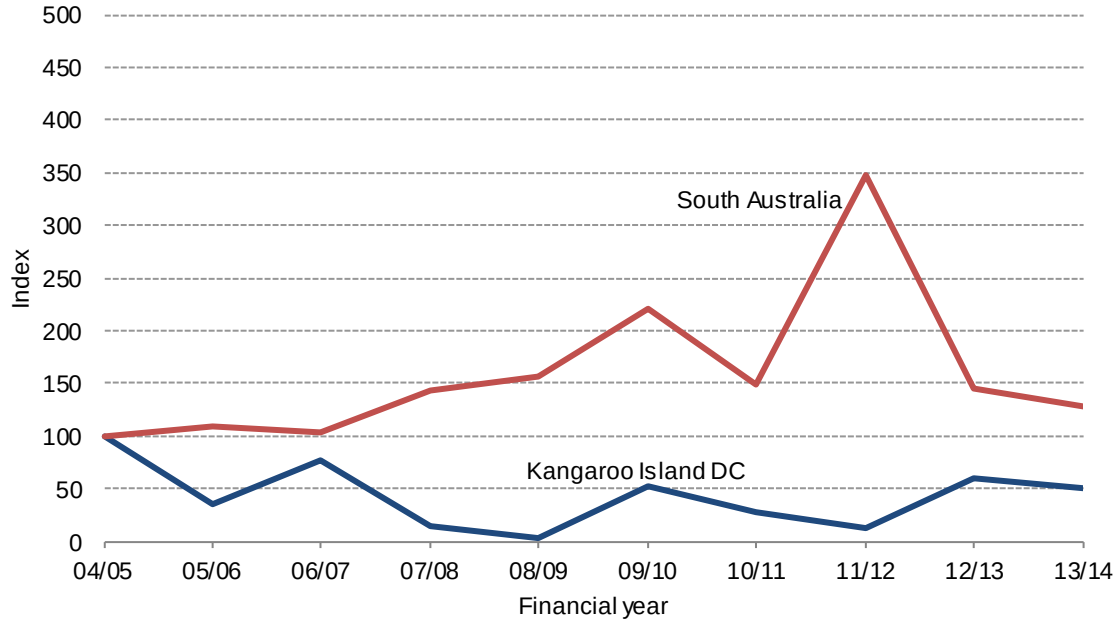

**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

**Figure 6.7: Index of Value of Residential Building Approvals**
**Kangaroo Island DC and South Australia – Base: 2004/05 = 100**




**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0.

**Figure 6.8: Index of Value of Non-residential Building Approvals**
**Kangaroo Island DC and South Australia – Base: 2004/05 = 100**

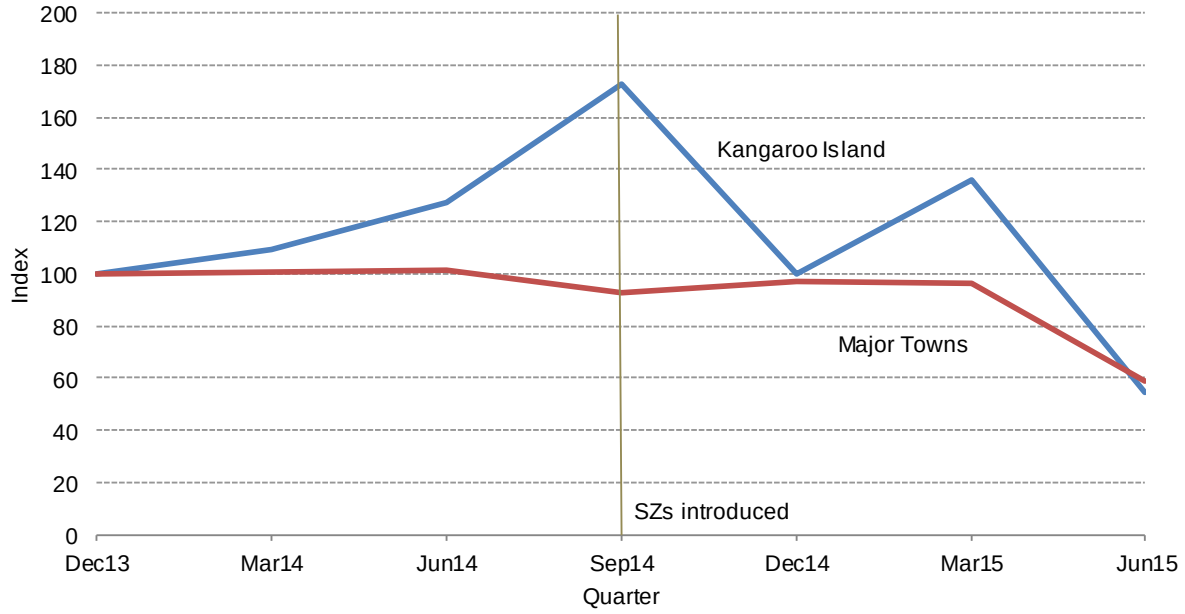



**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

## House Prices

Indices of the number of house sales in Kangaroo Island and major South Australian towns since the December quarter 2013 are illustrated in Figure 6.9. The major towns are presented for comparative purposes and comprise major towns located in rural and regional South Australia that are estimated to account for almost three quarters of the total estimated population residing outside the greater Adelaide metropolitan area in 2014.

**Figure 6.9: Index of the Number of House Sales**
**Kangaroo Island and Major Towns[(a)] – December Qtr 2013 = 100**

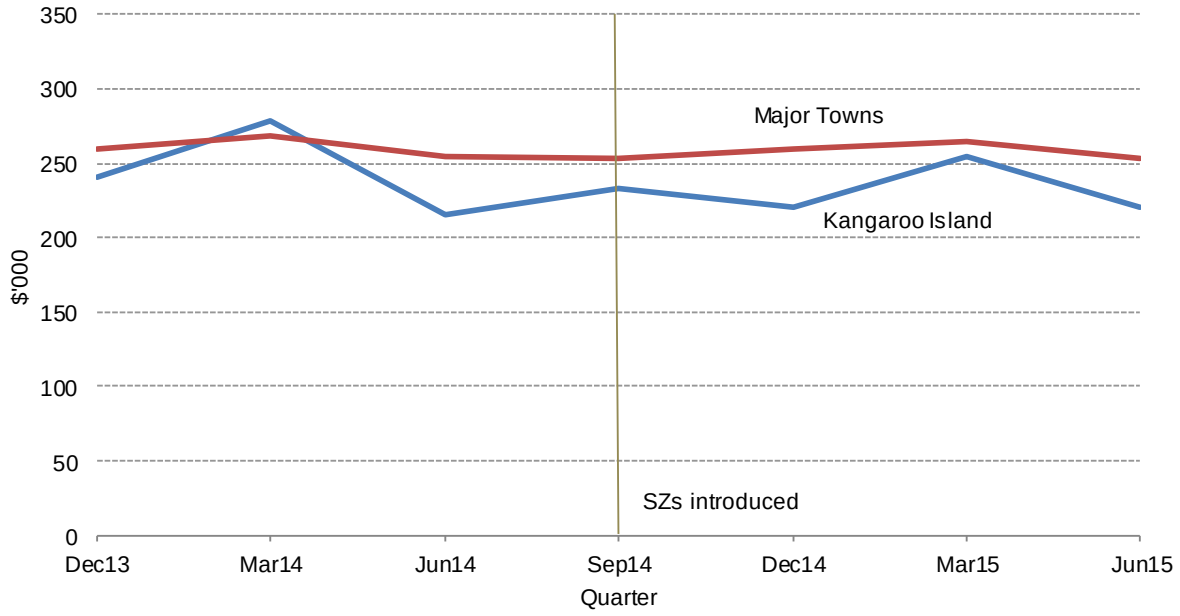



**Note:** (a) Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

As Figure 6.9 shows, the number of house sales in Kangaroo Island rose solidly through the middle of 2014 prior to the introduction of the SZs and then fell sharply in the December quarter 2014 before bouncing back in the March quarter 2015. Although the peak and then decline in house sales is well timed with the introduction of SZs once needs to be cautious about concluding that the recent pattern in house sales was driven by the introduction of SZs. The rise in house sales prior to the introduction of SZs was quite strong while a similar pattern is not evident for the two other study areas of Ceduna and Wakefield. In addition, the number of sales for the first six months under SZs (i.e. two quarters to end March 2015) was actually 13 per cent higher than under the corresponding period a year earlier.

Movements in the median house price for Kangaroo Island and the major towns are illustrated in Figure 6.10. There appears to be no significant change in median house prices for Kangaroo Island since the introduction of SZs. While the median house price for the March quarter 2015 was down 8.3 per cent compared to the March quarter 2014, the median house price for the June quarter was actually 2.3 per cent higher compared to a year earlier. It is also worth noting that there would appear to be some seasonality in the median house price data with prices appearing to peak in the March quarter. These results are consistent with the previous RIAS which concluded that marine parks were unlikely to cause a decline in beachfront property prices given trends in property prices observed elsewhere in Australia where marine parks have been introduced (EconSearch 2012)

**Figure 6.10: Median House Prices**
**Kangaroo Island and Major Towns[(a)] – $'000**



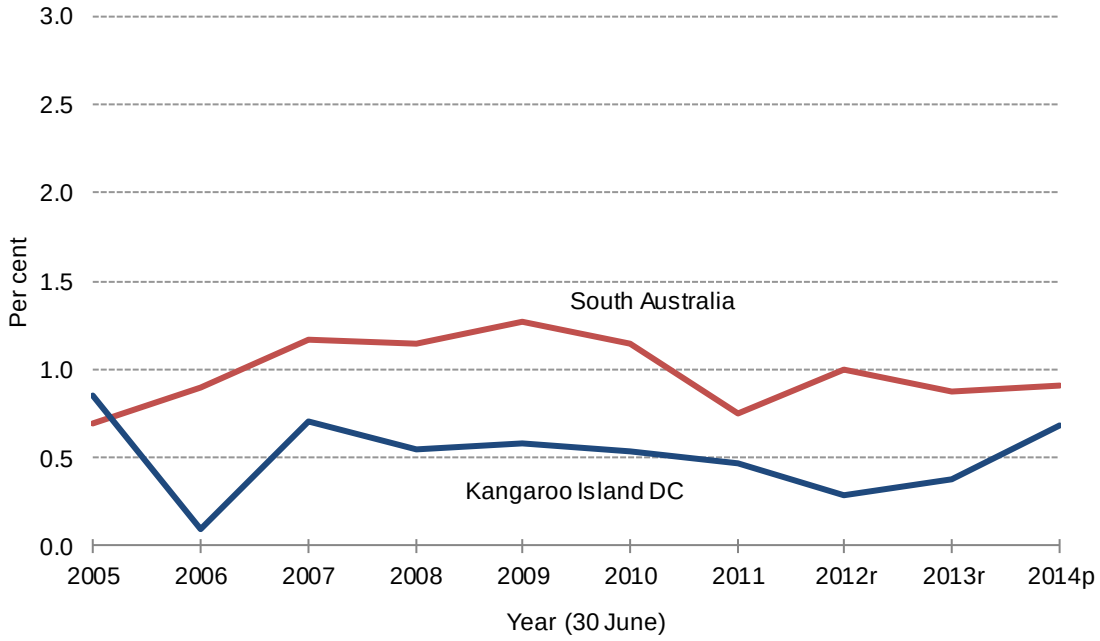

**Note:** Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

## Population Growth

ABS regional population estimates are only produced on an annual basis (for 30th of June) with a significant delay. Unfortunately population estimates for the post SZ period will not become available during the course of the study (they are expected to be released on 30th March 2016). Nonetheless, it is worth reviewing population trends for the region as population growth has significant implications for economic activity and important social dimensions (e.g. sustainability of public service provision).

In 2013/14 Kangaroo Island's estimated resident population (ERP) rose by 0.7 per cent compared with a 0.9 per cent increase across South Australia. As Figure 6.11 shows, annual growth of Kangaroo Island's ERP has been consistently below South Australia's annual growth rate although the differential in 2013/14 was at its lowest since 2004/05.

**Figure 6.11: Population Growth Rate**
**Kangaroo Island DC and South Australia - Annual per cent change**




**Note:** r = revised, p = preliminary, see explanatory notes for further information regarding estimating resident population.
**Source:** ABS, Regional population growth, Australia, Table 4. Estimated Resident Population, Local Government Areas, South Australia, Cat no. 3218.0

## Average Annual Taxpayer Income

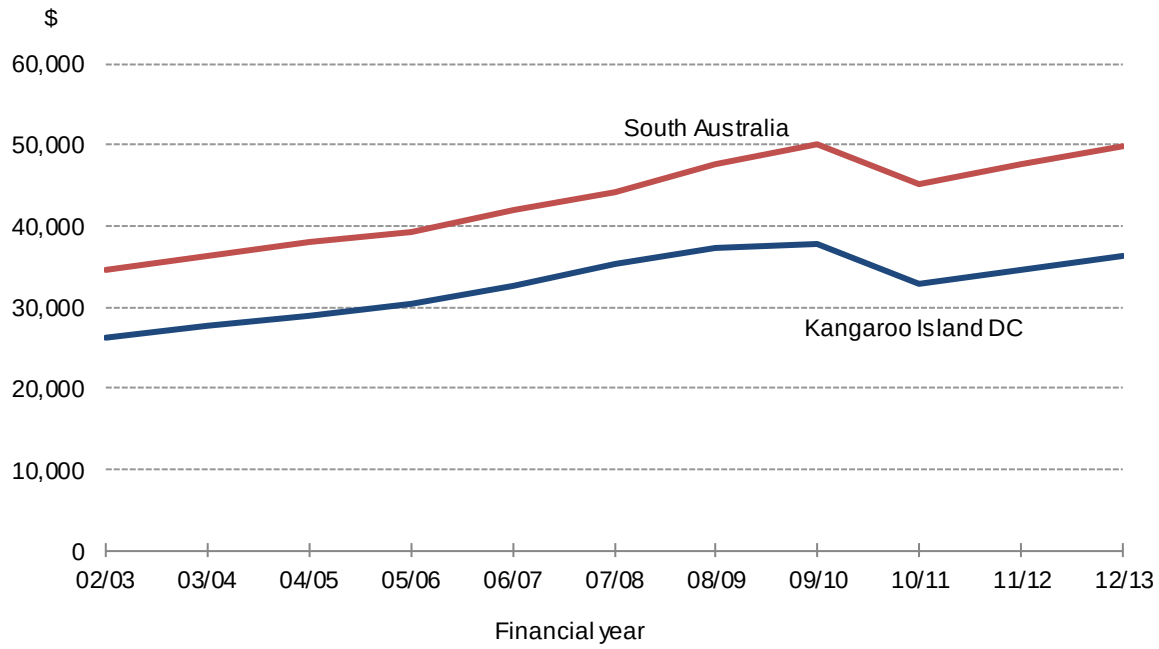
Unfortunately Australian Taxation Office (ATO) taxation statistics – the best measure of average incomes at a regional level outside Census data – for the current financial year will not become available for a couple of years. In the absence of such information we must rely on feedback from fishers (refer to section 6.4) and other indirect indicators to gain insight into potential impacts on average incomes.

Latest average annual salary or wage income on Kangaroo Island was reported to be $36,373 in 2012/13. Average income for Kangaroo Island was 27 per cent ($13,387) below the South Australian average annual income of $49,760 in 2012/13. Average incomes on Kangaroo Island have historically been consistently lower than those recorded for South Australia (Figure 6.12). In 2010/11 annual salary and wage income on Kangaroo Island and South Australia both fell in response to the Global Financial Crisis (GFC) before rising again in subsequent years. Kangaroo Island's persistent annual salary and wage disparity with South Australia indicates relatively lower living standards. Residents on Kangaroo Island are therefore likely to face greater difficulties adjusting and adapting to an economic downturn or other economic shocks given their smaller income buffer.

## Exports by Port

No major ports are in operation in the Kangaroo Island area.

**Figure 6.12: Average Annual Salary or Wage Income**
**Kangaroo Island DC and South Australia – $, 2004/05 to 2009/10**

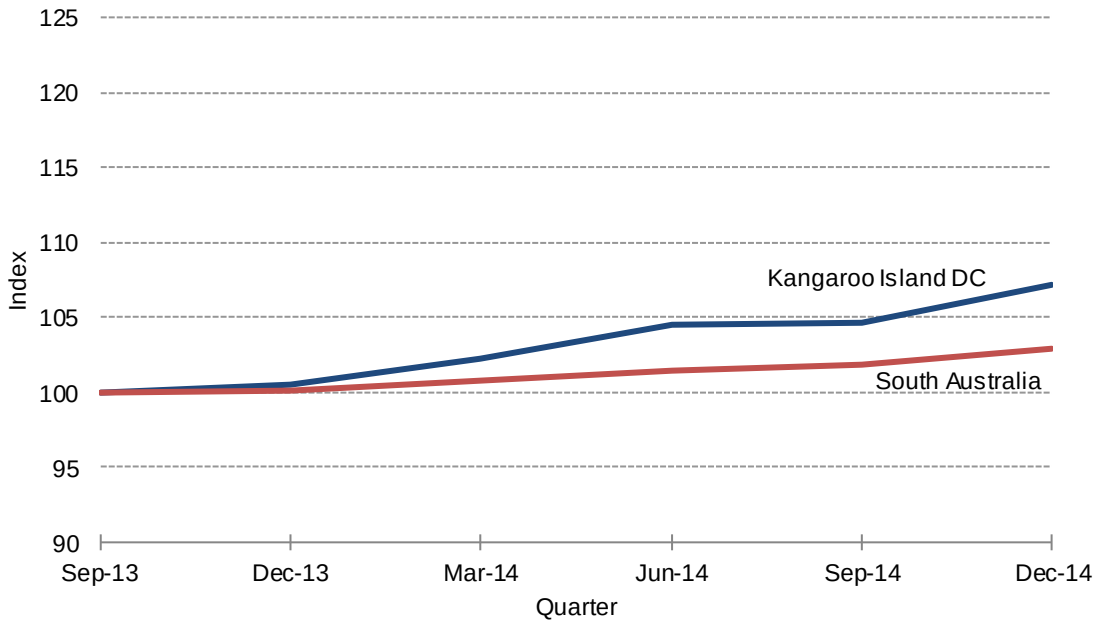



**Source:** Australian Taxation Office, Research and Statistics. Available: https://www.ato.gov.au/About-ATO/Research-and-statistics/Taxation-statistics/

## Government Support Payments – Aged Pension Recipients

An index of the number of Aged Pension recipients for Kangaroo Island and Australia is shown in Figure 6.13. As at December 2014 quarter there were 572 persons in Kangaroo Island DC receiving an Aged Pension, an increase of 6.5 per cent (an additional 35 recipients) over the December 2013 figure. By comparison the number of persons in receipt of the Aged Pension across South Australia increased by 2.8 per cent (an additional 5,676 recipients) over the same 12 month period. The relatively larger rise for Kangaroo Island emphasises the relatively older age structure of the Kangaroo Island population.

**Figure 6.13: Index of Aged Pension Recipients**
**Kangaroo Island DC and South Australia – Base: September Qtr 2013 = 100**




**Source:** data.gov.au - DSS Payment Demographic Data.

Between the September quarter of 2014 and December quarter of 2014 the number of persons receiving an aged pension in Kangaroo Island increased by 13 persons, an increase of 2.3 per cent. The comparable figure for South Australia was an increase of 1.0 per cent. This is consistent with the longer term trend of faster population aging across Kangaroo Island relative to South Australia. It is possible that any people directly negatively affected by the SZs have decided to enter retirement although this would only be reflected in the pension data for those individuals of pension age (i.e. early retirees would not show up).

## Tourism

Regional tourism data for the SZ era had not been published at the time of compiling the RIAS. The following analysis of tourism data is provided for baseline purposes but also to gain insight into the relative importance of tourism to the local economy.

In 2013 Kangaroo Island DC had 179,600 visitors comprised of 87,300 domestic overnight visitors, 57,800 domestic day visitors and 4,800 international visitors – refer Table 6.3. The number of international visitors to Kangaroo Island in 2013 was equivalent to 9.1 per cent of total international visitors to South Australia. Meanwhile, Kangaroo Island's share of total visitor nights stayed in South Australia by domestic residents was 1.9 per cent. Kangaroo Island clearly punches above its weight in respect of attracting international tourists, while its share of domestic visitors is closer to, though still outweighs, its share of the total state population (0.3 per cent). The well-developed tourism sector on the island suggests that it is well placed to benefit from any potential eco-tourism opportunities that may flow from SZs in the future. However, exploiting such potential benefits may require investments into complementary infrastructure (e.g. access roads, mobile communications, boat ramps etc.) to fully exploit them.

**Table 6.3: Tourist Visitor Expenditure and Accommodation, Kangaroo Island DC, 2013**

| Visitors to Kangaroo Island DC[a] | International | Domestic overnight | Domestic day | Total |
|---|---|---|---|---|
| Visitors ('000) | 34.5 | 87.3 | 57.8 | 179.5 |
| Visitor nights ('000) | 111.4 | 374.8 | - | 486.2 |
| Average stay (nights) | 3.2 | 4.3 | - | 4.0 |
| Spend ($m) | 26.0 | 61.4 | 6.1 | 93.6 |
| Average spend per trip ($) | 755.4 | 704.1 | 105.5 | 521.3 |
| Average spend per night ($) | 233.7 | 163.9 | - | 179.9 |
| Average spend (commercial accommodation) per night ($) | 255.8 | 227.0 | - | 242.6 |
| **Reason (visitors '000)** | | | | |
| Holiday | 33.4 | 66.7 | np | np |
| Visit friends or relatives | np | np | np | np |
| Other | np | np | np | np |
| **Travel party (visitors '000)** | | | | |
| Unaccompanied | 10.9 | np | - | np |
| Couple | 17.2 | 27.9 | - | 45.0 |
| Friend/relatives travelling together | 6.2 | 44.5 | - | 50.6 |
| **Accommodation (nights '000)** | | | | |
| Hotel or similar | 36.1 | 79.6 | - | 115.7 |
| Home of friend or relative | np | np | - | np |
| Commercial camping/caravan park | np | np | - | np |
| Backpacker | 11.6 | np | - | np |
| Other accommodation | 36.2 | 178.0 | - | 214.3 |

**Note:** a Four year averages to 2013.
np = not published due to unreliable estimate.
- = not available.

**Source:** Tourism Research Australia, Tourism in Local Government Areas, 2013.

Domestic overnight visitors had a total expenditure of $61.4 million in 2013. They were followed by international visitors with expenditure of $26.0 million and domestic day visitors spending of $6.1 million, giving a total spend of $93.5 million in 2013.

The effect of the SZs on tourism expenditure depends on offsetting effects, including the extent to which individuals may be attracted by potential ecotourism experiences versus those that may be discouraged by reduced access to fishing locations. The latter will be most immediately felt while the former will take longer to emerge and are more highly uncertain, depending in part on potential ecosystem improvements facilitated by SZs that will take years to emerge.

There were eight providers of hotel/motel/resort/guest accommodation services with 15 rooms or more in Kangaroo Island as of the June quarter of 2013 (Table 6.4). The breakdown by type of accommodation and number of establishments is as follows:[13]

- Hotels and resorts – 1 establishment; and
- Motels, Private Hotels and Guest Houses – 7 establishments.

**Table 6.4: Tourist Accommodation: Hotels, Motels and Serviced Apartments Kangaroo Island DC and South Australia – June quarter 2014**

| Accommodation statistics | Kangaroo Island | South Australia |
|---|---|---|
| Establishments (no.) | 8 | 261 |
| Rooms (no.) | 259 | 12,766 |
| Bed spaces (no.) | 692 | 34,576 |
| Room nights occupied (no.) | 11,065 | 685,237 |
| Room nights available (no.) | 23,569 | 1,161,216 |
| Room occupancy rate (per cent) | 47 | 59 |
| Guest nights occupied (no.) | 21,262 | 1,089,360 |
| Guest nights available (no.) | 62,972 | 3,145,196 |
| Bed occupancy rate (per cent) | 34 | 35 |
| Takings from accommodation ($) | 2,603,518 | 96,840,409 |
| Average takings per room night occupied ($) | 294 | 141 |
| Average takings per room night available ($) | 138 | 83 |

**Source:** Tourist Accommodation, Small Area Data, South Australia, Jun 2013, ABS Cat no. 8635.4.55.001

As at 2013 there were 107 tourism related businesses operating in the Kangaroo Island DC area, of which 67 employed more than one person – refer Table 6.5.

**Table 6.5: Tourism businesses, number, type, 2013**

| Category | Total |
|---|---|
| Non-employing | 40 |
| 1 to 4 employees | 37 |
| 5 to 19 employees | 27 |
| 20 or more employees | 3 |
| **Total** | **107** |

**Source:** Tourism Research Australia, Tourism in Local Government Areas, 2013.

In order to identify any impacts since the introduction of SZs SeaLink was invited to provide feedback on the impacts on its various tourism activities, including its ferry car and passenger service which is the only means of access to the island for motor vehicles (air travel being the only other conventional option for travellers). It advised that no effects had been noticed on the ferry services or on passenger

[13] See Tourist Accommodation, Small Area Data, Australia, Jun 2013, ABS Cat No. 8635.0.55.002. There were no Serviced Apartments available in Kangaroo Island DC as of the June Quarter of 2013.

numbers for coach tours. Other effects had been noticed by staff (e.g. rock lobster fishers leaving the Island) which are reported separately in section 6.4.

## 6.2 Commercial Fisheries

The following section analyses commercial fishers data provided by PIRSA/SARDI. This data includes logbook data on catch by species and weight, and fishing effort. Data was only available up to January 2015 for the purposes of the RIAS, meaning only 4 months of data with SZs was available, which much less than ideal. Nonetheless, it is worth reviewing the available data to identify any significant changes in fishing patterns since the introduction of SZs and recent trends in fishing for the region.

### 6.2.1 Abalone Fishery

Abalone fishing regions relevant to Kangaroo Island have been defined as those three spatial assessment units (SAUs) surrounding the Island: North Kangaroo Island, South Kangaroo Island and West Kangaroo Island. These regions are illustrated in Figure D.1 in Appendix D.

Unfortunately data, both individually and for the three SAUs as a whole, was not available for analysis purposes due to large number of confidentialised cells, including for the most recent period with SZs. As a consequence, only PIRSA commercial logbook data for the limited number of licences for which abalone fishers had signed the confidentiality release form could be used. Combined greenlip and blacklip catch for these fishers for the four months to January 2015 was down compared to the corresponding period a year earlier (-14 per cent), but up solidly relative to catch in the corresponding period in 2012/13 and 2011/12 (44 and 47 per cent respectively) due to increased effort. The decline in catch for the initial SZ period was driven by a decline in blacklip catch while greenlip catch rose. Catch rates for both species showed no adverse effects for the initial period with SZs. However, given the short period covered by the data, limited number of licences represented and potential for natural temporal and spatial variation, it is ultimately not possible to draw any conclusions regarding the impact of SZs on abalone fishers at this time; data for all fishers over a longer time period is ultimately required to properly assess the impacts of SZs.

### 6.2.2 Rock Lobster Fishery

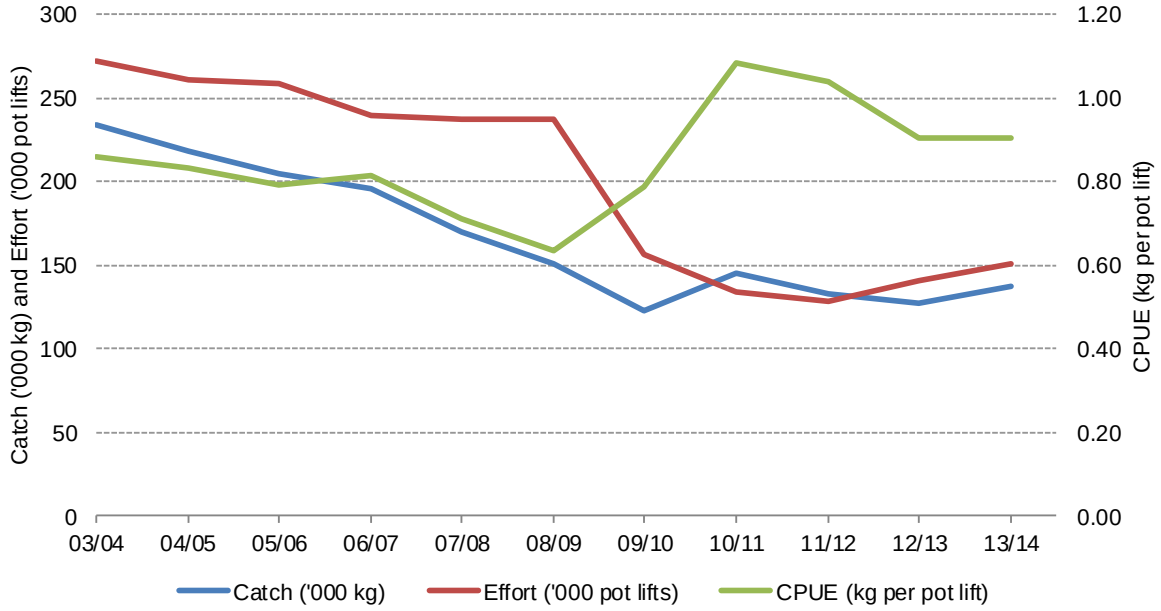
Rock lobster logbook data in respect of the MFAs surrounding Kangaroo Island – i.e. 39, 41, 42, 44, 48 and 49 – were supplied by PIRSA (refer Figure D.2 in Appendix D). Data was generally available for the key Rock Lobster MFAs (39, 48 and 49), while aggregated seasonal data for the MFAs as a whole was not subject to any confidentiality restrictions.

Looking first at recent historical trends prior to the introduction of SZs, Figure 6.14 shows the commercial rock lobster catch, effort and CPUE for the MFAs as a whole over the decade to 2013/14. Between 2003/04 and 2009/10 there was a general downward trend in catch, effort and catch rates, which is symptomatic of the resource declining in abundance. Since the reduction in TACC for the Northern Zone Rock Lobster Fishery in 2009/10 to “protect the remaining stock” (PIRSA 2014a), total catch stabilised in the range of 130 to 140 tonnes per annum. In addition, the catch rate improved considerably, from 0.63 kg per pot lift in 2008/09 to over 1 kg per pot lift in 2010/11 and 2011/12. While catch rates have since fallen to a lower level, they remain above the lows reached around 2008/09.

Analysis of catch by MFA indicates that Rock Lobster fishing activity is concentrated along southern and western Kangaroo Island. MFAs along these coast lines (MFA 39, 48 and 49) typically account for more than 90 per cent of seasonal catch, and often more than 95 per cent. Of these spatial units, MFA 39 typically accounts for the largest share of catch. Over the decade to 2013/14 it on average accounted for 48 per cent of the total rock lobster catch around Kangaroo Island, ranging from a low of 36 per cent in 2012/13 to a high of 62 per cent in 2010/11. The other MFA of particular interest is MFA 48 which includes the Cape du Couedic SZ – a SZ identified by Rock Lobster fishers as being a highly productive

area. This MFA on average accounted for 23 per cent of the total Kangaroo Island catch over the decade to 2013/14, ranging from a low of 16 per cent in 2009/10 to a high of 30 per cent in 2005/06.

**Figure 6.14: Rock Lobster Catch, Effort and Catch Rates by Season[(a)] Kangaroo Island (MFAs 39, 41, 42, 44, 48 and 49)**




**Note:** (a) Rock lobster season runs from November to May.
**Source:** PIRSA, logbook catch and effort, unpublished data.

Insight into developments since the introduction of SZs is provided by Table 6.6, which shows the catch, effort and catch rates by MFA for the 3 month period from November to January inclusive (more recent data was not available at a region level for the RIAS). While the period covered by the data is less than half the length of the rock lobster season (3 of 7 months), the 3 months account for a majority of total catch, typically in the order of 60 to 70 per cent.

Total rock lobster catch off Kangaroo Island for the first 3 months of the first season with SZs was 6.7 per cent higher compared to a year earlier. The increase in catch was brought about by an increase in fishing effort (up 2.4 per cent in terms of pot lifts) and catch rate (up 4.2 per cent to 0.89 kg per pot lift). The later was above the catch rates recorded between 2005/06 and 2009/10.

The increase in fishing effort despite removal of fishing effort displaced by SZs continues a trend of rising effort for Kangaroo Island post 2010/11. Whether the increase in effort for the initial SZ period was due to rock lobster fishers located on the Island versus elsewhere is unknown. The spatial data indicates that the increase in effort was concentrated in the two MFAs located off southern Kangaroo Island. Total effort in terms of pot lifts for MFA 48 was up 25 per cent (or 4,014 pot lifts) while catch for MFA 49 was up 9.7 per cent (2,141 pot lifts). On the other hand, effort for MFA 39 – the spatial area that accounts for the largest share of effort off Kangaroo Island – was down 6.7 per cent (3,246 pot lifts). These changes are within the range of recent historical annual changes for each MFA.

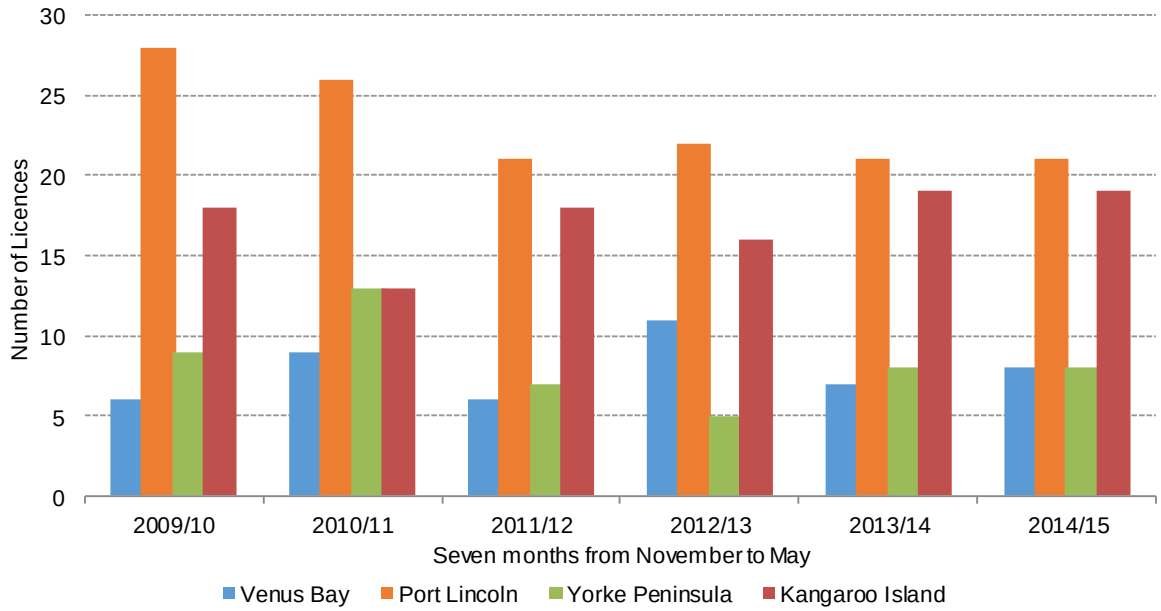
Port of landing data derived from PIRSA Catch Disposals Records data provide an alternative and more up to date source of information on rock lobster catch in the region. Landing data for the 7 month period from November to May inclusive over recent years by region for Northern Zone rock lobster fishery is presented in respect of the number of licence holders (Figure 6.15), number of landings (Figure 6.16) and kilograms caught (Figure 6.17). The allocation of ports to regions is summarised in Appendix I. Since the data refers to catch landed at ports on Kangaroo Island, it may provide a more accurate picture of impacts on rock lobster fishers who are located on the Island.

**Table 6.6: Rock Lobster Catch, Effort and Catch Rates by MFA Kangaroo Island – 3 month period beginning November**

| | Marine Fishing Area | | | | | | |
|---|---|---|---|---|---|---|---|
| Season | 39 | 41 | 42 | 44 | 48 | 49 | Total |
| **Catch (kg)** | | | | | | | |
| 2005/06 | 55,088 | conf. | conf. | 1,897 | 22,936 | 22,171 | 103,925 |
| 2006/07 | 51,142 | conf. | conf. | conf. | 18,824 | 32,105 | 104,971 |
| 2007/08 | 45,875 | conf. | 0 | 5,550 | 18,271 | 20,455 | 91,069 |
| 2008/09 | 40,776 | conf. | conf. | conf. | 14,076 | 18,831 | 78,832 |
| 2009/10 | 49,914 | 4,833 | conf. | 2,772 | 11,678 | 19,919 | 90,118 |
| 2010/11 | 54,969 | 0 | conf. | conf. | 14,172 | 17,196 | 87,768 |
| 2011/12 | 49,533 | conf. | conf. | conf. | 18,555 | 22,973 | 92,461 |
| 2012/13 | 35,233 | conf. | conf. | 4,261 | 23,546 | 19,832 | 83,801 |
| 2013/14 | 43,482 | conf. | conf. | conf. | 12,066 | 18,065 | 75,676 |
| 2014/15 | 39,140 | 0 | conf. | conf. | 18,877 | 21,184 | 80,738 |
| **Effort (number of pot lifts)** | | | | | | | |
| 2005/06 | 69,427 | conf. | conf. | 2,040 | 30,117 | 27,669 | 132,455 |
| 2006/07 | 63,695 | conf. | conf. | conf. | 23,893 | 36,578 | 127,820 |
| 2007/08 | 61,760 | conf. | 0 | 5,673 | 25,651 | 27,952 | 123,001 |
| 2008/09 | 62,773 | conf. | conf. | conf. | 23,469 | 29,321 | 122,636 |
| 2009/10 | 63,547 | 6,050 | conf. | 3,100 | 17,463 | 25,179 | 116,413 |
| 2010/11 | 48,844 | 0 | conf. | conf. | 14,451 | 15,739 | 80,371 |
| 2011/12 | 44,943 | conf. | conf. | conf. | 18,485 | 20,298 | 85,337 |
| 2012/13 | 36,716 | conf. | conf. | 3,143 | 25,132 | 20,619 | 86,195 |
| 2013/14 | 48,801 | conf. | conf. | conf. | 15,850 | 22,026 | 88,860 |
| 2014/15 | 45,554 | 0 | conf. | conf. | 19,864 | 24,167 | 91,003 |
| **CPUE (kg per pot lift)** | | | | | | | |
| 2005/06 | 0.79 | conf. | conf. | 0.93 | 0.76 | 0.80 | 0.78 |
| 2006/07 | 0.80 | conf. | conf. | conf. | 0.79 | 0.88 | 0.82 |
| 2007/08 | 0.74 | conf. | 0 | 0.98 | 0.71 | 0.73 | 0.74 |
| 2008/09 | 0.65 | conf. | conf. | conf. | 0.60 | 0.64 | 0.64 |
| 2009/10 | 0.79 | 0.80 | conf. | 0.89 | 0.67 | 0.79 | 0.77 |
| 2010/11 | 1.13 | 0 | conf. | conf. | 0.98 | 1.09 | 1.09 |
| 2011/12 | 1.10 | conf. | conf. | conf. | 1.00 | 1.13 | 1.08 |
| 2012/13 | 0.96 | conf. | conf. | 1.36 | 0.94 | 0.96 | 0.97 |
| 2013/14 | 0.89 | conf. | conf. | conf. | 0.76 | 0.82 | 0.85 |
| 2014/15 | 0.86 | 0 | conf. | conf. | 0.95 | 0.88 | 0.89 |

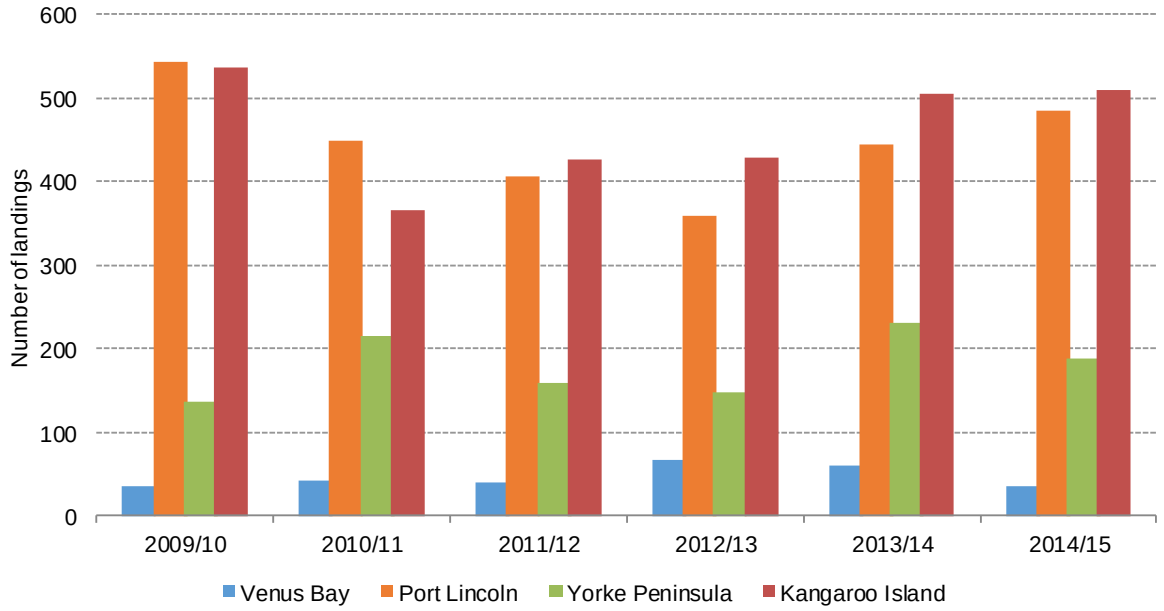
**Source:** PIRSA, logbook catch and effort, unpublished data.

**Figure 6.15: Catch Disposal Records: Number of Licence Holders Northern Zone Rock Lobster by Zone – 7 months to May**




**Source:** PIRSA, Catch Disposal Records, unpublished data.

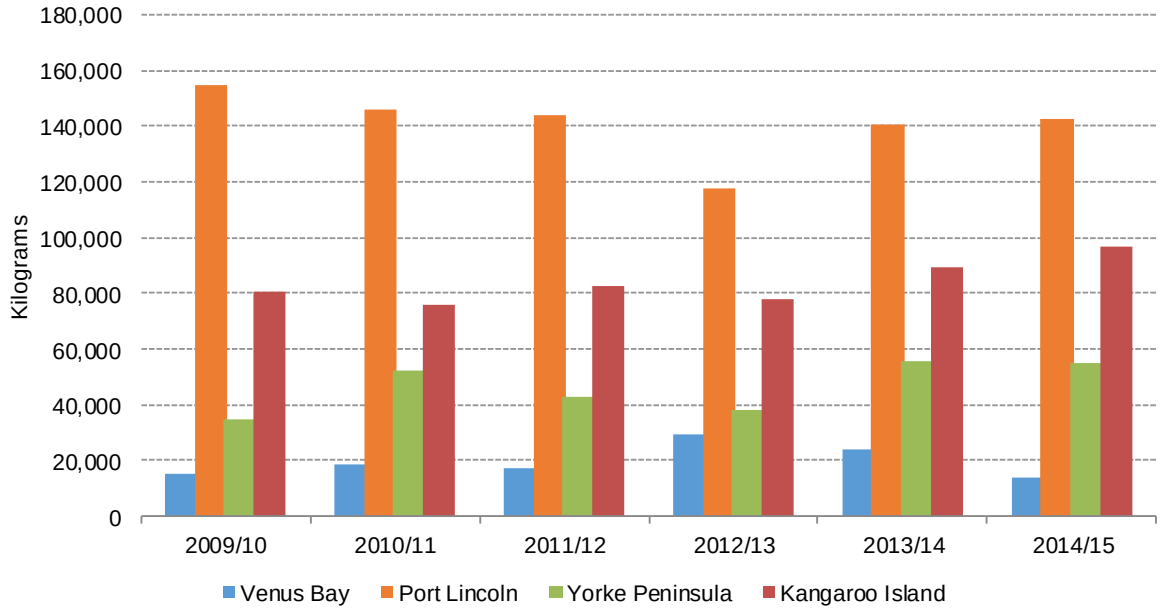
**Figure 6.16: Catch Disposal Records: Number of Landings Northern Zone Rock Lobster by Zone – 7 months to May**




**Source:** PIRSA, Catch Disposal Records, unpublished data.

The PIRSA Catch Disposals Records data indicates that there was no change in the number of licence holders landing at Kangaroo Island ports for the first 7 months operating with SZs relative to the previous year (Figure 6.15). This result conflicts with advice received through the consultations that the number of boats operating from the island had been reduced or fishers had exited the fishery. More significantly however, the port of landing data indicates that there was no change in the number of landings on Kangaroo Island relative to the previous year (Figure 6.16), while the catch landed rose by 7.7 per cent. In fact, the landed catch was higher than for the previous 5 years (Figure 6.17). These results indicate no negative short term impact on the Kangaroo Island rock lobster fishery from SZs.

**Figure 6.17: Catch Disposal Records: Kilograms Caught Northern Zone Rock Lobster by Zone – 7 months to May**

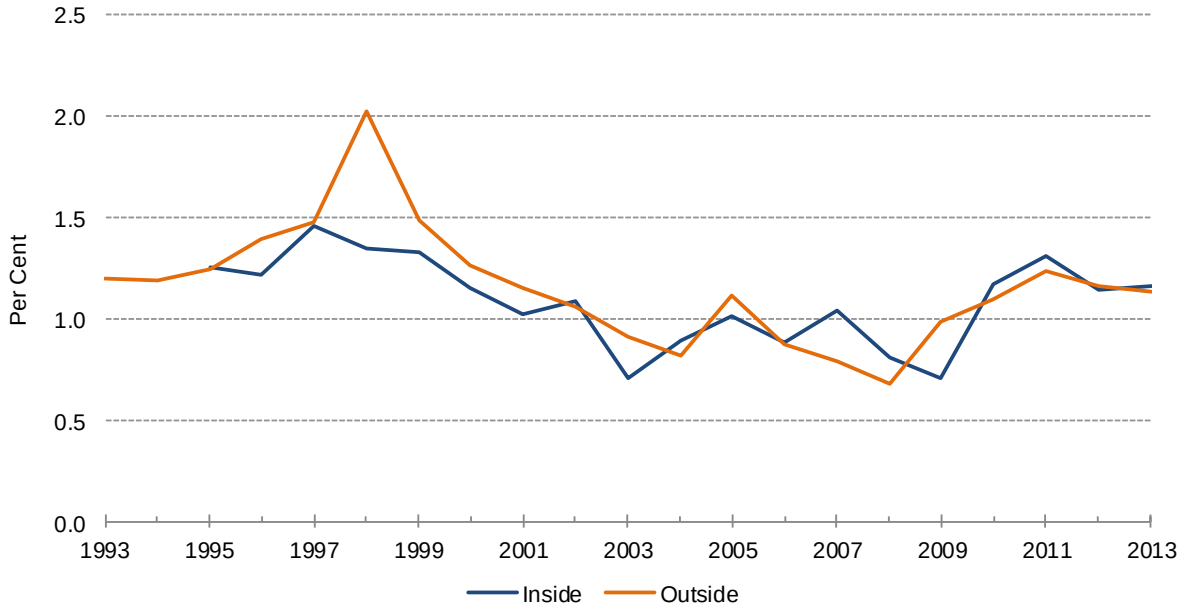



**Source:** PIRSA, Catch Disposal Records, unpublished data.

The relatively higher productive capacity of SZs, particularly in relation to Cape du Couedic SZ, has been identified as a factor that could have led to fishing catch displaced by SZs from being underestimated. With respect to the rock lobster fishery SARDI's research pot program provides some high quality data in respect productivity inside and outside SZs. As the research pots have associated Global Positioning System data, they provide fine level spatial data detail on activity.

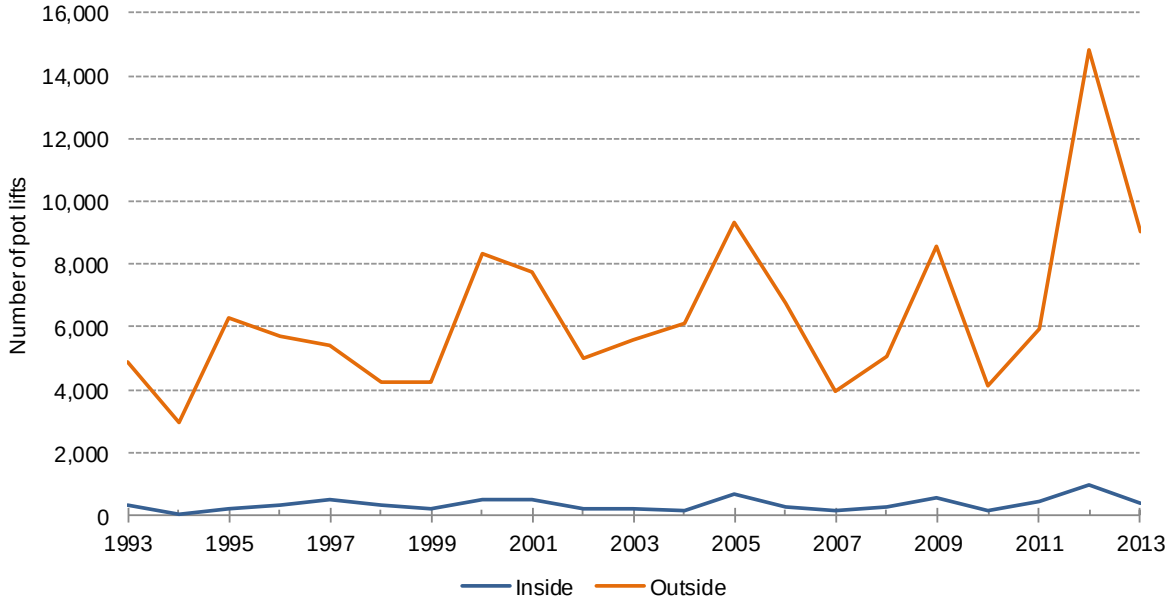
Figure 6.18 shows that CPUE inside and outside SZs around Kangaroo Island have closely tracked one another over the two decade to 2013. The research pots provide no evidence of higher productivity inside SZs. The research pots also provide insight into effort inside and outside SZs – refer Figure 6.19. Over the 2 decades to 2013 7.4 per cent of research pot lifts around Kangaroo Island occurred within SZs, ranging from a low of 2.7 per cent in 2004 to a high of 17 per cent in 2011.

**Figure 6.18: Rock Lobster Catch Per Unit Effort (kg per pot lift) Inside and Outside Sanctuary Zones Kangaroo Island – Research Pots, Season**




**Source:** SARDI, unpublished data.

**Figure 6.19: Number of Pot Lifts Inside and Outside Sanctuary Zones Kangaroo Island – Research Pots, Season**




**Source:** SARDI, unpublished data.

### 6.2.3 Marine Scalefish Fishery

MSF activity is concentrated off north eastern Kangaroo Island, centred on the sheltered areas of Bay of Shoals, Western Cove and Eastern Cove. As a consequence, PIRSA logbook targeted catch and hauling net data was sought in respect of the three spatial areas located off north and eastern Kangaroo Island: MFA 41, 42 and 44. Unfortunately data for the majority of those relevant species considered was confidential, leaving us with little data to gauge impacts.

In terms of targeted catch data, sector level data was only available for King George whiting (KGW) targeted handline and calamari targeted jig. Data for these two species for the 4 month period from October to January inclusive over previous years is presented in Table 6.7. Targeted handline KGW catch for the first 4 months with SZs was up 1.9 per cent compared to the previous year. The increase was wholly due to a significant increase in effort (up 8.6 per cent), with the catch rate being down from the previous year (by 6.2 per cent to 12.7 kg per day). On the surface these results suggest that KGW fishers may be putting in more effort in less productive areas to maintain catch levels since the introduction of SZs. However, the latest catch rate was in line or higher relative to those achieved in the same period in 2011/12 (12.5kg per day) and 2012/13 (10.2kg per day), while catch rates over recent years have been significantly lower compared to those achieved in earlier years. It is therefore difficult to separate the impact of SZs from short-term seasonal variations and the apparent longer term decline in catch rates.

**Table 6.7: Catch and Effort for King George Whiting and Calamari Kangaroo Island (MFAs 41, 42 and 44) – 4 month period beginning October[a]**

| | King George Whiting – handline | | | Calamari – targeted jig[b] | | |
|---|---|---|---|---|---|---|
| | Catch (kg) | Effort (days) | CPUE (kg per day) | Catch (kg) | Effort (days) | CPUE (kg per day) |
| 2005/06 | 8,403 | 497 | 16.9 | conf. | conf. | conf. |
| 2006/07 | 10,988 | 564 | 19.5 | conf. | conf. | conf. |
| 2007/08 | 9,191 | 531 | 17.3 | 28,216 | 832 | 33.91 |
| 2008/09 | 10,071 | 543 | 18.5 | 25,574 | 762 | 33.56 |
| 2009/10 | 9,420 | 616 | 15.3 | 39,828 | 1,023 | 38.93 |
| 2010/11 | 7,022 | 539 | 13.0 | 27,595 | 927 | 29.77 |
| 2011/12 | 6,300 | 503 | 12.5 | 43,383 | 1,104 | 39.30 |
| 2012/13 | 4,856 | 475 | 10.2 | conf. | conf. | conf. |
| 2013/14 | 4,419 | 327 | 13.5 | 32,662 | 831 | 39.30 |
| 2014/15 | 4,502 | 355 | 12.7 | 33,069 | 886 | 37.32 |

**Note:** (a) Data relates to "targeted" fishing effort only, i.e. excludes any non-targeted catch in the region (e.g. due to by-catch).
(b) Refers to MFA 42 and 44 only.
**Source:** PIRSA, logbook catch and effort, unpublished data.

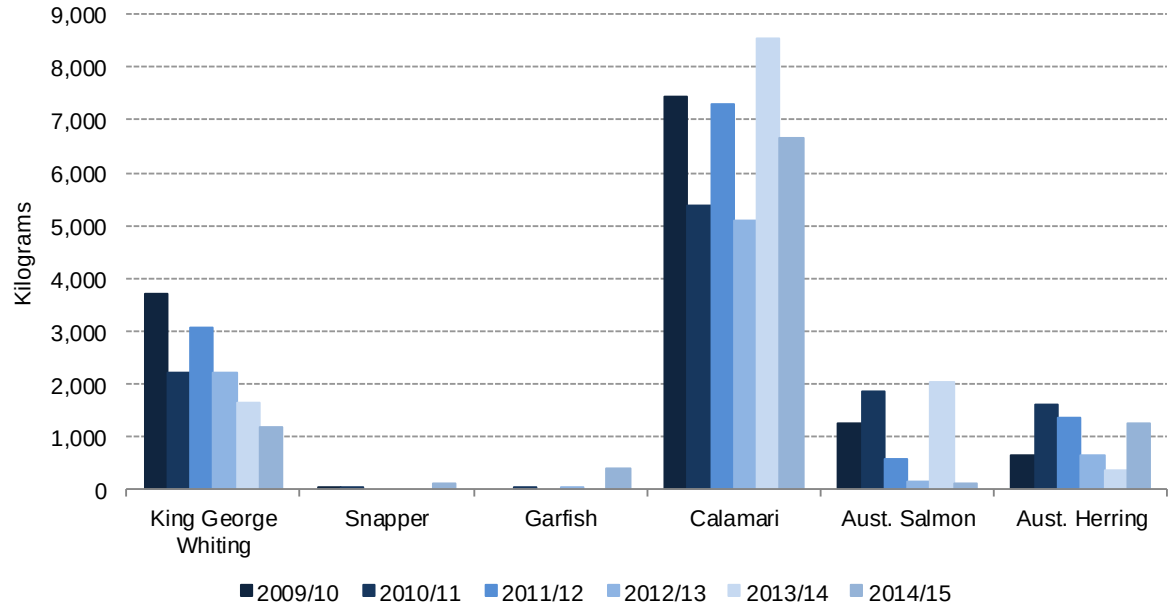
A similar scenario applies for targeted jig calamari catch. Both catch and fishing effort increased for the first 4 months with SZs compared to a year earlier (by 1.2 per cent and 6.6 per cent respectively), while catch rate was down (by 5.0 per cent). Although catch rate was down for the immediate SZ period, it remained slightly above its average level over the previous decade, at least measured by non-confidential data.

Much of the concern regarding the impact of SZs on the Kangaroo Island MSF relates to the impact of the Bay of Shoals SZ on local net fishers. Unfortunately data for all hauling net catch in respect MFA 42 – the spatial unit which incorporates Bay of Shoals – was confidential due to the small number of fishers operating in the region.

In the absence of sector wide level data, we must rely on PIRSA commercial logbook data for those fishers that waived confidentiality restrictions. Figure 6.20 shows the total catch for selected MSF species between 2009/10 and 2014/15 for the four month period from October to January inclusive for fishers that waivered confidentiality. The results highlight the limitations of the disclosed data. For

instance, snapper catch was minimal as the data period falls outside the peak seasonal period for snapper, while a similar scenario applies for Australian Salmon. The latter along with Australian herring have experienced significant annual changes for the period shown, which in part reflects the relatively low level of targeted effort for these species. Similarly, while targeted jig calamari catch for the first 4 months under SZs was down 22 per cent compared to the corresponding period a year earlier, catch was consistent with earlier years, indicating that the latest change was within the natural range of temporal variation. Finally, targeted handline KGW catch for the 4 months to January 2015 was down 13 per cent compared to a year earlier. This decline follows similar falls over the previous two years, making it difficult to discern whether the latest result reflects underlying longer term factors, an impact from SZs or natural variation.

**Figure 6.20: Catch of Select MSF Species for Non-confidentialised Limited License Data[a] Kangaroo Island (MFAs 41,42, 44) – 2009/10 to 2014/15, 4 month period beginning October**



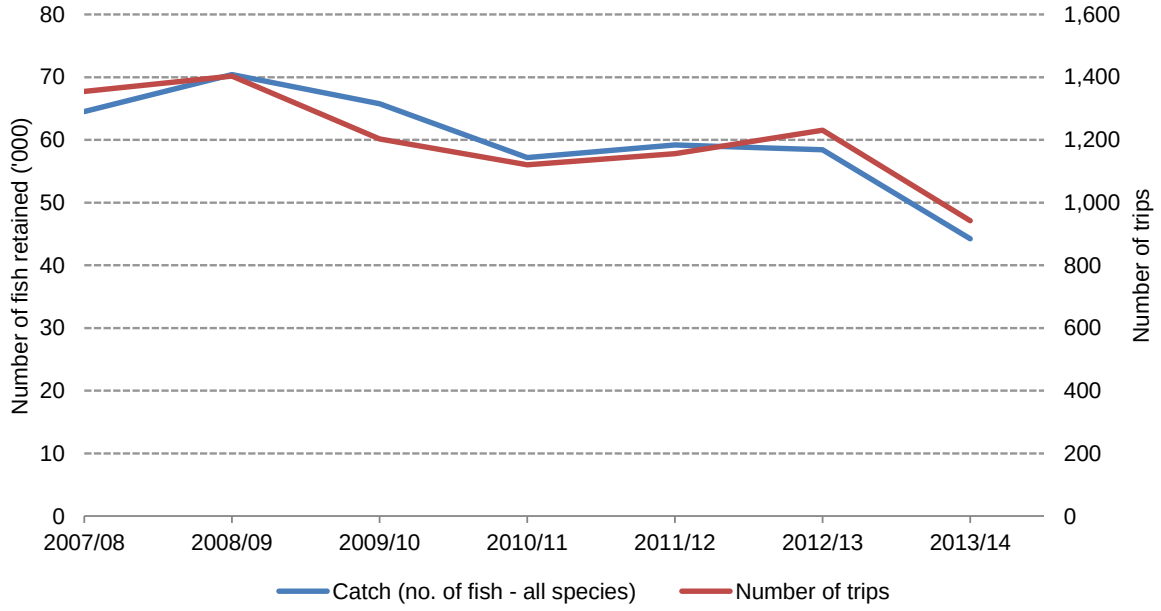

**Note:** King George Whiting = targeted handline and longline, snapper = targeted handline and longline, garfish = hauling net, calamari = targeted jig, Australian salmon = hauling net, Australian herring = hauling net and bronze whaler = longline.
**Source:** PIRSA, logbook catch and effort, unpublished data.

### 6.2.4 Charter Boat Fishery

Historical catch and effort for the charter boat fishery around Kangaroo Island for the 7 financial years leading up to the introduction of SZs is illustrated by Figure 6.21. There has been some decline in charter boat activity over this period. A total of 942 trips were undertaken in 2013/14, down 30 per cent compared to 2007/08. Total fish retained was down by a similar magnitude over this period. Much of the decline was concentrated in 2013/14 with the number of trips falling by 23 per cent. It is possible the 2013/14 result reflects seasonal conditions given the lack of any major management changes over this timeframe.

Charter boat effort around Kangaroo Island under the first four months with SZs was down 4.9 per cent relative to the corresponding period the previous year in terms of the number of trips undertaken – refer Table 6.8. In contrast, there was an improvement in catch with the total number of fish retained up 6.3 per cent between these periods.

**Figure 6.21: Catch and Effort for Charter Boat Sector[a] Kangaroo Island (MFAs 41, 42, 44, 48 and 49) – Financial Year**




Note: a Number of trips includes eco-tour effort.
Source: PIRSA, logbook catch and effort, unpublished data.

**Table 6.8: Catch and Effort for Charter Boat Sector[a] Kangaroo Island (MFAs 41, 42, 44, 48 and 49) – 4 month period beginning October**

| | Catch (number of fish retained) | | | | Effort (number of trips) | Catch per trip (no. of fish – all species) |
|---|---|---|---|---|---|---|
| | KGW | Snapper | Redfish | All species | | |
| 2007/08 | 7,277 | 6,014 | 4,128 | 29,056 | 624 | 46.6 |
| 2008/09 | 9,807 | 6,623 | 5,225 | 35,922 | 704 | 51.0 |
| 2009/10 | 7,214 | 5,480 | 5,125 | 32,423 | 584 | 55.5 |
| 2010/11 | 6,757 | 5,239 | 2,921 | 24,677 | 488 | 50.6 |
| 2011/12 | 6,616 | 6,260 | 4,722 | 30,924 | 562 | 55.0 |
| 2012/13 | 4,703 | 5,023 | 5,693 | 27,688 | 586 | 47.2 |
| 2013/14 | 2,467 | 4,094 | 3,588 | 17,772 | 385 | 46.2 |
| 2014/15 | 2,249 | 4,097 | 3,422 | 18,897 | 366 | 51.6 |

**Note:** a Number of trips includes eco-tour effort.
**Source:** PIRSA, logbook catch and effort, unpublished data.

At a state-wide level SZs were estimated to have displaced 5.2 per cent of total annual Charter Boat Fishery effort (Ward et al 2012.). The 4.9 per cent reduction in the number of trips undertaken around Kangaroo Island for 2014/15 is in line with this estimate; however, the figures are not directly comparable due to methodological differences (e.g. displaced effort was calculated based on person days, while trips with no fishing effort were excluded etc.).

Finally, the trip estimates presented here include eco-tour trips. The decline in overall effort suggests that there has been little to no increase in eco-tour effort since the introduction of SZs. This result is not unexpected given the limited period of experience with SZs.

## 6.3 Evidence for Economic Impact

There are a number of limitations to assessing the impact of marine sanctuary zones on the value of catch by Kangaroo Island based fishers, largely related to the short time period for which data is available since the introduction of the SZs and limitations in the catch data. For a full discussion, see section 3.4.

As value of landed catch data is not available on a regional basis, regional estimate have been imputed by combining regional catch data with state-wide average landed price for each fishery.

***Landed catch – Kangaroo Island***

PIRSA data has been used to estimate the catch of rock lobster, as they report catch actually landed on Kangaroo Island.

The greenlip abalone fishery has not been included in this economic impact analysis as SARDI have indicated that there has been a shift in the temporal pattern of greenlip abalone harvesting unrelated to the SZs, namely that in response to data that average weights of greenlip abalone are significantly higher in autumn fishing effort has shifted to these months (Stobart et al 2013). The recent change in fishing patterns applies more so to the Western Zone rather than Central Zone abalone fishery in which Kangaroo Island is located. However, given some change may have also applied to the Central Zone we have decided to exercise caution and exclude the greenlip fishery.

SARDI data has been used to estimate the change in catch for blacklip abalone catch on Kangaroo Island. Unfortunately, data by MFA is not available for central zone abalone (nor is the PIRSA port of landing available) due to confidentiality restrictions. As such the only available data is for the Central Zone as a whole.

SARDI data has also been used to estimate the catch of the four marine scalefish for which price data is available. For marine scalefish catch data is available on an MFA basis, although in the case of the three MFAs adjacent to Kangaroo Island (41, 42 and 43) confidentiality restrictions prevent the release of MFA level data in some instances. In these cases, where possible, either data for a single MFA, or data aggregated across the three MFAs has been used. Confidentiality restrictions also mean that for some scalefish catch data may only reflect one or two of the possible catch techniques (e.g. data for King George Whiting for Kangaroo Island only includes catch by targeted handline). Whether this will result in changes being under- or over-estimated is not known.

It is important to note that as the analysis is based on MFAs it will be an imperfect guide as to regional impacts, as fishing in a MFA is not restricted to boats operating out of the nearest region. For example, some of the catch in MFAs 41, 42, and 43 is likely to be from boats based in other regions such as the Fleurieu Peninsula, Adelaide, the Yorke Peninsula etc.

As can be seen from the data in Table 6.9, there was an increase in the landed catch of Rock Lobsters from the 2013/14 season to the 2014/15 season. As the PIRSA Catch Disposals Records data is available up to May 2015, it covers the whole 2014/15 Rock Lobster season. Whilst seasonal or stock related factors certainly cannot be ruled out, particularly as there has only been a single season since the introduction of SZs, there is certainly no evidence of an adverse impact of SZs on the rock lobster fishers based on Kangaroo Island.

**Table 6.9: Rock lobster fishery Kangaroo Island, landed catch and number of license holders, 2012/13 to 2014/15**

| | Nov 2012 - May 2013 | | Nov 2013 - May 2014 | | Nov 2014 - May 2015 | | Change in catch 2013/14 to 2014/15 (%) |
|---|---|---|---|---|---|---|---|
| | No of Lic Holders | Catch (kg) | No of Lic Holders | Catch (kg) | No of Lic Holders | Catch (kg) | |
| Kangaroo Island | 16 | 78,228.9 | 19 | 89,629.4 | 19 | 96,553.2 | 7.7 |

**Source:** PIRSA, unpublished data.

Data for other fisheries for which price data exists are more mixed. Catch data for Garfish and Snapper was not available due to confidentiality restrictions on the data. The catch of blacklip abalone was down 4 per cent for the period October 2014 to January 2015 compared to the same period in the previous

financial year, although it should be noted that the fall over the same months from 2012/13 to 2013/14 was even larger at over 20 per cent, suggesting that there may be other factors influencing the catch than just the introduction of the SZs. Catch of both King George Whiting and Southern calamari were up modestly for the period October 2014 to January 2015 compared to the same period in the previous financial year, although they were down compared to the same period in 2012/13.

**Table 6.10 Landed catch MFAs adjacent to Kangaroo Island October to January, 2012/13 to 2014/15**

| | 2012/13 (kg) | 2013/14 (kg) | 2014/15 (kg) | Change 2013/14 to 2014/15 No. | Per cent |
|---|---|---|---|---|---|
| Blacklip Abalone - Central zone | 4,737.0 | 3,673.9 | 3,529.6 | -144.3 | -3.9 |
| Garfish - MFA 42 only | CONF | CONF | CONF | | |
| King George Whiting - MFAs 41, 42 & 43[(a)] | 4,856.0 | 4,419.0 | 4,502.0 | 83.0 | 1.9 |
| Snapper - MFAs 41, 42 & 43 | CONF | CONF | CONF | n/a | n/a |
| Southern calamari - MFAs 42 & 43 only and excludes 42 for 2012/13[(b)] | 37,042.4 | 32,662.0 | 33,069.4 | 407.4 | 1.2 |

**Note:** (a) Targeted handline only.
(b) Total haulnet only.
**Source:** PIRSA, unpublished data.

### *Landed value of catch*

Data on the total monthly landed value of catch for key fisheries is available from PIRSA. As with other SARDI data, this was only available up to January 2015 for this study. Estimates of average prices received have been calculated by dividing the value of landed catch by the volume of catch for that period.

The weighted average landed price of rock lobster was over 16 per cent higher in the period October to January 2014/15 compared to the same period in the previous year. The timing of the PIRSA data may mean that the average value of catch for the season is slightly overstated as prices in January tend to be higher than in other months and January prices will have a higher weight in data from October to January than in November to May. However as this difference appears relatively consistent between years this should not distort the year to year comparisons too much.

Average landed prices for blacklip abalone were broadly stable in the period October 2014 to January 2015 compared to the same period in the previous year, as were prices for King George Whiting and snapper. The average landed prices for Garfish were higher in the period October 2014 to January 2015 than over the same time period in the previous year. The average price of southern calamari was down over this period compared to the previous year.

The net effect of these changes in quantity and estimated price is that Kangaroo Island has seen the value of its landed catch increase strongly for the period after the introduction of the SZs due to a very large (almost $1.6 million) increase in the estimated value of rock lobster.

**Table 6.11: Estimated value of landed catch, Kangaroo Island, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| Rock lobster | 6,143.3 | 7,715.3 | 1,572.0 | 25.6 |
| Abalone | 107.1 | 102.7 | -4.5 | -4.2 |
| Garfish | CONF | CONF | n/a | n/a |
| King George Whiting | 93.9 | 96.5 | 2.5 | 2.7 |
| Snapper | CONF | CONF | n/a | n/a |
| Southern Calamari | 384.0 | 354.3 | -29.7 | -7.7 |
| Total | 6,728.4 | 8,268.8 | 1,540.4 | 22.9 |

**Source:** PIRSA, unpublished data.

Positive economic impacts arising from increased rates of return are not suited to analysis using input-output tables, which are at their most useful when assessing changes in production. The degree to which impacts are felt locally will also crucially depend on the ownership of the fishing license and the place of residence of the license holder. As such the positive regional economic impacts on Kangaroo Island have not been modelled.

## 6.4 Consultations

A Senior Research Economist of SACES visited Kangaroo Island from 23rd to 25th of April. Face to face meetings were conducted with local commercial fishers, related businesses (fish retail, marine servicing), tourism stakeholders, the Kangaroo Island Natural Resources Management (NRM) Board and the Kangaroo Island Council. Phone conversations and face to face meetings in Adelaide were conducted with other stakeholders including abalone fishers. Several submissions were also received, including from the Kangaroo Island Marine Action Group (MAG).

### Summary of Issues

Several respondents noted that not much time had passed under the new SZ management plans and that impacts would take some time to fully materialise. Assessing impacts on fishers would also be complicated by certain other factors. For instance, catches will be affected by the favourability of weather and marine conditions while yields for particular species may reflect historical factors that occurred prior to introduction of the SZs (see discussion on rock lobster below). Furthermore, some fisheries have seasonal restrictions meaning actual experience operating under SZs may be less than the duration for which SZs have been in place. One would preferably have a full year operating under SZs to assess their impact and ideally several years in order to mitigate other factors. Nonetheless, some fishers have experienced negative impacts or expressed concerns, which are discussed in turn.

### Marine Scalefish Fishery

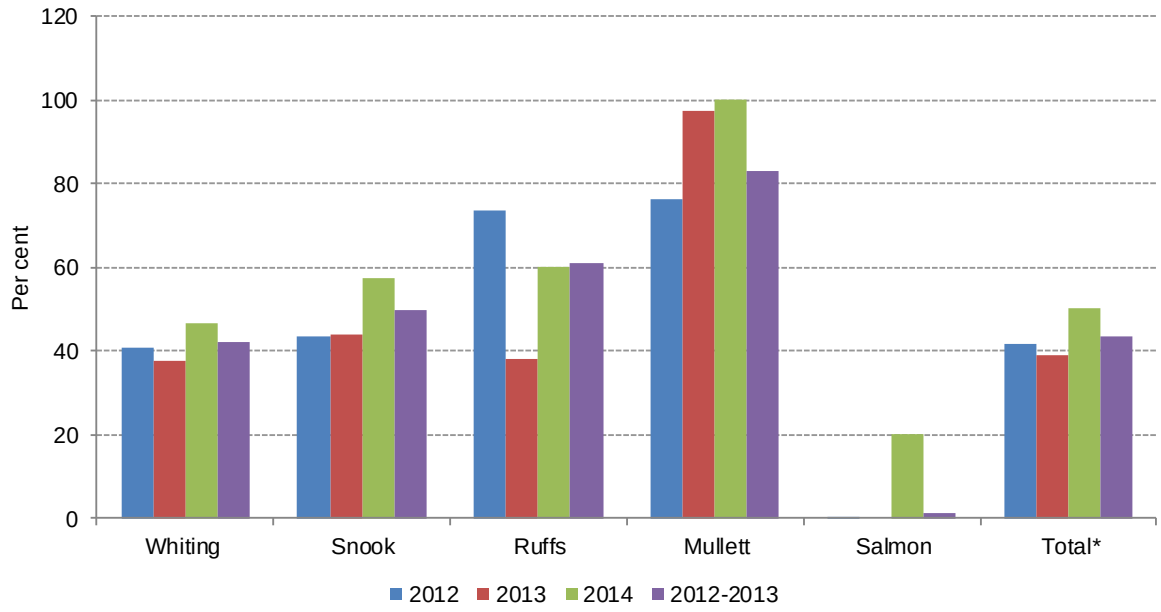
Marine net fishers on KI appear to be most significantly affected in the short term. There are two main net fishers on KI who previously operated primarily in two regions: the Bay of Shoals and Western Cove. Establishment of the Bay of Shoals SZ in their view has significantly reduced the area of commercially viable fishing ground. The net fishers advised that their ability to offset the displaced fishing effort by fishing in other areas was limited. In their view other coastal areas of KI were not favourable for net fishing, due either to the nature of the marine environment and/or being more exposed to sea conditions, while other areas were less accessible due to a lack of roads and boat ramps. The negative production impact of the SZ would have been mitigated to date somewhat by the fact that Bay of Shoals was previously closed to net fishing from January to March of each year. Hence, any negative production impacts will become more acute from April onwards as the two fishers would have resumed fishing in this area. As a consequence, the net fishers expected that their production would decline significantly. One of the fishers felt that the establishment of the Bay of Shoals SZ had reduced the number of sustainable net fishing jobs in the region from approximately 1.75 jobs to 0.75 jobs. Data compiled by the Marine Fishers Association has previously estimated the potential loss of marine scalefish production in respect of Bay of Shoals at $153,750 per annum (KI MAG submission).

One net fisher provided data that illustrated the significant extent to which Bay of Shoals contributed to their total catch – refer Figure 6.22. For 5 of their key species targeted – whiting, snook, Australian herringruffs, mullet and salmon – the Bay of Shoals typically accounted for approximately 40 per cent of their total catch over recent years. There was significant variation across species, with Bay of Shoals accounting for approximately 40 per cent of their catch of whiting, almost 50 per cent of their catch of snook, and almost all of their catch of mullet.

In addition to reducing production, it was felt that the SZs had increased fuel costs as fishers had to drive and/or boat further to reach alternative fishing spots. One net fisher indicated that their fuel use had increased from 15 to 40 litres per day. There were also safety concerns as fishers had to travel to

less accessible areas where infrastructure such as roads and boat ramps are less well developed or maintained.

**Figure 6.22: Proportion of Catch (Weight) by Species Derived from Bay of Shoals for One MSF Net Fisher**




The reduction in production for the two net fishers has had an apparent negative flow on impact to one local seafood retailer/wholesaler. The seafood business advised that its supply was dependent on the two fishers and the consequent reduction in the consistency of supply had affected its operating viability. As a consequence the retailer was planning to shut down the customer oriented seafood take away component of the business in May as it was no longer considered viable (closure was subsequently confirmed for 31 May). While the retailer imported seafood to the Island and could possibly obtain additional supply from Adelaide, this would result in less fresh product being made available and, more significantly, would be antithesis to the mission of the business which is to provide local "Kangaroo Island" seafood. In addition to affecting incomes for the two proprietors, closure of the business affected employment for part-time/casual staff.

In a community notice the seafood business noted that lifestyle and health reasons also contributed to the decision to close the shop front. SACES notes that other feedback indicates that retail conditions have been challenging in Kingscote which may have also contributed to the decision. In such an environment and given a narrow supply base, an adverse supply shock associated with implementation of the SZs (or any other factor for that matter) would seem sufficient to tip the shop front into an unsustainable position.

Beyond the reduction in income, closure of the shop front may have social ramifications for the Kingscote community. As one member of the KI NRM Board noted, closure of the shop is potentially significant for the local community as it is the only one in Kingscote. Its closure may impact the range of choice of fish available to local consumers, and may also reduce the supply of affordable seafood for consumers. The proprietor advised that it sold affordable species such as Australian herring, snook and mullet that were supplied by the local net fishers. According to the proprietor such varieties are popular with pensioners. SeaLink staff based on Kangaroo Island noted that closure of the shop and restricted hours of the wholesaler made it more difficult to obtain local gummy shark that is used for the lunch they prepare as part of personalised tours. It also meant that produce could no longer be promoted as local as it was often sourced from the mainland. In its submission the Kangaroo Island MAG noted that "it is becoming increasingly unusual to eat Kangaroo Island seafood in a hotel or restaurant on the island and the SZs have contributed to this in the last 12 months and will continue to do so in the future".

Another MSF processor with operations on Kangaroo Island advised that they had raised their wholesale prices as a consequence of a reduction in KGW catch. They noted that their combined KWG and rock lobster catch was probably down 40 per cent since the introduction of SZs. The price rises would have flow on impacts to local businesses. They had relocated one boat off the Island which involved the relocation of two jobs. With the loss of economies of scale they have had to make cost savings on the processing side of the business including reductions in hours. One processer has moved on due to the reduction in hours.

A line and long line MSF fisher from Cape Jervis advised that they had been adversely affected by the loss of fishing spots due to SZs and had not been able to find alternative fishing spots. SZs in this respect include the Orcades Banks in the straits and Sponge Gardens off eastern Kangaroo Island. They had also been affected by a fisher displaced by the Rapid Head SZ who has subsequently moved into their usual area. This fisher was previously leasing quota but was no longer doing so with the exception of some 'schoolie' and were thinking of selling their license. They also advised they regularly saw recreational fishers fishing in the Sponge Gardens SZ.

### Rock lobster fishers

Several rock lobster fishers were interviewed. The lobster fishers had generally not been significantly affected by the SZs to date. Two rock lobster fishers interviewed had been able to meet their quotas but claimed to have experienced lower productivity and higher input costs in doing so. These two fishers provided data on the number of days spent fishing, boat fuel used and total catch for the current and previous financial years. The percentage change in these and related metrics for the two fishers are presented in Figure 6.23 along with data for a third fisher/boat that was submitted as part of the Kangaroo Island MAG submission. The three rock lobster fishers appear to have experienced a decline in productivity with the total catch per day declining by 8 to 14 per cent (the change in catch per pot lift is unknown). Meanwhile, boat fuel used per day for the first two fishers rose by 2.2 per cent and 4.1 per cent respectively.

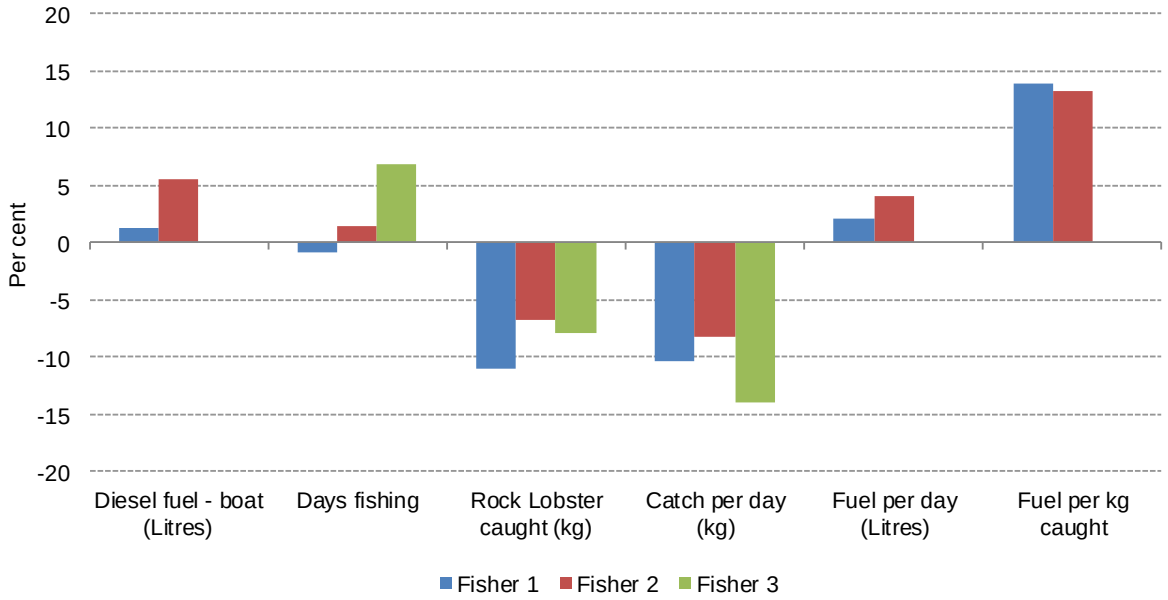
The establishment of the Cape du Couedic SZ was considered by the fishers interviewed to have the most significant impact for rock lobster fishers. Although a relatively small area, it was claimed by fishers to be a productive area that was also favourable due to it being partly sheltered. The latter gave rock lobster fishers some flexibility in terms of an alternative location when weather and sea conditions made other areas less favourable. One respondent considered it to be one of the most productive areas in the Northern Zone due to a high level of nutrients and available anchorage on either side, being able to support 5 boats all season. It is interesting to note that the largest reduction in catch per day reported for the three fishers in Figure 6.23 was for fisher 3 who indicated the greatest previous effort in Cape du Couedic of the three.

With the Cape du Couedic area no longer being available for fishing, there has been a flow on effect with fishers moving into each other's regions. One fisher noted more "friction" between the fishers during the most recent season.

The rock lobster fishers' main concern is the sustainability of fishing in other regions of Kangaroo Island over coming years. There was a worry that displaced catch from the SZs, especially Cape du Couedic, had been underestimated and that more catch should have been bought out. One fisher noted that given modern technology fishers had explored most areas and found the most productive areas. Fishers were consequently concerned that yields from other areas would not be able to be maintained over the next several years. At the same time there may be more effort from fishers outside the region – at least one fisher from Port Lincoln with a significant quota has been observed more regularly off the western coast of Kangaroo Island, although whether this fisher was displaced by SZs or some other factor is unknown. Meanwhile, a rock lobster and MSF processor on the island noted concerns about fishers

moving into unsustainable areas as a consequence of the SZs, and potential negative implications for production in future years. In relation to concerns expressed above about the productivity of SZs, we note that SARDI research pot program data indicates no significant difference in the productivity between SZs and non-SZs which would suggest that displaced catch has not been underestimated (refer section 6.2.2).

**Figure 6.23: Change in Fishing Metrics – Percentage Change, 2013/14 to 2014/15 Rock Lobster Fishers, Kangaroo Island[(a)]**




**Note:** (a) Data in respect of fuel use not available in respect of fisher 3.

The fishers noted that any deterioration in sustainability outside the SZs would show up in terms of reduced catch per pot lift, which would subsequently be reflected in reduced allowable catch per quota unit. Thus monitoring trends in catch per pot lift over the next several years may provide a guide towards the impact of the SZs and associated management changes. However, making such assessments is complicated by the fact that rock lobster yields are influenced by various factors such as weather, water temperature and currents, some of which are not well understood. For instance, during their larvae stage rock lobster swim and drift in ocean currents for one to two years, with their final destination being unknown. Thus current yields may in part reflect events that occurred several years ago.

If rock lobster yields and catch per quota unit were to decline, fishers noted that they may be required to lease additional quotas in order to maintain a viable level of overall production.

The ability of Kangaroo Island rock lobster fishers to shift fishing effort to other areas was considered to be more limited compared to those on the mainland due to the fact that Kangaroo Island is physically isolated from the mainland. KI is located near the eastern area of the Northern Zone rock lobster fishery, meaning fishers located there have less scope to travel east compared to fishers located in more central areas such as Port Lincoln.

Feedback received by SeaLink from their staff based on Kangaroo Island reveals that the exit of rock lobster fishers from the industry had been noticed. A family member of one staff member had exited the industry, selling their licence and boat. A couple of rock lobster fishing families selling out and moving off Kangaroo Island or into different industries was also observed. Whether the exit of the fishers noticed by staff was due to SZs, voluntary exit of fishers as part of the buyback scheme prior to the introduction of SZs, or other factors is ultimately unknown.

### Abalone fishers

Kangaroo Island lies in the Central Zone Abalone fishery. Unlike most other fisheries, no licences in the zone were voluntary surrendered as part of the buyback program to remove displaced catch from the SZs. As a consequence the required reduction was achieved by a pro rata reduction in catch across all licence holders in the region (DEWNR, *pers. comm.*, 23 June 2015). Thus all licence holders in the regions have experienced a reduction in quota and thus production capacity for which they have been financially compensated.

Like rock lobster fishers, abalone fishers felt they were also negatively affected by the implementation of the Cape du Couedic SZ. This was considered by them to be a highly productive area that is favourable for diving due to it being somewhat sheltered. There was a concern that displaced catch from Cape du Couedic was underestimated and that insufficient catch was removed. For the abalone fisheries, displaced catch was estimated based on the SZ area in the fishing region which can result in errors where fishing effort is not distributed evenly across the region. This limitation was recognised in the revised estimates of displaced catch developed by Ward et. al. (2012, p.39):

> *"The absence of fine-scale spatial (GPS) data results in significant uncertainty in estimates of historical abalone catch. As a result, there is significant potential for error in the estimates of historical catches for individual final SZs."*

Abalone fishers noted they now travelled further distances leading to higher fuel costs. Specific estimates of fuel costs were not provided.

Since the vast majority of abalone is exported reduced quota allocations will be felt in terms of reduced export incomes. Reduced quotas would also mean reduced fishing effort which will translate into lower incomes for employees and reduced purchases from local suppliers. In quantitative terms one abalone fisher claimed that fuel for boat and vehicles together with food costs may be equivalent to approximately $300 per day.

In terms of social impacts, one operator noted potential safety concerns associated with having to dive in more exposed areas more often due to the loss of Cape du Couedic.

Poaching is considered to be a significant issue for the abalone sector and there were concerns that poachers would have "a field day" in the SZs in the future.

### Charter Boat Industry

Charter boat operators provided mixed feedback. One charter boat operator on Kangaroo Island advised that one preliminary draft SZ was of a size and position that would have effectively sent them out of business. However, following consultations the zoning was adjusted to minimise the impacts and they were consequently satisfied with the outcome. They estimated the final SZ affected about 10 per cent of their catch but they have learnt to adapt. The other main effect of the SZ would have been to increase the length of one trip by approximately 20 miles per trip, this is undertaken approximately 10 times per year. Another charter boat operator consulted on Kangaroo Island had experienced minimal negative impact. This operator did not do a significant amount of offshore fishing, tending to operate in their local bay which has been unaffected by SZs. However, they had experienced some initial increase in costs as they had to invest time and effort locating new off shore fishing spots to replace those trips that had been affected by SZs. They has also noticed some increase in fishing effort in their usual operating area but was not sure of it was due to SZs or longer term trends as increasing effort had been observed over recent years.

On the other hand, a charter boat operator operating out of Cape Jervis advised that they had been adversely affected by SZs. The Sponge Gardens SZ had reduced access to certain species such as gummy sharks and meant they had to travel further distances when targeting tuna. The latter would

almost double fuel use for these trips. One effect of the SZ was that it had bunched all of the charter operators together, typically in Backstairs Passage. They were consequently planning on reducing their charter operation by one boat in order to give the remaining two more room to operate in. Otherwise it was felt that there had been no reduction in demand while costs overall generally remained the same. More significantly however, this fisher also had a MSF license and targeted snapper in the Sponge Gardens SZ during the winter period. Without access to this region the fisher had taken a significant hit to catch and thus income. As a consequence this individual was now supplementing their income with alternative employment during the winter period, but was not making up the loss from the displaced snapper catch. One of the biggest concerns was that there was overfishing in the remaining area left. It was acknowledged that in the longer term they may benefit from SZs, but it would take at least 5 years before the impacts could be properly gauged.

### General fishing issues, potential management changes

Fishers across the board raised concerns about future increases in licence fees due to the overall reduction in licences. Whether any such potential move was equitable was questioned. One abalone fisher noted that their licence fees relative to quota allocation had now effectively increased. If commercial fishers are facing other costs in terms of reduced productivity or higher input costs then what sacrifices are PIRSA making to limit the impact on licence fees?

Although outside the scope of our analysis, fishers were generally extremely dissatisfied with the marine parks determination process. There was a feeling that decisions were decided from the start and implemented from top, and that fishers' local knowledge was not taken into account as part of the decision making process.

In terms of mitigating the economic and social impacts of SZs, the Kangaroo Island MAG identified several options, including adoption of:

- pilot areas;
- multi-use zones; and
- setting aside an area for a period of time and gathering agreed environmental and economic data during that period.

### Tourism, Ecotourism and Investment

No specific examples of any eco-tourism benefits or developments resulting from SZs were identified to date. This is not surprising given the short time frame under which SZs have been operating. Furthermore, any potential marine ecosystem benefits and thus related tourism benefits may take years to emerge. That said, one marine tourism operator did leverage the SZs as part of their existing tours, and was thinking about adding a boat to provide snorkelling in one of the SZs.

Fishers felt there was negligible potential for ecotourism due to the nature of the Kangaroo Island marine environment. In their view cold waters and the exposed nature of parts of the Kangaroo Island shoreline would limit marine based tourism opportunities, particularly diving which would also be discouraged by the presence of sharks. A lack of roads, boat ramps and mobile phone coverage in certain areas of the island such as at Cape du Couedic also currently limit the potential to expand ecotourism.

Several stakeholders expressed concern that the number of recreational fishers may have declined due to the incorrect perception that fishing was no longer allowed in marine parks. On the other hand a tourism representative noted that there was no evidence at present that SZs have had a negative impact on overall tourism to the island. SeaLink also advised that there was no noticeable impact on demand for their ferry services.

For stakeholders outside the fishing industry, there was generally a concern about the impact of SZs on local commercial fishers but also recognition that SZs represented an investment in the future. Marine SZs complement KI's main attractive features to tourists, namely its terrestrial natural wildlife and landscapes.

While no specific tourism developments related to the SZs have been implemented to date, some consideration was being given to potential future developments. For example, the idea of a marine interpretive centre that leverages the SZs is being considered.

One fish processing operator was considering a potential wharf tourism development that would link in with an existing wildlife tourism operator. This potential development would focus on supplying tourists as well as local residents. However, with the decline in economies of scale the wharf development has become less likely. There was also considered to be a lack of concern for the business case on the behalf of local government officials.

Another proposal raised in respect of the wharf at Kingscote (by a member of the Kangaroo Island Natural Resources Management Board) was the potential development of a marine research centre. The centre could focus on emerging tidal energy generation technology as well as other marine related disciplines. Initial discussions with the University of Adelaide had apparently been held. It was advised that any such potential development should incorporate or engage existing fishers.

One non-fishing stakeholder argued that the fragmented way in which marine parks had been implemented had limited the marketing potential of the parks. A park around the entire island named Kangaroo Island Marine Park would have provided for improved marketing synergy.

### Scientific Monitoring

Fishers and some representatives of the KI Natural Resources expressed concerns over the lack of baseline scientific data scientific analysis. Information relating to recent environmental monitoring efforts in respect of Kangaroo Island are summarised in Appendix G.

### General Economy

Several respondents noted that the Kingscote economy was currently in a poor state. While the precise reasons for this are not known, general weakness in the broader South Australian and Australian economies were identified as primary contributing factors. The SZs were not considered a primary factor behind the current weakness, but rather an unwelcome additional negative factor on top of an already tough situation.

## 6.5 Environmental Impact

SZs provide protection for habitats that in turn support various species and ecosystems. Maintenance of these habitats is expected to have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). Such benefits may include changes in the size and/or abundance of particular species. It is too early for any measurable ecological changes to have occurred within SZs around Kangaroo island since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program together with preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Kangaroo Island region are presented in Appendix G.

# 7. Port Wakefield (Wakefield)

The following section examines various economic and social indicators for Wakefield Regional Council, and to a lesser degree Port Wakefield, to gain insight into the potential short term economic and social impact of SZs. In some cases data sources are not yet available for the post SZ period and are consequently presented for baseline purposes to assist any future analysis. Initial catch and effort data for relevant commercial marine fisheries in upper Gulf St Vincent are also considered.

### Summary – Wakefield

- The small population of Wakefield RC and relative lower median incomes would generally make the region more susceptible to economic, social or environmental shocks. As the third smallest township in the Wakefield RC area and with even lower median incomes Port Wakefield would be even more sensitive to such shocks.
- The Wakefield RC economy is heavily geared toward primary industries, particularly agriculture.
- Approximately 1 per cent of the working population in Wakefield RC were employed in industry sectors that could be potentially affected by SZs. Exposure for Port Wakefield township would be relatively higher given its strategic location for commercial fishers.
- There is evidence of an increase in unemployment since 1 October 2014 with Small Area Labour Markets (SALM) data indicating an increase in unemployment since the September quarter 2014. The SALM data is inherently volatile and more quarterly data are required to confirm that the increase in unemployment has been sustained. Nonetheless, the data is consistent with feedback received during the consultations indicating a loss of jobs, although broader economic weakness would also be a contributing factor.
- There appears to have been some deterioration in the number of house sales for Wakefield DC since 1 October 2014. While data for the township of Port Wakefield was not obtained, the Wakefield Regional Council advised of a notable decline in real estate sales in the town.
- Population data is not yet available for the post-SZ period. The Wakefield RC population has grown at a slower rate compared to the state population over recent years, although the growth differential has narrowed over the past 5 years.
- Below average employment in the 'accommodation and food services' sector and a lack of published data in respect of tourism suggests that Wakefield RC is not a significant tourism destination and that SZ related tourism potential in the region is quite limited.
- The marine scalefish fishery is the dominant commercial fishery in upper Gulf St Vincent with no significant abalone, rock lobster or charter boat activity in the region.
- As PIRSA logbook data was only available for the first 4 months of activity with SZs (i.e. to January 2015) and late June / early August was advised to be the peak MSF season for the region, the available data would not properly capture the potential actual impacts to date.
- Total catch for 7 key MSF species for which non-confidential data was available indicate that total catch for these species in upper Gulf St Vincent for the first 4 months with SZs was down 5.9 per cent compared to the corresponding period a year earlier. This decline follows relatively larger falls for the corresponding period in 2013/14 (-14 per cent) and 2012/13 (-45 per cent), while catch for the most recent period was above (14 per cent) the catch recorded for the corresponding period in 2009/10. Thus non-SZ medium term factors and natural temporal variation cannot be discounted as factors explaining the recent decline in catch.
- Looking at individual species, there were large declines in garfish hauling net catch (-25 per cent), Australian herring hauling net catch (-53 per cent) and a small decline in snapper longline catch (-1.7 per cent). On the other hand there was relatively large increase in hauling net catch of Australian salmon (up 376 per cent). Whether this last result reflects a switch in targeted species or natural stock variations is unknown. There were also increases in hauling net catch of calamari (37 per cent) and yellowfin whiting (8.3 per cent), although the results for these species should be treated with caution given that effort for these species is generally concentrated at other times of the year. A similar scenario applies for King George whiting which historically has recorded minimal catch during the 4 month period covered by the available data.
- Based on the limited data available, the estimated value of combined catch landed for garfish, King George whiting, snapper and southern calamari for the four month period October to January 2014/15 was down $14,000 compared to the corresponding period a year earlier. Scaling up this result based on historical intra-annual patterns of fishing we project a total fall in the value of catch of $100,000. This reduction is estimated to have a total economic impact equivalent to 0.6 full-time equivalent jobs and $75,000 in gross value added. While the estimated impacts are relatively small, they are based on quite limited data in terms of both species

and time and may not properly capture impacts on the peak fishing season for fishers in the region. They should therefore be considered preliminary and conservative.

- During the community consultations several fishers provided evidence of a reduction in incomes which they attributed to SZs, while one Port Wakefield fishing family had moved away from the region due to concerns about sustainability, incurring significant relocation costs. Locals in Port Wakefield were concerned that even a small loss of population could affect the sustainability of local public services such as the school.
- Commercial MSF fishers consulted in the region noted increased confrontation with recreational fishers.
- Local fishers consulted expressed similar concerns to those from other regions, such as equity implications due to increases in licence fees with a reduced number of fishers; potential under-estimation of displaced catch; safety concerns with operating in more exposed areas more often; and local knowledge not being reflected more greatly in final zoning.

## 7.1 Socio-economic Indicators

### 7.1.1 Socio-economic Profile

Key socio-economic indicators for Wakefield DC are summarised in Table 7.1.

As at 30th June 2014 the ERP of Wakefield DC was 6,885 persons (preliminary estimate). The population is spread across a number of townships, the largest being Balaklava which accounted for 27 per cent of Wakefield DC's population at Census 2011. Other major population centres include the townships of Owen (9.2 per cent) and Port Wakefield (8.1 per cent). The relatively small population of Port Wakefield (556 persons) makes it relatively exposed to economic, social and environmental shocks.

Wakefield DC's youth dependency ratio – a measure of the proportion of the population aged 0 to 14 years – was higher than the state average in 2013 (21 per cent compared with 18 per cent). Likewise, the aged dependency ratio – a measure of the proportion of persons aged 65 years and over – was above the state average (19 per cent compared with 17 per cent). As a consequence, the total dependency ratio for Wakefield DC in 2013 was larger compared to the South Australian population as a whole (40 per cent compared to 34 per cent).

Taking a closer look at the working age population, the number of young adults i.e. persons aged 15 to 34 years accounted for 21 per cent of Wakefield DC's population in 2011, compared to 26 per cent of the total South Australian population. As with most regional areas Wakefield DC has a lower proportion of young adults compared with South Australia, as younger persons from regional areas are encouraged to migrate to metropolitan areas for employment and education opportunities.

In terms of the labour force, the unemployment rate for Wakefield DC was modestly lower compared with South Australia in the March quarter 2015 (6.4 per cent c.f. 6.7 per cent). It may be the case that Wakefield DC's estimated rate of unemployment is understated by younger adults migrating away from the council area in search of employment. A comparison with the non-metropolitan rate of unemployment for South Australia (6.8 per cent) suggests this is not the case and the labour market conditions across Wakefield DC are similar to South Australia.

Average incomes for Wakefield DC are relatively lower compared to the state average. At the time of the 2011 Census median total household weekly income in the council area was $842, approximately 19 per cent below the state average of $1,044. Median total household income for the suburb of Port Wakefield was even lower at $749, 28 per cent below the state average. Relatively lower incomes in the region and Port Wakefield specifically imply a higher degree of sensitivity to both negative and positive shocks.

There were 789 businesses (includes 24 unclassified businesses) operating in Wakefield DC as at 30th June 2012, this is equivalent to 0.5 per cent of all businesses in South Australia.

In 2013/14 Gross Regional Product of Wakefield DC was $437 million. Economic activity in Wakefield DC is therefore a small proportion of South Australia's total output, equivalent to 0.5 per cent of South Australia's 2013/14 Gross State Product.

**Table 7.1: Key Socio-Economic Indicators for Wakefield DC**

| Indicator | Period | Wakefield DC | South Australia |
|---|---|---|---|
| Total Population (persons) | 30 June 2014 | 6,885 | 1,685,714 |
| Population density (persons/km$^2$) | 30 June 2014 | 2.0 | 1.7 |
| Average household size (persons) | 2011 (Census) | 2.4 | 2.4 |
| Population age structure | | | |
| 0 to 14 years | 30 June 2013 | 20.6 | 17.7 |
| 15 to 64 years | 30 June 2013 | 60.4 | 65.6 |
| 65 years and over | 30 June 2013 | 19.0 | 16.7 |
| Population of key localities | | | |
| Balaklava (persons) | 2011 (Census) | 1,827 | - |
| Owen (persons) | 2011 (Census) | 634 | - |
| Port Wakefield (persons) | 2011 (Census) | 556 | - |
| Total (Wakefield DC) | 2011 (Census) | 6,662 | - |
| Labour market | | | |
| Unemployment Rate[(a)] | Mar. Qtr. 2015 | 6.4 | 6.7 |
| Unemployed (persons)[(a)] | Mar. Qtr. 2015 | 207 | 57,500 |
| Labour force (persons)[(a)] | Mar. Qtr. 2015 | 3,246 | 859,500 |
| Incomes | | | |
| Median personal income ($/week) | 2011 | 460 | 534 |
| Median total household income ($/week) | 2011 | 842 | 1,044 |
| Mean taxable income/loss ($/individual) | 2012/13 | 45,775 | 50,025 |
| Mean salary or wages ($/individual) | 2012/13 | 44,259 | 49,760 |
| Government Support Payments | | | |
| Newstart Allowance recipients (No.) | Dec. Qtr. 2014 | 263 | 64,757 |
| Age Pension recipients (No.) | Dec. Qtr. 2014 | 894 | 209,156 |
| Businesses | | | |
| Number of businesses[(b)] | 2012 | 789 | 145,911 |
| % in agriculture, forestry, fishing | 2012 | 51 | 13 |
| % in mining | 2012 | 0.4 | 0.4 |
| % in manufacturing | 2012 | 2.4 | 4.4 |
| % in electricity, gas, water & waste services | 2012 | 0.5 | 0.4 |
| % in construction | 2012 | 7.2 | 14.8 |
| % in services | 2012 | 35.5 | 65 |
| Building Approvals | | | |
| Number of houses approved | 2013/14 | 32 | 8,296 |
| Value of residential buildings approved ($m) | 2013/14 | 7.3 | 2,680 |
| Tourism | | | |
| Visitors ('000 persons) | 2013 | | 16,624 |
| Visitor nights ('000) | 2013 | | 29,963 |
| Visitor expenditure ($m) | 2013 | | 5,096 |
| Number of tourism businesses[(c)] | 2013 | | 17,231 |
| Gross Regional/State Product ($m) | 2013/14 | 437 | 89,898 |

**Note:** (a) Smoothed series.
(b) Per cents do not sum to 100 per cent due to 11 unclassified businesses.
(c) Estimate of businesses for South Australia as at 30th June 2013

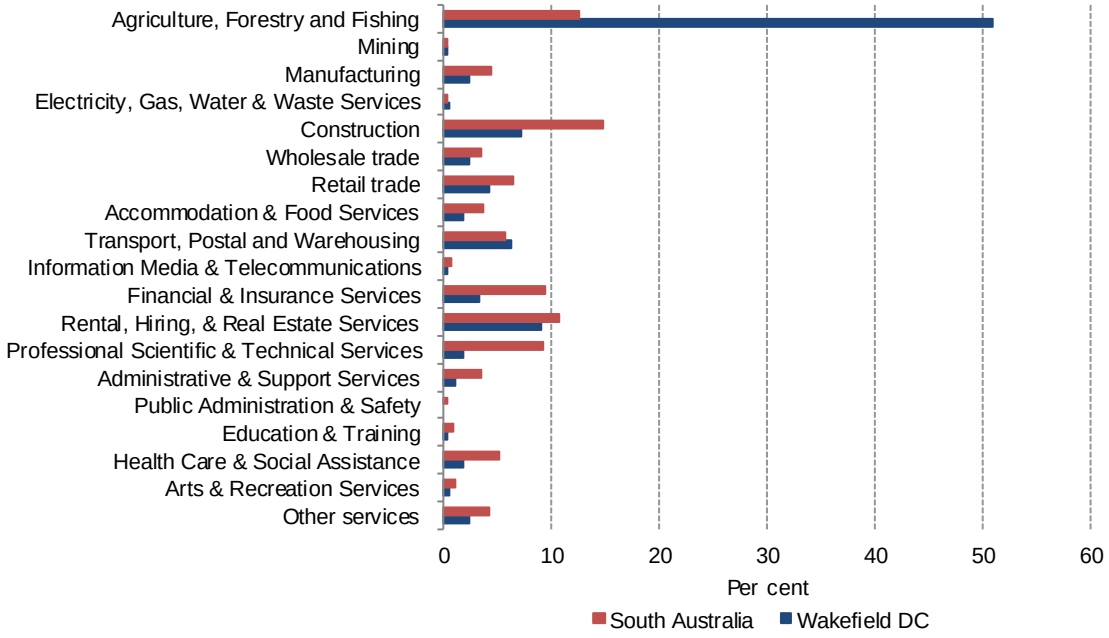
**Source:** ABS, Regional Population growth, Cat. No. 3218.0; ABS.Stat; ABS, *Census of Population and Housing*, 2011; Department of Employment, *Small Area Labour Markets Data*. Tourism Research Australia, *Tourism in Local Government Areas*, 2013. Australian Taxation Office, *Taxation Statistics, 2012/13*. .id the Population Experts, National economic indicators for local government areas, 2013/14.

### 7.1.2 Economic Structure

The economy of Wakefield DC depends heavily on primary industries. Businesses engaged in agriculture, forestry and fishing accounted for 51 per cent of businesses operating in the council area in 2012, well above the corresponding figure for South Australia of 13 per cent (Figure 7.1). The proportion of businesses providing 'professional, scientific and technical services' and 'financial and insurance services' across South Australia is approximately five times greater and three times greater respectively than in Wakefield DC. Unlike the other regions considered in the RIAS a relatively smaller share of businesses were in 'accommodation and food services' relative to the state average. It can therefore be inferred that tourism is of less importance for Wakefield in comparison with other regional areas.

Businesses across all other industries were underrepresented in Wakefield DC relative to the state pattern with the exception of the 'transport, postal and warehousing' and 'electricity, gas and wastewater services' sectors.

**Figure 7.1: Businesses by Industry**
**Wakefield DC and South Australia - per cent of total businesses by industry, 2012**




**Note:** Total excludes 24 unclassified businesses.
**Source:** National Regional Profile, 2008 to 2012, Cat No. 1379.0.55.001.

The relatively large number of businesses in agriculture, forestry and fishing' suggest that the Wakefield DC economy may be particularly exposed to any potential negative impacts associated with SZs to the extent that businesses are concentrated in fishing. Unfortunately the published ABS data does not provide more fine-level industry detail of businesses by industry. In the absence of such data one can obtain a better idea for concentration in fishing by considering Census data on employment by industry which is summarised in Table 7.2.

Approximately 26 per cent of employed persons in Wakefield DC in 2011 were employed in 'agriculture, forestry and fishing', which is significantly less than the share of businesses operating in the sector (51 per cent). This large discrepancy indicates that agricultural businesses on the island are typically small operations with few if no employees (i.e. pure owner operated businesses).

Looking more closely at more fine level industry data, the majority of people employed in 'agriculture, forestry and fishing' in Wakefield DC in 2011 were employed in respect of 'agriculture' (87 per cent). In terms of fishing related industries, no persons were employed in 'aquaculture', while 10 people (0.4 per cent of total employment) were employed in 'fishing, hunting and trapping'. A further breakdown

indicated no persons employed in fishing, 2 persons were employed in hunting and trapping, while 8 people could not be allocated to either sector due to a lack of information (i.e. not further defined). The lack of fishers is surprising given that commercial fishers are known to operate from Port Wakefield. It is likely that such individuals were allocated to the not further defined category. It could also reflect issues with classifying fishers on a 'place of work' basis.

**Table 7.2: Employed Persons by Industry Wakefield DC and South Australia (Place of Work) – 2011**

| | Wakefield (DC) | | South Australia | |
|---|---|---|---|---|
| | Persons | Per cent | Persons | Per cent |
| Agriculture, Forestry and Fishing[(a)] | 621 | 26.3 | 27,675 | 3.8 |
| *Agriculture* | *538* | 22.8 | 24,060 | 3.3 |
| *Aquaculture* | *0* | 0.0 | 652 | 0.1 |
| *Forestry and Logging* | *0* | 0.0 | 497 | 0.1 |
| *Fishing, Hunting and Trapping* | *10* | 0.4 | 837 | 0.1 |
| *Agriculture, Forestry and Fishing Support Services* | *75* | 3.2 | 1,529 | 0.2 |
| Mining | 0 | 0.0 | 9,205 | 1.3 |
| Manufacturing | 274 | 11.6 | 76,386 | 10.6 |
| Electricity, Gas, Water and Waste Services | 24 | 1.0 | 9,832 | 1.4 |
| Construction | 56 | 2.4 | 53,574 | 7.4 |
| Wholesale Trade | 117 | 5.0 | 25,427 | 3.5 |
| Retail Trade | 183 | 7.8 | 81,845 | 11.4 |
| Accommodation and Food Services | 108 | 4.6 | 45,110 | 6.3 |
| Transport, Postal and Warehousing | 144 | 6.1 | 29,762 | 4.1 |
| Information Media and Telecommunications | 13 | 0.6 | 10,480 | 1.5 |
| Financial and Insurance Services | 26 | 1.1 | 21,903 | 3.0 |
| Rental, Hiring and Real Estate Services | 8 | 0.3 | 9,354 | 1.3 |
| Professional, Scientific and Technical Services | 28 | 1.2 | 40,133 | 5.6 |
| Administrative and Support Services | 38 | 1.6 | 24,696 | 3.4 |
| Public Administration and Safety | 128 | 5.4 | 51,712 | 7.2 |
| Education and Training | 251 | 10.6 | 58,201 | 8.1 |
| Health Care and Social Assistance | 251 | 10.6 | 99,275 | 13.8 |
| Arts and Recreation Services | 17 | 0.7 | 9,202 | 1.3 |
| Other Services | 50 | 2.1 | 28,499 | 4.0 |
| Inadequately described | 13 | 0.6 | 6,513 | 0.9 |
| Not stated | 7 | 0.3 | 440 | 0.1 |
| **Total** | **2,357** | **100.0** | 719,224 | 100.0 |

**Note:** (a) Total includes agriculture, forestry and fishing not further defined.
**Source:** ABS, 2011 Census of Population and Housing.

Census data suggests that seafood processing is not a significant activity in Wakefield DC, in 2011 there were zero persons employed in this sector in 2011.[14] This estimate is an underestimate as people engaged in 'seafood processing' may be classified to other sectors such as 'fish and seafood wholesaling' (3 persons), and 'fresh meat, fish and poultry retailing' (9 persons) and 'aquaculture', which as noted earlier had no employment as at the 2011 Census.

In summary, taking a narrow but realistic view, Census data suggests that 0.9 per cent of Wakefield DC's workforce may work in industry sectors that could potentially be directly affected by SZ management plans (i.e. 'fishing, hunting and trapping', 'seafood processing', 'fish and seafood wholesaling' and 'fresh meat, fish and poultry retailing').

[14] The number of people reported by Census data should not be taken too literally as the ABS slightly randomises small numbers in an effort to preserve confidentiality.

### 7.1.3 Economic and Social Indicators

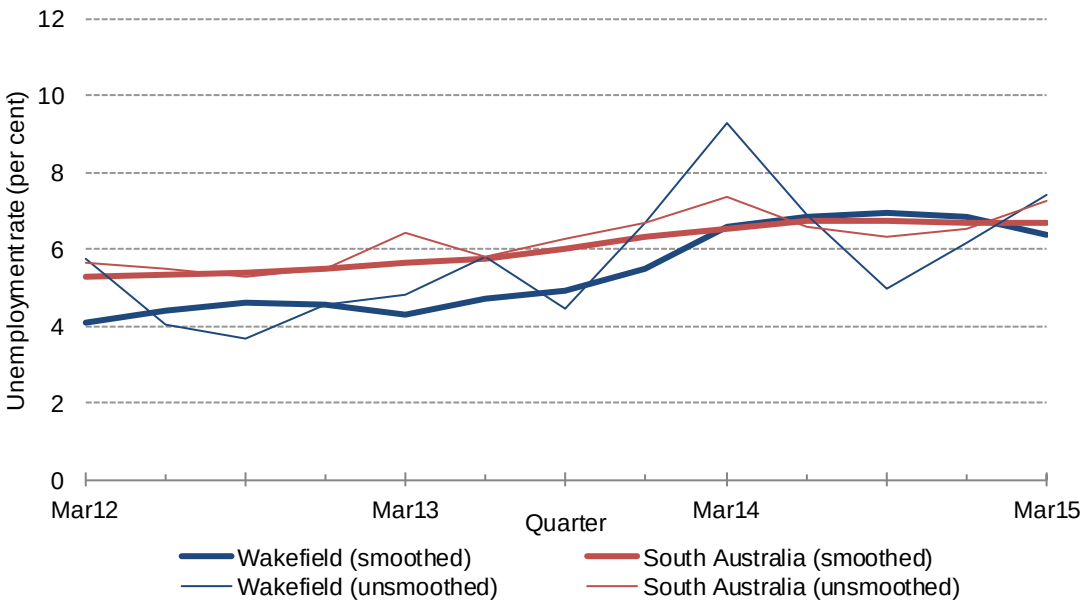
The following section summarises various indicators that provide insight into recent economic and social developments in Wakefield DC. While the emphasis is placed on developments since the SZ management plans were introduced from 1st October 2014, data for some indicators in the post SZ period had not been published at the time of writing. Such indicators are included in the following analysis for baseline purposes to inform any subsequent analyses and obtain context of recent economic and social developments in the region.

#### Labour Force

According to smoothed estimates from the Department of Employment Small Area Labour Markets data, Wakefield DC's rate of unemployment in the March quarter of 2015 was 6.4 per cent (Figure 7.2), a little lower than South Australia's overall rate of unemployment of 6.7 per cent. The trend in the rate of unemployment in Wakefield DC has been for rising unemployment converging to South Australia's average rate of unemployment. Since the March quarter of 2013 unemployment in Wakefield DC has trended upwards by 2.1 per cent, while South Australia's unemployment rate rose by 1 per cent. We note that more recent state data indicates that the unemployment rate has deteriorated since March.

Examining developments since 1 October 2014, the 'unsmoothed' unemployment rate rose by 1.2 per cent in the December quarter of 2014 to 6.2 per cent, up from 5 per cent in the September quarter and rose by a further 1.2 per cent in the March 2015 quarter. Such a rise would suggest a rise in unemployment since the introduction of SZs. But unsmoothed estimates do exhibit high quarterly volatility and therefore provide a less reliable indication of any change in the unemployment. For example, as Figure 7.2 shows, the unemployment rate for Ceduna has fluctuated wildly between September quarter 2013 and December quarter 2014, changing by more than 2 per cent per quarter in either direction on several occasions. The Department of Employment considers the 'smoothed' estimates to be the official figures. However, the averaging process used to generate these estimates means short term fluctuations will not immediately show up in the smoothed estimates, which is problematic in the currency instance where only limited data points are available since introduction of SZs.

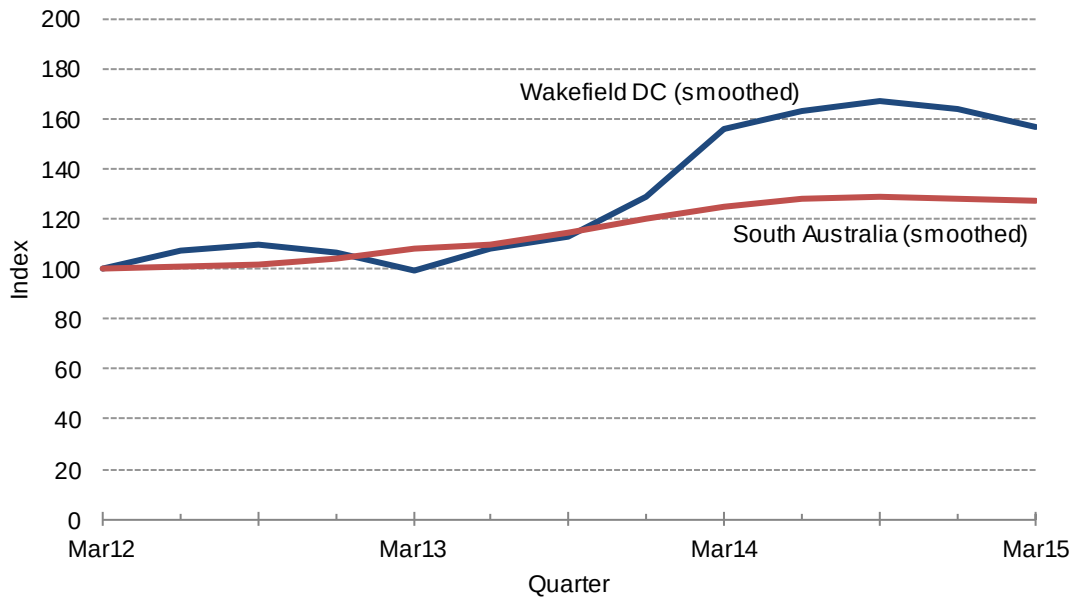
**Figure 7.2: Unemployment Rate**
**Wakefield DC and South Australia – Smoothed and Unsmoothed Series**




**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

There were an estimated 207 unemployed persons in Wakefield DC as of the March quarter of 2015. Consistent with the trend in the smoothed unemployment rate, the level of unemployed persons in Wakefield DC rose strongly from early 2013 through to mid-2014, before plateauing toward the end of 2014 – refer Figure 7.3.

**Figure 7.3: Index of Unemployed Persons**
**Wakefield DC and South Australia – Smoothed Series, Base: March Qtr 2012 = 100**




**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

There were an estimated 3,039 employed persons in Wakefield DC as of the March quarter of 2015. Following a decrease in employment of 6.6 per cent through the year to the June quarter 2013 employment for Wakefield DC recovered, rising by 4.0 per cent through the year to the March quarter 2015 (see Figure 7.4). In comparison, over the same period employment for South Australia remained relatively stable, rising just 0.2 per cent through the year to the March quarter 2015.

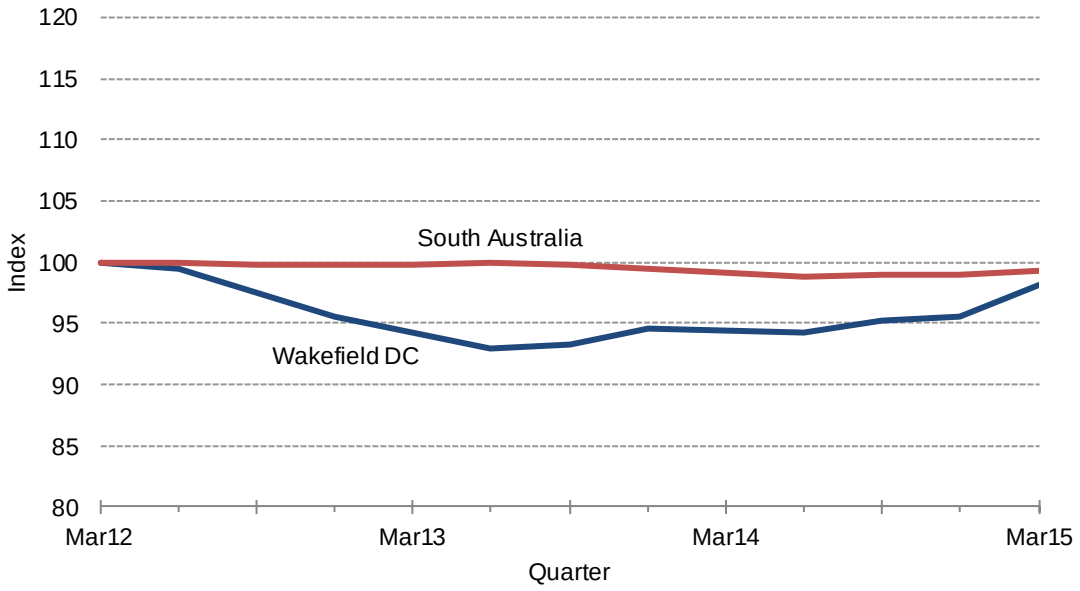
**Newstart Allowance Recipients**

Movements in government income support payments provide further insights into regional labour market trends. Figure 7.5 shows the index of Newstart Allowance recipients for Wakefield DC and South Australia over the six quarters to December 2014.

As at the December quarter of 2014 quarter there were 263 persons in Wakefield DC receiving a Newstart Allowance, an increase of 8.2 per cent (20 recipients) from the September quarter. The proportional rise in the number of persons receiving Newstart Allowance in Wakefield DC for the December quarter 2014 was significantly larger compared to the rise at the State level (8.2 per cent vs 4.2 per cent).

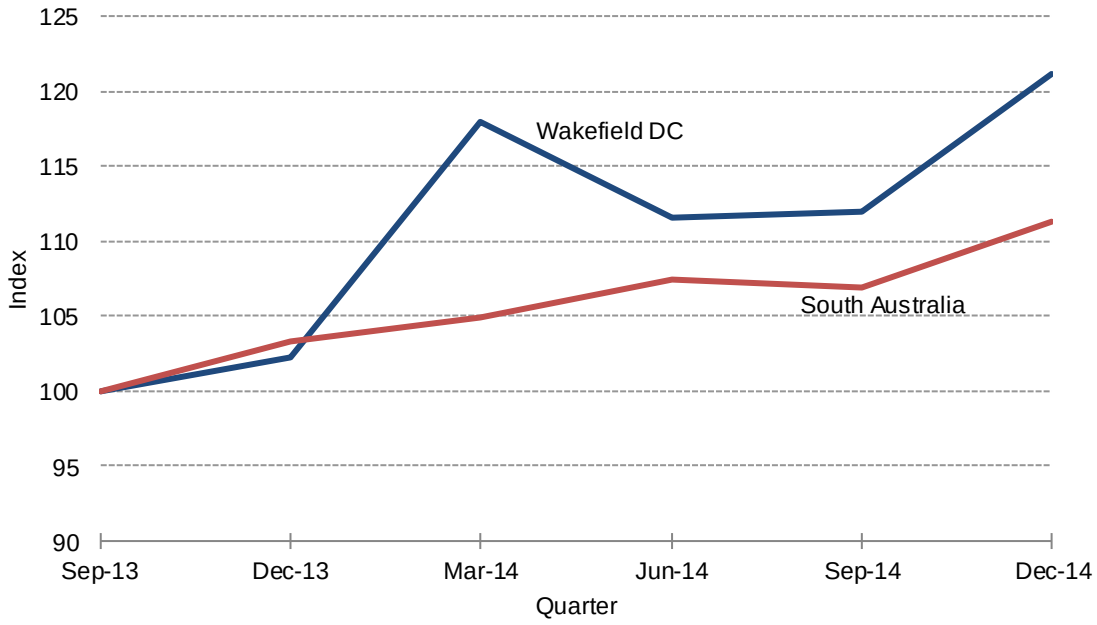
The rise in Newstart Allowance recipients for the first quarter with SZs is consistent with the unsmoothed Small Area Labour Markets Data that indicated a rise in the unemployment rate for the quarter. This result is to be expected given that Newstart Allowance data in an input to the SALM estimates. The income support data also indicates a large rise in Newstart Allowance recipients in the March quarter 2014 (Figure 7.5), which pre-dates the introduction of SZs.

**Figure 7.4: Index of Employed Persons**
**Wakefield DC and South Australia – Smoothed Series, Base: March Qtr 2012 = 100**




**Source:** Department of Employment, Small Area Labour Markets - March Quarter 2015.

**Figure 7.5: Index of NewStart Allowance recipients**
**Wakefield DC and South Australia – Base: September Qtr 2013 = 100**



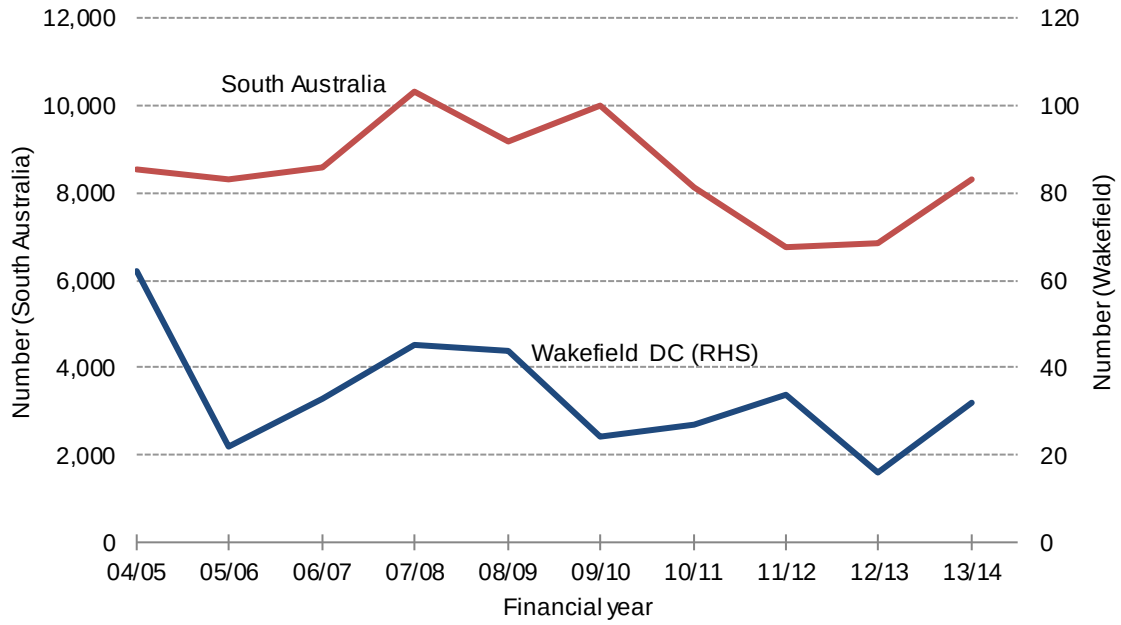

**Source:** data.gov.au - DSS Payment Demographic Data.

## Building Approvals

Building approvals data, which are one of the higher quality sources of regional economic activity, were scheduled to be published for the first financial year with SZs (2014/15) just prior to the delivery of the RIAS. For baseline purposes recent trends in building approvals in the lead up to the introduction of SZs are briefly reviewed here.

Figure 7.6 shows the annual number of new home approvals for Wakefield DC and South Australia for the decade to 2013/14. Wakefield DC recorded approvals for 32 new houses in 2013/14, which is double the 16 houses approved in 2012/13 – the lowest number of new home approvals in the past ten years. In general, the trend in new house approvals for Wakefield DC has loosely tracked the state pattern of approvals tracking downward since 2007/08.

**Figure 7.6: New Houses**
**Wakefield DC and South Australia – Number**




**Note:** Building approvals data for 2011-12 includes Barunga West DC
**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

The value of residential building approved across Wakefield DC (new houses + new other residential building + alterations and additions) for 2013/14 was valued at $7.3 million, up 48 per cent from 2012/13 – refer Figure 7.7. Over the same period the value of South Australia's residential building approvals rose by 20 per cent.

Like most small regional areas, approvals of non-residential building for Wakefield DC are more volatile compared with South Australia – refer Figure 7.8. Year to year changes may consequently not provide a good indication of underlying trends. Non-residential building approvals for 2013/14 were valued at $10.7 million, up 352 per cent from the previous year. Over the same period South Australia's non-residential building approvals fell by 12 per cent.

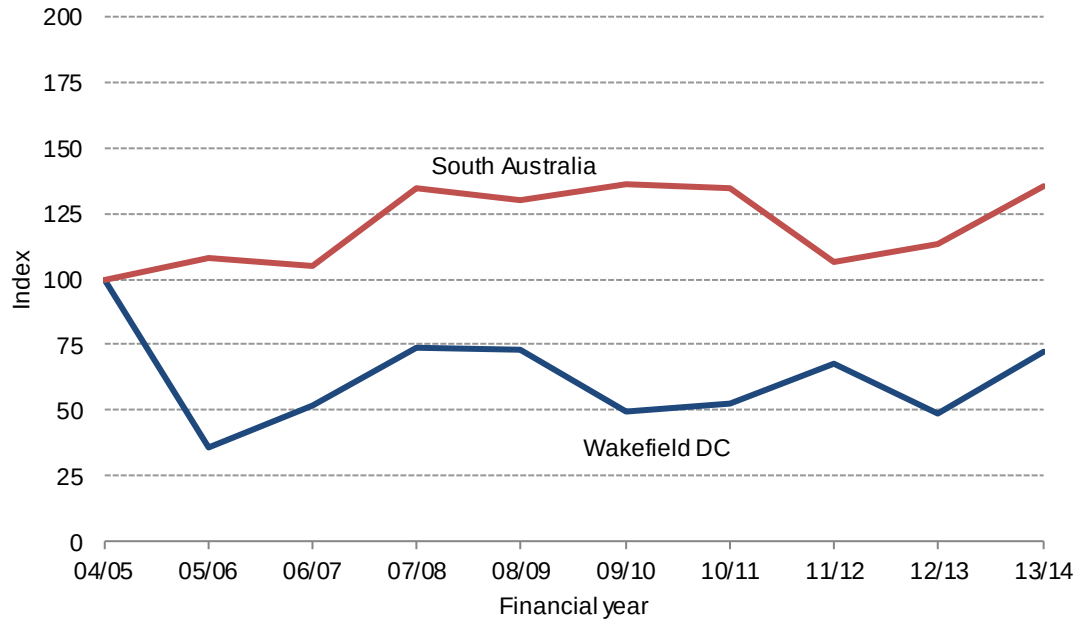
## House Prices

House sales in the Wakefield RC have shown some deterioration since 1 October 2014 – refer Figure 7.9. Total house sales for the 6 months to March 2014 was down 25 per cent (12 houses) compared to the corresponding period a year earlier. There was a modest recovery in house sales in the June quarter 2015 which may end up being stronger than currently indicated given the preliminary nature of this data.

Median house prices in the Wakefield RC have held up better than house sales with the median house price rising in the December quarter 2014 – refer Figure 7.10. Thereafter the median house price fell over the first two quarter of 2015 to be down relative to a year earlier. The median house price in the June quarter 2015 was down 5.4 per cent compared to a year earlier, while the average house price in the March quarter 2015 was down 11 per cent compared to a year earlier. However, the recent median price remains well above its low of only $133,000 in the December quarter 2013. The June quarter data

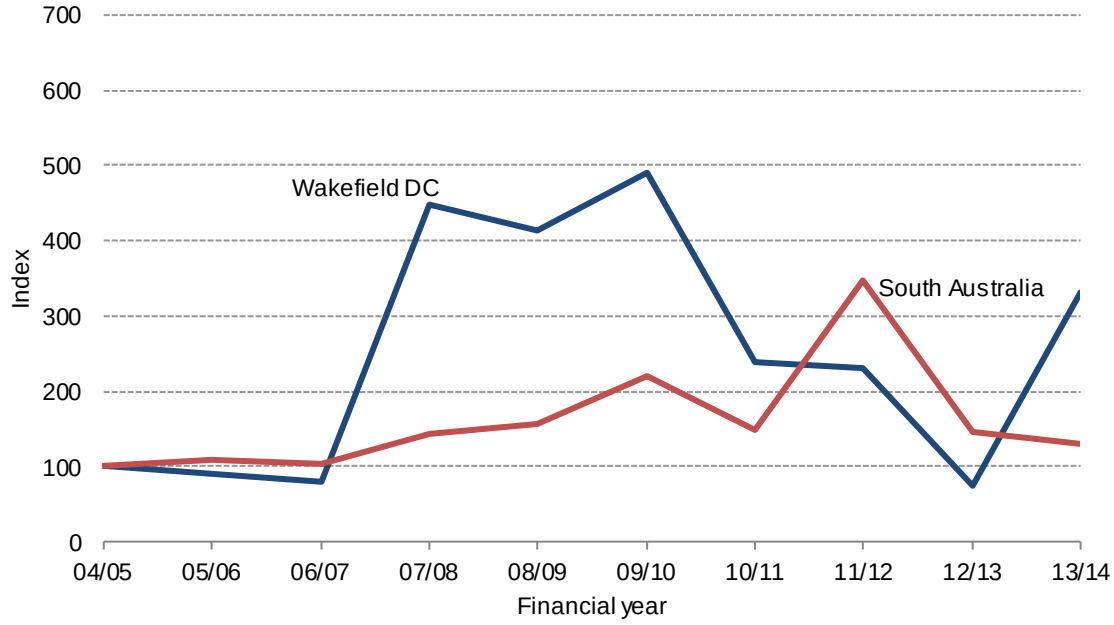
remains preliminary and one would ideally require more quarters of data to assess the underlying trend in house prices since the introduction of SZs given the short data period.

**Figure 7.7: Index of Value of Residential Building**
**Wakefield DC and South Australia – Base: 2004/05 = 100**



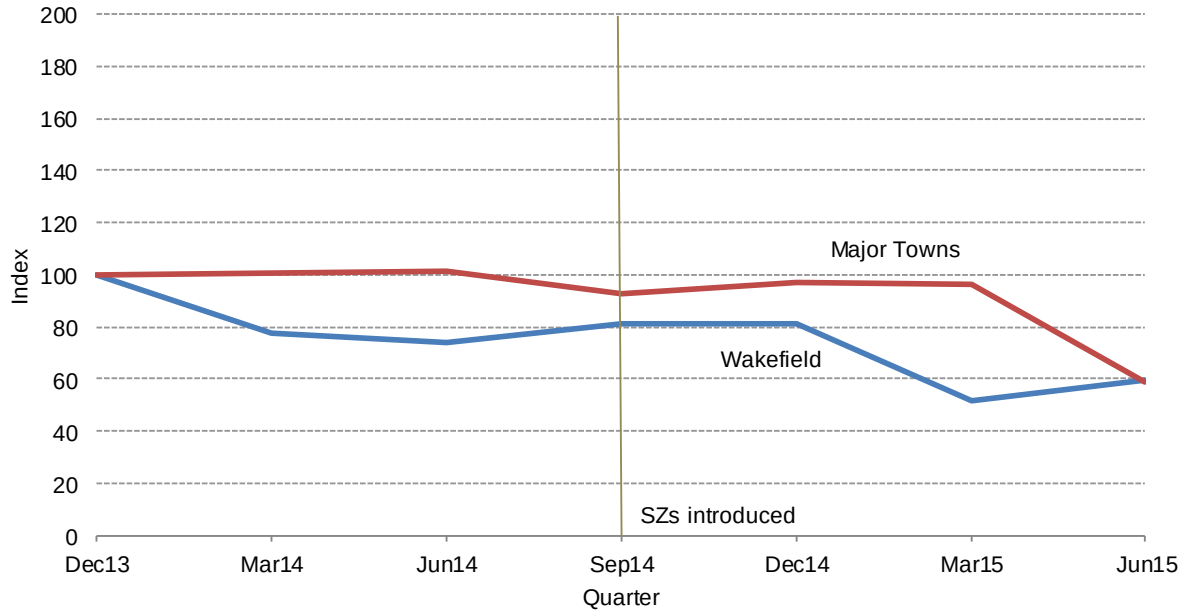

**Note:** Building approvals data for 2011-12 includes Barunga West DC
**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

**Figure 7.8: Index of Value of Non-residential Building**
**Wakefield DC and South Australia – Base: 2004/05 = 100**



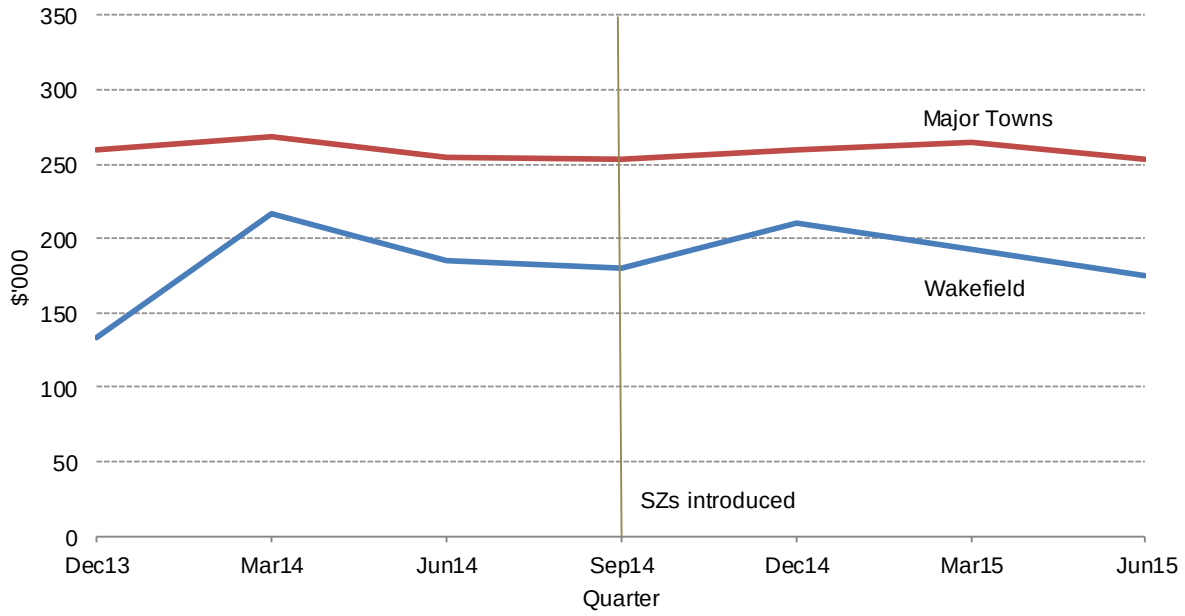

**Note:** Building approvals data for 2011-12 includes Barunga West DC
**Source:** ABS, Building Approvals, Australia, Cat No. 8731.0

**Figure 7.9: Index of the Number of House Sales**
**Wakefield DC and Major Towns[(a)] – December Qtr 2013 = 100**




**Note:** (a) Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

**Figure 7.10: Median House Prices**
**Wakefield DC and Major Towns[(a)] – $'000**




**Note:** (a) Composed of Millicent, Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie, Victor Harbor and Whyalla.
**Source:** Department of Planning, Transport and Infrastructure, unpublished data. SACES calculations.

Another reason to treat the housing data with caution is that any negative impacts from SZs are expected to be concentrated in Port Wakefield which accounts for only a small share of the region's population and housing.[15] For this reason it is likely that other economic factors (e.g. developments in broad acre agriculture, mining) have played an important role in housing market developments in the Wakefield Regional Council area. In this respect it is important to note that the previous RIAS concluded that marine parks were unlikely to cause a decline in beachfront property prices given trends in property prices observed elsewhere in Australia where marine parks have been introduced (EconSearch 2012)

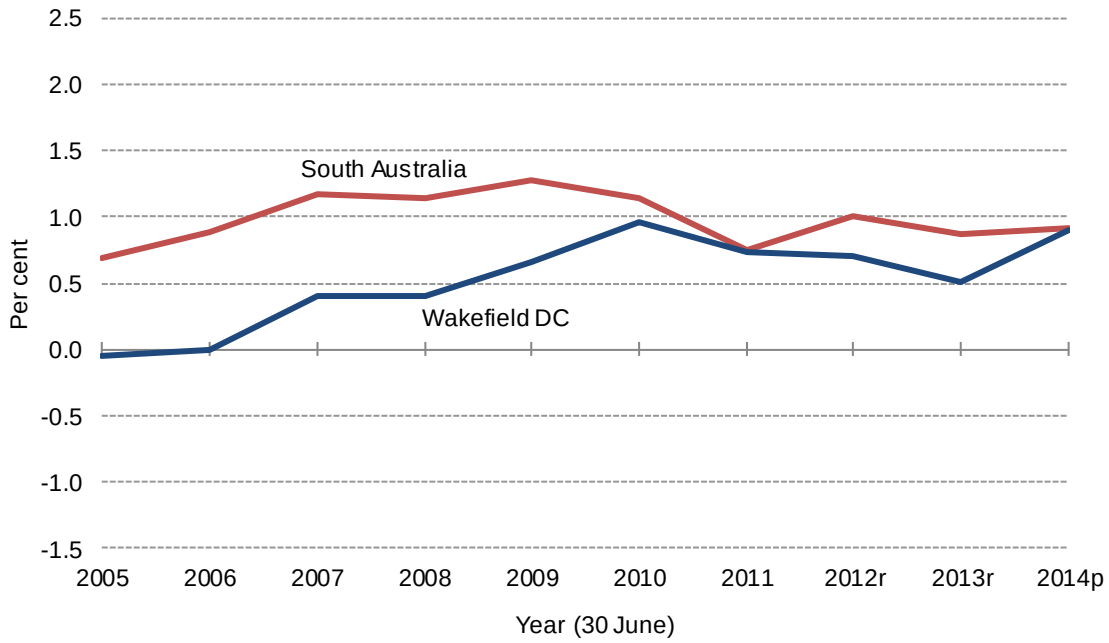
[15] According to 2011 Census of Population and housing data, 8.2 per cent of occupied private separate houses in the Wakefield Regional Council area were located in the suburb of Port Wakefield.

Based on consultation undertaken with professional and recreational fishers, Wakefield Regional Council advised that "there has been a noticeable decline in real estate sales in the town as there is the perception that you cannot fish in the Gulf St Vincent".

## Population Growth

As at 2014 the ERP of Wakefield DC was 6,885 persons (preliminary estimate). Over the year to 30 June 2014 Wakefield DC's resident population is estimated to have grown by 0.9 per cent, which is in line with growth in the South Australian population over this period. Like many regional areas, Wakefield DC's population has grown at a slower rate compared to the total state population, although the differential has narrowed considerably over the past 5 years – refer Figure 7.11.

**Figure 7.11: Population Growth**
**Wakefield DC and South Australia – Annual per cent change**



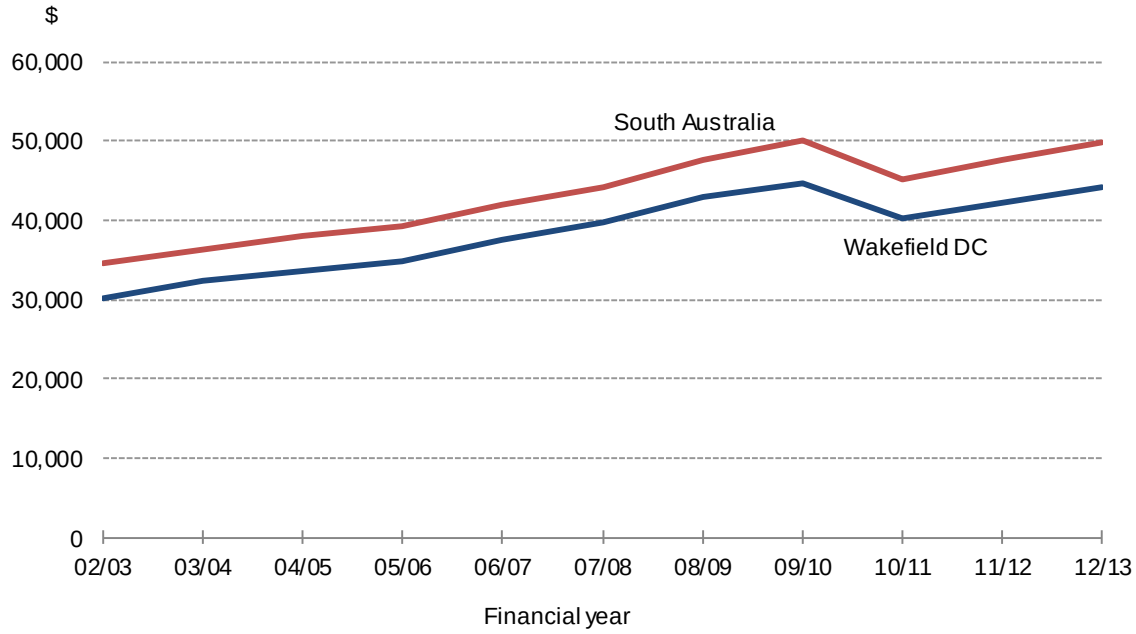

**Note:** r = revised, p = preliminary, see explanatory notes for further information regarding estimating resident population.
**Source:** ABS, Regional population growth, Australia, Table 4. Estimated Resident Population, Local Government Areas, South Australia, Cat no. 3218.0

## Average Annual Salary or Wage Income

Given ATO taxation statistics for the current financial year will not be available for a couple of years, we have relied upon feedback from fishers and other indirect indicators to determine potential impacts on average incomes (see section 7.4). Nonetheless, we briefly review the ATO data to understand recent developments for the region and set a baseline for any future assessments.

Average annual salary or wage income for Wakefield DC in 2012/13 was $44,259. Average income for the region was 11 per cent below the South Australian average annual income of $49,760 in 2012/13. As we saw earlier, Census data indicates that household incomes for Port Wakefield were lower compared to the Wakefield DC average, and a similar scenario probably applies to the ATO data. Given such income differentials residents in Wakefield DC and Port Wakefield are likely to face greater difficulties adjusting to any economic shocks. Despite the income differentials, movements in average annual incomes for Wakefield DC have generally closely tracked movements in South Australian incomes – refer Figure 7.12.

**Figure 7.12: Average Annual Taxpayer Income**
**Wakefield DC and South Australia – $, 2002/03 to 2012/13**




**Source:** Australian Taxation Office, Research and Statistics, https://www.ato.gov.au/About-ATO/Research-and-statistics/Taxation-statistics/

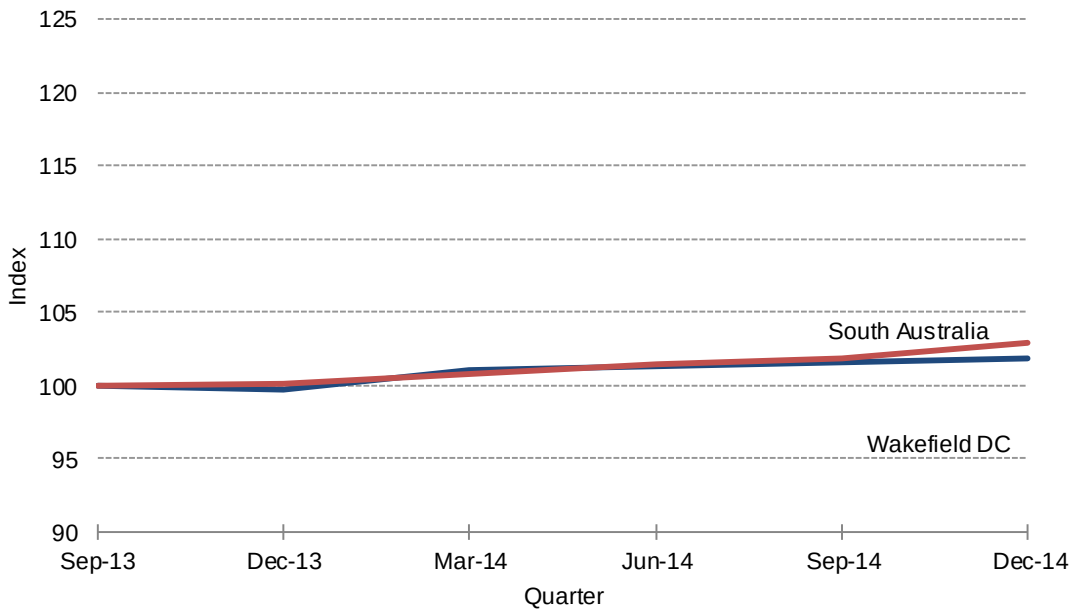
## Exports by port

No major ports are in operation in the Wakefield DC area.

## Government Support Payments – Aged Pension recipients

An index of the number of Aged Pension recipients for Wakefield DC and South Australia is shown in Figure 7.13 below. As at December 2014 quarter there were 894 persons in Wakefield DC receiving an Aged Pension, an increase of 2.1 per cent (18 recipients) over the December quarter 2013 figure. By comparison, the number of persons in receipt of the Aged Pension across South Australia rose by 2.8 per cent over this period.

**Figure 7.13: Index of Aged Pension Recipients**
**Wakefield DC and South Australia – Base: September Qtr 2013 = 100**




**Source:** data.gov.au - DSS Payment Demographic Data.

The number of persons receiving an aged pension in Wakefield DC rose by 2 persons or 0.2 per cent in the December quarter 2014 – the first quarter with SZs. The corresponding figure for South Australia was a rise of 1.0 per cent. Even if difficulties caused by SZs encouraged a shift into retirement by affected persons, such a trend may not show up in Aged Pension data to the extent such individuals are not immediately eligible for the payment. Furthermore, many fishers could be expected to try and adjust to the SZ environment for an extended period before considering exiting the industry and/or retiring.

### Tourism

No Local Government Area tourism profile is available from Tourism Research Australia. Based upon quarterly tourist accommodation data from the ABS as of the June quarter of 2013 Wakefield – Barunga West DC had one establishment categorised under hotels, motels or serviced apartments. Data relating to arrivals, occupancy and takings is not published for confidentiality reasons. The lack of tourism infrastructure in the region suggests that the potential for SZ related tourism growth is limited in the short to medium term.

## 7.2 Commercial Fisheries

The following section analyses PIRSA regional logbook catch and effort data provided by commercial fishers to SARDI. This data includes catch by species and weight, and fishing effort. Data was only available up to January 2015 for the purposes of the RIAS, meaning only 4 months of data with SZs was available. Nonetheless, it is worth reviewing the available data to identify any significant changes in fishing patterns since the introduction of SZs and recent trends in fishing for the region.

For the purposes of the analysis the relevant fishing areas for Port Wakefield were defined at those in upper Gulf St Vincent.

### 7.2.1 Abalone Fishery

No significant abalone fishing activity in undertaken in the vicinity of Port Wakefield.

### 7.2.2 Rock Lobster Fishery

No significant rock lobster fishing activity in undertaken in the vicinity of Port Wakefield.

### 7.2.3 Marine Scalefish Fishery

The MSF is the dominant commercial fishery in upper Gulf St Vincent. Table 7.3 shows the catch and effort in upper Gulf St Vincent (MFA 35) for 9 of the most significant MSF species caught in South Australia for the 4 month period from October to January inclusive over recent years. Data for targeted snapper handline was not available for the two most recent periods due to confidentiality restrictions, while most data for bronze whaler was not available due to such restrictions. Another limitation of the data is that as data was only available for the first 4 months of SZs from October to January, it excludes the peak catch period for certain species during the middle part of the year. The data may therefore not provide a good indication of the actual impact of Clinton Wetlands SZ on local commercial fishers.

Total catch for the 7 key MSF species in Table 7.3 for which non-confidential data was available – i.e. KGW hauling net, snapper long line and garfish, calamari, yellowfin whiting, Australian salmon and Australian herring hauling net – for the first 4 months with SZs was down 5.9 per cent compared to the corresponding period a year earlier. This decline follows relatively larger falls for the corresponding period in 2013/14 (-14 per cent) and 2012/13 (-45 per cent), while catch for the most recent period was above (14 per cent) the catch recorded for the corresponding period in 2009/10.

Total garfish hauling net catch for the 4 months commencing October 2014 was 7.6 tonnes, down 25 per cent compared to the corresponding period a year earlier. This result represents the lowest catch for the period shown in Table 7.3. Meanwhile, hauling net catch of Australian herring for the immediate SZ period was down 53 per cent to 8.95 tonnes. The herring catch was marginally lower compared to the previous lowest herring catch in the corresponding period in 2011 (9.2 tonnes). On the other hand, there was a substantial rise in hauling net catch of Australian salmon. Salmon catch for the first four months with SZs was almost 10 tonnes, some 7.9 tonnes or 376 per cent higher compared to a year earlier. The salmon catch was actually the highest for the period considered. Whether the large salmon catch represents a shift in focus between species due to the introduction of SZs or other natural seasonal variations is unknown.

Snapper is one of the more significant species caught off Port Wakefield. Total snapper longline catch for the first 4 months with SZs was 1.7 per cent lower compared to the corresponding period a year earlier. In general snapper longline catch would not be affected by the Clinton Wetlands SZ located adjacent Port Wakefield as the marine environment here is not suitable for longlining. Data for snapper handline effort was not available due to confidentiality restrictions, but such effort has historically been much smaller relative to longline effort – see Table 7.3. In fact, no targeted snapper handline effort in MFA 35 was reported for the relevant 4 month period over the past two years by those MSF fishers who waivered confidentiality restrictions.

Looking at other less significant species in terms of catch weight, there were increases in hauling net catch of calamari (up 37 per cent to 1.8 tonnes) and yellowfin whiting (up 8.3 per cent to 1.1 tonnes) and a decline in hauling net catch of King George whiting (down 65 per cent to 61 kg) for the most recent period under SZs relative to a year earlier. While catch for these species tends to be from very low levels, catch for these species also tends to be concentrated at other times of the year which are not captured by the data presented in Table 7.3. For example, only 2.8 per cent of the King George whiting catch for the year to January 2013 was in respect of the 4 months from October to January. A longer time series of data is clearly required to properly assess the impacts on these species.

Data for those fishers that waived confidentiality restrictions recorded no catch or effort in respect of Bronze Whaler and Gummy Shark for the initial four months with SZs or the corresponding period a year earlier.

PIRSA port of landing data provides partial insight into trends in spatial visitation by fishers. The data records the distinct number of licences recorded at each port based on each fisher's main port of landing for the period in question. As it does not record the total number of landings made during the period it is an imprecise indicator of visitation.

Figure 7.14 shows the number of distinct MSF licence holders recorded for Port Wakefield for the 4 month period to January over recent years. A total of 20 distinct MSF licences were recorded for Port Wakefield for the 4 month period to January 2015, which was down 6 licences compared to the corresponding period a year earlier. Given the targeted removal of several MSF licences in the broader region some reduction in visitation to Port Wakefield would be expected. In addition, from community consultations we know of one MSF fisher relocated away from the region. The number of distinct licences recorded for the most recent month period was similar to the level recorded 5 years earlier, indicating that the latest result is not unusual by historical standards. This factor combined with the short period covered by the data suggests a need for a longer period of data to properly assess the impacts of SZs on visitation by fishers to Port Wakefield.

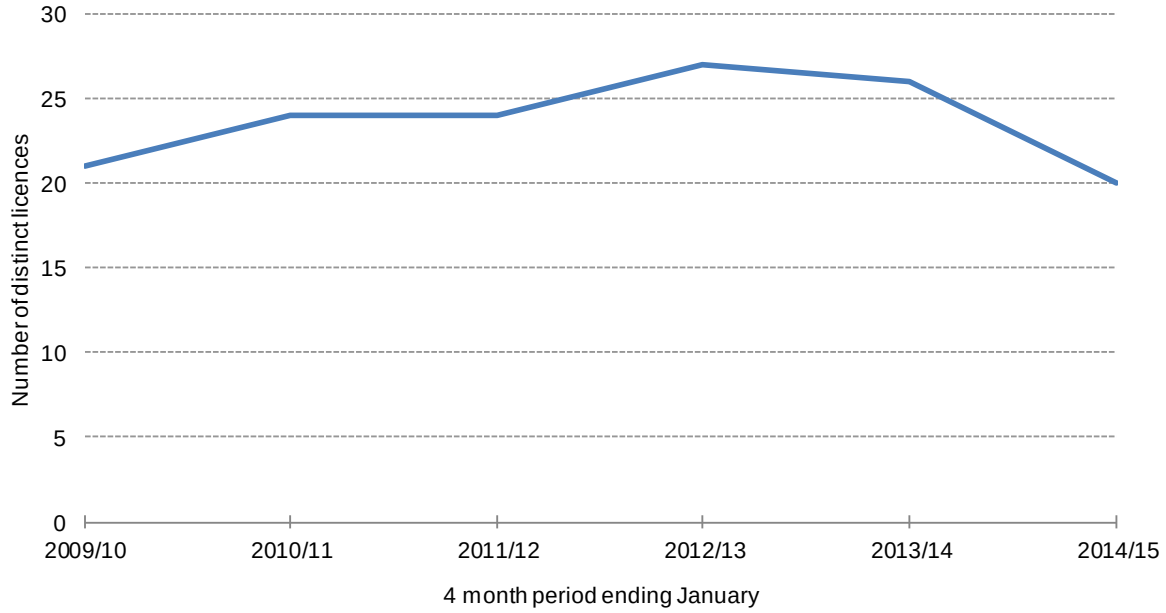
**Table 7.3: Catch and Effort for Select MSF Species by Gear Type**
**Upper Gulf St Vincent (MFA 35) – 4 month period beginning October[a]**

| Gear type | King George Whiting Hauling net | Snapper Handline | Snapper Longline | Garfish Hauling net | Calamari Hauling net | Yellowfin Whiting Hauling net | Australian Salmon Hauling net | Australian Herring Hauling net | Bronze Whaler Longline | Gummy Shark Longline |
|---|---|---|---|---|---|---|---|---|---|---|
| **Catch (kg)** | | | | | | | | | | |
| 2009/10 | 316 | 7,338 | 44,075 | 9,408 | 1,173 | 1,808 | 1,289 | 16,398 | 0 | 0 |
| 2010/11 | 250 | 7,240 | 165,743 | 11,280 | 811 | 1,693 | 4,395 | 13,020 | conf. | 0 |
| 2011/12 | 296 | 2,310 | 159,700 | 10,909 | 796 | 1,693 | 6,555 | 9,193 | conf. | 0 |
| 2012/13 | 215 | 3,507 | 70,397 | 11,144 | 2,149 | 3,457 | 5,305 | 12,095 | conf. | 0 |
| 2013/14 | 175 | conf. | 56,359 | 10,172 | 1,340 | 989 | 2,090 | 19,144 | conf. | 0 |
| 2014/15 | 61 | conf. | 55,402 | 7,596 | 1,842 | 1,071 | 9,951 | 8,951 | conf. | conf. |
| **Effort (days)** | | | | | | | | | | |
| 2009/10 | .. | 58 | 281 | 254 | .. | .. | .. | .. | 0 | 0 |
| 2010/11 | .. | 37 | 902 | 285 | .. | .. | .. | .. | conf. | 0 |
| 2011/12 | .. | 16 | 737 | 322 | .. | .. | .. | .. | conf. | 0 |
| 2012/13 | .. | 26 | 456 | 314 | .. | .. | .. | .. | conf. | 0 |
| 2013/14 | .. | conf. | 444 | 340 | .. | .. | .. | .. | conf. | 0 |
| 2014/15 | .. | conf. | 382 | 270 | .. | .. | .. | .. | conf. | conf. |
| **(CPUE (kg per day)** | | | | | | | | | | |
| 2009/10 | .. | 126.5 | 156.9 | 37.0 | .. | .. | .. | .. | 0.0 | 0.0 |
| 2010/11 | .. | 195.7 | 183.8 | 39.6 | .. | .. | .. | .. | conf. | 0.0 |
| 2011/12 | .. | 144.4 | 216.7 | 33.9 | .. | .. | .. | .. | conf. | 0.0 |
| 2012/13 | .. | 134.9 | 154.4 | 35.5 | .. | .. | .. | .. | conf. | 0.0 |
| 2013/14 | .. | conf. | 126.9 | 29.9 | .. | .. | .. | .. | conf. | 0.0 |
| 2014/15 | .. | conf. | 145.0 | 28.1 | .. | .. | .. | .. | conf. | conf. |

**Note:** (a) Data for handline and longline reflates to "targeted" effort only, i.e. does not include any non-targeted catch in the region (e.g. due to by-catch).
.. Denotes not applicable or no data sourced.

**Source:** PIRSA, logbook catch and effort, unpublished data.

**Figure 7.14: Port of Landing Data**
**Number of Distinct MSF Licences Counted for Port Wakefield (Region level 1)**




**Source:** SARDI, unpublished data.

### 7.2.4 Charter Boat Fishery

No significant charter boat fishery activity in undertaken in the vicinity of Port Wakefield.

## 7.3 Evidence for Economic Impact

There are a number of limitations to assessing the impact of SZs on the value of catch by Port Wakefield based fishers, largely related to the short time period for which data is available since the introduction of the SZs and limitations in the catch data. For a full discussion, see section 3.4.

As value of landed catch data is not available on a regional basis, regional estimate have been imputed by combining regional catch data with state-wide average landed price for each fishery.

***Landed catch – Port Wakefield***

Port Wakefield is a marine scalefish fishery only and so there is no catch for rock lobster or abalone attributed to it.

Price data is only available for four of the marine scalefish fisheries – Garfish, King George Whiting, Snapper and Southern Calamari. As price data is required for the value of catch, only these four fisheries are included in this section. This may understate the impacts on Port Wakefield as it excludes species with a substantial catch in MFA 35 such as Australian herring, yellowfin whiting and Australian salmon. It is also important to note that due to confidentiality restrictions the catch of certain species will be understated catch data for certain techniques (such as handline for snapper) are excluded from the published data.

The available data suggests that there were substantial falls in catch for both garfish and King George whiting for the period October to January 2014/15 compared to the previous year (Table 7.4), a broadly stable catch of snapper, and a large increase in catch for southern calamari (although catch for the latter is still below that of the same period in 2012/13).

**Table 7.4: Landed catch MFA adjacent to Port Wakefield, October to January, 2012/13 to 2014/15**

| | 2012/13 (kg) | 2013/14 (kg) | 2014/15 (kg) | Change 2013/14 to 2014/15 No. | Per cent |
|---|---|---|---|---|---|
| Garfish - MFA 35 | 11,144.0 | 10,172.0 | 7,596.0 | -2,576.0 | -25.3 |
| King George Whiting - MFA 35[a] | 215.0 | 175.0 | 61.0 | -114.0 | -65.1 |
| Snapper - MFA 35[b] | 70,397.0 | 56,359.0 | 55,402.0 | -957.0 | -1.7 |
| Southern calamari - MFA 35[a] | 2,148.8 | 1,340.0 | 1,842.0 | 502.0 | 37.5 |

**Note:** (a) Total haulnet only.
(b) Targeted longline only as catch data for targeted handline for MFA 35 is confidential for 2013/14 and 2014/15.
**Source:** SARDI.

A further complication in assessing the impact on Port Wakefield is that average monthly catch is substantially higher in the winter season than in the summer season, but no winter season data is available subsequent to the introduction of SZs. It is not known whether the proportionate change in catch will be greater, lesser or the same for the winter season.

### *Landed value of catch*

Data on the total monthly landed value of catch for key fisheries is available from PIRSA. As with other PIRSA data, this was only available up to January 2015 for this study. Estimates of average prices received have been calculated by dividing the value of landed catch by the volume of catch for that period.

Average landed prices for King George whiting and snapper were broadly stable in the period October 2014 to January 2015 compared to the same period in the previous year. The average landed prices for Garfish were higher in the period October 2014 to January 2015 than over the same time period in the previous year. The average price of southern calamari was down over this period compared to the previous year.

**Table 7.5: Value of landed catch, Port Wakefield, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| Garfish | 129.5 | 116.4 | -13.2 | -10.2 |
| King George Whiting | 3.7 | 1.3 | -2.4 | -64.9 |
| Snapper | 506.9 | 504.1 | -2.8 | -0.5 |
| Southern Calamari | 15.8 | 19.7 | 4.0 | 25.3 |
| Total | 655.9 | 641.6 | -14.4 | -2.2 |

**Source:** SARDI, PIRSA.

Three of the four key marine scalefish fisheries in Port Wakefield experienced a fall in the value of their catch in October 2014 to January 2015 compared to the same period in the previous year, with calamari being the only fishery experiencing an increase (Table 7.5). The net effect was to decrease the value of catch by $14,000 compared to the same period in the previous year.

### *Modelling potential wider economic impact*

Port Wakefield is the only one of the three selected regions for which the data indicates that the value of landed catch has fallen since the introduction of SZs.

In order to estimate the potential impact of SZs over a full year, the observed changes to landed catch since October were scaled up by applying the percentage change to the previous year's catch volume, and then calculating the value of the catch using average prices for the period October 2014 to January 2015. As not all of the changes to catch or landed price are due to the introduction of SZs and the buying out of fishing licenses that accompanied it, this estimate will be an imperfect measure of the impact of SZs, however it is the best feasible estimate given the constraints of the data. The estimate

will also be imperfect to the extent that it assumes that historical intra-annual patterns of fishing will be maintained with the introduction of SZs. Finally, the exclusion of a number of fisheries from the calculation, most notably Australian herring, means that this calculation is likely to understate the fall in economic activity.

Applying this approach to Port Wakefield a 'baseline' full year catch was calculated from Summer 2013/14 and Winter 2014. In order to calculate the notional catch for 2014/15 it was assumed that the change in the weight of catch observed for Summer 2014/15 would apply to the whole year. These two catch estimate were then combined with the prices for the summer period for their respective years to identify the change in the value of landed catch. The net impact of this for Port Wakefield is a projected total fall in value of catch of $100,000 (Table 7.6).

**Table 7.6: Estimated change in the value of catch, Port Wakefield/Upper Gulf St. Vincent**

| | Baseline catch 2013/14 Kg | Notional catch 2014/15 Kg | Change in value $'000 |
|---|---|---|---|
| Garfish | 70,683.0 | 52,782.9 | -91.4 |
| KGW -total catch | 9,259.0 | 3,227.4 | -127.6 |
| Snapper | 158,246.0 | 155,558.9 | -7.8 |
| Calamari | 42,431.0 | 58,326.8 | 126.1 |
| Total | | | -100.8 |

Changes in the value of landed catch only identify the direct impacts on the revenue of the fishing industry. In order to understand how this may flow through to their employees, suppliers, and the broader economy it is necessary to undertake economic modelling.

The gross economic impact of was assessed using an Input-Output model. The methodology employed involves estimating the total direct and indirect employment and gross regional product arising from changes in the value of production of fishing.

### Results

The gross impact of a fall in the value of landed catch of $100,000 in Port Wakefield is shown below. Almost all of the impact on employment is expected to occur in the fishing sector itself with employment falling by 0.35 full time equivalent employees. Taking into account flow on impacts, total employment is projected to decline by 0.6 FTE jobs. Gross value added for the region is projected to fall by $75,000 (Table 7.7). Clearly these estimates represent relatively small impacts. However, they are based on quite limited data and may not properly capture the peak fishing season for many MSF fishers in the region.

**Table 7.7: Estimated direct and total economic impacts**

| Direct employment in fishing (FTE) | Total employment in region (FTE) | Gross value added ($'000) |
|---|---|---|
| -0.35 | -0.58 | -74.7 |

## 7.4 Consultations

SACES visited Port Wakefield on 19th of May 2015 to participate in an introductory group meeting with commercial fishers, recreational fishers and other related stakeholders. Participating fishers included those based in Port Wakefield and fishers located in other regions of northern Gulf St Vincent including Ardrossan and south east of Port Wakefield (e.g. Parham). The purpose of the meeting was to gather general feedback on economic and social impacts to date and exchange contact details so that individuals could provide more detailed information on impacts at a later date. The majority of fishers were contacted in July (i.e. early in the new financial year) and given the opportunity to provide further

feedback. Several fishers took the opportunity to provide data on financial and catch performance while others provided qualitative responses.

The Wakefield Regional Council also sought feedback from local stakeholders including professional and recreational fishers. Individual written submissions were also received from professional and recreational fishers, as well as other regional stakeholders.

**Fishing Activities**

Marine scalefish is the predominant form of commercial fishing undertaken in the northern Gulf St Vincent region. Commercial fishers were comprised of net and line fishers. Participants advised that of the 35 net fishers operating in the State, 17 (49 per cent) operated in Gulf St Vincent, making it a relatively concentrated region for fishing activity.

The local commercial catch is largely supplied to SAFCOL, while some product is also shipped direct to Victoria and supplied to a local processor.

**Study Timing**

Participants observed that any impacts from the SZ management plans would become most evident over the next several months (from time of interviews) as winter to early spring is the peak harvest period for marine scalefish in upper Gulf St Vincent. There was strong agreement that the current economic and social impact study should be extended to capture impacts for one complete year of operation under the new SZ management plans.

**Fishing Impacts**

General feedback from the introductory meeting with fishers was that SZs had resulted in a reduction in productivity (i.e. catch per unit of effort) and rise in input costs which had a negative impact on net incomes.

The causes for the decline in productivity were largely twofold. Firstly, implementation of the three SZs in the region (Clinton Wetlands, Offshore Ardrossan and Seagrass of Upper Gulf St Vincent) had reduced the area available for fishing, including prime productive areas. The Clinton Wetlands SZ in particular reduces the flexibility of fishers to respond to changes in weather conditions. When conditions in the open waters of Gulf St Vincent are rough, fishers were previously able to move into the relatively sheltered northern area of Clinton Wetlands SZ in order to continue operating. This option is no longer available to fishers.

The second cause of reduced productivity identified by fishers was the view that insufficient fishing effort was removed though the buyback scheme. In theory, fishing effort displaced by the SZs was accounted for through buyback measures, thus preventing increased pressure from being placed on fishing stocks outside the SZs. One participant noted that PIRSA has a strong view that it has properly accounted for the displaced catch. However, other fishers still felt that displaced catch had been underestimated. One person had the view that spatial information on fishing activity was not available at a low enough level to accurately estimate the catch displaced by the SZs. This limitation was acknowledged by SARDI in the estimation of the displaced catch for SZs:

> *"There is considerable uncertainty in estimates of historical marine scalefish effort within the final SZs due to the lack of fine-scale spatial data in this multi-gear, multi-species fishery."*[16]

Displaced effort for the marine scalefish fishery was initially estimated on a pro rata basis based on the proportion of the SZ area that intersected with the eligible fishing area in the Marine Fishing Area (MFA).[17] Based on feedback provided by the industry, the eligible fishing area was narrowed down in

16 Ward et al. 2012, p.60.

17 Eligible fishing area here refers to the area for which particular gear types are restricted, e.g. 5 metres or less water depth for net fishers.

some instances to focus on those areas that were actively fished rather than the broader eligible fishing area. In either case the SARDI approach assumed that fishing effort was evenly distributed across the relevant fishing area, which is a reasonable assumption in the absence of more detailed spatial data. Nonetheless, an unavoidable consequence of this assumption is that displaced catch would be underestimated if actual fishing effort was relatively greater in the SZ, and be overestimated if actual fishing effort was relatively greater outside the SZ. Fishers in the upper Gulf St Vincent contend that actual fishing effort was relatively greater in the SZ.

There was also a view from one commercial fisher that actual observed fishing effort for a couple of the licences that were bought out was relatively low compared to their potential maximum fishing effort, implying that actual fishing effort removed was relatively low. Another fisher observed that some purchased licences "were not going to be functioning in the very near future" and included "a lay licence that wasn't being used". SACES was advised that displaced effort for MSF was calculated as an average of the best 4 years out of the 5 years to 2011/12, based on licence holders' fishery returns over this period.[18] On this basis any lack of fishing effort on behalf of those fishers bought out should not have contributed to lack of regional fishing effort being bought out. Related to this issue, concern about a lack of "an appropriate focus on buying of current and active licences within the region to offset the reduction in area for fishing" was identified by Wakefield Regional Council as part of consultations with professional and recreational fishers. However, the Technical Advisory Group tasked with buying out licences did give consideration toward the spatial distribution of displacement. Of the 4 haul net licences accepted for surrender, 3 licences (representing 490 effort days of the 794 haulnet days that were surrendered across the State as a whole) expended most of their effort at the top of Gulf St Vincent (DEWNR, 2015, pers. comm., 19 February).

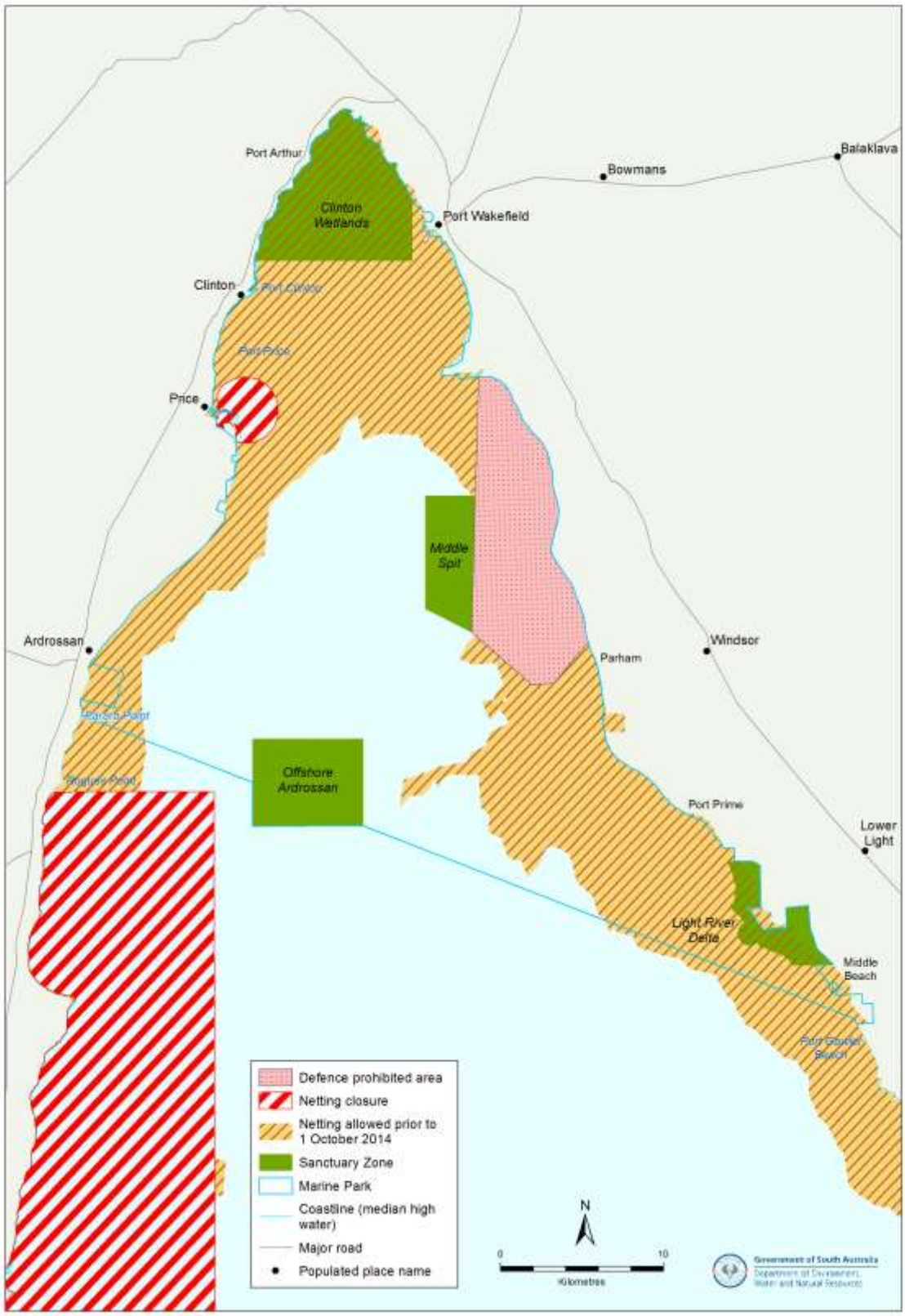
One recreational fisher who regularly visited Port Clinton argued that the buyback of licences was ineffective due to the characteristics of fishing in the region. As upper Gulf St Vincent is "a centrally located and easily accessible fishery", "professional netters and longliners come from towns all over the Yorke Peninsula from both the Gulf St. Vincent side and the Spencer Gulf side when fish are available". In other words, fishing effort was highly mobile and could not be easily removed at a regional level. Since the introduction of SZs this recreational fisher had observed a significant increase in commercial fishing activity, stating that the "more than halving of the professional fishers coastal netting area has seen at least doubling of the netting activity in our area".

It is important to note that fishers' ability to accommodate the loss of fishing areas in Gulf St Vincent by shifting effort to other areas has been curtailed by other fishing restrictions being implemented in the region over previous years. For instance, in addition to the closed snapper fishing season, fishers have had to contend with the closure of commercial fishing areas off southern Yorke Peninsula which came into effect in 2005 and an apparent recent increase in the number of days for which the Proof & Experimental Establishment (Army Base) range temporary buffer zone is in effect (in addition to the permanent exclusion zone) due to live firing operations – refer Figure 7.15. Some of these measures such as the netting closures were introduced to address concerns about the sustainment of the MSF. Nonetheless, they have the cumulative impact of reducing the flexibility of commercial fishers to respond to loss of access associated with SZs.

In the absence of prime fishing grounds, some fishers argued that they had to travel further distances which led to increased input costs. Several recreational fishers noted that the Clinton Wetlands SZ had displaced them from their usual fishing location, forcing them to travel further to Port Clinton on the other side of the gulf or further south to Port Parham. Such alternative arrangements increase per trip travel distance by 35km to 50km adding to fuel costs and opportunity cost in terms of reduced time for other activities.

[18] For fishers working less than 5 years, the lowest effort/catch year was removed and an average derived from the remaining years. (DEWNR, 2015, pers. comm., 19 February)

**Figure 7.15: Sanctuary Zones and Other Restricted Fishing Areas for Net Fishers in Upper Gulf St Vincent**

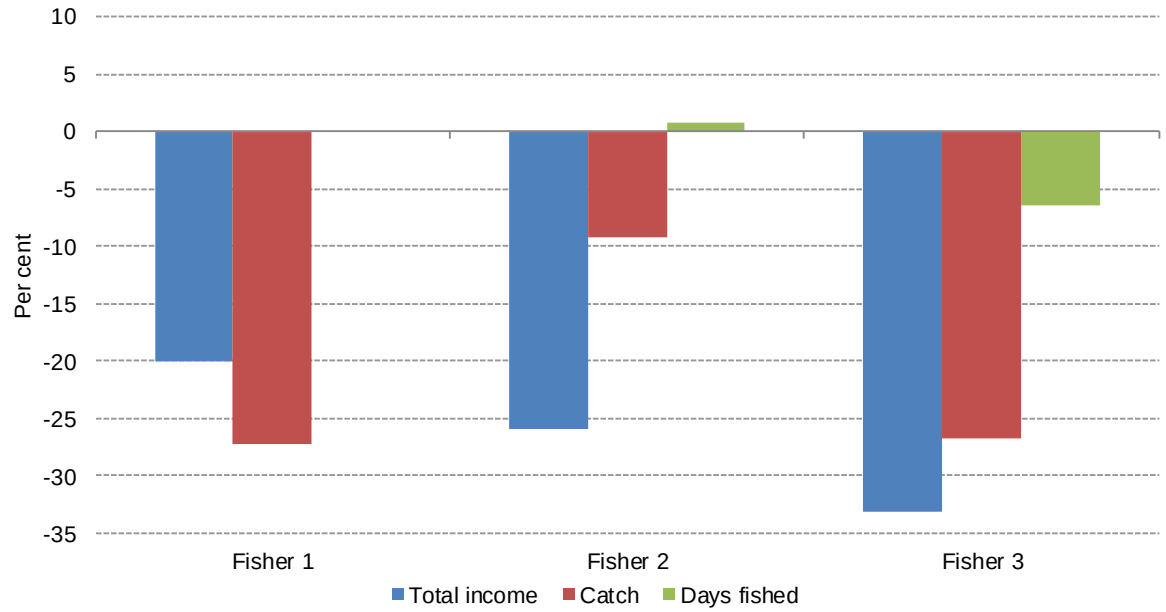


## Economic Impacts

As a consequence of more difficult fishing conditions, fishers reported reductions in production and incomes. One commercial fisher indicated that their income for the period from October 2014 to April 2015 was down 35 per cent compared to the corresponding period a year earlier. Another commercial fisher noted that their crew had to seek the Newstart Allowance for the first time in 5 years in order to supplement their incomes. The extent to which non-SZ related factors (e.g. fishing effort, prices and weather conditions) may have contributed to such declines in production are unknown.

Several fishers of the approximately dozen that attended an initial meeting provided data on their fishing catch up to June 2015 as well as financial records in respect of the last two financial years as evidence of the negative impact on their incomes. Total catch for these fishers for the 9 months to June 2015 were down by magnitudes ranging from 9.2 per cent to 27 per cent compared to the corresponding period a year earlier. Total incomes for these fishers in 2014/15 were 20 per cent to 33 per cent lower compared to the previous financial year – refer Figure 7.16. The decline in catch for fisher 2 came despite effectively no change in fishing effort as measured in fishing days, while a decline in fishing effort by fisher 3 only partly explains the decline in catch and thus income for this fisher. In considering the change in catch it is important to note that the data does not include catch for the September quarter which is considered to be an important harvest period in the region. Fishers consequently advised that the data may not provide a true indication of the negative impact of SZs on catch and total incomes. On the other hand, one would ideally have a longer time series of data in order to be able to assess whether recent changes for these fishers are significantly different from previous historical annual changes.

**Figure 7.16: Change in Total Income for Individual Fishers Port Wakefield – 2013/14 to 2014/15 (various periods)[(a)]**




**Note:** (a) Change in income is for full financial year except for fisher 3, which is based on total income for 9 month period from October to June. Change in catch and days fished for all fishers is based on catch for 9 month period from October to June. No fishing effort data for entire period was supplied by fisher 1.

For one of the above fishers, net income had fallen by only a small magnitude (4 per cent) despite the significant decline in total gross income. While this in part reflects a reduction in costs associated with reduced catch, it also reflects "avoiding essential maintenance and equipment upgrades due to a reduction in cash flow". This fisher had also sold one of their boats to improve cash flow and purchased a utility via finance in the expectation that they would need to travel further to fish. Another of the fishers advised that they were "only just covering costs" as they fished into July – a time when they are making

their best income. Both of these fishers expressed concern that their future catch and income would be further reduced "as the fishers over exploit the fishing area that is available to us".

Other fishers contacted that did not provide quantitative data provided mixed feedback. One fisher advised that the season had been good till June with July being pretty bad. There was a concern about the impact over the next few months as during this period they would typically be fishing in the region now occupied by Clinton Wetlands SZ. Another fisher advised that catch was down significantly in terms of weight but that financially they were in about the same position as last year due in part to higher prices. They were concerned that prices may subsequently fall.

Fishers advised that any negative economic flow on impacts due to reduced commercial fishing production in Port Wakefield would probably be most significantly felt by the freight and ice supply sectors. Fuel suppliers could also be potentially negatively affected although one participant noted that any change in fuel use by commercial fishers may not be noticeable for local petrol stations due to the significance of inter-regional traffic (i.e. freight and to a lesser degree passenger vehicles) passing through the town. Inspection of financial records provided by a couple of fishers indicates that reductions in inputs would be concentrated in respect of ice, repair and maintenance, freight and fuel costs. SACES notes there is an offsetting effect here whereby costs to suppliers in terms of reduced fuel usage represents a benefit for fishers in terms of reduced input costs, and vice versa. We would place greater weight on any fuel cost implications for fishers as fuel usage would have an impact on the productivity of fishers and is an imported commodity.

As a consequence of reduced income two fishers advised that they had to dip into their superannuation to top up their incomes. For one fisher superannuation was accessed to complete works/repairs on their boat. Another fisher had accessed their superannuation in previous years which suggests that SZs have not been the only factor causing difficulties, but may have accentuated existing problems. A third fisher was concerned that their superannuation would not grow over the next 8 years to the amount they had expected, which would cause them to access the Aged Pension prematurely.

While some fishers from other regions were now coming to Port Wakefield to fish, it was felt they did not stay in the town and therefore contribute to the local economy.

One recreational fisher noted that a fellow recreational fisher from Tasmania who would normally visit upper Gulf St Vincent for one month at a time indicated that they would no longer visit given the implementation of the SZs.

One fish processor who serviced the local community indicated that supply has been reduced and more intermittent since the introduction of the SZs. The seasonal nature of fishing makes it difficult to separate the impacts of SZs from such broader seasonal effects. They also advised that they continued to receive questions from the general public regarding whether you could still fish around Port Wakefield, indicating ongoing uncertainty regarding the nature of marine parks.

A couple of suggestions were made regarding ameliorating the economic impacts in Upper Gulf St Vincent. One fisher suggested allowing fishing in areas now protected by Marine Park 14 in certain months of the year. Another commercial fisher noted that the original zoning advice provided by the Upper Gulf St Vincent Marine Park Local Advisory group was more satisfactory. This advice envisioned a significantly smaller Clinton Wetlands SZ, jutting out several kilometres from the shore, running along the eastern coastline from Port Wakefield to a point approximately 1km north of Port Arthur.

On the other hand, a recreational fisher suggested extending the existing commercial netting exclusion around Price northward to include Port Clinton as it was a known spawning area for Yellowfin Whiting and has a greater diversity of sea life compared to the Clinton Wetlands SZ. It was also suggested that

the existing Middle Spit could be extended northward to include the rest of Proof Range as it would create a larger continuous SZ while the existing zone was already not readily accessible to the public. These extensions could be offset by converting the Clinton Wetlands SZ to a Habitat Protection Zone. It was felt that:

> *"… the area selected at the head of the Gulf is unremarkable compared to other areas in the Marine Park and was seldom visited by anyone other than netters and a few campers who were catered for in the sanctuary. It is never going to be an area people are going to visit for water activities, or to gaze at the abundance of marine life in a SZ."*

**Social Impacts**

A third generation fisherman had decided to relocate his family to the West Coast near Cowell due to unfavourable fishing conditions. He came to the "conclusion that there was definitely no future for me at Port Wakefield loosing that sort of money". For this fisherman the failure to "buy-out sufficient 'effort' of licence holders to allow those left in the fishery to survive" and reduced fishing area had contributed to reduced production. The fisher had spent in excess of $40,000 as part of the re-location (funded via a loan) with part of the funds spent on "upgrading plant [and equipment] to withstand the rigours of a different fishing environment". A need to purchase new tools and equipment was also necessitated by no longer being able to utilise equipment of other immediate family members who also worked in the industry. After allowing for reduced fishing time due to the move, the family advised that they had been able to effectively maintain their overall fishing income. Based on feedback they had received from family members in Port Wakefield they advised it would not have been possible to maintain their incomes had they remained in Port Wakefield. However, in addition to the transitional economic costs there were significant ongoing psychological costs for the family, especially the children associated with having to relocate away from family, including the loss of friends and fitting into a new school.

Two other fishers had advised that they were thinking about relocating to other regions. One fisher was thinking or relocating to Port Pirie while another was considering a move to Port Broughton. Another fisher consulted at a later date noted that two boats that were previously operating in the region were now operating out of Port Pirie.

The potential for fishers and their families relocating to other regions raises concerns about the sustainability of public facilities and organisations such as the local school and sporting groups due to the loss of children and adults respectively. Given the relatively small nature of the Port Wakefield community, small changes in the number of children can influence whether the school bus continues to service the region or particular areas within the region.

For some fishers remaining in Port Wakefield and the broader Upper Spencer Gulf region adjusting to the new management changes had had negative psychological impacts. At least one fisher advised that they were now taking medication prescribed by their medical practitioner to aid with sleeping at night due to the stress associated with adapting to the new regulations. Another fisher advised that their stress had impacted their partner.

A number of businesses in the commercial fishing sector are family businesses and negative impacts on economic viability can affect the family unit. For instance, one fisher claimed that they would no longer be able to employ their son as a deck hand. As a consequence the son and his family were considering moving interstate to find alternative employment.

As stated previously, the Clinton Wetlands SZ provided relatively sheltered conditions in the southern part of Gulf St. Vincent were rough. In the absence of such a sheltered area fishers found themselves potentially working in rough conditions on a more frequent basis. Such a circumstance has the potential to increase the risk of injury.

With fishers travelling to different areas or other areas more frequently, fishers had noticed an increase in confrontation with other communities or fishers. As one fisher noted, "communities do not take kindly to new fishermen moving into their areas, it only puts more pressure on the waters that they fish out of". In particular, commercial fishers noted increased conflict with recreational fishers from Ardrossan. One fisher had received verbal abuse while others argued that recreational fishers would falsely report commercial fishers for being in SZs as a punishment.

Highlighting the potential conflict between recreational and commercial fishers, one recreational fisher wrote to PIRSA Fishwatch expressing "growing concern in the increased, and increasing, commercial fisheries longlining efforts, in particular in the upper reaches of Gulf St Vincent around Ardrossan and Black Point". They advised that since December 2014 increased effort by local and professional fishers, which first emerged at the same time the previous year, had resulted in the "systematic eradication of Snapper schools due to longlining and conjoined efforts by commercial boats".

**Sanctuary Zone Implementation**

Fishers advised that while they have nothing against SZs in concept and the Marine Park Local Advisory Group did put forward preferred zoning for Clinton Wetland SZ that they could "live with", subsequent enlargement of the SZ had a detrimental impact.[19] As a consequence the existing Clinton Wetlands SZ had no ownership by fishers or community support, such that if recreational fishers were operating in the SZ commercial fishers did not bother reporting them.

**Equity Factors**

Fishers raised equity concerns about rising licence fees in an environment where the SZs had made fishing conditions more difficult and restrictive.

In addition to reducing superannuation (i.e. the value of the future sale of licence and assets) due to lower production, at least one fisher noted that the value of licences had dropped and would likely fall further due to the impact of SZs. Any such event would have a negative impact on retirement incomes.

**Environmental Issues**

Several fishers identified other environmental issues that have negatively affected fishing conditions in the region. Two recreational fishers indicated that while they could still fish at Bald Hill Beach, it is "not safe to fish there because of the build-up masses of floating seagrass from low water mark to high water mark". Dead seagrass had the effect of shading shallow sea grass, causing it to die back. Such habitat is important feeding grounds for garfish and squid.

One commercial fisher wrote that "pollution from the land is a major concern for our waters in our area". Whether such pollution has contributed to seagrass die back is unknown and beyond SACES area of expertise and the terms of reference for this study.

A couple of recreational fishers indicated that silting up of the gulf had become a greater issue over time.

In respect of the recreational fisher mentioned previously who observed increased commercial fishing effort off Port Clinton, they felt that current commercial fishing practices between Port Clinton and Price – i.e. netting where the flats and channels drain into and direct the fish to aggregate as the tide receives – were counter-productive to the creation of the netting exclusion zone around Price. In addition, they noted the commercial fishers' "practice of power hauling a net, causes damage to the seabed, it dislodges weed by the roots and pulls over razor fish". It was felt that such practice was incompatible with the status of the region as a habitat protection zone.

[19] The preferred zoning was for a SZ on the eastern side of upper Gulf St Vincent running from Port Wakefield to the top of the gulf, leaving the area up to Port Arthur open for commercial fishing.

### Recreational Fishing

A recreational fisher stated that $5.5 million had been promised to the recreational fishing sector by the State Government in order to create artificial reefs to encourage fish breeding and buy out commercial fishing effort. However, no action on this promise had since been forthcoming. Establishment of the reef would help to promote recreational fishing in the region. SACES notes that since this advice was received the results for the first round of the South Australian Recreational Fishing Grants programme were announced with 37 projects receiving $557,170 in funding, while a further 11 projects valued at $188,550 received in-principle support.[20] The overall programme is valued at $2.25 million over 3 years.

### Local Government Recommendations

On the basis of feedback obtained from professional and recreational fishermen, the Mayor of Wakefield Regional Council made the following recommendations:

1. *Reconsider its buy back of licences and ensure that appropriate funding is available to purchase back current operating licences in the locality. This would reduce the overall number of commercial fishing operators to a more sustainable level.*
2. *Amend the Marine Park 14 boundaries to align with those developed by the local community which better reflects sound management of the fishery in Gulf St Vincent. This respects the work undertaken by the local community during the development of the Marine Parks using local and specialized knowledge of the fishery.*
3. *Establish a more appropriate policing of Marine Park 14 as there is anecdotal evidence that fishermen are not respecting the boundaries and are illegally fishing within the boundaries.*
4. *Provide funding to undertake a comprehensive dredging of the Port Wakefield Channel to facilitate the development of the tourism sector.*

The action would allow charter boat operators to operate confidently from the town.

## 7.5 Environmental Impact

SZs provide protection for habitats that in turn support various species and ecosystems. Maintenance of these habitats is expected to have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). Such benefits may include changes in the size and/or abundance of particular species. It is too early for any measurable ecological changes to have occurred within SZs of the Upper Gulf St Vincent Marine Park (UGSVMP) since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program together with preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Port Wakefield region are presented in Appendix H.

[20] DEWNR, 2015 South Australian Recreational Fishing Grants Programme. Available: http://www.environment.sa.gov.au/marineparks/2015-south-australian-recreational-fishing-grants-programme [16 September 2015]

# 8. Broader Impacts

The following section considers Adelaide metropolitan and state level indicators, specifically price indicators for fish and boat registrations. Historical and recent developments for commercial fisheries at the state and broad region level are also examined.

## Summary – South Australia

- The Adelaide Consumer Price Index (CPI) for 'fish and other seafood' for the first two quarters under SZs suggest no upward impact on prices relative to historical patterns due to a potential reduction in local seafood supply, while a relatively large rise in the June quarter 2015 was within the range of recent historical quarterly variation.
- Retail price data collected by DEWNR from 3 retail outlets in the Adelaide central business district provides some evidence of a rise in the price of KGW and garfish since the introduction of SZs, while other species show unclear or no evidence of an upward impact on prices. As the data series is relatively new, we do not know if recent price increases for KGW and garfish are unusual relative to historical patterns.
- Recent stock assessment concluded that the stock abundance of greenlip and blacklip abalone in the Central Zone (Kangaroo Island) and blacklip abalone in the Western Zone (Ceduna, Port Lincoln) were likely to decrease further at existing allowable commercial catch levels. Only the Western Zone greenlip abalone fishery was assessed as 'sustainable'.
- Greenlip abalone catch for the first 4 months with SZs was down significantly in the Central Zone and Western Zone. However, this would largely reflect a recent shift in fishing activity in terms of delaying effort to the autumn-winter period to target greenlip abalone with a larger weight-to-length ratio. This result emphasises the need for data covering a full season with SZs.
- Blacklip abalone catch for the first 4 months with SZs was down marginally for the Central Zone (-3.9 per cent) but up strongly for the Western Zone (53 per cent). The latter reflects that catch a year earlier was well below average; compared to earlier years blacklip catch for the initial SZ period was down modestly. CPUE for blacklip in the Central Zone, showed an improvement, indicating no short term impact on productivity from SZs, while CPUE for the Western zone fell. The extent to which the latter reflects a negative impact from SZs, a continuation of recent decline in the blacklip fish stock, or a combination of both is unknown.
- Rock lobster fishers for the whole Northern Zone, which includes the three RIAS study regions, were able to effectively reach their quota (99.2 per cent) for the 2014/15 season. While catch was lower relative to the previous year (down 2.8 per cent), the fall was driven by the reduction in the allowable catch (down 6.3 per cent) as a consequence of removing displaced fishing effort associated with the SZs.
- The value of landed rock lobster catch for the state as a whole for first 4 months with SZs was $96.6 million, up 12 per cent from the corresponding period a year earlier. To the extent that the rise in value was not driven by an increase in production for the Southern Zone, this result suggests that price rises helped offset any reduction in catch due to displaced fishing effort. Since rock lobster is mostly exported such price rises may not show up in the CPI.
- Rock lobster research pot data indicates no difference in productivity between SZ and non-SZ regions.
- Total catch for 19 marine scalefish taxa that together account for 90 per cent of the total catch for the South Australian commercial marine scalefish fishery (MSF) has experienced a sustained decline over the past two decades with catch more than halving since the early 1990s. The decline mainly reflects a concerted reduction in effort to restructure the fishery to address latent effort, support profitability and maintain a sustainable fishery.
- The total value of the MSF catch for the first 4 months with SZs was $6.0 million, virtually identical to the value recorded for the corresponding period a year earlier. An identical value of catch despite removal of effort suggests some possible offsetting price impacts.
- Data for the four primary MSF species indicates mixed experiences for the initial 4 month period with SZs compared to the corresponding period a year earlier. King George Whiting targeted handline and hauling net catch was up 9.3 per cent due to a significant increase in handline fishing effort. Targeted handline and longline snapper catch was down only marginally (-1.6 per cent) despite a significant reduction in fishing effort (-12.5 per cent), indicating that catch rates were significantly improved. There was a large fall in hauling net garfish catch (-21 per cent) despite an increase in effort (12 per cent), indicating a significant decline in catch rates. Whether this reflects that garfish fishers have been pushed into less productive areas with the introduction of SZs, seasonal factors or other issues regarding the sustainability of the fishery (in 2012 it was assessed as 'over-exploited') is unknown. Finally, total hauling net and targeted jig catch for calamari was up significantly (29 per cent) due to increases in fishing effort and, to a lesser degree, catch rates.

- Total hauling net catch for all relevant MSF species in the first 4 months with SZs was down 10 per cent compared to a year earlier despite an increase in effort (6.8 per cent). Assessing the extent to which SZs contributed to the decline in catch and catch rates is complicated by the potential role of other factors such as seasonal factors, fishery degradation and fisheries management changes, the complex nature of the MSF and the short time frame (only 4 months) for the data.
- Catch and effort for the South Australian charter boat fishery exhibited some decline in the 2 financial years prior to the introduction of SZs after being relatively stable over the previous 5 years.
- The number of fish retained by the charter boat fishery in the first 4 months with SZs was down 6.2 per cent compared to a year earlier. The decline was wholly due to a reduction in effort, down 13 per cent in terms of the number of trips undertaken. The estimated charter boat effort displaced by SZs was estimated at 5.2 per cent in terms of mean number of customer days.

## 8.1 Economic Factors

### 8.1.1 Retail Prices

One potential consequence of a reduction in commercial fishing effort due to the SZs is an increase in retail prices due to a reduction in the quantity of fish supplied to the market. Any price increase would represent a cost to consumers and a benefit to commercial fishers and/or processors/wholesalers, meaning the impacts would ultimately net out from a whole of community perspective. For the commercial fishing sector price rises may offset any potential negative impacts that are experience, such as a reduction in productivity or increase in input costs.

The extent to which a potential reduction in supply translates into an increase in retail prices will depend on various factors including, among other things, the level of import competition (interstate and overseas), exchange rates, the availability of substitute fish products and market structure in terms of potential market power wielded by processors and wholesalers. The latter may have a bearing on the extent to which the proceeds from any price increases are passed to fishers (i.e. producers). This issue is complex with potential variation across species. A detailed examination of this issue is considered beyond the scope and resources allocated for the RIAS, particularly given the short experience with SZs to date. However, recent developments in the value of commercial fishing catch landed are considered in section 8.2.5.

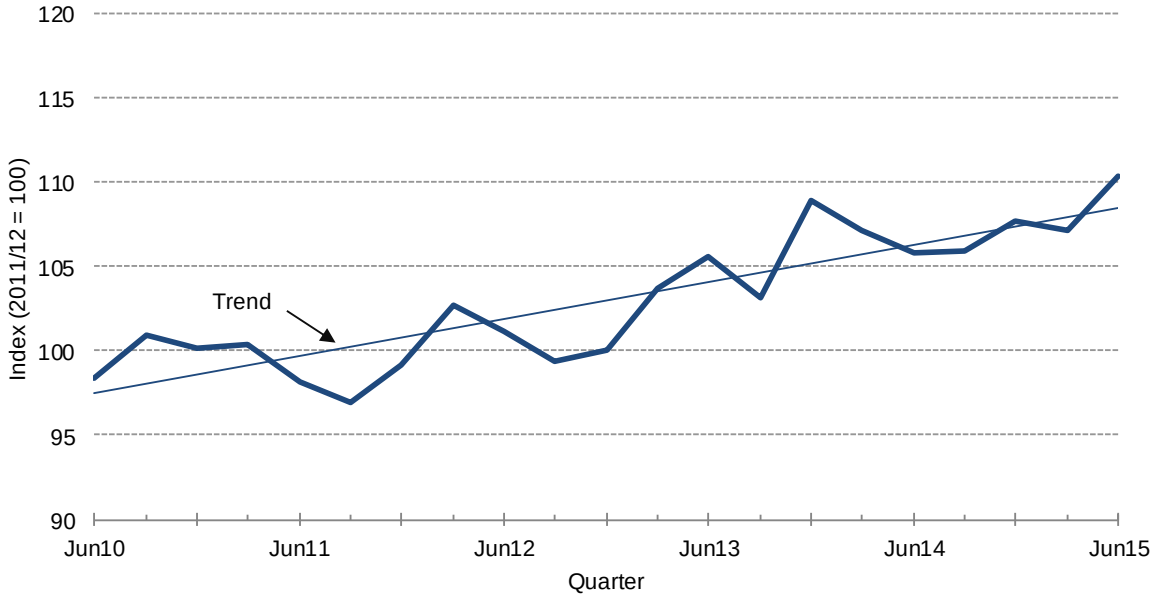
As there may be concerns about seafood price rises to the extent that consumers face cost of living issues, the remainder of this section focuses on developments in retail seafood prices to determine if implementation of the SZs had any meaningful impact on seafood prices. Two data sources are considered: the ABS's Consumer Price Index and local price monitoring conducted by DEWNR.

#### Consumer Price Index

The Australian Bureau of Statistics publishes a price index for the 'fish and other seafood' expenditure class as part of the Consumer Price Index (CPI). Unfortunately the CPI is not published at a regional level with data only being published for capital cities at the state level. Any effects on the index from SZs may be muted to the extent that domestic seafood consumption is satisfied by imports and production of certain species are mainly exported (e.g. rock lobster). While data on the extent to which South Australian seafood consumption is satisfied by imports is not readily available, data for Australia indicates that two-thirds of Australia's apparent consumption of seafood in 2012/13 was satisfied by imports (Stephan, M & Hobsbawn, 2014). One would expect that a similar level of import penetration would apply for South Australia, if not higher given the scope for South Australian consumption to be satisfied from interstate production. On the other hand South Australia accounts for a relatively high share of national production – 19 per cent of the gross value of Australian wild-catch and aquaculture production in 2012/13 (Stephan, M & Hobsbawn, 2014) – which suggests that the state could satisfy a larger share of its domestic consumption needs from local production.

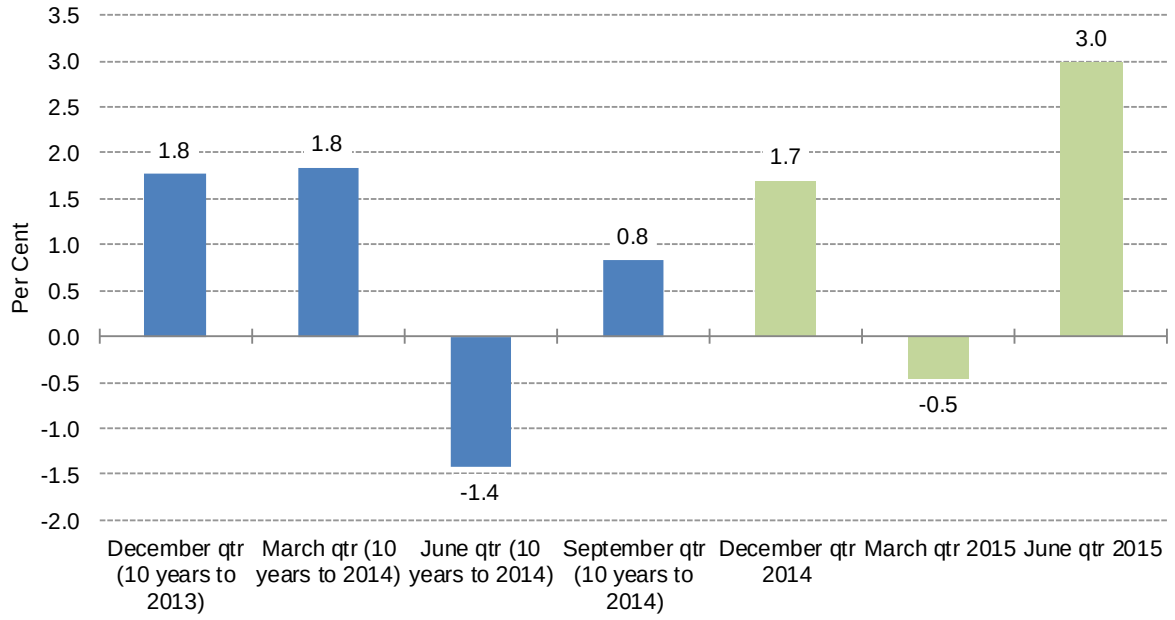
Figure 8.1 shows the quarterly index for the 'fish and other seafood' expenditure class for Adelaide over the past 5 years. The index effectively rose in line with the long term trend during the first 2 quarters with SZs (i.e. December qtr 2014 and March qtr 2015) and exhibited a relative large rise of 3 per cent in the third quarter under SZs (i.e. June qtr 2015).

**Figure 8.1: Consumer Price Index for Fish and Other Seafood Expenditure Class Adelaide – March quarter 2010 to March quarter 2015**




**Source:** Australian Bureau of Statistics, Consumer Price Index: www.abs.gov.au

**Figure 8.2: Historical and Recent Quarterly Changes in Fish and Other Seafood Expenditure Class CPI, Adelaide – 10 year average quarterly change and select quarterly changes**




**Source:** Australian Bureau of Statistics, Consumer Price Index: www.abs.gov.au

There is a high degree of seasonality in the 'fish and other seafood' price index with prices tending to rise strongly in the December and March quarters, and fall in the June quarter (Figure 8.2). Looking at the more recent changes in a historical perspective given such seasonality, a 1.7 per cent rise in the 'fish and other seafood' price index in the December quarter 2014 was actually in line with the average quarterly rise in the index for the December quarter over the previous 10 years of 1.8 per cent – refer Figure 8.2. The 0.5 per cent decline in the 'fish and other seafood' price index for the March 2015

quarter was in contrast to its average movement over the previous decade whereby the index rose by an average of 1.8 per cent in the March quarter. On the other hand and more significantly, the relatively large 3.0 per cent rise in the index for the June quarter 2015 compares with an average fall for the quarter of 1.4 per cent over the previous decade. This last result may point to an inflationary impact from SZs. However, the increase is in the range of quarterly increases over recent years and it is possible that other factors have contributed to the rise. For example, the rise could reflect a lagged response to the recent depreciation of the Australian dollar which would have had the effect of increasing the Australian dollar price of imported seafood. The Australian dollar measured on a trade weighted index basis fell by 3.9 per cent in the December quarter 2014 and then a further 6.3 per cent in the March quarter 2015, before rebounding slightly by 0.8 per cent in the June quarter 2015.[21] The decrease in price competitiveness of imported products would have increased the scope for local seafood producers to raise prices.

**In conclusion**, evidence regarding the impact of SZs on seafood prices for Adelaide as measured by the CPI is highly uncertain. Data for the first two quarters under SZs suggest no upward impact on prices relative to historical patterns, while a relatively large rise in the June quarter 2015 is within the range of natural historical quarterly variation. Of course, it is possible that 'fish and other seafood' prices may not have risen as strongly in the December and June quarters and fallen even further in the March quarter had SZs not been implemented. However, this is a hypothetical scenario that cannot be directly measured. An alternative measure of seafood prices is considered in the following section.

In addition to impacts on seafood prices in the Adelaide metropolitan area, SZs may have regional impacts on pricing including for particular species. Impacts may also manifest in non-price forms, such a reduction in the range and/or quality of local seafood available in a regional community. For instance, community consultations suggest that a reduction in commercial net fishing production in Kangaroo Island reduced the supply of affordable fish species to a local fresh seafood shop, potentially contributing to its subsequent closure.

## Local Price Monitoring

Given a general lack of existing research into the impacts of SZs and marine parks on fish prices, DEWNR decided to record local fish prices in order to gain insight into any price impacts.

### Methods

Between June 2014 and 31 July 2015, DEWNR recorded the retail prices (per kilogram) of the fresh fish and calamari that are taken by the South Australian Marine Scalefish Fishery. The prices were recorded at 3 retail outlets in the Adelaide central business district. For fish, the market prices of both whole fish and fillets were recorded, but the graphs and analyses of trends only present the most commonly recorded product (whole fish or fillets), as follows: King George whiting (fillets), snapper (whole), garfish (fillets), calamari (whole), yellowfin whiting (fillets) and snook (whole). If "large" and "small" fillets were for sale in a store (as was occasionally the case for garfish) the "small" fillets were always cheaper. In these cases, the price of the "small" fillets is presented in the graphs and analyses of trends.

If fish were imported during periods when areas of the fishery are closed, or at other times, then the use of market prices may differ due to the cost of transport or as a result of factors that are not influenced by the SZs. Most of the fish or fillets appeared to have been sourced from the South Australian Marine Scalefish Fishery, as indicated by their fresh appearance (DEWNR unpublished data). It is possible that some retailers import fish from elsewhere or sell frozen fish when local fish are not available, or when

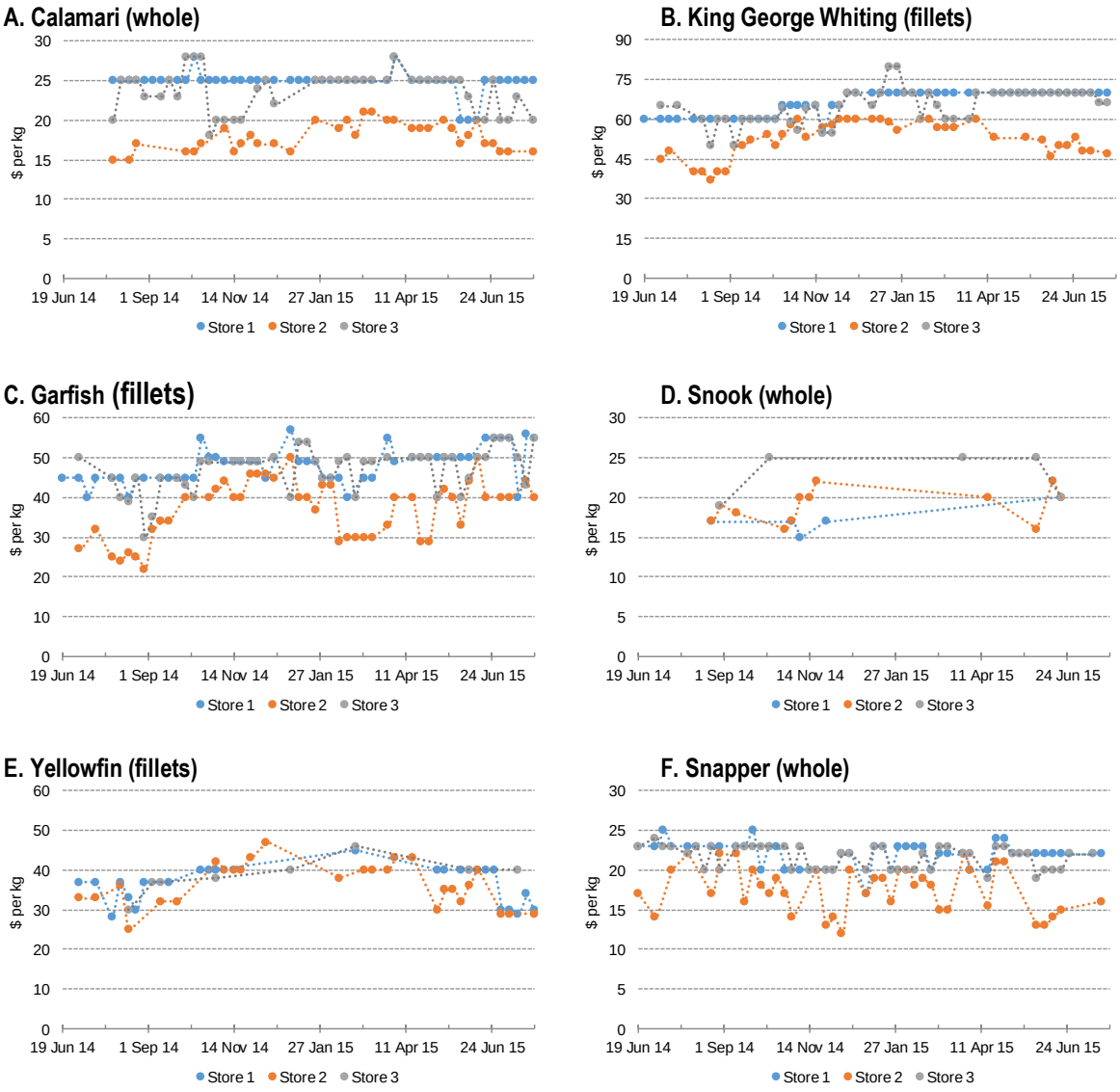
[21] Reserve Bank of Australia, *Statistics*, *Exchange Rates*. Available: http://www.rba.gov.au/statistics/historical-data.html#exchange-rates [Accessed 27 April 2015].

they were relatively expensive. For example, King George whiting and garfish are typically less accessible in summer, and during fishery closures.[22]

## Analysis

Recorded retail spot prices for the select MSF species across three retail outlets over the year to 31 July 2015 are illustrated in Figures 8.3A to 8.3F. In considering the results note that the CPI rose from 105.9 to 107.5 in the same period. One also needs to be careful regarding price movements driven by seasonal factors, particularly price increases over the summer holiday period. There appears to have been some upward movement in prices for King George whiting fillets (Figure 8.3B) and garfish fillets (8.3C) over the year to July 2015. Across the 3 stores surveyed average retail prices for KGW fillets in July 2015 were up by amounts ranging from 2.7 per cent to 16.7 per cent compared to a year earlier. Prices for garfish fillets between these periods were up by amounts ranging from 3.2 per cent to 39 per cent.

**Figure 8.3: Retail Prices of Select MSF Species – Adelaide**




**Source:** DEWNR, unpublished data.

[22] Fishery closures for snapper (1 November 2014 to 15 December 2014), for garfish (Spencer Gulf: 16 May 2014 to 28 June 2014, 12 June 2015 to 1 July 2015, 11 August 2015 to 30 August 2015; and Gulf St Vincent: 29 June 2014 to 7 August 2014, 2 July 2015 to 10 August 2015).

On the other hand, prices for whole calamari (8.3A) and snapper (8.3F) have been relatively stable over the past year, notwithstanding some variable movements through the year for individual stores (e.g. store 2 in respect of calamari which saw prices rise during the first 6 months of SZs but fall back near their initial level more recently). In fact, average whole snapper retail prices in July 2015 across the 3 stores were down compared to their average level in July 2014, by amounts ranging from 5.7 per cent to 7.0 per cent. Retail prices for yellowfin fillets generally rose in the second half of 2014 but subsequently fell through mid-2015 (Figure 8.3E). For the two CBD retail outlets that reported prices in July 2015, monthly average yellowfin retail prices were down by 17 per cent and 12 per cent compared to a year earlier.

Only limited observations were available for snook (Figure 8.3D), making it difficult to discern any trends. No consistent pattern or trend was observed across the stores.

**In summary**, the retail price data collected by DEWNR provides a mixed picture of price movements by species since the introduction of SZs. There is an indication of a rise in the price of KGW and garfish, but this cannot be directly attributed to the impact of SZs. Other species show unclear or no evidence of an upward impact on prices.

### 8.1.2 Boat Registrations

All vessels with an engine must be registered to travel in South Australian waters. Changes in the number of boats registered potentially provide insight into the use of the marine environment for recreational and commercial purposes. Unfortunately a change in registration arrangements around the time of the introduction of SZs has created a break in the boat registration series, preventing us from gaining any insight into the impact of SZs. From 3 October 2014 boats up to 7 metres long could be registered for 6 months or 12 months, rather than only 12 months as was the case previously. There has consequently been an artificial drop in registrations for 2014/15, which presumably reflects boat owners delaying renewals and taking advantage of the shorter renewal period (i.e. only renewing for 6 months over the summer period). A general decline in economic conditions in South Australia may have contributed to the decline.

## 8.2 Commercial Fisheries

The following section provides an overview of historical and recent trends for key fisheries at the state or fishing management area level. While a state or management level analysis was not necessarily within the scope of the terms of reference, confidentiality restrictions at lower region levels often mean there is insufficient data available to assess recent developments. We must consequently consider higher level data in order to gain insight into actual developments in commercial fisheries since the introduction of SZs.

There are four key commercial fisheries potentially impacted by the introduction of SZs:

- abalone;
- rock lobster;
- marine scalefish; and
- charter boat.

Data for the 4 fisheries was supplied by PIRSA (Mayfield et al. in prep.). A number of important management changes have been made to the various fisheries over recent years. Important changes to the management of these fisheries are summarised in Appendix C.

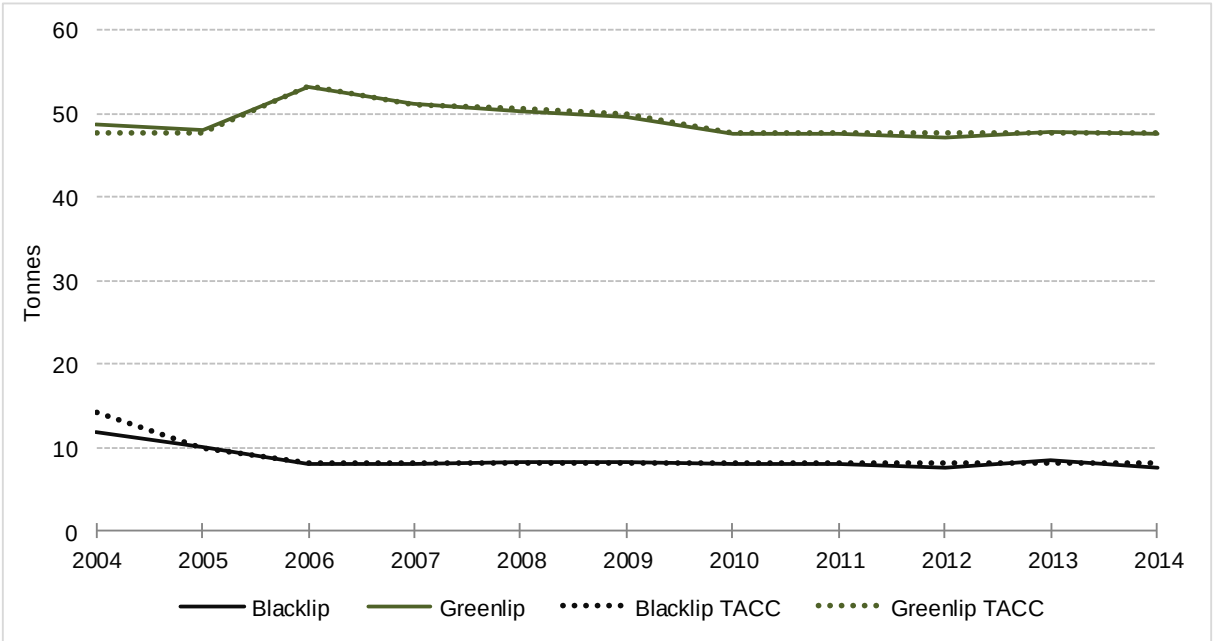
### 8.2.1 Abalone Fishery

Management of the abalone fishery is split into 3 zones: the Western Zone, Central Zone and Southern Zone. The study areas of Kangaroo Island and Port Wakefield both fall within the Central Zone while Ceduna falls within the Western Zone. In the following section we analyse overall results for these two zones.

Figure 8.4 shows historical information on the annual historical catch in the Central Zone for the two abalone species harvested: blacklip (*Haliotis rubra*) and greenlip (*H. laevigata*). Greenlip is clearly the most significant species in the region, accounting for approximately 85 per cent of the total abalone catch. The total allowable commercial catch (TACC) for both species has been maintained at a constant level for a number of years. Total catches for both species have been maintained at the TACC for the period shown. However, there have been important spatial changes in the distribution of the catch over time. For instance, in respect of greenlip there has been a significant redistribution of catch from Tiparra Reef to other spatial units, particularly South Kangaroo Island, West Kangaroo Island and Cape Elizabeth, due in part to an apparent reduction in abundance at Tiparra Reef (Mayfield et al. 2014). Furthermore, there has been a steady decline in the greenlip catch per unit effort since the early 2000s across the Central Zone. These factors, combined with evidence that catches have shifted to regions where historically few greenlip have been harvested led SARDI to conclude that greenlip "stock abundance is likely to decrease further at the current TACC", and classify the Central Zone greenlip fishery as 'transitional depleting' under the national framework for reporting stock status (Mayfield et al. 2014).

The vast majority of the blacklip fishing catch (90 per cent) is taken from fishing grounds surrounding Kangaroo Island. While catch per unit effort was relatively stable between 1990 and 2009, catch rates have declined over recent years, by a little over 10 per cent (Mayfield et al 2014). There has also been evidence of fishers moving into deeper waters in order to sustain their catch. A recent stock assessment concluded that "most of the evidence indicates that the CZ blacklip stocks are in one of their weakest positions since at least 2001 and that stock abundance is likely to decrease further at the current TACC" (Mayfield et al. 2014, p.61).

**Figure 8.4: Abalone Catch by Species Central Zone – Year**




**Source:** PIRSA, logbook catch and effort, unpublished data.

The historical catch for greenlip and blacklip in the Western Zone is illustrated in Figure 8.5 along with the combined catch and TACC for both species. In considering developments for this fishery it is important to note that prior to 2014 the Western Zone was split into two management regions, A and B. These regions were amalgamated into a single region from 1 January 2014. The amalgamation provides management and economic efficiencies, providing fishers with greater flexibility in meeting their quotas. For the purposes of the analysis the historical catch and TACC for both regions has been added together (as there was a combined TACC for greenlip and blacklip in Region B in earlier years it is not possible to show a separate TACC for each species in Figure 8.5).

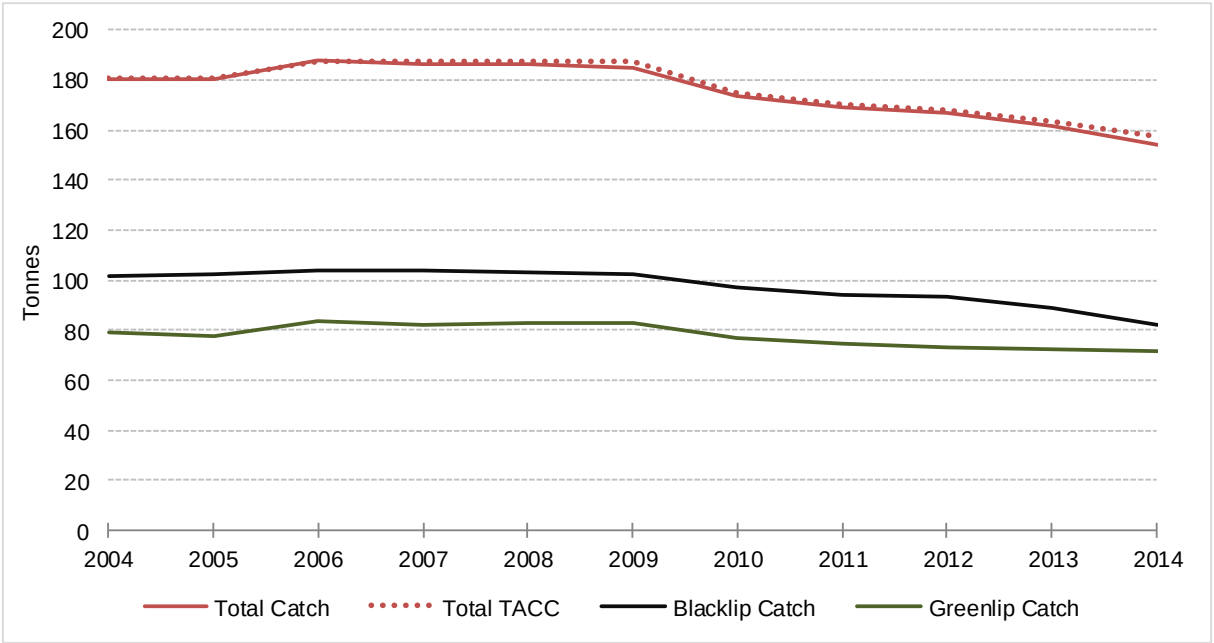
The blacklip and greenlip catch in the Western Zone have fallen since 2009 in response to repeated reductions in the TACC for both species. Nonetheless, abalone fishers in the region have consistently been able to land the TACC over the period shown.

The recent reduction in greenlip catch and TACC does not so much reflect a reduction in the sustainability of the fisheries as production falling back to long run average levels after a 'rapid increase in greenlip abundance during the 2000s' (Stobart et al. 2014). A recent stock assessment classified the Western Zone greenlip abalone fishery as "sustainable" under the national reporting framework (Stobart et al. 2014).

On the other hand, the blacklip fishery would be assessed as "transitional depleting" under the national stock status framework with stocks in 2013 assessed as being at their weakest position in 15 years (Stobart et al. 2014a). Catch per unit effort has been declining steadily since 2006 with CPUE in 2013 being as its weakest since 1996. The most recent stock assessment concluded that "there is no evidence that the recent reductions in WZ catch have been adequate to arrest the ongoing declines and facilitate stock rebuilding", and that current catches in most spatial administrative units "may not be sustainable" (Stobart et al. 2014a).

In terms of assessing impacts on abalone fishing since implementation of SZs, PIRSA was only able to provide data for the first 4 months under SZs – i.e. from October 2014 to January 2015 inclusive – given the compressed reporting timeframe. This is an extremely short time frame. Ideally one would have at least a full year's of data in order to assess short term impacts given the potential for seasonal variations. The following analysis must consequently be considered very much preliminary.

**Figure 8.5: Abalone Catch by Species Western Zone – Year**




Source: PIRSA, logbook catch and effort, unpublished data.

Table 8.1 shows the catch, effort and catch per unit effort for blacklip and greenlip in the Central Zone for the 4 months since the commencement of the SZs and the corresponding period for the previous 5 years. Looking first at blacklip, there was a small decline in catch for the 4 months to January 2015 compared to the corresponding period a year earlier (down 3.9 per cent). The decline was wholly due to a large decline in effort, measured either in hours or days. Catch per unit effort was high relative to the corresponding period for previous years. This result provides no evidence to suggest that SZs had a negative short term impact on blacklip in the Central Zone as a whole. Apart from the buyout of effort displaced by the SZs, the reduction in effort may reflect natural temporal variation through the year.

**Table 8.1: Abalone Catch by Species**
**Central Zone – 4 months beginning October**

| Period | Catch (kg) | Effort (hr) | Effort (days) | CPUE (kg per hour) |
|---|---|---|---|---|
| **Blacklip** | | | | |
| 2009 | 2,668 | 127.5 | 21.0 | 21.4 |
| 2010 | 6,096 | 211.6 | 40.0 | 24.3 |
| 2011 | 4,539 | 218.2 | 39.0 | 20.9 |
| 2012 | 4,737 | 225.5 | 41.0 | 17.9 |
| 2013 | 3,674 | 191.7 | 30.0 | 18.4 |
| 2014 | 3,530 | 156.0 | 26.0 | 22.1 |
| **Greenlip** | | | | |
| 2009 | 19,460 | 659 | 113 | 26.6 |
| 2010 | 14,979 | 638 | 108 | 22.2 |
| 2011 | 13,859 | 588 | 106 | 22.9 |
| 2012 | 15,747 | 621 | 104 | 23.2 |
| 2013 | 13,057 | 572 | 92 | 23.6 |
| 2014 | 10,502 | 430 | 70 | 22.0 |
| **Total** | | | | |
| 2009 | 22,237 | 820.8 | 139 | 27.1 |
| 2010 | 20,947 | 880.7 | 169 | 23.8 |
| 2011 | 18,516 | 770.9 | 152 | 24.0 |
| 2012 | 20,246 | 859.0 | 173 | 23.6 |
| 2013 | 16,765 | 678.7 | 113 | 24.7 |
| 2014 | 14,022 | 600.4 | 101 | 23.4 |

Source: PIRSA, logbook catch and effort, unpublished data.

Greenlip has experienced a much larger decline. Total catch for the four months to January 2015 was down 20 per cent compared to a year earlier, and down 33 per cent compared to two years earlier. However, CPUE for the most recent period was broadly in line with earlier years. The decline in catch could reflect various reasons, including natural and seasonal and temporal variation which are potentially exacerbated by the data period falling toward the end of the quota year (i.e. after a majority of catch is landed). Greenlip catch may also have been affected by a recent behavioural shift in seasonal harvesting from summer to autumn (see below), although this applies more to the Western Zone rather than Central Zone.

Data on catch, effort and catch per unit effort in respect of abalone fishing in the Western Zone for the four month period commencing October for recent years is presented in Table 8.2. The blacklip catch for the first four months under SZs was up strongly (53 per cent) compared to the corresponding period a year earlier, but well aligned to the catch for the period 2009 to 2012.

Blacklip CPUE for the first 4 months under SZs was slightly lower compared to a year earlier (down 2.4 per cent) and lower compared to the previous 5 years. As mentioned above, CPUE for blacklip in the Western Zone has been steadily falling since 2006 – well before SZs – and the most recent result is consistent with this trend. It is therefore not clear whether the most recent decline in CPUE reflects an

impact from SZs or ongoing decline in abundance of the western zone blacklip fish stock. The short data period further compounds this issue.

**Table 8.2: Abalone Catch by Species**
**Western Region – 4 months beginning October**

| Period | Catch (kg) | Effort (hr) | Effort (days) | Catch rate (kg per hour) |
|---|---|---|---|---|
| **Blacklip** | | | | |
| 2009 | 33,557 | 1,481 | 259 | 20.9 |
| 2010 | 39,035 | 1,756 | 313 | 21.5 |
| 2011 | 30,750 | 1,301 | 228 | 23.2 |
| 2012 | 31,200 | 1,444 | 250 | 21.2 |
| 2013 | 18,736 | 927 | 168 | 19.4 |
| 2014 | 28,691 | 1,543 | 274 | 18.9 |
| **Greenlip** | | | | |
| 2009 | 39,073 | 1,950 | 339 | 18.9 |
| 2010 | 33,528 | 1,704 | 305 | 18.2 |
| 2011 | 25,861 | 1,271 | 224 | 19.9 |
| 2012 | 28,741 | 1,415 | 245 | 19.9 |
| 2013 | 24,138 | 1,476 | 277 | 16.2 |
| 2014 | 13,600 | 810 | 155 | 16.0 |
| **Total** | | | | |
| 2009 | 72,048 | 3,108 | 566 | 23.2 |
| 2010 | 72,963 | 3,167 | 581 | 23.0 |
| 2011 | 56,613 | 2,327 | 419 | 24.3 |
| 2012 | 59,870 | 2,520 | 451 | 23.8 |
| 2013 | 42,412 | 2,125 | 408 | 20.0 |
| 2014 | 42,126 | 2,039 | 379 | 20.7 |

**Source:** PIRSA, logbook catch and effort, unpublished data.

Greenlip catch for the 4 months commencing October 2014 was down 44 per cent compared to the corresponding period a year earlier. This substantial decline would largely be driven by recent changes in fishing practices rather than any impacts from SZs. Recent research conducted by SARDI showed that the weight-to-length ratio of individual greenlip abalone is greater in the autumn period (Stobart et al 2013). The implication of this insight was that abalone fishers could significantly improve their productivity by delaying fishing effort until the autumn-winter period. The researchers demonstrated that:

> *'…changing harvesting from summer to autumn would allow either (1) a 13% reduction in the number of abalone harvested for the same quota, thereby reducing fishing mortality; or (2) a 13% increase in the landed weight of catch (16.5% increase in revenue) while leaving the number and mean length of individuals harvested unchanged' (Stobart et al 2013).*

The potential to increase revenue by a margin greater than the landed weight reflects that heavier abalone are more valuable.

As a consequence the western zone abalone fishery began to change fishing practices in 2014, reducing quotas and thus fishing effort for the early months of the year. The significant decline in greenlip catch for the 4 months to January 2015 may thus largely reflect this recent shift in fishing practices. This behavioural change emphasises the need for having a full year of commercial fisheries data with which to assess the impacts of SZs. More recent anecdotal evidence indicates that abalone fishers are seeing positive results with the change in harvesting practices (Port Lincoln Times, 2015).

Given the above behavioural changes, only catch per unit effort may provide some insight into the impact of SZs. For the post SZ period CPUE was only marginally lower (1.3 per cent) compared to a previous year at approximately 16 kg per hour.

State-wide data on the value of landed catch indicates that the total value of landed blacklip for the 4 month period beginning October 2014 was $4.3 million, up 8.9 per cent compared to the corresponding period a year earlier. Reflecting the shifting pattern in greenlip harvesting activity, the value of landed greenlip for the first 4 months with SZs was $1.5 million, down 64 per cent compared to a year earlier.

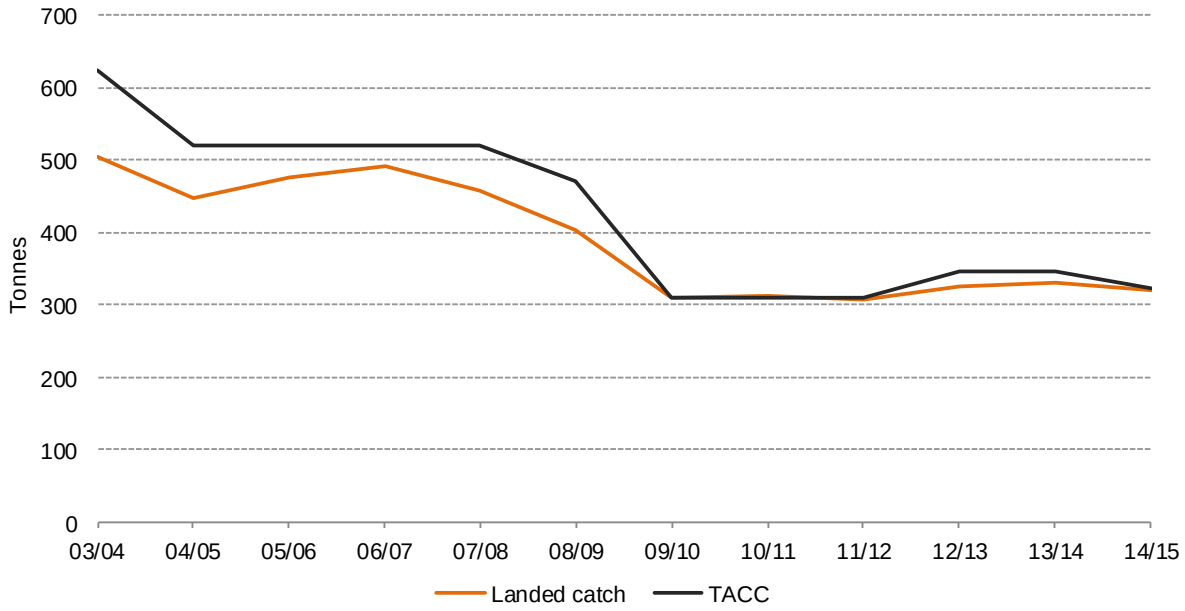
### 8.2.2 Rock Lobster Fishery

Management of the rock lobster fishery in South Australia is split into two zones: the Northern Zone and Southern Zone. In general terms the boundary between the two zones is formed by a staggered line that runs south westerly from the River Murray mouth – refer Figure D.2 in Appendix D. Thus the three study regions are all located in the Northern Zone. In the following section we consequently examine developments for the Northern Zone, unless otherwise stated.

The rock lobster season for the Northern Zone runs from 1 November to 31 May each year.

The landed catch and total allowable commercial catch for the Northern Zone rock lobster fishery since the introduction of the quota system in 2003/04 is illustrated in Figure 8.6. It can be seen that until 2009/10 season the landed catch fell continually short of the TACC. The TACC was significantly reduced in 2009/10 to 310 tonnes in an effort to ensure protection of the remaining stock following six year of declining catch rates (PIRSA 2014a). Over recent years the TACC was raised slightly in response to the landed catch reaching the TACC. In 2014/15 the quota was reduced in line with the estimated displaced fishing effort from the introduction of SZs.

**Figure 8.6: Rock Lobster Catch and Total Allowable Commercial Catch**




**Source:** PIRSA, logbook catch and effort, unpublished data.

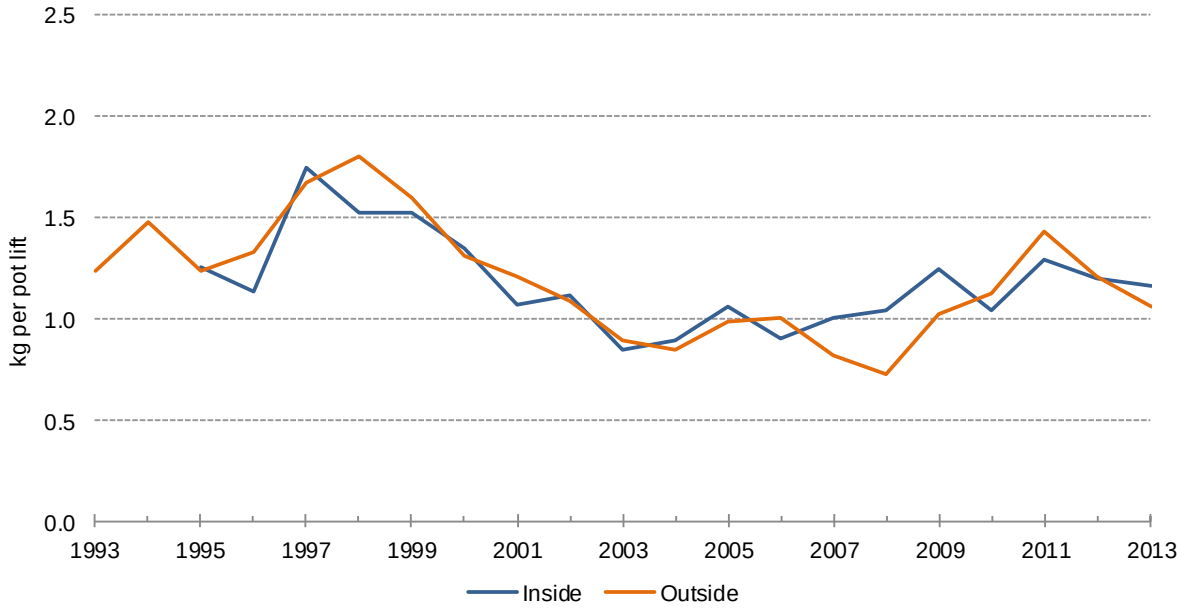
Data for the 2014/15 season – the first full season under SZs – indicates that a total catch for the season was 320.6 tonnes, which is 99.2 per cent of the TACC. Thus rock lobster fishers as a whole in the Northern Zone were able to effectively reach their quota in 2014/15. While the total catch was slightly lower in 2014/15 (down 2.8 per cent), this fall was effectively driven by the reduction in the TACC (down 6.3 per cent) as a consequence of removing displaced fishing effort associated with the SZs.

Data on the value of landed rock lobster catch for the state as a whole for the first 4 months with SZs paints a positive picture. The total value of landed rock lobster catch for this period was $96.6 million, which was 12 per cent higher compared to a year earlier.

License holders participate in a voluntary catch sampling program that involves deploying research pots in conjunction with their commercial pots. Information collected from the research pots is used to inform fishery management processes. Importantly, the research pots have GPS capabilities meaning that data collected in respect of these pots can provide insight into fishing activities inside and outside SZs. Such insights include whether SZs are more productive relative to non-SZ areas, which has raised concerns about the displaced catch associated with SZ being underestimated.

Figure 8.7 shows the catch per unit effort (CPUE) or kilograms per pot lift for rock lobster commercial fishing inside and outside SZs based on the research pots data. Inspection of the graph indicates that the catch rate inside SZs has basically matched the catch rate outside SZs over the past two decades. A simple t-test indicates no statistically significant difference in the mean catch rate between inside and outside SZs for the period 1995 to 2013. Thus there appears to be no difference in productivity (at least measured solely by pot lifts) between SZs and non-SZs.

**Figure 8.7: Rock Lobster Catch Per Unit Effort (kg per pot lift) Inside and Outside Sanctuary Zones Northern Zone**




**Source:** SARDI, unpublished data.

The research pots data also provides evidence of the extent of fishing effort that has been conducted within the SZs. Figure 8.8 shows the number of pot lifts conducted inside and outside SZs. For the decade to 2013, SZs accounted for 5.4 per cent of the total pot lifts recorded in respect of the research pots.

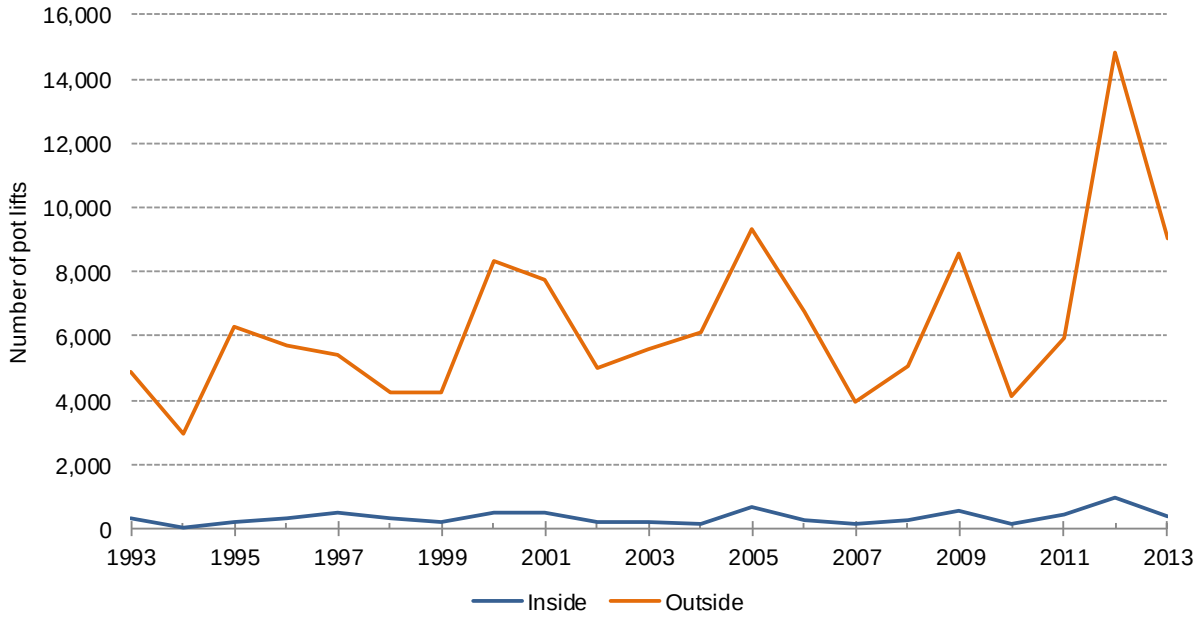
### 8.2.3 Marine Scalefish Fishery

The South Australian marine scalefish fishery (MSF) is a complex multi-species, multi-gear industry.

While more than 60 species are targeted by commercial fishers, the majority of effort is concentrated of four 'primary' species: King George whiting, southern garfish, snapper and southern calamari. The management plan for the industry identifies a range of 'secondary', 'tertiary' and 'other' species.

Management of the fishery is accomplished through control of input methods such as gear type, minimum size limits and seasonal fishing restrictions rather than output restrictions such as quotas. While a broad array of gear types are used, the most common types employed include handlines, longline, haul nets, mesh nets and squid jigs.

**Figure 8.8: Number of Pot Lifts Inside and Outside Sanctuary Zones South Australia – Year**

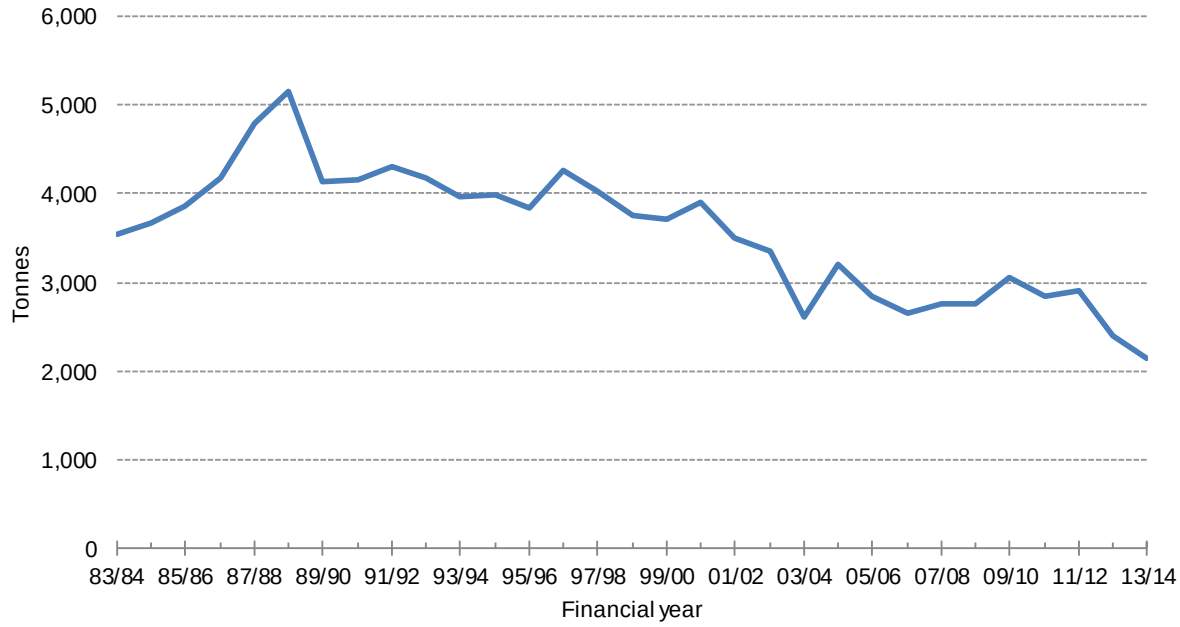



Source: SARDI, unpublished data.

In 2012/13, the South Australian MSF had a total catch of 2,631 tonnes at an estimated total value of $24.9 million (EconSearch, 2014a).

Figure 8.9 shows the longer term historical commercial catch for 19 of the most significant marine scalefish taxa which together account for more than 90 per cent of the total catch for the South Australian commercial marine scalefish industry.

**Figure 8.9: Total Commercial Catch for 19 Marine Scalefish Taxa South Australia – Tonnes[(a)]**




**Note:** (a) Excludes data for select years for mud cockles ('83/84, '85/86 & '88/89) and sand crabs ('83/84) due to confidentiality restrictions.
**Source:** Fowler et al (2014).

After peaking in the late 1980s and early 1990s, total catch for the 19 taxa selected has declined steadily, from approximately 5,150 tonnes in 1988/89 to 2,151 tonnes in 2013/14. The decline mainly reflects a concerted reduction in effort, in part due to concerns regarding the sustainability of some existing fisheries. Notable management changes in this respect include:

- the licence amalgamation scheme introduced in 1994 to reduce the number of licences and thus maximum (i.e. latent) fishing effort, within the fishery;
- rationalisation of the net sector in 2005 when a net licence buy-back scheme resulted in the removal of approximately 45 per cent of net fishing effort; and
- permanent netting closures in southern Yorke Peninsula, the south west of Spencer Gulf (SG) and the West Coast (Venus Bay region).

Further details regarding management changes in respect of MSF are provided in Appendix C.

The annual catch for the four primary MSF species by gear type and fishing effort and catch per unit effort since 2003/04 are shown in Figure 8.10. King George Whiting annual catch in respect of targeted handline and hauling net has declined steadily since 2006/07 (Figure 8.10A). Data in relation to targeted handline indicates that this in part reflects a reduction in effort while CPUE has remained relatively stable since 2006/07 (Figure 8.10B).

Total annual snapper catch had been rising steadily up until 2010/11 in response to a notable shift from handline to longline effort (refer Figure 8.10C). However, catch declined by over a third in 2012/13 in response to a decline in longline and handline effort and a large decline in CPUE for handline (Figure 8.10D).

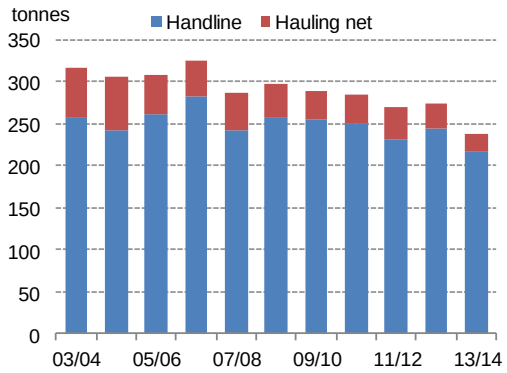
The annual garfish targeted hauling net catch has been relatively stable since 2007/08 at approximately 200 tonnes per annum (Figure 8.10E). The last stock assessment conducted in 2012 found that the garfish fishery has showed no signs of recovery despite voluntary net buy-back and spatial closures in 2005 and concluded that the fishery remained 'over-exploited' (Steer *et al* 2012). More recently, a new harvest strategy was introduced in June 2012 as part of an effort to reduce the harvest rate from 69 per cent to 30 per cent by 2020 (Steer *et al* 2012).

Annual calamari catch rose strongly in 2011/12 (by 48 per cent) but fell steadily over the subsequent 2 years back toward average levels for the past decade (Figure 8.10G). This pattern largely reflect a sharp increase then decline in targeted jig effort (Figure 8.10H).

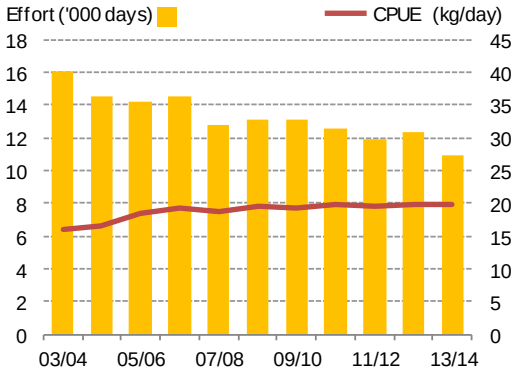
In terms of developments since the introduction of SZs on 1 October, data was only available up to end January 2015. Data on the value of MSF and miscellaneous fisheries catch for this 4 month period over recent years and the catch for whole financial year periods are shown in Table 8.3. The total value of the MSF catch for the 4 months beginning October 2014 was $6.0 million, which is virtually identical to the catch in the corresponding period of the previous year. Thus in the short term SZs do not appear to have negatively affected the overall value of the MSF catch despite the removal of effort. Unfortunately we do not have corresponding data on total catch for the MSF in order to determine whether there were any changes in total catch and thus relative prices. It is possible that maintenance of overall revenue could reflect a price response to reduced catch, an increase in fishing effort on the part of remaining commercial MSF fishers, or a combination of the two. Unfortunately the multi- species and multi-gear nature of the fishery makes it impossible to estimate changes in fishing effort for the fishery as a whole.

## Figure 8.10: Catch and Effort for Primary MSF Species[a]

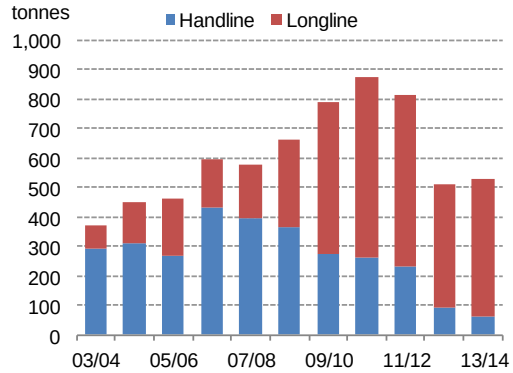
### A. KGW catch by gear type



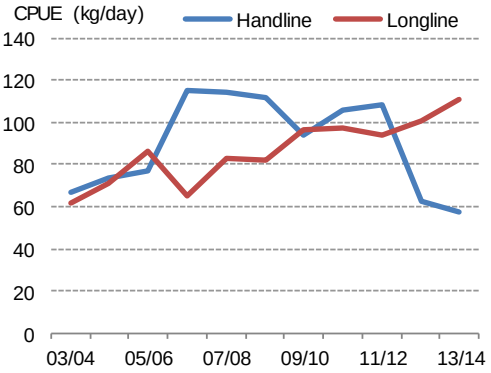

### B. KGW Targeted handline effort and CPUE



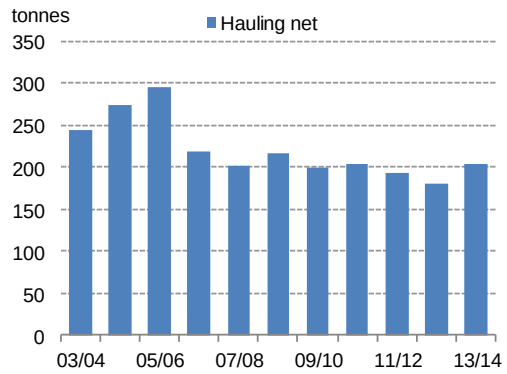

### C. Snapper catch by gear type



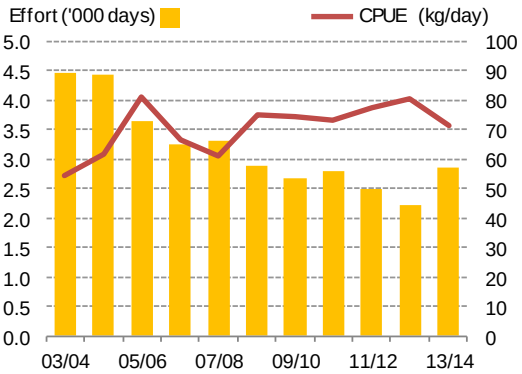

### D. Snapper targeted handline and longline CPUE



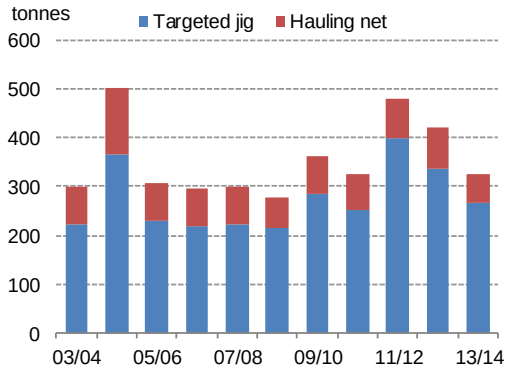

### E. Garfish catch by hauling net



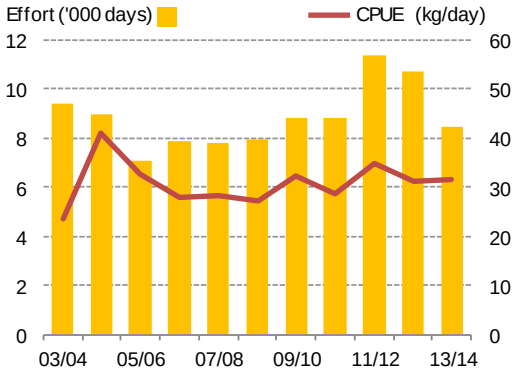

### F. Garfish hauling net effort and catch




### G. Calamari catch by gear type




### H. Calamari targeted jig effort and CPUE




**Note:** (a) Total catch does not include catch by other gear types and non-targeted catch for gear types shown.
**Source:** PIRSA, logbook catch and effort, unpublished data.

**Table 8.3: Value of MSF and Miscellaneous Fisheries[a] – South Australia**

| Period | 4 month period beginning October $'000 | 4 month period beginning October Percentage change from previous period | Financial Year $'000 | Financial Year Percentage change from previous period |
|---|---|---|---|---|
| 2009/10 | 7,930 | - | 22,947 | - |
| 2010/11 | 7,349 | -7.3 | 22,059 | -3.9 |
| 2011/12 | 8,004 | 8.9 | 23,540 | 6.7 |
| 2012/13 | 6,526 | -18.5 | 21,335 | -9.4 |
| 2013/14 | 6,010 | -7.9 | 19,829 | -7.1 |
| 2014/15 | 6,010 | 0.0 | na | Na |

**Note:** (a) Excludes giant crabs and blue crab gulfs.
**Source:** SARDI, unpublished data.

Data for the four primary MSF species provides some insight into changes in fishing effort and catch for the MSF – refer Table 8.4.

Total King George whiting targeted handline and hauling net catch for the 4 month period beginning October 2014 was up 9.3 per cent to 43.7 tonnes. The improvement was wholly due to an increase in targeted handline catch (up 10 per cent) due to expanded fishing effort (up 14 per cent). There was a small decline in CPUE for the period under SZs. While this could reflect movement into less productive areas, the yield (15.5 kg per day) was actually higher compared to the recent low achieved in 2014 (14.0 kg per day).

The targeted handline and longline snapper catch for the 4 month period commencing October 2014 was down 1.6 per cent compared to the corresponding period a year earlier. The decline was brought about by a reduction in fishing effort (down 12.5 per cent) which was largely offset by a significant improvement in CPUE (up 12 per cent). These developments were driven by longline activity; CPUE for handline fell slightly while overall effort remained the same. Trying to assess the impact of SZs on snapper catch is complicated by large behavioural changes over recent years, namely large reductions in fishing effort and catch and a shift to greater longline effort, brought about in large part by various new management arrangements that have been implemented since 2012 (refer section C.4 in Appendix C).

Total hauling net garfish catch for the 4 month period commencing October 2014 was down 21 per cent compared to the corresponding period a year earlier. This reduction was despite an increase in fishing effort (up 12 per cent), meaning catches rates were by down (by 30 per cent), from 51.2 kg per day in the 2013/14 period to 36.0 kg per day in the 2014/15 period. The reduction may reflect that fishers have moved into less productive areas with the introduction of SZs or that the fishery has become less productive. However, seasonal factors could also have played a role and catch rate also varies inter-annually.

The total hauling net and targeted jig catch for calamari for the first 4 months under SZs was up 29 per cent compared to the corresponding period a year earlier. The improvement was driven by a significant rise in targeted jig catch (also up 29 per cent) which was brought about by an increase in fishing effort (up 19 per cent) and improvement in CPUE (up 8.5 per cent). Thus the calamari industry does not appear to have suffered any ill effects in respect of total catch under SZs, at least for the limited period for which data is available.

**Table 8.4: Catch and Effort for Primary MSF Species by Gear Type South Australia – 4 month period beginning October**

| | Targeted handline | | | Targeted longline | | | Hauling net | | | Targeted Jig | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch (kg) | Effort (days) | CPUE (kg/day) | Catch (kg) | Effort (days) | CPUE (kg/day) | Catch (kg) | Effort (days) | CPUE (kg/day) | Catch (kg) | Effort (days) | CPUE (kg/day) | Catch (kg) | Effort (days) | CPUE (kg/day) |
| **King George Whiting** | | | | | | | | | | | | | | | |
| 2009/10 | 61,944 | 3,551 | 17.4 | - | - | - | 4,069 | - | - | - | - | - | 66,013 | - | - |
| 2010/11 | 52,791 | 3,248 | 16.3 | - | - | - | 2,941 | - | - | - | - | - | 55,732 | - | - |
| 2011/12 | 43,778 | 2,757 | 15.9 | - | - | - | 3,812 | - | - | - | - | - | 47,590 | - | - |
| 2012/13 | 39,302 | 2,802 | 14.0 | - | - | - | 3,176 | - | - | - | - | - | 42,478 | - | - |
| 2013/14 | 38,067 | 2,381 | 16.0 | - | - | - | 1,898 | - | - | - | - | - | 39,965 | - | - |
| 2014/15 | 42,026 | 2,710 | 15.5 | - | - | - | 1,674 | - | - | - | - | - | 43,700 | - | - |
| **Snapper** | | | | | | | | | | | | | | | |
| 2009/10 | 160,003 | 1,409 | 113.6 | 161,774 | 1,541 | 105.0 | - | - | - | - | - | - | 321,777 | 2,950 | 109.1 |
| 2010/11 | 128,219 | 972 | 131.9 | 317,866 | 2,331 | 136.4 | - | - | - | - | - | - | 446,085 | 3,303 | 135.1 |
| 2011/12 | 142,527 | 877 | 162.5 | 231,745 | 1,938 | 119.6 | - | - | - | - | - | - | 374,272 | 2,815 | 133.0 |
| 2012/13 | 53,312 | 624 | 85.4 | 138,534 | 1,229 | 112.7 | - | - | - | - | - | - | 191,846 | 1,853 | 103.5 |
| 2013/14 | 17,954 | 332 | 54.1 | 130,814 | 1,230 | 106.4 | - | - | - | - | - | - | 148,769 | 1,562 | 95.2 |
| 2014/15 | 17,605 | 332 | 53.0 | 128,742 | 1,035 | 124.4 | - | - | - | - | - | - | 146,347 | 1,367 | 107.1 |
| **Garfish** | | | | | | | | | | | | | | | |
| 2009/10 | - | - | - | - | - | - | 37,536 | 686 | 54.7 | - | - | - | - | - | - |
| 2010/11 | - | - | - | - | - | - | 39,987 | 790 | 50.6 | - | - | - | - | - | - |
| 2011/12 | - | - | - | - | - | - | 42,946 | 853 | 50.3 | - | - | - | - | - | - |
| 2012/13 | - | - | - | - | - | - | 33,543 | 667 | 50.3 | - | - | - | - | - | - |
| 2013/14 | - | - | - | - | - | - | 38,683 | 756 | 51.2 | - | - | - | - | - | - |
| 2014/15 | - | - | - | - | - | - | 30,604 | 849 | 36.0 | - | - | - | - | - | - |
| **Calamari** | | | | | | | | | | | | | | | |
| 2009/10 | - | - | - | - | - | - | 2,369 | - | - | 144,053 | 3,824 | 38 | 146,422 | - | - |
| 2010/11 | - | - | - | - | - | - | 2,719 | - | - | 120,550 | 3,751 | 32 | 123,269 | - | - |
| 2011/12 | - | - | - | - | - | - | 2,925 | - | - | 189,649 | 4,545 | 42 | 192,574 | - | - |
| 2012/13 | - | - | - | - | - | - | 3,426 | - | - | 136,376 | 3,856 | 35 | 139,801 | - | - |
| 2013/14 | - | - | - | - | - | - | 2,544 | - | - | 114,403 | 3,216 | 36 | 116,947 | - | - |
| 2014/15 | - | - | - | - | - | - | 2,882 | - | - | 147,877 | 3,833 | 39 | 150,759 | - | - |

**Note:** - Not available or not applicable.
**Source:** PIRSA, logbook catch and effort, unpublished data.

In considering the recent changes discussed above it should be noted that a further complication relates to the ease with which fishers can easily switch target species. For instance, handline fishers only require minor gear modifications to switch between snapper, King George Whiting and calamari, while minor gear changes allow haul net fishers to switch between King George whiting and garfish (Steer, 2009). Such dynamics point to the need for longer time series data in order to properly assess impacts on specific fisheries.

Data on the catch and effort in respect of hauling net fishing for all relevant MSF species is presented in Table 8.5. Total hauling net catch for the 4 months beginning October 2014 was down 9.9 per cent to 132.5 tonnes despite a moderate increase in fishing effort (up 6.8 per cent). The decline was a consequence of a significant reduction in CPUE (down 16 per cent). Whether the decline in CPUE was a consequence of seasonal factors, SZs, fishery degradation, fisheries management changes or other factors is ultimately unknown given the complex nature of the MSF and short time frame (only 4 months) for the data.

**Table 8.5: Catch and Effort for Hauling Net for ALL MSF Species South Australia – 4 month period beginning October**

| | Catch (kg) | Effort (days) | CPUE (kg / day) |
|---|---|---|---|
| 2009 | 252,879 | 1,727 | 146.4 |
| 2010 | 155,839 | 1,775 | 87.8 |
| 2011 | 147,644 | 1,798 | 82.1 |
| 2012 | 146,800 | 1,731 | 84.8 |
| 2013 | 147,044 | 1,659 | 88.6 |
| 2014 | 132,528 | 1,771 | 74.8 |

**Source:** PIRSA, logbook catch and effort, unpublished data.

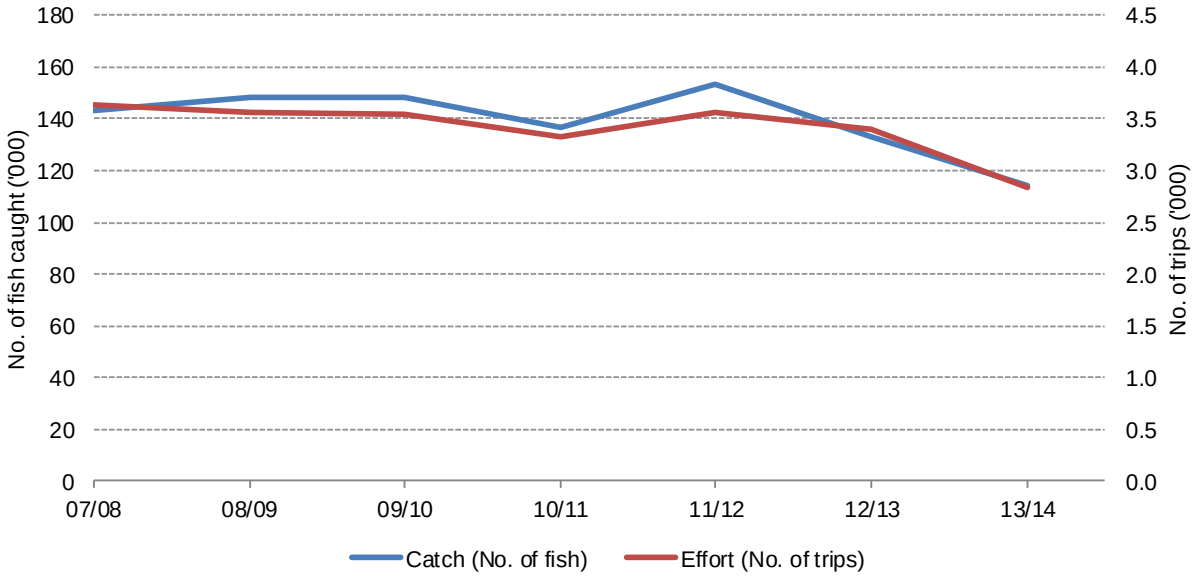
### 8.2.4 Charter Boat Fishery

Recent trends in overall catch and effort in relation to the South Australian charter boat sector are illustrated in Figure 8.11. Catch measure in terms of the number of fish caught and effort in terms of number of trips undertaken were relatively stable between 2007/08 and 2011/12. However, between 2011/12 and 2013/14 – the last complete financial year for which data was available at the time of writing – there was a significant decline in total catch, driven mainly by a reduction in effort. The total number of fish caught in 2013/14 was down 26 per cent compared total number caught in 2011/12. Total effort was down 21 per cent over this period. Thus there appears to have been a declining trend in catch and effort for the charter boat sector in the couple of years just prior to the introduction of SZs.

PIRSA logbook data for the first 4 months under SZs commencing October 2014 and the corresponding period for previous years is presented in Table 8.6. While the 4 month period only a short duration, it does cover part of the summer period which is the seasonal peak for the charter industry. Catch during these 4 months on average accounted for 45 per cent of total annual catch over the 7 years to 2013/14, ranging from a low of 40 per cent to a high of 48 per cent.

As expected given the removal of fishing effort, total catch has fallen since the introduction of SZs. Total catch for the 4 months to January 2015 was down 6.2 per cent compared to the previous year. This decline was due to a reduction in effort, which was down 13 per cent measured in terms of number of trips. The reduction in actual effort compares with estimated effort displaced by SZs of 5.21 per cent (Ward et al 2012). However, the estimated displaced effort was based on the mean number of person days and is thus not directly comparable to the trips measure used here. The fall in effort over recent years suggests that factors other than SZs may have contributed to the relatively large decline in effort observed.

**Figure 8.11: Catch and Effort for Charter Boat Sector South Australia – Financial Year**




**Source:** PIRSA, logbook catch and effort, unpublished data.

**Table 8.6: Catch and Effort for Hauling Net for ALL MSF Species South Australia – 4 month period beginning October**

| | Catch (number of fish retained) | Effort (number of trips) | Catch per trip |
|---|---|---|---|
| 2009 | 71,610 | 1,698 | 42.2 |
| 2010 | 57,766 | 1,418 | 40.7 |
| 2011 | 74,835 | 1,659 | 45.1 |
| 2012 | 57,492 | 1,506 | 38.2 |
| 2013 | 45,994 | 1,138 | 40.4 |
| 2014 | 43,139 | 994 | 43.4 |

**Source:** PIRSA, logbook catch and effort, unpublished data.

The number of fish caught per trip actually rose by 7.4 per cent to 43 fish per trip, indicating that productivity was not negatively affected in the short term. However, this result needs to interpreted with caution given the mixed-species nature of the charter boat fishery and use of number of fish used as a measure of catch. It is possible that catch measured in weight would have been higher or lower.

Disaggregated data suggests that the reduction in total catch for the most recent 4 month period was largely brought about by a decline in King George whiting caught (down 18 per cent). The number of snapper caught was effectively unchanged.

### 8.2.5 State-wide Impact on the Value of Catch

In assessing the economic impact of the marine parks and SZs, both as a whole and for specific regions, the change in the volume of catch since their commencement is not relevant. Instead the questions of interest are whether or not gross revenues for fishing businesses fell, and whether the cost of production has increased (and, in the latter case, whether the spending on *"imported"* inputs production has increased).

As noted previously, there are a number of limitations in the data available for this assessment which reduce the strength of any conclusions reached, or indeed in a number of cases the ability to form any view on the impact from the catch data. The two most significant data limitations with respect to assessing economic impact are that:

- there are only four months of data available since the introduction of the SZs (up to January 2015), this creates the potential that any observed change is a result of different prevailing weather conditions, differences in demand in the market for that particular product, or changes in the quality of fish stocks rather than the SZs themselves; and
- confidentiality provisions in the *Fisheries Management Act 2007* mean that data is not available for many of the relevant administrative marine fishing zones, or even for broader regions.

In order to compare the value of catch over time on a (closer to) like-for-like basis, all calculations have been for the period October to January in the respective financial years.

The greenlip abalone fishery has not been included in this economic impact analysis as SARDI have indicated that there has been a shift in the temporal pattern of greenlip abalone harvesting unrelated to the SZs, namely that in response to data that average weights of greenlip abalone are significantly higher in autumn fishing effort has shifted to these months.

The value of landed catch from October to January for selected fisheries is shown in Table 8.7 for each of the last three financial years.

At the level of the state as a whole, the total ***value*** of landed catch increased for most of the fisheries of interest. This indicates that there has been no reduction in revenue compared to the previous year for most of the fisheries affected by the SZs, with the total value of catch for the four months to January 2015 up $10.8 million from the same period in the previous year, due to a strong increase in the value of catch of Rock Lobster.

**Table 8.7: Landed value of commercial catch for selected fisheries in October to January, SA total, 2012/13 to 2014/15**

| | 2012/13 ($'000) | 2013/14 ($'000) | 2014/15 ($'000) | Change from 2013/14 ($'000) | Change from 2013/14 Per cent | Change from ave. of 2012/13 & 2013/14 ($'000) | Change from ave. of 2012/13 & 2013/14 Per cent |
|---|---|---|---|---|---|---|---|
| Rock lobster | 67,948.7 | 86,117.9 | 96,621.2 | 10,503.3 | 12.2 | 19,587.9 | 25.4 |
| Blacklip abalone | 6,014.9 | 3,923.5 | 4,273.8 | 350.3 | 8.9 | -695.4 | -14.0 |
| All marine scale fish | 6,525.5 | 6,009.7 | 6,009.8 | 0.1 | 0.0 | -257.8 | -4.1 |
| Garfish | 422.2 | 492.6 | 468.9 | -23.7 | -4.8 | 11.5 | 2.5 |
| King George Whiting | 819.1 | 849.4 | 936.4 | 87.0 | 10.2 | 102.2 | 12.2 |
| Snapper | 1,634.5 | 1,338.1 | 1,331.7 | -6.4 | -0.5 | -154.6 | -10.4 |
| Southern Calamari | 1,508.6 | 1,374.9 | 1,615.2 | 240.3 | 17.5 | 173.5 | 12.0 |
| Total for 3 fisheries | 80,489.1 | 96,051.1 | 106,904.8 | 10,853.7 | 11.3 | 18,634.7 | 21.1 |

**Source:** SARDI, unpublished data.

This, in turn, would mean that the total impact of these fisheries on the regions from which they operate (and in which their employees live) will be greater than in the previous year in aggregate.

The overall increase in the value of catch does not necessarily mean that there has been no reduction in revenue relative to what would have occurred had the SZs not been introduced and the TACs reduced.

### 8.2.6 Impact on the Value of Catch, Selected Regions

Total value of catch is not available at the level below the state as a whole for any of the fisheries in any of the potential data sources. This means that changes to the value of catch in a region needs to be imputed from state-wide average price data and the volume of landed catch for the region or MFA. This section presents an overview of the changes to the value of catch for those regions and species for which data was available to the researchers. As this broader regional analysis is incidental to the

focussed analysis undertaken for the regions subject to the RIAS data availability is skewed towards Ceduna, Port Wakefield and Kangaroo Island.

Data on average prices and landed catch combined provide the regional economic impact of any change in catch for each of the species. As noted previously, much of the available data is collected for MFAs making allocation to the specific regions of interest somewhat approximate. Confidentiality restrictions also mean that the specific impact of some fisheries on some regions cannot be assessed.

Average prices have been estimated from the statewide total value of catch, and total volume of catch data for each fishery for the period October to January in the years of interest. Catch data was taken from the PIRSA Catch Disposal Record port of landing based data for rock lobster and abalone (which gives data up to May 2015), with the PIRSA/SARDI logbook data used for marine scalefish. The confidential data was also used to cross check these data.

The (landed catch) weighted average price of rock lobster was over 16 per cent higher in the period October to January 2014/15 compared to the same period in the previous year. The use of this price data may slightly overstate the value of catch for the period November to May as prices in January tend to be higher than in other months and January prices will have a higher weight in data from October to January than in November to May. However, as this difference appears relatively consistent between years this should not distort the year to year comparisons too much.

The scale of the price increases means that the two regions that experience modest falls in catch still recorded increases in the value of landed catch, with Venus Bay being the only port for which data is available that experienced a fall in value of catch (Table 8.8).

**Table 8.8: Rock lobster, value of landed catch, selected ports of landing November to May, 2013/14 to 2014/15**

| | Nov 2013 – May 2014 $'000 | Nov 2014 - May 2015 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| Adelaide | n/a | n/a | n/a | n/a |
| Fleurieu | n/a | n/a | n/a | n/a |
| KI | 6,143.3 | 7,715.3 | 1,572.0 | 25.6 |
| Ceduna | n/a | n/a | n/a | n/a |
| Port Lincoln | 9,622.6 | 11,378.4 | 1,755.8 | 18.2 |
| Venus Bay | 1,643.9 | 1,133.9 | -510.0 | -31.0 |
| *Eyre Peninsula Total* | *11,266.6* | *12,512.3* | *1,245.7* | *11.1* |
| Yorke Peninsula | 3,794.2 | 4,375.5 | 581.3 | 15.3 |
| South East | n/a | n/a | n/a | n/a |

**Source:** PIRSA, SARDI, unpublished data.

Landed price data for abalone is currently only available for blacklip abalone. As greenlip abalone tends to be more expensive this will probably somewhat understate changes in the value of catch landed.

Port of landing data for abalone is only available over the analysis period for Venus Bay and Port Lincoln, with all of the Central Zone data confidential as is the catch data for Ceduna for 2 of the 3 years. This shows a small decline in the value of catch for abalone for Venus Bay and a large increase in Port Lincoln, with the Eyre Peninsula as a whole up by 7 per cent (Table 8.9).

Average prices for Garfish have been higher in the October to January 2014/15 compared to the same time period last year. Prices for King George Whiting and snapper have been stable over the same period, whilst prices for southern calamari have been lower. Landed price data is not available for other marine scalefish fisheries, thus species such as Australian Herrings are not included in this analysis.

**Table 8.9: Abalone, value of landed catch, selected ports of landing November to May, 2013/14 to 2014/15**

| | Nov 2013 – May 2014 $'000 | Nov 2014 - May 2015 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| Ceduna | CONF | 19.8 | CONF | n/a |
| Venus Bay | 2,052.1 | 2,018.4 | -33.6 | -1.6 |
| Port Lincoln | 1,348.3 | 1,605.4 | 257.0 | 19.1 |
| Kangaroo Island | CONF | CONF | CONF | n/a |
| *Eyre Peninsula Total* | *3,400.4* | *3,623.8* | *223.4* | *6.6* |

**Source:** PIRSA, SARDI, unpublished data.

Port Wakefield is the only one of the three regions for which garfish catch data is available, experiencing a fall in value of catch of 10 per cent (Table 8.10).

**Table 8.10: Garfish, landed value of catch, selected regions, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| West Coast (MFAs 7,8 & 9) | n/a | n/a | | |
| Port Wakefield (MFA 35) | 129.5 | 116.4 | -13.2 | -10.2 |
| Kangaroo Island (MFAs 41, 42 & 43) | CONF | CONF | | |

**Source:** PIRSA, SARDI, unpublished data.

The West Coast and Kangaroo Island both experienced increases in the landed value of King George whiting, and in the case of the West Coast this was a significant increase (Table 8.11). Port Wakefield experienced a very large percentage fall in the value of King George whiting however as this was a very low value catch to begin with such that the lost revenue for the region was only $2,400.

**Table 8.11: King George Whiting, landed value of catch, selected regions, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| West Coast (MFAs 7,8 & 9) | 151.8 | 206.5 | 54.6 | 36.0 |
| Port Wakefield (MFA 35) | 3.7 | 1.3 | -2.4 | -64.9 |
| Kangaroo Island (MFAs 41, 42 & 43) | 93.9 | 96.5 | 2.5 | 2.7 |

**Source:** PIRSA, SARDI, unpublished data.

Port Wakefield and the West Coast both experienced falls in value of snapper caught, although the change in value was relatively small in dollar terms for each region (Table 8.12).

**Table 8.12: Snapper, landed value of catch, selected regions, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| West Coast (MFAs 7,8 & 9) | 29.1 | 25.2 | -3.9 | -13.3 |
| Port Wakefield (MFA 35) | 506.9 | 504.1 | -2.8 | -0.5 |
| Kangaroo Island (MFAs 41, 42 & 43) | CONF | CONF | n/a | n/a |

**Source:** PIRSA, SARDI, unpublished data.

Kangaroo Island which has the largest calamari fishery of the three selected regions experienced a fall of 8 per cent in the value of its catch, reducing revenue by $30,000 (Table 8.13). The other two regions experienced increased which whilst large in percentage terms were not financially significant.

**Table 8.13: Southern Calamari, landed value of catch, selected regions, October to January, 2013/14 to 2014/15**

| | 2013/14 $'000 | 2014/15 $'000 | Change 2013/14 to 2014/15 $'000 | Per cent |
|---|---|---|---|---|
| West Coast (MFAs 7,8 & 9) | 0.3 | 1.8 | 1.5 | 480.5 |
| Port Wakefield (MFA 35) | 15.8 | 19.7 | 4.0 | 25.3 |
| Kangaroo Island (MFAs 42 & 43 only & excludes 42 for 2012/13) | 384.0 | 354.3 | -29.7 | -7.7 |

**Source:** PIRSA, SARDI, unpublished data.

# 9. Conclusion and Recommendations

Drawing conclusions regarding the impact of SZs on the three study regions is a difficult task given the short time frame for preparing the RIAS and therefore limited availability of data and trends. Many of the economic and social indicators relevant to assessing impacts are not yet available for the post-SZ period (e.g. population, taxable income, building approvals etc.). Such data would provide a useful counterpoint to the subjective, varied feedback that one may obtain from consultations. Moreover, even where data is available for the post SZ period, the volatile nature of certain data series at the regional level can mean short term movements reflect statistical noise rather than a response to a particular policy.

One of the most significant limitations for the RIAS was the availability of catch and effort data for commercial fisheries. The bulk of data was only available for the first 4 months since the introduction of SZs, i.e. October 2014 to January 2015, while confidentiality restrictions in the *Fisheries Management Act 2007* prevent the release of data where there is a risk of individuals being identified. There was unanimous feedback from those fishers that the timeframe was insufficient to assess the impact of SZs on commercial fisheries. Key fishing periods for certain fisheries (e.g. marine scalefish off Port Wakefield) would not be captured by the available data. Others noted that the impacts of SZs would take several years to fully emerge. On this basis there is a clear need that data for the respective commercial fisheries (abalone, rock lobster, marine scalefish and charter boat) for the three study regions and state be reviewed at least 12 months after the implementation of the SZs. Even then several years of data may be required to account for natural inter-annual variation.

Given the focus of the RIAS on small groups of individuals in regional areas and the limited period for which data was available, the confidentiality restrictions pertaining to commercial fisheries data have actively prevented the researchers from assessing regional impacts as well as independently confirming the feedback provided by fishers and other stakeholders in certain circumstances.

## General Issues

A number of issues were identified during the consultations that applied generally across the regions.

Many stakeholders claimed that recreational fishers believe that they cannot fish inside marine parks, and that this has led to a decline in recreational fishing activity. While available data on participation in recreational fishing is quite limited, the survey of community attitudes indicates no decline in participation in recreational fishing in the short term (state-wide results from the 2015 survey indicate that 27 per cent of respondents fished in the marine environment at least monthly, up from 21 per cent in 2013). The survey also indicates that while community understanding of the exact arrangements for fishing in marine parks is mixed, there was a high awareness of the existence of SZs or 'areas' in marine parks where no fishing is allowed (80 per cent). However, understanding of exactly where SZs were located was much lower (37 per cent).

Several commercial fishers commented that previous fisheries management arrangements – e.g. quotas, seasonal restrictions, size limits etc. – meant fisheries were sustainably managed and SZs were consequently not required. Such perceptions represent a misunderstanding of the purpose of marine parks and SZs, which is to protect and enhance marine biodiversity. In this sense SZs are designed to protect the marine environment from a range of potential threats, including population growth, pollution, development, climate change etc.

Commercial fishers are generally concerned about the sustainability of remaining fishing grounds due to a perception of increased effort within a smaller remaining area. One reason for this view is a belief of insufficient effort being bought out due to licences with latent effort (i.e. high inactivity) being targeted. However, licences were targeted based on actual effort over recent years. A related issue in this respect

may be that spatial fishing patterns for those commercial fishing licences that were surrendered do not correspond well with the catch displaced by SZs given the voluntary nature of the buyback process. While efforts were made to target the buyout of licences in respect of those areas most affected by displaced catch/effort for certain fisheries (e.g. Upper Gulf St Vincent Marine Park in respect of marine scalefish and Encounter Marine Park in respect of charter boat fishery), the high mobility of fishers in some regions may mean that bought out effort is soon replaced.

Another reason for believing insufficient effort was removed was a view from fishers that SZs were more productive than non-SZ areas, and insufficient effort was bought out given the methodology of estimating displaced catch based on the area of SZs overlapping with marine fishing areas and the assumption of fishing effort being evenly distributed within these areas. To the extent fishing effort is not evenly distributed then displaced catch may well be under- or even overestimated. In the absence of finer level spatial data the approach adopted for estimating displaced catch is reasonable. Such data does exist for rock lobster and indicates no significant difference in productivity between SZs and non-SZ areas, either for the Northern Zone rock lobster fishery or study regions. Nonetheless, it remains a possibility that displaced catch has been underestimated for certain fisheries and regions. Assessing whether catch outside the SZs is sustainable is ultimately outside SACES's area of expertise and more time and data will be required to make any such assessments.

One mechanism through which SZs potentially affect commercial fisheries is by reducing fishers' flexibility in terms of responding to certain weather conditions. Fishers stated they would move into particular SZs depending on certain weather conditions (e.g. Clinton Wetlands SZ and Cape du Couedic SZ). As a consequence, some fishers said they may be encouraged, or forced, to operate in rougher conditions than they otherwise would, which could have safety implications.

Several commercial fishers reported recreational fishers illegally fishing within SZs (e.g. Clinton Wetlands SZ, Sponge Gardens SZ). In addition, the potential for poaching in respect of abalone was also identified as a significant concern in Kangaroo Island and Ceduna. A degree of illegal fishing in SZs is to be expected in the short term as fishers adjust to the recently introduced zoning for marine parks.

Full cost recovery applies to management of commercial fisheries with costs recovered from fishers through licence fees. Fishers raised equity concerns regarding the potential for licence fees to increase as State Government costs are being spread over a smaller numbers of licences and a smaller catch after the buyout of licences and reduction in fishing area. This view is a legitimate equity concern to the extent that the buyout has been driven by environmental objectives. It is possible there may be offsetting impacts to the extent there is any shift in the level of market prices associated with a reduction in overall industry supply.

Another equity concern related to potential reductions in the market value of commercial licences from the potential negative impacts of SZs. Older fishers nearing retirement are particularly vulnerable in this respect as they use the market value of their licences as a form of retirement savings. Some are reluctant to exit the industry due to concerns about their ability to find alternative employment and the lack of transferability of their skills. Insufficient time has passed to be able to assess impacts on the market value of licences. While the market value of fishery licences will provide a guide toward any potential negative impacts it may be difficult to directly attribute any such impacts to SZs given the influence of other market and environmental factors. There may also be quite disparate experiences across fishery sectors and regions as preliminary state level data indicates an increase in the total value of catch for some fisheries for the initial months with SZs.

A number of economic development opportunities or projects were identified during the consultations in the regions. These were typically not related or only tangentially related to SZs. Readers are referred to the respective community consultation summaries in the report for further information.

## Regional Impacts

In terms are regional economic and social impacts from SZs two main areas of potential impact were identified: marine scalefish fishery (MSF) fishers at Port Wakefield and upper Gulf St Vincent more broadly in respect of Clinton Wetlands SZ, and MSF net fishers at Kingscote on Kangaroo Island in respect of Bay of Shoals SZ. The impacts to date relate to small groups of individuals in both regions and rests significantly on feedback obtained through the community consultations. As such feedback is potentially subjective and may be skewed towards those experiencing negative impacts there is a need to independently confirm such feedback through analysis of the commercial fisheries data administered by Primary Industries and Regions SA (PIRSA). Although it is difficult to make direct comparisons, it would appear that the economic impacts to date are less significant than forecast in the previous RIAS.

### *Port Wakefield*

Several MSF fishers in upper Gulf St Vincent and at Port Wakefield provided evidence of reduced incomes while one fishing family has moved away from the region (incurring significant relocation costs). PIRSA logbook catch data indicates that total commercial catch in the region for 7 key MSF species for which non-confidential data was available – i.e. KGW hauling net, snapper long line and garfish, calamari, yellowfin whiting, Australian salmon and Australian herring hauling net – for the first 4 months with SZs was down 5.9 per cent compared to the corresponding period a year earlier. (As the decline was concentrated in Australian herring, the relative change in terms of value is likely to have been relatively smaller.) This decline follows relatively larger falls for the corresponding period in 2013/14 (-14 per cent) and 2012/13 (-45 per cent), while catch for the most recent SZ period was above (14 per cent) the catch recorded for the corresponding period in 2009/10. These results suggest that other non-SZ related medium term factors may also have contributed to the recent decline while natural temporal variation can also not be discounted.

The concentration of fishers in the upper Gulf St Vincent region would generally make any potential impacts more noticeable. They would also be compounded by cumulative impacts over time as other fishing areas have been removed by previous management changes, reducing flexibility in terms of alternative fishing areas. These impacts include closure of commercial fishing areas off southern Yorke Peninsula which came into effect in 2005 and an apparent recent increase in the number of days for which the Proof & Experimental Establishment (Army Base) range temporary buffer zone is in effect in addition to the permanent exclusion zone. Commercial fishers also noted increased conflict with recreational fishers. In this respect submissions from a couple recreational fishers were received noting concern about the concentration or activities of commercial fishers in the upper Gulf St Vincent region. More generally, indicators for the broader Wakefield Regional Council region indicate some deterioration in economic conditions over the past year, although other broader economic factors are probably more significant in this development.

As a coastal town located adjacent the Clinton Wetlands SZ with a small population and below average incomes, Port Wakefield is relatively vulnerable to any potential short term negative impacts from SZs. Existing tourism activity in the region appears quite limited which suggests that potential for longer term future eco-tourism development in relation to SZs may face significant barriers.

Port Wakefield / upper Gulf St Vincent was the only one of the three selected regions for which the data indicates that the value of landed catch has fallen since the introduction of SZs. The value of catch for 4 key species in the region – garfish, King George whiting, snapper and calamari – is projected to fall by $100,000 in 2014/15.[23] This reduction is estimated to have total economic impact equivalent to a loss of 0.6 full-time equivalent jobs and $75,000 in gross value added (the reduction in FTE may be realised through reduced hours worked by more than one person). While the estimated impacts are relatively

[23] Value of catch for other marine scalefish was not available.

small, they are based on quite limited data in terms of both species and time and may not properly capture impacts on the peak fishing season for fishers in the region. The results should therefore be considered preliminary. The preliminary estimate of impact is less than that projected in the RIAS undertaken before the SZs were introduced. It should also be noted that current preliminary data cannot be used to assess whether there appears to be a causal relationship between the change in volume of catch and the SZs, particularly given the significant reductions in catch that occurred from 2010/11 to 2013/14.

***Kangaroo Island***

On the basis of qualitative feedback obtained short-term economic and social impacts for Kangaroo Island appear most evident for two MSF net fishers at Kingscote who have reported a loss of fishing area with the introduction of the Bay of Shoals SZ directly north of Kingscote. These fishers stated they predominantly fished in the Bay of Shoals and Western Cove which provide sheltered conditions. Their ability to shift fishing effort to other regions is apparently curtailed by the more exposed and rougher conditions in other areas of the island and the lack of accessibility to other coastal areas due to lack of boat ramps and access roads. A reduction in catch for these fishers has been identified as a factor, among others such as health and lifestyle factors, contributing to the decision of a local seafood takeaway store to shut down their retail operation and instead focus on their intermittent wholesale operations. Unfortunately, without access to catch data for the MSF net fishers due to confidentiality restrictions we are unable to independently verify the extent to which the Bay of Shoals SZ may have contributed to a reduction in MSF catch and thus contributed to the closure of the store. While the loss of employment associated with the closure of the seafood retail store and potential future non-viability of the local net fishers may represent relatively minor impacts from a broader regional economic perspective, there are possibly important social impacts for the local community in terms of a seafood takeaway store no longer being available and reduced supply of affordable fish species to local residents. In addition, a separate tourism operator noted reduced availability of local seafood as a consequence of changes implemented by the takeaway/wholesale operator, indicating a loss of complementary tourism services. We recommend that the impact of the Bay of Shoals SZ on affected fishers be investigated by SARDI who have access to the individual licence data.

Looking at other fisheries on Kangaroo Island, rock lobster fishers appear to have been unaffected in the short term with PIRSA logbook catch data indicating that catch rates for the initial months with SZs showed an improvement compared to the corresponding period a year earlier and with an increase in average prices revenue is estimated to have increased. Furthermore, fishers for the broader Northern Zone rock lobster fishery have been able to land their TACC. Kangaroo Island rock lobster fishers reported potential negative impacts in terms of increased fuel usage due to travelling further distances. We have been unable to verify this advice based on the data available to us.

All abalone fishers operating in the Central Zone have experienced a reduction in quota (for which they have been financially compensated) due to no voluntary surrender of displaced effort coming forward. The area now occupied by Cape du Couedic SZ has been identified by fishers as a highly productive source for abalone and therefore a significant loss. The PIRSA commercial logbook catch data for abalone fishers was highly restricted due to confidentiality. The limited data made available by those fishers that waived confidentiality indicates that catch for the initial months with SZs was in the range recorded over recent years. Further analysis based on a greater duration of experience with SZs and data for all fishers is required to properly assess impacts on abalone fishers.

Those charter boat operators on Kangaroo Island that were consulted were minimally affected by SZs. Consultations suggest that negative impacts may have been more prominent for charter boat fishers (and MSF fishers) operating out of Cape Jervis, but further research and consultations are required to confirm this.

### *Ceduna*

Impacts for Ceduna appear limited. Commercial fishing activity in relation to abalone, rock lobster and charter boat fishing is relatively limited in the region. On the basis of broader economic indicators the region has performed better than the state average over the past year, which would partly reflect stimulus associated with resources exploration activity. While local community representatives raised concerns about a reduction in regional spending due to reduced visitation by abalone fishers, PIRSA port of landing data indicates that a declining trend in visitation to Ceduna by abalone fishers preceded the introduction of SZs. This earlier decline would reflect that the total allowable commercial catch (TACC) for the Western Zone abalone fishery has been steadily reduced over recent years as production has fallen back to long run average levels, while management changes introduced from 1 January 2014 to provide fishers with greater flexibility in terms of where they can fish has been a more recent contributing factor. Mixed impacts have been observed for individual MSF species. This pattern combined with the relatively low level of effort in the region and limited period for which data was available points to a need for more comprehensive data in order to properly assess impacts. The relative remoteness of Ceduna would be a significant barrier to unlocking any future potential ecotourism benefits related to SZs.

## Recommendations

As the above discussion has highlighted, the short time frame for preparing the RIAS and various data limitations, including reliance on qualitative information obtained through consultations, points to a need for subsequent and/or ongoing analysis of socio-economic and environmental indicators to properly assess regional impacts of SZs. DEWNR will be tracking various economic, social and environmental indicators as part of its marine park monitoring framework. To assist with the development of the monitoring framework we provide advice regarding those economic and social indicators that would be most appropriate to track, along with gaps and related issues (we have excluded environmental indicators as such considerations are outside our area of expertise and well within the domain of the Department).

As much of the negative economic impacts in the short term relate to commercial fisheries it is recommended that those commercial fishing indicators considered in the RIAS continued to be monitored. Relevant indicators in this respect would include:

- logbook catch data in respect of catch rates, catch and effort;
- Catch Disposal Records data on the number of landings and catch landed by port for abalone and rock lobster fishers; and
- port of landing data for MSF fishers, although we note that this data is much more narrow in scope (and therefore useful) compared to the Catch Disposals Records recorded for other fisheries.

In considering the logbook catch data confidentiality restrictions significantly hamper the ability to verify impacts in some regional circumstances. A clear example of this in the current RIAS was MSF net fishers affected by the Bay of Shoals SZ. It is recommended that DEWNR consult with PIRSA and related stakeholders to determine whether there are any potential options that could be pursued to support monitoring public policy initiatives.

Another area worth exploring is whether any analysis can be conducted in respect of GPS data for rock lobster fishers to determine whether they are travelling longer distances since the introduction of SZs.

Given the equity issues identified by fishers and concerns about impacts on incomes it is recommended that information in relation to:

- average real incomes for commercial licence holders;
- licence fees as a proportion of the gross value of production, and
- market value of commercial fishery licences

be monitored to identify any significant impacts that may be related to SZs. Such State level data is published as part of PIRSA's *Economic Indicators* series for various commercial fisheries but are not yet available for financial years with SZs in place.

In considering the above indicators in relation to commercial fisheries it is important to remember that various factors may affect outcomes, including broader economic factors (exchange rates, demand, input costs etc.), changes in species abundance, as well as natural temporal and spatial variation. It may consequently be difficult to attribute any impact specifically to SZs.

A number of indicators have been considered in the RIAS that provide insight into broader regional economic and social trends. These indicators include regional estimates of employment and unemployment, population, building approvals, average taxable incomes, house prices and tourist visitation and expenditure. Such regional characteristics are influenced by a wide variety of complex economic, social and environmental factors, of which SZs would play a very small role. It will therefore be virtually impossible to attribute any shift in these indicators directly to SZs. As a consequence we would place a low priority on tracking such indicators.

DEWNR's survey in relation to community attitudes towards marine parks should be maintained, in part to monitor trends in participation in recreational fishing over time given the general lack of available data in respect of recreational fishing. Another key indicator to monitor from the community survey will be the extent to which regular fishers know where SZs are located in their local area or fishing region as this will provide insight into the effectiveness of community education efforts. Related to this, as part of its compliance monitoring activities DEWNR should monitor the number of breaches in respect of people caught illegally fishing in SZs. The relative number of breaches should decline over time as fishers become more familiar with the exact location of SZs. Any failure to see a decline or significant increase in the number of breaches would point to a need for increased community education efforts and/or compliance monitoring.

Given the feedback from regional stakeholders regarding potential misconceptions held by recreational fishers, it may be worth considering additional research with recreational fishers to further explore their understanding of the marine parks policy. Such research may potentially be accommodated through the existing community attitudes survey.

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# Appendix A

## Region Maps

**Figure A.1: Nuyts Archipelago Marine Park with marine zoning/use and adjacent land use**

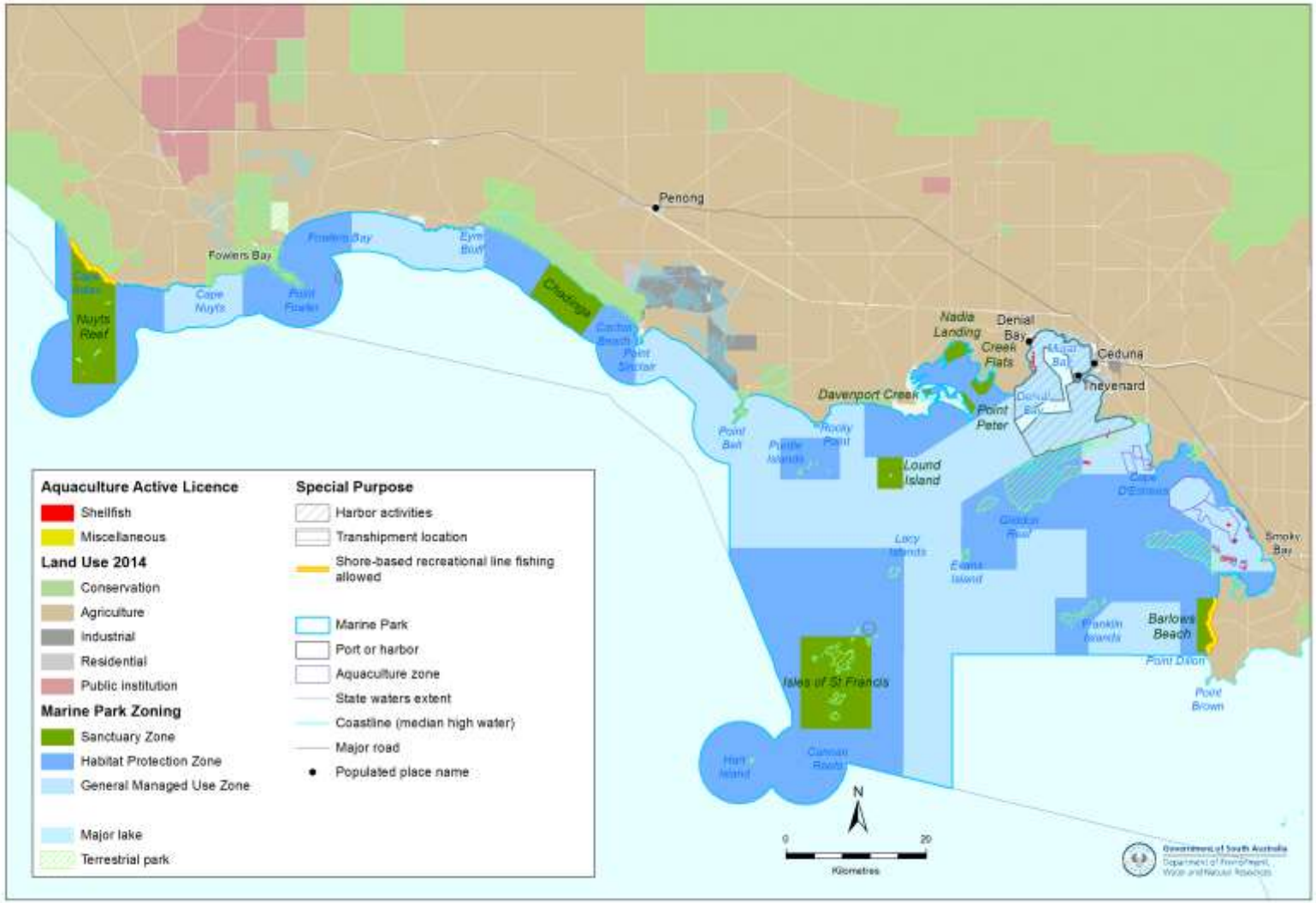
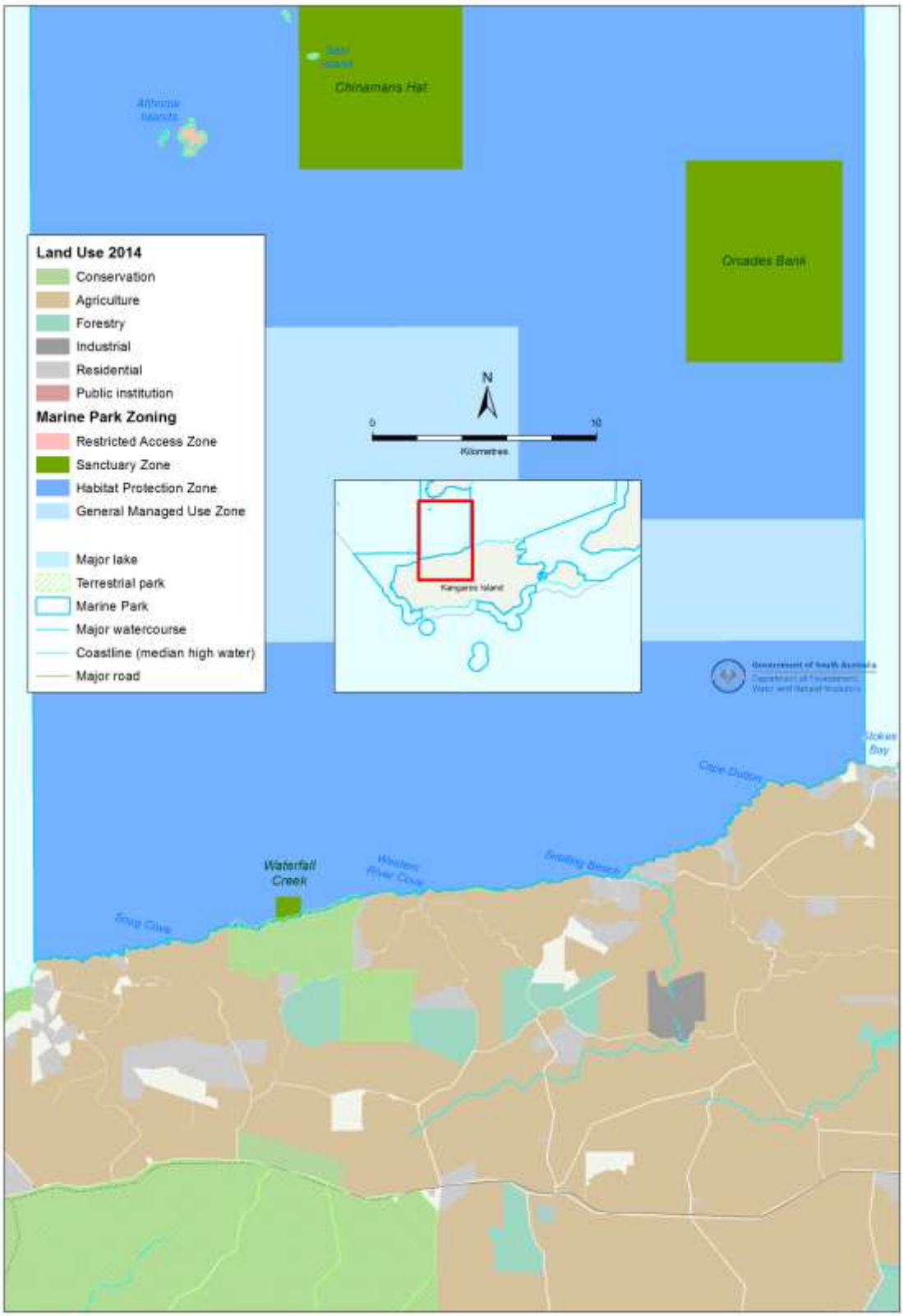
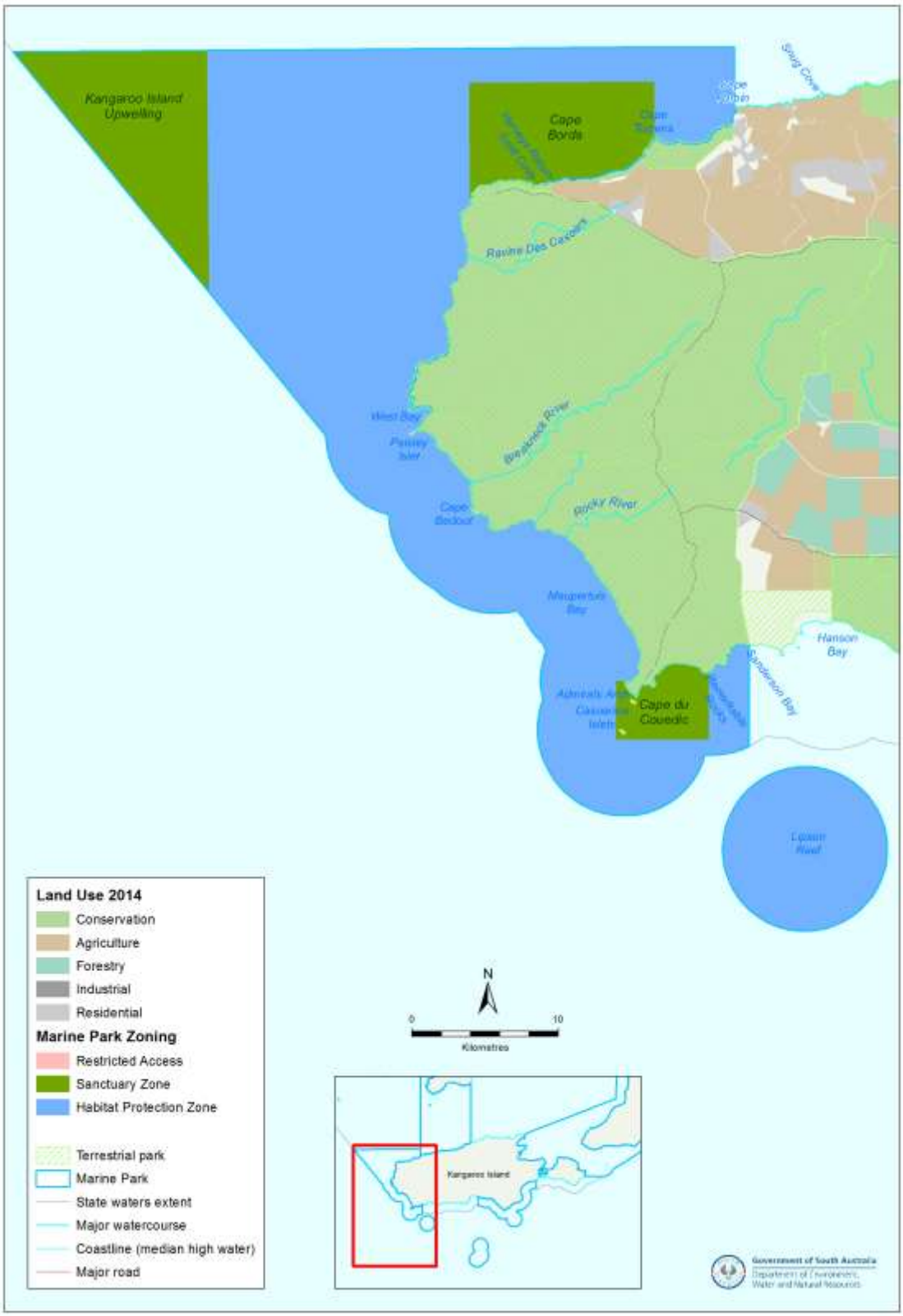


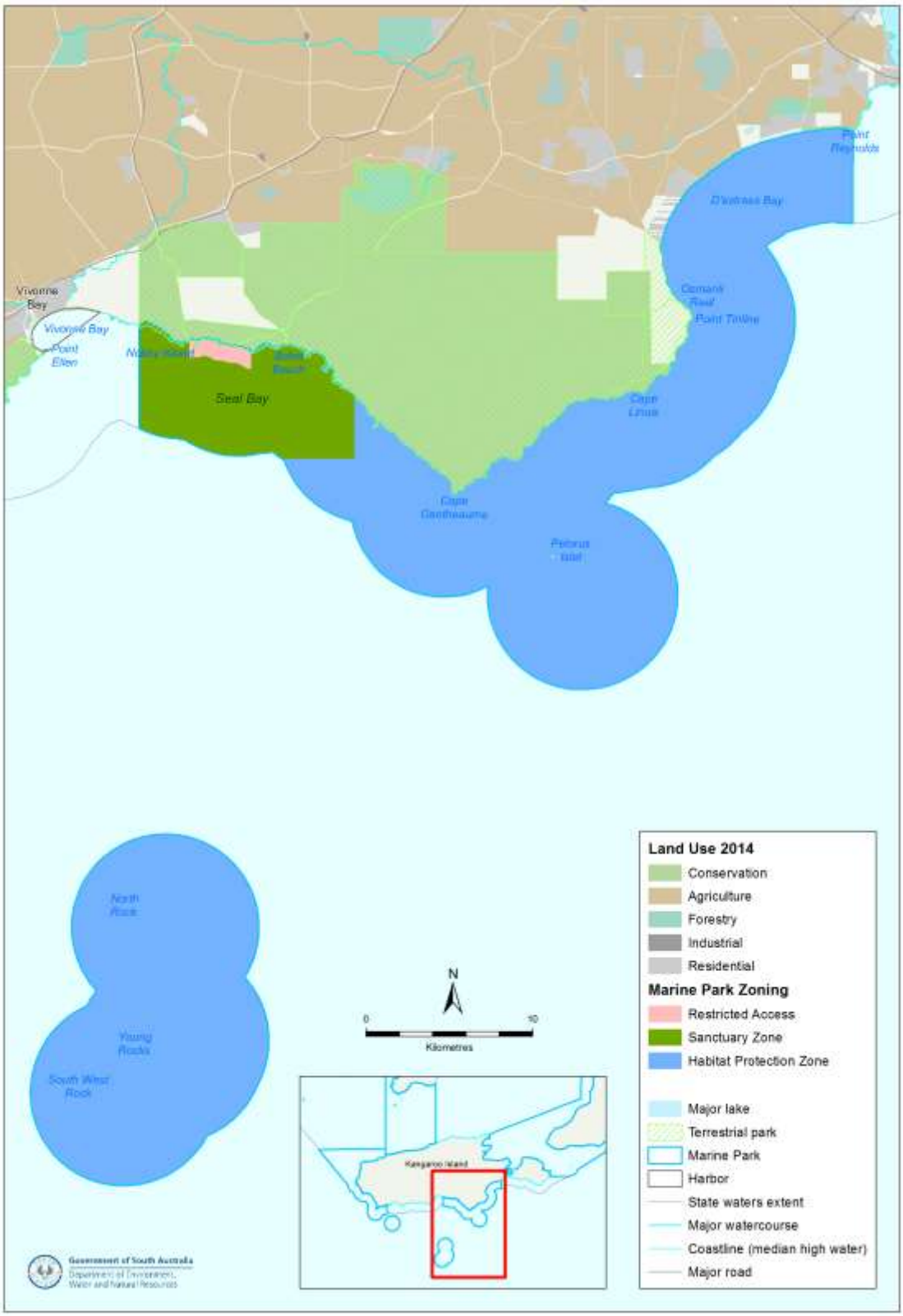
**Figure A.2 Southern Spencer Gulf Marine Park with marine zoning/use and adjacent land use relevant to Kangaroo Island**



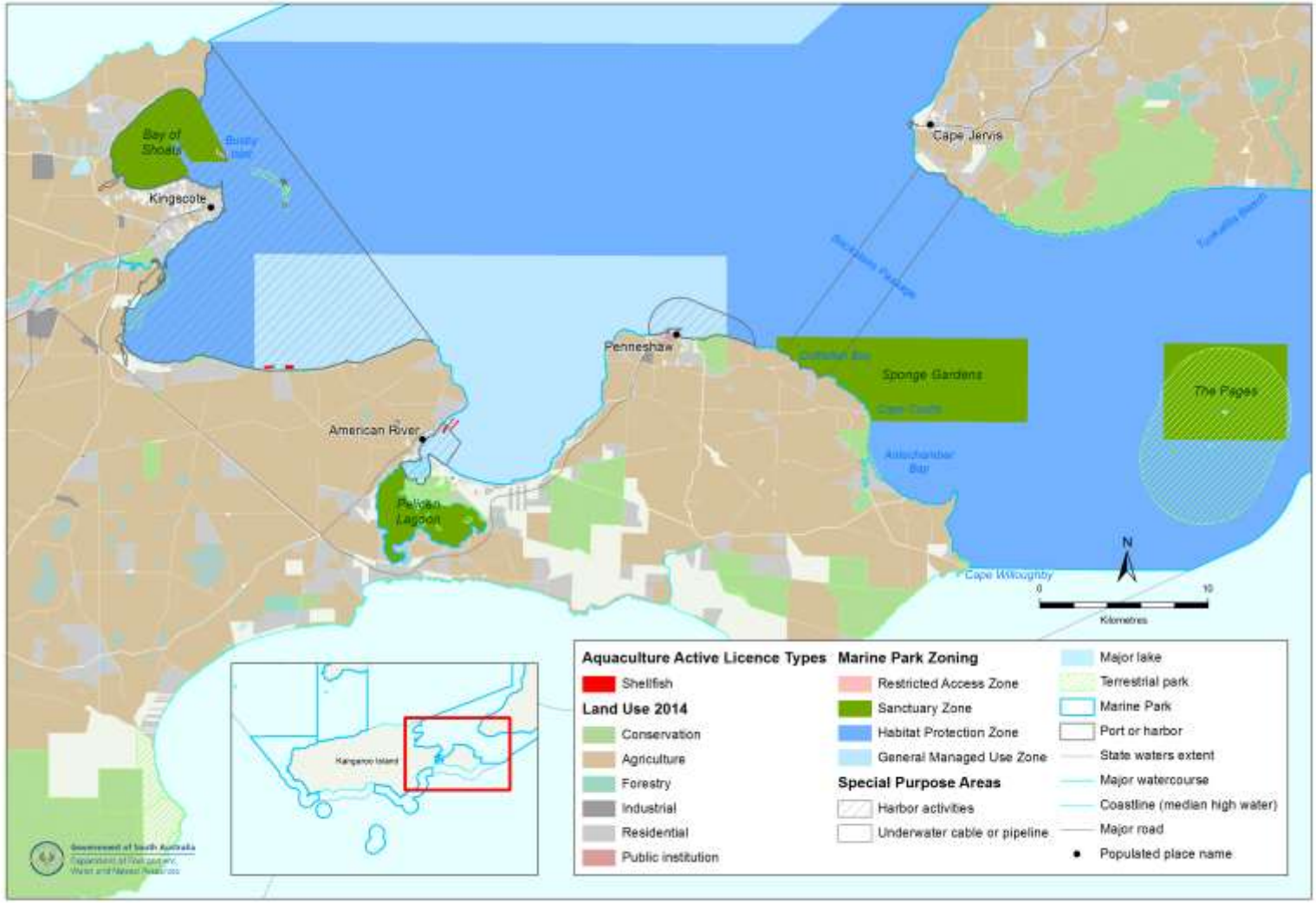
## Figure A.3 Western Kangaroo Island Marine Park with marine zoning/use and adjacent land use



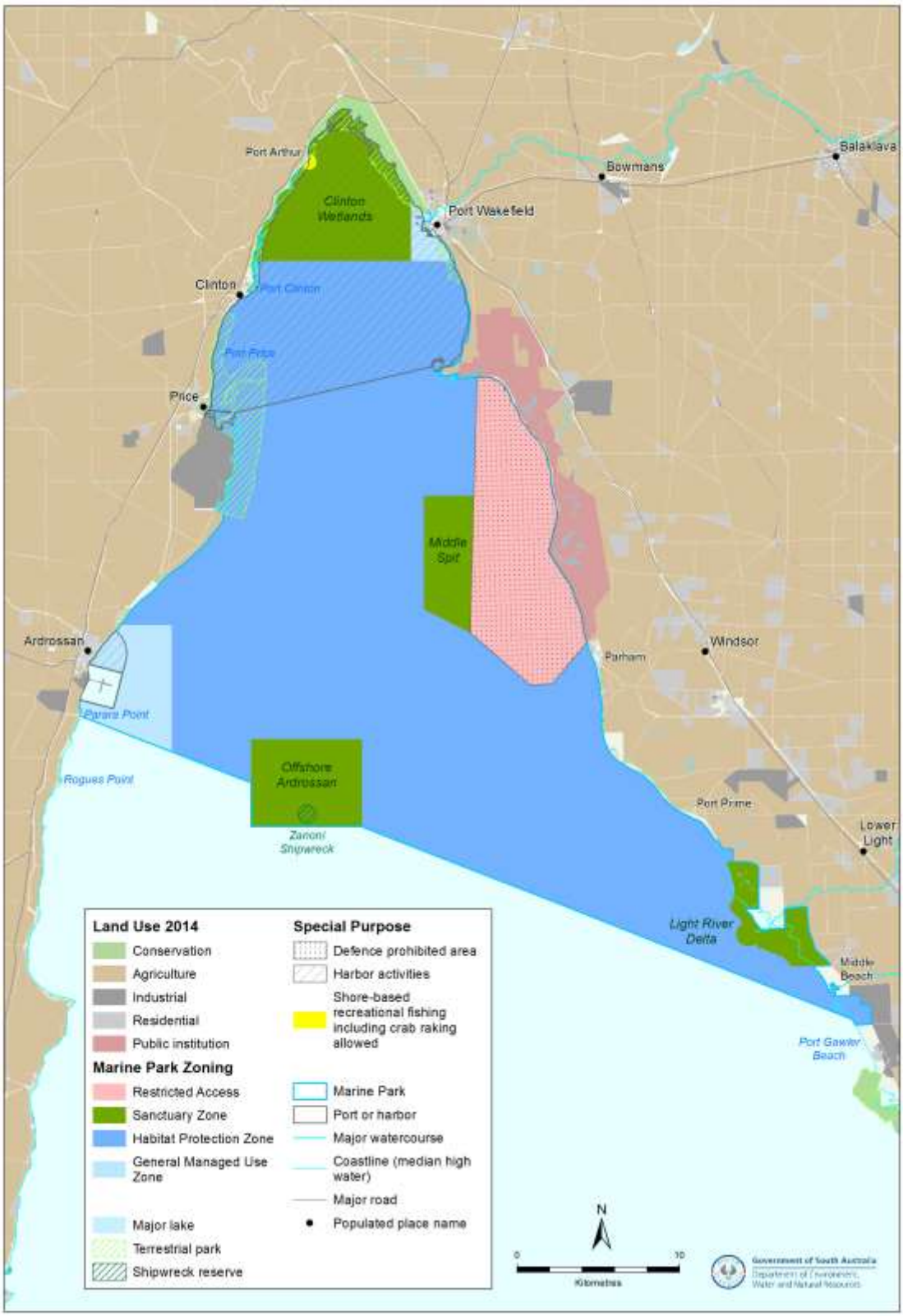
## Figure A.4 Southern Kangaroo Island Marine Park with marine zoning/use and adjacent land use



## Figure A.5 Encounter Marine Park with marine zoning/use and adjacent land use relevant to Kangaroo Island



## Figure A.6 Upper Gulf St Vincent Marine Park with marine zoning/use and adjacent land use



# Appendix B

## Stakeholder Consultations: People and Organisations Consulted

A range of individuals and organisations in each region including fishers from the relevant commercial fishing sectors were consulted through face-to-face, telephone and written correspondence. In some instances these stakeholders provided additional information in the form of financial data, commercial fishery catch data, copies of previous documents/reports, and impact statements. The estimated number of stakeholders consulted in each region are:

- Kangaroo Island – at least 26 individuals and organisations;
- Ceduna – at least 16 individuals and organisations through formal meetings, an estimated 20 additional individuals and business through informal discussions on a walk through the town; and
- Port Wakefield and broader Upper Spencer Gulf Region – at least 19 individuals and organisations.

### Submissions received

For the purpose of the RIAS an official contact email address was established and publicised on the RIAS website to enable interested stakeholders to make a submission. Submissions were received from the following organisations and individuals:

- Regional Development Australia, Whyalla and Eyre Peninsula Inc.;
- Kangaroo Island Marine Action Group;
- A. Suter, Mayor, The District Council of Ceduna; and
- 2 recreational fishers from the upper Gulf St Vincent region.

# Appendix C

## Fisheries Management Change Summaries

### C.1 Management changes to the South Australian Abalone Fishery

Key milestones and management change for the **Western Zone** abalone fishery include:

| Date | Milestone |
|---|---|
| 1964 | Fishery started |
| 1971 | Licences made non-transferable<br>Fishery divided into three zones (western, central and southern)<br>Minimum legal length (MLL) set at 130 mm for both species |
| 1976 | 30 Licences remained; 5 additional licences issued |
| 1978 | Sub-zones and fishing blocks replaced by map numbers and codes |
| 1980 | Licences became transferable |
| 1984 | Greenlip minimum legal length amended to 145 mm in the Western Zone |
| 1985 | Western Zone divided into regions A and B<br>Quota introduced to Region A in the Western Zone (97.75 t blacklip; 97.75 t greenlip) |
| 1989 | TACC in Western Zone Region A greenlip fishery reduced to 69 t |
| 1991 | Quota introduced to Region B in the Western Zone (9.2 t both species) |
| 1993 | Abolition of owner-operator regulation<br>TACC in Western Zone Region B increased to 11.5 t |
| 1994 | TACC in Western Zone Region B increased to 13.8 t |
| 1996 | TACC in Western Zone Region A blacklip fishery decreased to 86 t (for one year) |
| 1997 | Management Plan implemented (Zacharin 1997)<br>TACC in Western Zone Region A blacklip fishery increased to 97.75 t (previous level) |
| 2004 | Management Plan reviewed (Nobes *et al.* 2004) |
| 2006 | TACC in Western Zone Region A greenlip fishery increased to 75.9 t |
| 2010 | TACC in Western Zone Region A blacklip fishery decreased to 92 t<br>TACC in Western Zone Region A greenlip fishery decreased to 69 t |
| 2011 | TACC in Western Zone Region B fishery decreased to 9.2 t<br>Voluntary closed season in Region B from October to February |
| 2012 | New management plan including harvest strategy<br>TACC in Western Zone Region B fishery decreased to 6.9 t |
| 2013 | TACC in Western Zone Region A blacklip fishery decreased to 87.4 t |
| 2014 | Regions A and B merged, One licence removed from WZ<br>TACC in Western Zone greenlip fishery increased to 73 t, blacklip fishery decreased to 84.1 t |

Key milestones and management change for the **Central Zone** abalone fishery include:

| Date | Management milestone |
|---|---|
| 1964 | Fishery started |
| 1971 | >100 licences; licences made non-transferable<br>Fishery divided into three Zones (Western, Central and Southern)<br>MLL set at 130 mm SL for all species |
| 1976 | Number of licences in CZ capped at six |
| 1978 | Change in spatial reporting of catch and effort data |
| 1980 | Licences became transferable |
| 1990 | Quota introduced to the CZ.<br>TACCs set at 47.4 t and 13.7 t (meat weight) for greenlip and blacklip |
| 1993 | Abolition of owner-operator regulation |
| 1994 | CZ greenlip TACC increased from 47.4 t to 47.7 t (meat weight)<br>CZ blacklip TACC increased from 13.7 t to 14.1 t (meat weight) |
| 1997 | Management Plan implemented (Zacharin 1997) |
| 2002 | Voluntarily increase in harvest length to 135 mm SL in the CZ |
| 2004 | Management Plan revised (Nobes *et al*. 2004)<br>Fishery assessed against the Principles of Ecologically Sustainable Development |
| 2005 | CZ greenlip catch capped at 30 t (meat weight) in FA 21 (Tiparra Reef and Cape Elizabeth)<br>CZ blacklip TACC reduced from 14.1 to 9.9 t (meat weight) |
| 2006 | CZ blacklip TACC reduced from 9.9 to 8.1 t (meat weight) |
| 2009 | Catch-cap increased to 33.3 t (meat weight) in FA 21 (Tiparra Reef and Cape Elizabeth) |
| 2010 | Catch capped at 1.6 t (meat weight) in Port Victoria (mapcode 22A)<br>Catch capped at 1 t (meat weight) in Hardwicke Bay (mapcode 24A) |
| 2011 | Catch-caps removed from Port Victoria and Hardwicke Bay |
| 2012 | Management Plan revised (PIRSA 2012) – application of new harvest strategy |
| 2013 | Use of GPS and depth loggers mandated in CZ<br>MLL for greenlip increased to 135 mm SL in CZ |

## C.2 Management changes to the South Australian Rock Lobster Fishery

Key milestones and management change for the **Northern Zone** rock lobster fishery include:

| Date | Management milestone |
|---|---|
| 1968 | Limited entry declared |
| 1985 | 10% pot reduction; max number of pots 65 |
| 1992 | 10% pot reduction; max number of pots 60 |
| 1993 | 1 week closure during season |
| 1994 | Minimum legal size (MLS) increased from 98.5 to 102 mm carapace length (CL); further "1 week" closure |
| 1995 | Further "1 week" closure added |
| 1997 | Flexible closures introduced; Management Plan published (Zacharin 1997) |
| 1999 | Extra 3 days of fixed closure added |
| 2000 | MLS increased from 102 to 105 mm CL |
| 2001 | 7% effort reduction |
| 2002 | 8% effort reduction |
| 2003 | TACC implemented for the 2003 season at 625 tonnes; VMS introduced |
| 2004 | TACC reduced to 520 tonnes; Vessel length and power restrictions removed |
| 2007 | New Management Plan published (Sloan and Crosthwaite 2007) |
| 2008 | TACC reduced to 470 tonnes |
| 2009 | TACC reduced to 310 tonnes |
| 2011 | New Harvest Strategy developed |
| 2012 | TACC increased to 345 tonnes |

## C.3 Management changes to South Australian Charter Boat Fishery 2005 – 2015

No major changes to the Charter Boat fishery over the last ten years since the new licencing arrangements became effective from July 1 2005. It is a limited entry fishery and there are currently 109 licences (77 active) and 148 vessels (83 active) registered in the fishery with (2011/12). Number of licences will remain the same until the end of the current management plan. Licences may (and have) been voluntarily surrendered. The current management plan is effective from August 2011 to 30 June 2021.

The management arrangements in the Charter Boat Fishery include both input and output controls. Current input controls include:

- Limit on the number of licences,
- Restrictions on the number of vessels that can be used on the water at any one time,
- Gear limits per passenger; and
- Limited number of qualified registered masters per vessel.

Output controls include limits on the length of retained fish, and bag limits on a per boat and trip basis.

These arrangements are legislated under the *Fisheries Management (General) Regulations 2007* and *Fisheries Management (Charter Boat Fishery) Regulations 2005* and are in place to pursue ESD outcomes for the fishery.

Management history:

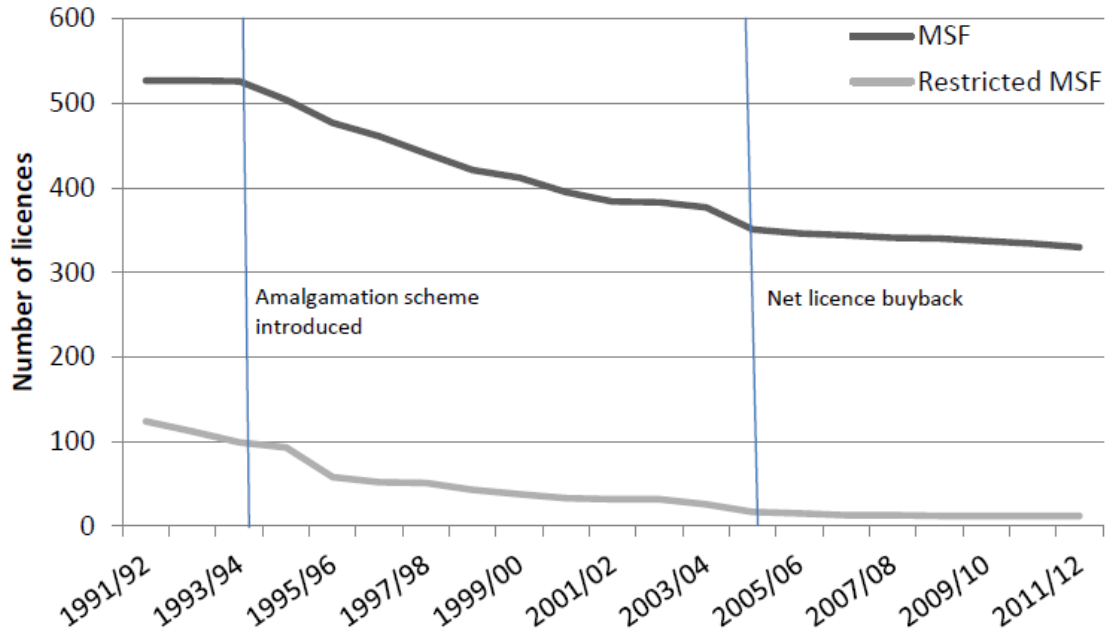
- 2004/2005 eligibility process for granting licences to limit effort and set a cut-off point for new operations.
- New licencing arrangements effective from July 1 2005
- From July 1 2005 operators required to fill in fishing logbook sheets for each trip
- Logbook reviewed in 2007 to collect catch per unit effort (CPUE) data to inform stock assessments and reporting (Marine Scale Fishery)
- Fisheries Management (Charter Boat Fishery) Regulations 2005 were gazetted on 21 July 2007 allowing for increased passenger catch limits
- Wildlife interaction logbook requirement introduced to all commercial fisheries with mandatory reporting of interactions with threatened, endangered and protected species (TEPS) 2007.
- New Fisheries Management Act 2007 introduced and Charter Boat Fishery regulations carried over under the new Act
- Ecologically Sustainable Development (ESD) Risk Assessment of the South Australian Charter Boat Fishery 2010 informed current management plan

## C.4 Management changes to the South Australian Marine Scalefish Fishery 1995 – 2015

Two main changes to the management of the MSF have been influencing licence numbers and effort over the last 20 years: the licence amalgamation scheme and the voluntary net buyback scheme. Together these schemes have resulted in a reduction of licences from 701 in 1984 to 322 in 2014 and an approximate 40% reduction in effort across the fishery (see figure below).

The licence amalgamation scheme was introduced in 1994 as a method for reducing the number of licences, and therefore the maximum amount of fishing effort, within the fishery. The amalgamation scheme requires at least two licences to be joined together, with one of those licences being removed from the fishery as a consequence.

A significant rationalisation of the net sector was undertaken in 2005 when a net licence buy-back scheme resulted in the reduction of 61 net licences and endorsements from 113 to 52. This resulted in the removal of approximately 45% of net fishing effort. Following the net buyback in 2005, complimentary permanent netting closures were implemented in three priority areas; southern Yorke Peninsula, the south west of Spencer Gulf (SG), and the West Coast (Venus Bay region).




Other management changes include the 2012 introduction of the seasonal closure for Southern Garfish and the extension of the Snapper closure with the introduction of catch and gear limits.

**Southern Garfish**

- A new harvest strategy for Southern Garfish was introduced in June 2012 that aimed to reduce the exploitation rate (harvest fraction) from the current level of 69% to 30% by 2020.
- This strategy included the implementation of a series of temporal closures and increasing the legal minimum hauling net mesh size to minimise the catch of undersize Garfish.
- The seasonal closures have occurred in Spencer Gulf and Gulf St Vincent for between 20 and 40 days in 2012 and 2014.
- They include the entire gulfs which were closed alternately between May and August.
- The response of the fishery to these new management arrangements will be explored in the next stock assessment scheduled for completion in late 2015.

**Snapper**

- Statewide closed season from November 1 to December 15
- Snapper spawning spatial closures from 15 December 2014 – 31 January 2015 at 4 locations in Spencer Gulf and 1 location in Gulf St Vincent. Closures extend 4km radially from known spawning locations.
- A daily commercial catch limit of 500kg across all South Australian waters from 15 December 2012, to control the level of commercial impact on Snapper stocks
- Commercial fishers are restricted to using 200 hooks on set lines (reduced from 400 hooks) when operating in Spencer Gulf and Gulf St Vincent from December 2012, to assist in

restricting daily catches of Snapper to the 500 kg daily limit and avoid excess Snapper being discarded

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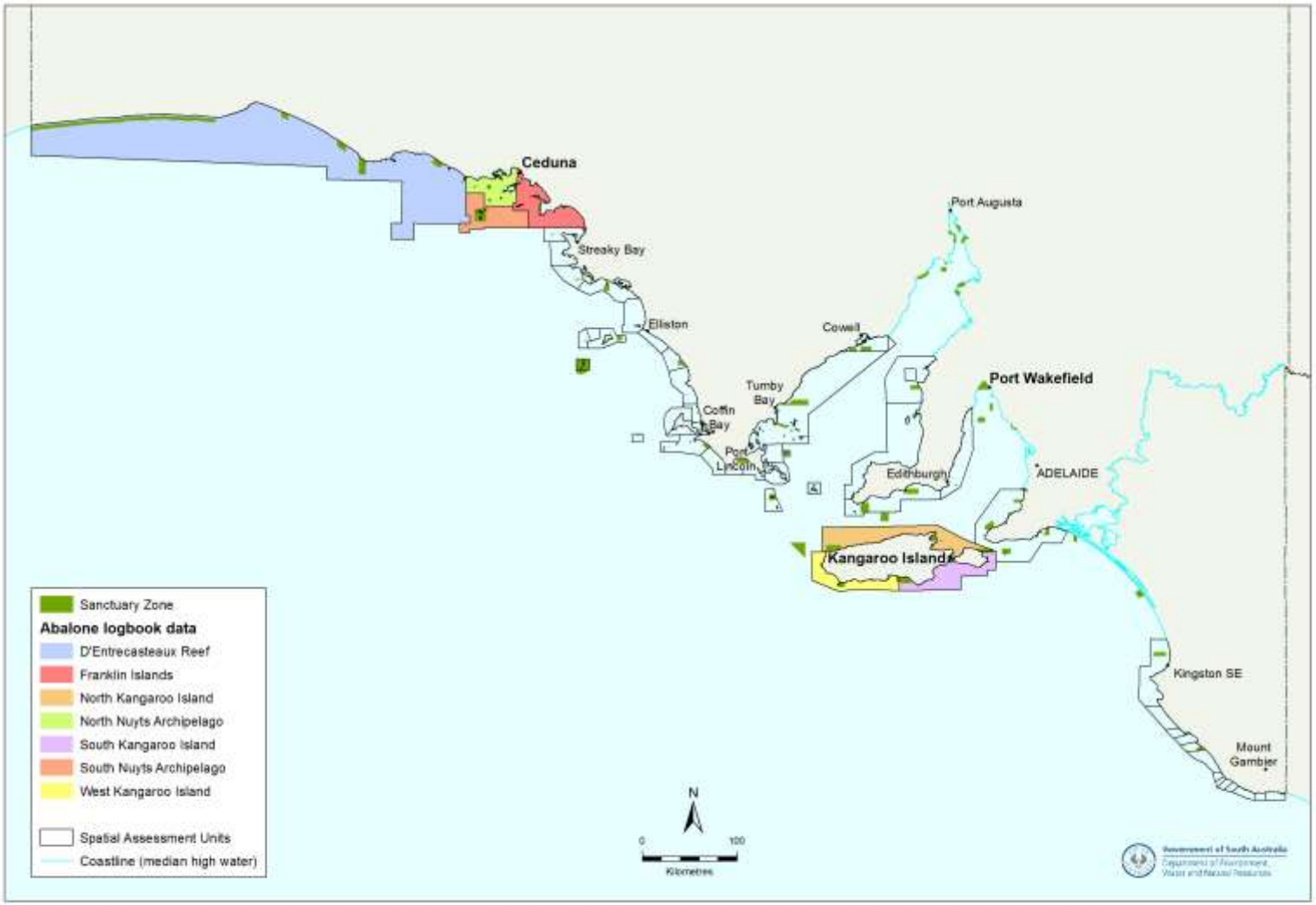
# Appendix D

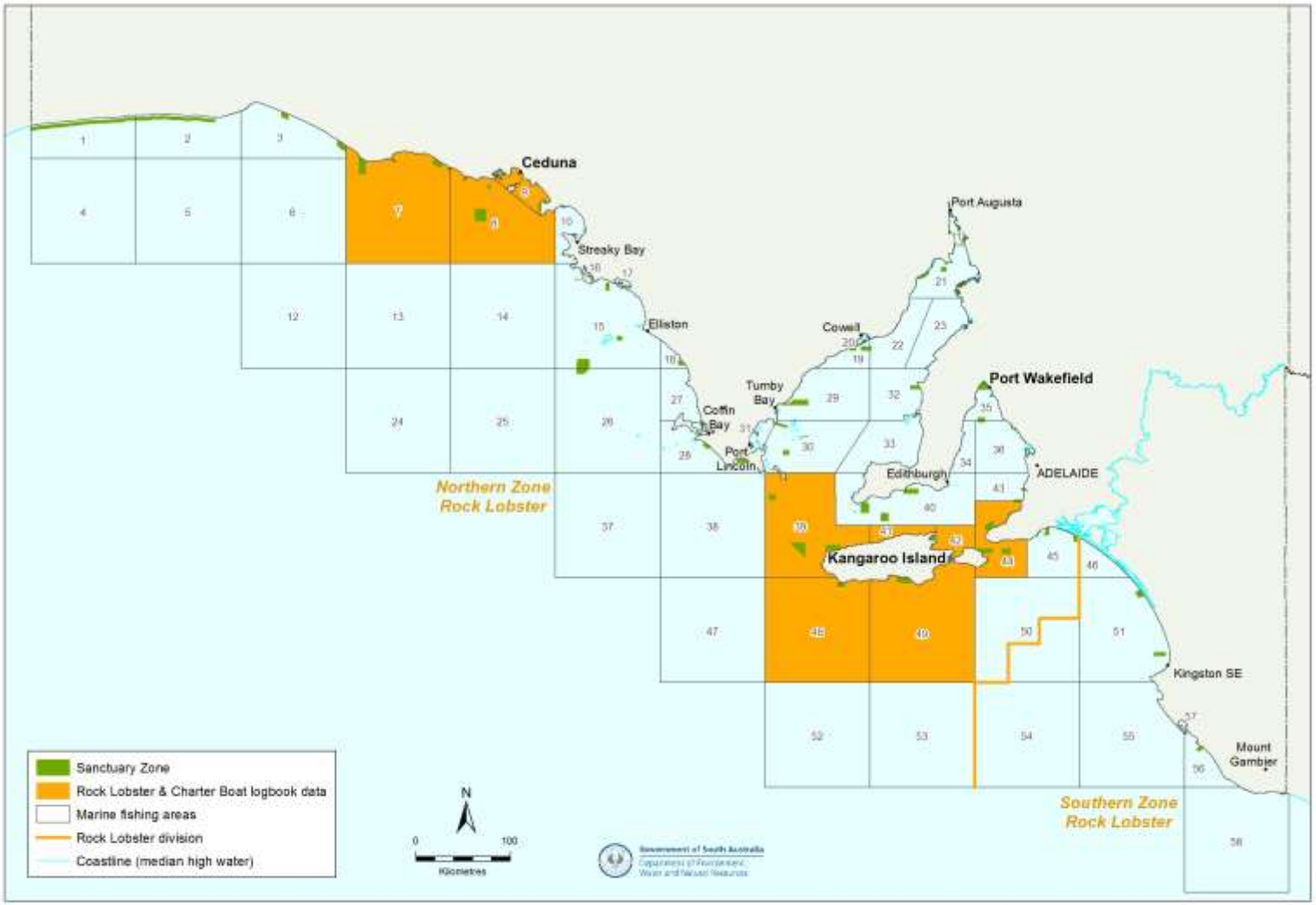
## Spatial Areas Used for Fisheries Management

## Figure D.1: Spatial Unit for Abalone SARDI Logbook Data



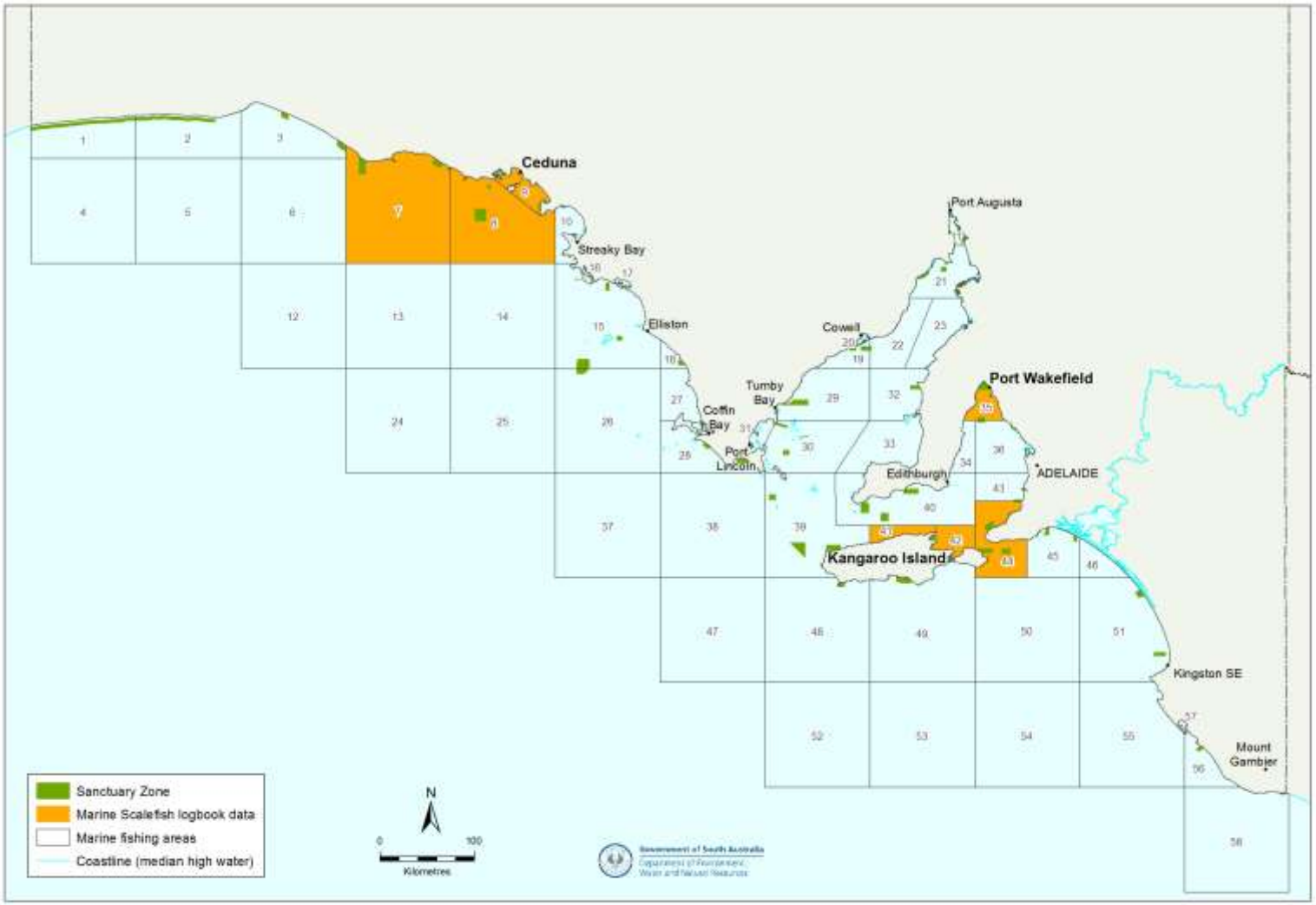

**Source:** DEWNR.

## Figure D.2: Spatial Unit for Rock Lobster SARDI Logbook Data




**Source:** DEWNR.

## Figure D.3: Spatial Unit for Marine Scalefish SARDI Logbook Data




**Source:** DEWNR.

# Appendix E

## Disclaimer and Metadata for Maps

| | |
|---|---|
| Produced by: | Science, Monitoring and Knowledge<br>Department of Environment, Water and Natural Resources<br>GPO Box 1047 Adelaide SA 5001<br>www.environment.sa.gov.au |
| Data Source: | see below |
| Date Compiled: | July & August, 2015 |
| Coordinate System: | GDA 1994 Lambert<br>Geocentric Datum of Australia, 1994 |



MAPS
Figure 2.1: DEWNR map name = A-2_STATEWIDE_A5_L
Figure 3.1: DEWNR map name = B-1_CEDUNA_A4_L
Figure 3.2: DEWNR map name = B-2_KANGAROOISLAND_A4_L
Figure 3.3: DEWNR map name = B-3_WAKEFIELD_A4_P
Figure A.1: DEWNR map name = C-1_MP2-LandUse_A4_L
Figure A.2: DEWNR map name = C-2_MP12-LandUse_A4_P
Figure A.6: DEWNR map name = C-3_MP14-LandUse_A4_P
Figure A.5: DEWNR map name = C-4_MP15-LandUse_A4_L
Figure A.3: DEWNR map name = C-5_MP16-LandUse_A4_P
Figure A.4: DEWNR map name = C-6_MP17-LandUse_A4_P
Figure F.1: DEWNR map name = D-1_MP2-Benthic_A4_L
Figure G.1: DEWNR map name = D-2_MP12-Benthic_A4_P
Figure H.1: DEWNR map name = D-3_MP14-Benthic_A4_P
Figure G.4: DEWNR map name = D-4_MP15-Benthic_A4_L
Figure G.2: DEWNR map name = D-5_MP16-Benthic_A4_P
Figure G.3: DEWNR map name = D-6_MP17-Benthic_A4_P
Figure F.2: DEWNR map name = E-1_StFrancisSZ_A4_P
Figure F.8: DEWNR map name = E-2_LoundIslandSZ_A4_P
Figure G.5: DEWNR map name = E-3_CapeDuCouedicSZ_A4_P
Figure G.7: DEWNR map name = E-4_SpongeGardensSZ_A4_P
Figure G.11: DEWNR map name = E-5_ThePagesSZ_A4_P
Figure H.2: DEWNR map name = E-6_ClintonWetlandsSZ_A4_P
Figure G.14: DEWNR map name = E-7_BayOfShoalsSZ_A4_P
Figure D.2: DEWNR map name = F-1_StateMFARockLobster_A4_L
Figure D.3: DEWNR map name = G-1_StateMFAMarineScalefish_A4_L
Figure D.1: DEWNR map name = H-1_StateSAUAbalone_A4_L
Figure 7.15: DEWNR map name = I-1_MP14-Netting_A4_P
Figure F.3: DEWNR map name = J-1_MP2_NuytsArchipelago-ReefDives_A4_L
Figure G.8: DEWNR map name = J-2_MP14_SpongeGardens-ReefDives_A4_L
Figure G.12: DEWNR map name = J-3_MP14_CapeBorda-ReefDives_A4_L
Figure F.6: DEWNR map name = K-2_MP2_NuytsArchipelago-BRUVS_A4_L
Figure H.3: DEWNR map name = K-2_MP14_ClintonWetlands-BRUVS_A4_L

Data Sources

| | |
|---|---|
| PlaceNamesPopn_2011 | Populated Centres 2011 (ABS) |
| TOPO.PlaceNames50k | SA Placenames 1:50000 (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=596 | |
| TOPO.Gazetteer | SA Placenames Gazetteer (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=595 | |
| | |
| TOPO.Australia | Australia infill |
| TOPO.Australia_arc | Australia coastline & borders |
| TOPO.SouthAust | SA infill (DEWNR) |
| TOPO.SouthAust_arc | SA coastline & borders (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=978 | |
| | |
| ADMIN.MaritimeBoundaries | State Waters Extent (Geoscience Australia) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=319 | |
| | |
| CONSERVATION.StateMarineParkNetwork | SA Marine Parks (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1185 | |
| CONSERVATION.StateMarineParkNW_Zoning | SA Marine Parks Zoning (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1220 | |
| | |
| DCDB.LGA | Local Government Areas (DTEI-Land Services) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=42 | |
| | |
| CONSERVATION.StateMarineParkNW_SpecPurpLine | Shore-based recreational line fishing allowed (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1569 | |
| CONSERVATION.StateMarineParkNW_SpecPurpArea | Special Purpose Areas (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1405 | |
| | |
| ADMIN.Ports_Harbors | Port or Harbor |
| | |
| CONSERVATION.RockLobsterSanctuaries | Rock Lobster Sanctuary (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=802 | |
| CONSERVATION.ShipwreckReserves | Shipwreck Reserve (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=824 | |
| CONSERVATION.NpwsaReserves | Terrestrial Park (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=137 | |
| | |
| TOPO.GeoData250k_WatercourseLines | Major watercourse (Geoscience Australia) |
| TOPO.GeoData250k_WatercourseAreas | Major watercourse (Geoscience Australia) |
| TOPO.GeoData250k_Lakes | Major lake (Geoscience Australia) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=928 | |
| | |
| TOPO.SaRefMap_Roads | Major road (DEWNR) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1045 | |

Aquaculture

| | |
|---|---|
| ADMIN.AquacultureZones | Aquaculture zone (PIRSA-Fisheries) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=864 | |
| ADMIN.AquacultureLicences | Aquaculture Active Licence Types (PIRSA-Fisheries) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=324 | |

Benthic Habitats

| | |
|---|---|
| Inventory.gdb\Inventory_piecharts_BayOfShoals_2013 | 2013 Inventory Mapping (DEWNR) |
| Inventory.gdb\Inventory_piecharts_Statewide_2015 | 2015 Inventory Mapping (DEWNR) |
| Statewide_BenthicxDepth_StatAnalysisLayer_23062015 | Broad Benthic Habitat (SARDI-Aquatic Sciences) |
| http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=463 | |

BRUVS

| | |
|---|---|
| NgerinExpedition_BRUVS_2015.shp | BRUVS (DEWNR) |
| Drops2014-15.shp | BRUVS (DEWNR) |

Landuse

| | |
|---|---|
| ADMIN.LandUse2014 | Land Use 2014 (PIRSA-Planning) |

http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=1080

### Marine Fishing Areas

| | |
|---|---|
| MFAS.gdb\LOBSTER_NorthSouth | Rock Lobster division (DEWNR) |
| MARINE.FishBlocksMscale | Marine fishing areas (SARDI-Aquatic Sciences) |

http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=691

| | |
|---|---|
| MARINE.FishBlocksAbalone | Spatial assessment units (SARDI-Aquatic Sciences) |

http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=690

### Netting Closures

| | |
|---|---|
| ADMIN.NettingClosures | Netting closure (PIRSA-Fisheries) |

http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=325

### Reef Dives

| | |
|---|---|
| REEFS.gdb\CapeBordaSites_2008_10 | Survey Method, Depth, Year (DEWNR) |
| REEFS.gdb\NuytsArchipelagoSites_20150609 | Survey Method, Depth, Year (DEWNR) |
| REEFS.gdb\Sites_20150311 | Survey Method, Depth, Year (DEWNR) |
| REEFS.gdb\SpongeGardensSites | Survey Method, Depth, Year (DEWNR) |

### Shoreline

| | |
|---|---|
| SHORELINE.gdb\ShorelineGeneral | Shoreline Type (DEWNR) |
| COASTAL.ShorelineClassification | Shoreline Type (DEWNR) |

http://sim.env.sa.gov.au/sim/dataSet-display.do?cmd=DataSetDto&dsNumber=641

# Appendix F

## Environmental Indicators − Ceduna

SZs provide protection for habitats that in turn support various species and ecosystems. It is expected that the spatial extent and condition of these habitats will be maintained inside SZs and that this will have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). In addition, it is expected that some of the habitat-associated fishes and invertebrates will change in size and/or abundance following protection from fishing inside SZs and that this may in turn drive ecosystem changes (Bailey et al. 2012a). It is too early for any measurable ecological changes to have occurred within SZs of the Nuyts Archipelago Marine Park (NAMP) since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Nonetheless, it is worth presenting in the RIAS some of the baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program and to discuss preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Ceduna region.

### Predicted changes after 1 October 2014

Rock lobster, greenlip abalone, blacklip abalone and/or snapper, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Nuyts Reef, Chadinga, Lound Island, Isles of St Francis and Barlows Beach SZs of the NAMP (Bailey et al. 2012b). Inside some of those SZs, western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep are predicted to maintain size and abundance over the next 20 years (Bailey et al. 2012b). Populations of seabirds, shorebirds, marine mammals, and sharks are not predicted to change as a direct result of the SZs (Bailey et al. 2012a).

### Environmental monitoring activities

DEWNR is the lead agency responsible for monitoring environmental (and socio-economic) changes across the marine parks network. Monitoring activities are designed to test predictions of change and to assist with the assessment of the performance of the entire marine parks network (noting that all marine park management plans must be reviewed by 2022). DEWNR will therefore monitor selected SZs within the SA marine parks network in order to address the key evaluation questions that are derived from the marine park management plans and the *Marine Parks Act 2007* (DEWNR, pers. comm., August 2015) Indicators of change inside SZs include the size/abundance/diversity of fish, invertebrate and algal communities. Across the parks network, habitat mapping is also being conducted in SZs where baseline information is currently lacking. Other government agencies and non-government groups are involved in monitoring shorebirds, seabirds and marine mammals, and results from these programs will be incorporated into the DEWNR marine parks monitoring program (DEWNR, pers. comm., August 2015).

Building upon the work of Bailey et al. (2012b) and based upon a number of factors including the size of the SZ, life history characteristics of different species and prior level of fishing, Bryars (2013) predicted with a high level of confidence that multiple species would show a response to protection inside the Isles of St Francis SZ. Within the NAMP, monitoring activities by DEWNR have been focused on the Isles of St Francis SZ through diver surveys on reef habitat and Baited Remote Underwater Video System (BRUVS) surveys on a variety of habitats.

### Seafloor habitats in the Nuyts Archipelago Marine Park

About 19 per cent of the seafloor (or benthic) habitats of the NAMP have been mapped at a fine scale (1:10,000) by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (DEWNR 2015a, b, Miller et al. 2009, Figure F.1). An additional 10 per cent has been mapped at a broad scale (1:100,000) using satellite imagery (DEWNR 2015c,

Edyvane 1999a, b, Figure F.1). The majority (71 per cent) of the subtidal habitats in the NAMP are not mapped. The smaller SZs near Ceduna have been well mapped and include mangrove, saltmarsh, seagrass and sand habitats (Figure F.1). The larger offshore SZs are less well mapped but are known to include reef habitat of importance to a variety of reef life, including commercially-important rock lobster and abalone. In 2015, new 'inventory mapping' was undertaken at the Isles of St Francis SZ and Lound Island SZ to improve our understanding of what habitats are being protected in those zones (DEWNR, pers. comm., August 2015).

**Isles of St Francis SZ**

**Benthic habitats**

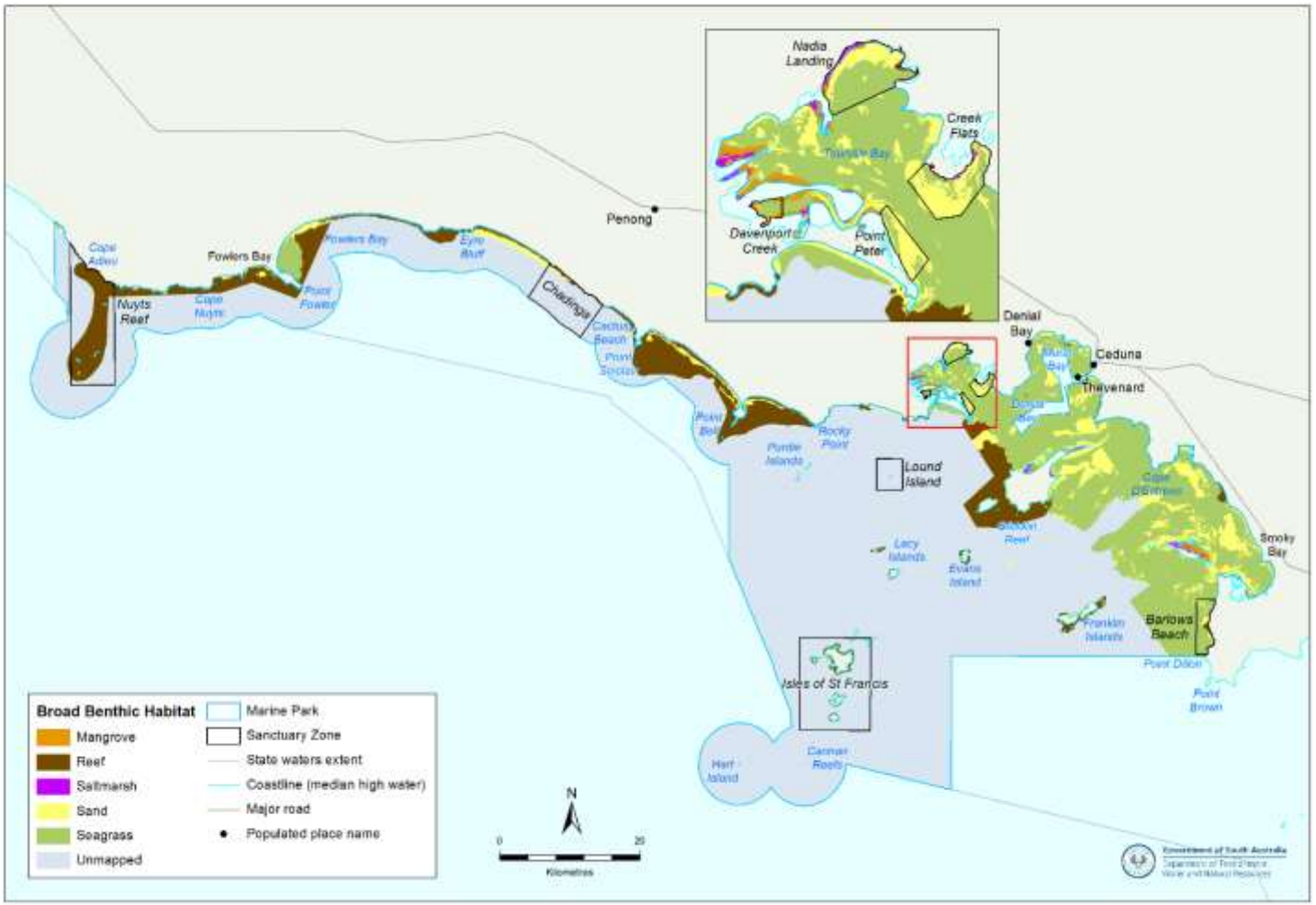
Reef, sand and seagrass habitats are all found within the Isles of St Francis SZ. While much of the SZ (59 per cent of the sampled area) was covered by sand, substantial areas (32 per cent) of reef occur to the SW of St Francis Island and seagrass meadows (8 per cent) are located in the sheltered lee sides of St Francis and Masillon Islands (Figure F.2).

**Diver surveys on reef habitat**

Fish, invertebrate and macroalgal diversity and abundance were surveyed by divers at 14 sites (5 inside the Isles of St Francis SZ) at depths of 5 or 10 metres during 2009 (DEWNR and the University of Tasmania unpublished data, (Figure F.3). About 70 fish species, 40 invertebrate species and 120 macroalgal and sessile invertebrate species were recorded during the surveys. Four of the existing 2009 sites and 6 new sites (5 inside the Isles of St Francis SZ) were surveyed at a depth of 5 metres during March 2015 (Figure 5.3). Sites were surveyed using standard techniques: either Marine Protected Area (see Edgar and Barrett 1999) or Reef Life Survey (see Reef Life Survey 2013). Data from the two techniques are comparable following some transformation (see Brook and Bryars 2014). Figure F.4 shows baseline abundance data for 6 species that are predicted to increase or maintain abundance inside the SZ following protection from fishing. Ongoing monitoring will enable these predictions to be tested.

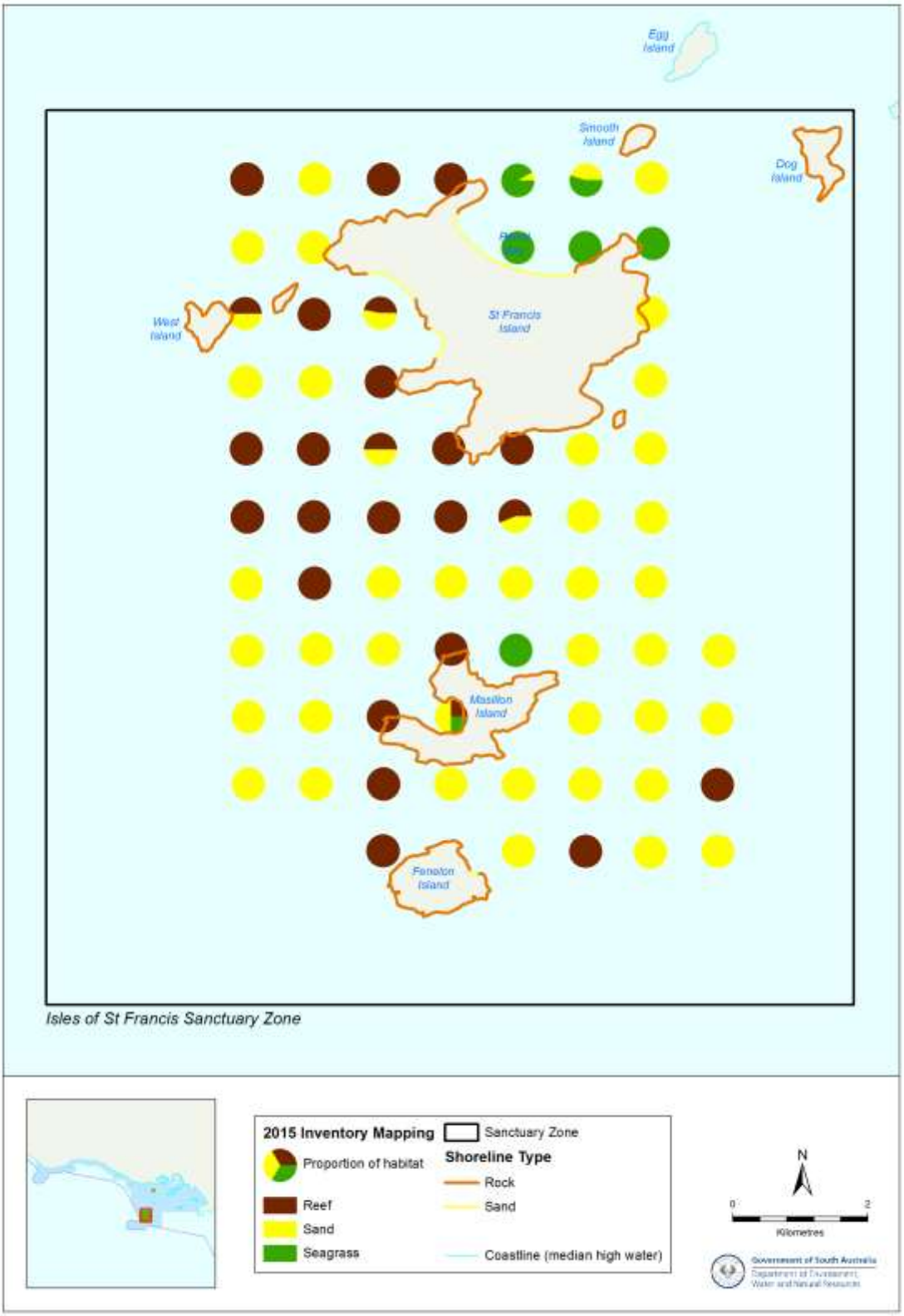
The most abundant macroalgae recorded during the dive surveys were crustose corallines, the kelp *Ecklonia radiata* and the large brown algae *Cystophora monilifera* and *Sargassum verruculosum*. The most common mobile invertebrates were the feather star *Comanthus trichoptera*, the purple urchin *Heliocidaris erythrogramma,* the gastropod *Turbo torquatus* and greenlip and blacklip abalone. The most common fish were smaller, schooling species including the yellow-headed hulafish *Trachinops noarlungae,* slender bullseye *Parapriacanthus elongates* and pencil weed whiting *Siphonognathus beddomei,* as well as common bullseye *Pempheris multiradiata*, sea sweep *Scorpis aequipinnis*, bluethroat wrasse *Notolabrus tetricus* and herring cale *Olisthops cyanomelas* (DEWNR, pers. comm., August 2015).

**Figure F.1: Benthic habitats of the Nuyts Archipelago Marine Park with marine park Sanctuary Zones.**



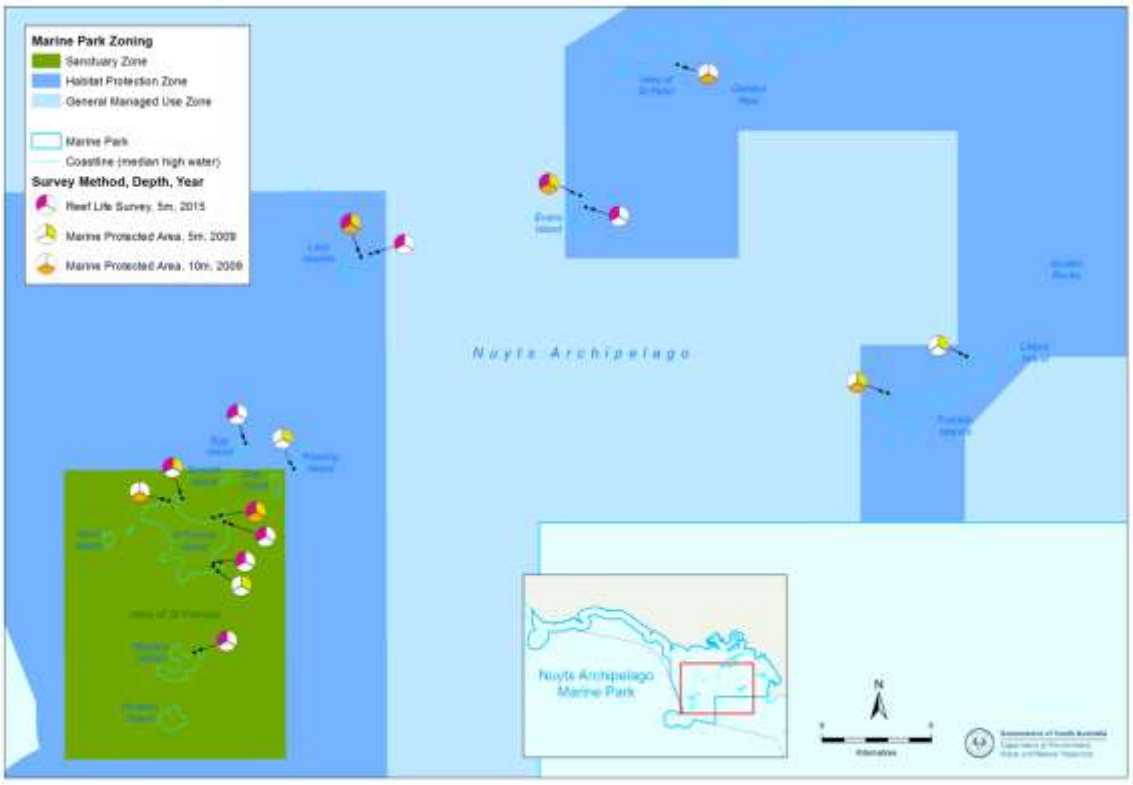

**Source:** DEWNR.

**Figure F.2: Inventory mapping of benthic habitats of the Isles of St Francis Sanctuary Zone. Pie charts display proportions of different habitats as determined from underwater video transects at 69 sites located in a 1 x 1 km grid laid across the area.**



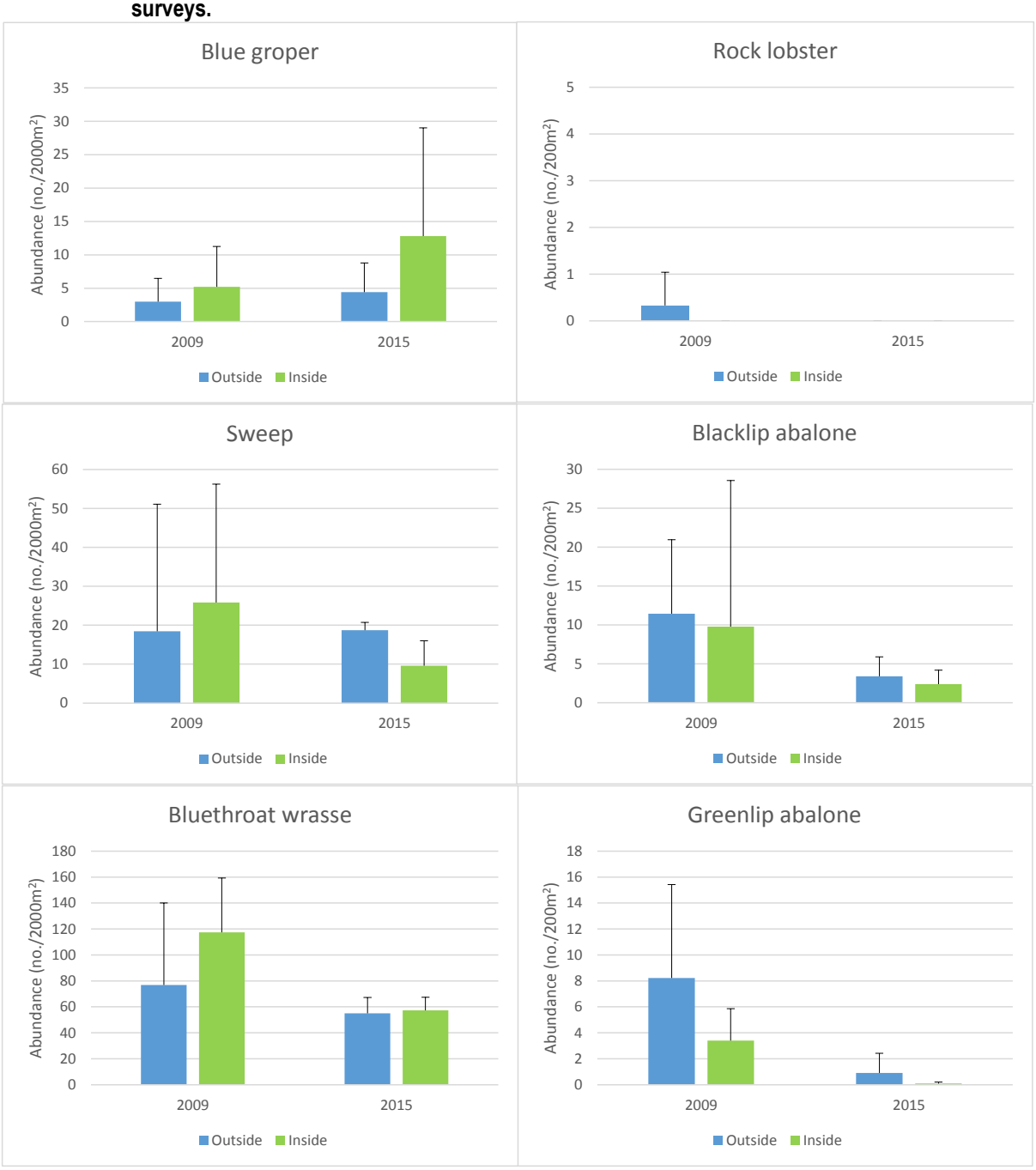

**Source:** DEWNR.

**Figure F.3: Location of diver survey sites inside and outside of the Isles of St Francis Sanctuary Zone.**




**Source:** DEWNR.

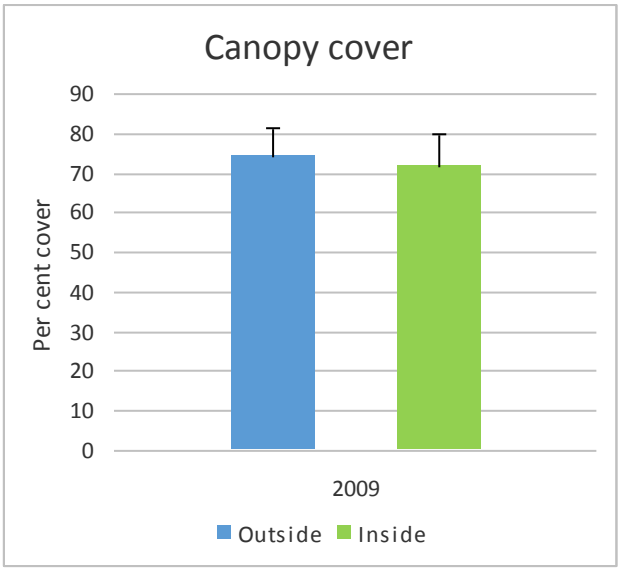
**Figure F.4: Abundance (mean + standard deviation) of selected species that are predicted to respond to protection from fishing inside the Isles of St Francis Sanctuary Zone. Data derived from dive surveys.**




**Source:** DEWNR.

The cover of canopy-forming macroalgae is an important indicator of subtidal reef condition in South Australia (Cheshire et al. 1998, Turner et al. 2007, Gaylard et al. 2013). The macroalgal data recorded during 2009 (DEWNR and the University of Tasmania unpublished data, Figure F.5) were used to calculate condition of subtidal reefs in the NAMP following the methods of Brook and Bryars (2014). Reefs in the NAMP were above the threshold for reefs in "good" condition (Figure F.5), with an average canopy cover inside and outside the Isles of St Francis SZ of 71.6 per cent ± 6.8 per cent (standard deviation) and 74.6 per cent ± 8.1 per cent, respectively.

**Figure F.5: Per cent canopy cover (mean + standard deviation) of subtidal reefs surveyed during 2009.**




**Note:** Canopy cover estimates were derived from unpublished DEWNR/University of Tasmania data following the method described by Brook and Bryars (2014). Reefs with a canopy cover greater than 60 per cent are considered to be in 'good' condition (Turner et al. 2007).
**Source:** DEWNR.

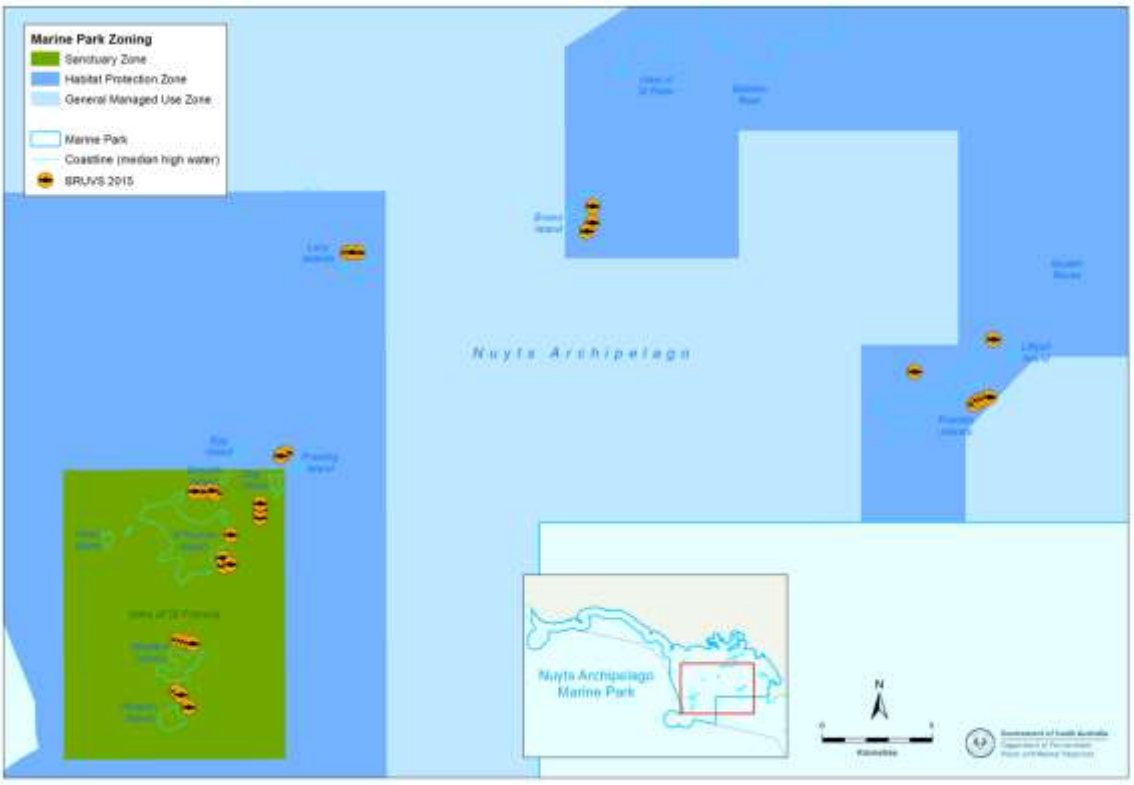
## BRUVS surveys

Fish diversity and abundance were surveyed using BRUVS (see Cappo et al. 2003) at 10 sites (5 inside and 5 outside the Isles of St Francis SZ, Figure F.6) during March 2015. As there are no previous BRUVS data, these data represent the baseline against which future comparisons can be made.

Across the five sites inside the Isles of St Francis SZ, usable video was obtained from 18 replicate surveys, with 7, 8 and 3 replicates on reef, seagrass and sand, respectively. For the outside sites, usable video was obtained from 14 replicate surveys, with 9 and 5 on reef and seagrass, respectively.

A total of 66 species were recorded during the surveys, of which 57 were recorded inside the Isles of St Francis SZ, and 47 outside (Table F.1). Nineteen of the species are considered to be of commercial or recreational importance, including King George whiting, southern calamary, Australian herring, sea sweep, bight redfish, queen snapper, western blue groper and harlequin fish. Data on the mean fish length inside and outside of the Isles of St Francis SZ are provided for some of these species (Figure F.7). The most abundant species were trevally, southern Maori wrasse and sea sweep (DEWNR, pers. comm., August 2015).

## Figure F.6: Location of BRUVS survey sites inside and outside of the Isles of St Francis Sanctuary Zone




**Source**: DEWNR.

**Table F.1: Species recorded during baited remote underwater video system surveys in the Nuyts Archipelago Marine Park**

| Scientific name | Common name | In | Out |
|---|---|---|---|
| *Acanthaluteres brownii* | Spiny tail leatherjacket | Y | |
| *Acanthaluteres spilomelanurus* | Bridled leatherjacket | Y | |
| *Acanthaluteres vittiger* | Toothbrush leatherjacket | Y | Y |
| *Achoerodus gouldii* | Western blue groper * | Y | Y |
| *Aptychotrema vincentiana* | Western shovel-nose ray | | Y |
| *Aracana ornata* | Ornate cowfish | | Y |
| *Arripis georgianus* | Australian herring * | Y | Y |
| *Austrolabrus maculatus* | Black-spotted wrasse | Y | Y |
| *Caesioperca rasor* | Barber perch | Y | Y |
| *Centroberyx gerrardi* | Bight redfish * | Y | Y |
| *Cheilodactylus nigripes* | Magpie perch | Y | Y |
| *Chelmonops curiosus* | Western talma | Y | Y |
| *Chironemus maculosus* | Silver spot | Y | |
| *Dactylophora nigricans* | Dusky morwong | Y | |
| *Dasyatis brevicaudata* | Smooth stingray | Y | Y |
| *Dinolestes lewini* | Long-fin pike | Y | Y |
| *Enoplosus armatus* | Old wife | Y | Y |
| *Eupetrichthys angustipes* | Snakeskin wrasse | | Y |
| *Galeorhinus galeus* | School shark * | Y | |
| *Girella zebra* | Zebra fish | Y | Y |
| *Heterodontus portusjacksoni* | Port Jackson shark | Y | |
| *Heteroscarus acroptilus* | Rainbow cale | Y | Y |
| *Kyphosus sydneyanus* | Silver drummer | Y | |
| *Latropiscis purpurissatus* | Sergent Baker | | Y |
| *Meuschenia flavolineata* | Yellow-striped leatherjacket | Y | Y |
| *Meuschenia freycineti* | Six-spine leatherjacket | Y | Y |
| *Meuschenia galii* | Blue-lined leatherjacket | Y | Y |
| *Meuschenia hippocrepis* | Horseshoe leatherjacket | Y | Y |
| *Meuschenia scaber* | Velvet leatherjacket | Y | |
| *Meuschenia venusta* | Stars and stripes leatherjacket | | Y |
| *Monacanthidae* sp. | Leatherjacket | | Y |
| *Mustelus antarcticus* | Gummy shark * | Y | |
| *Myliobatis tenuicaudatus* | Eagle ray | Y | Y |
| *Neatypus obliquus* | Western footballer | Y | Y |
| *Nemadactylus valenciennesi* | Queen snapper * | Y | Y |
| *Notolabrus parilus* | Brown-spotted wrasse | Y | Y |
| *Notolabrus tetricus* | Blue-throat wrasse | Y | Y |
| *Olisthops cyanomelas* | Herring cale | Y | Y |
| *Omegophora armilla* | Ringed toadfish | Y | |
| *Omegophora cyanopunctata* | Blue-spotted toadfish | Y | |
| *Ophthalmolepis lineolatus* | Southern Maori wrasse | Y | Y |
| *Othos dentex* | Harlequin fish * | | Y |
| *Parascyllium variolatum* | Varied catshark | Y | |
| *Parequula melbournensis* | Melbourne silverbelly | Y | Y |
| *Parma victoriae* | Scalyfin | Y | Y |
| *Pictilabrus laticlavius* | Senator wrasse | Y | Y |
| *Platycephalus* sp. | Flathead * | Y | |
| *Platycephalus speculator* | Yank flathead * | Y | |
| *Pseudocaranx* sp. | Trevally * | Y | Y |
| *Pseudocaranx wrighti* | Skipjack trevally * | Y | |
| *Scobinichthys granulatus* | Rough leatherjacket | Y | Y |
| *Scorpis aequipinnis* | Sea sweep * | Y | Y |
| *Sepia apama* | Giant cuttlefish | Y | |
| *Sepioteuthis australis* | Southern calamary * | Y | Y |
| *Seriola hippos* | Sampson fish * | Y | |

| Scientific name | Common name | In | Out |
|---|---|---|---|
| *Seriola lalandi* | Yellow-tail kingfish * | Y | |
| *Sillaginodes punctatus* | King George whiting * | Y | Y |
| *Sillago bassensis* | Silver whiting * | Y | Y |
| *Siphonognathus attenuatus* | Slender weed whiting | | Y |
| *Siphonognathus beddomei* | Pencil weed whiting | | Y |
| *Siphonognathus* sp. | Weed whiting | Y | |
| *Sphyraena novaehollandiae* | Snook * | Y | Y |
| *Tetrarogidae* sp. | Wasp fish | | Y |
| *Tilodon sexfasciatus* | Moonlighter | Y | Y |
| *Trygonorrhina dumerilii* | Southern fiddler ray | Y | Y |
| *Upeneichthys vlamingii* | Blue-spotted goatfish | Y | Y |
| *Urolophus* sp. | Stingaree | Y | |
| Number of species | | 57 | 47 |

**Note:** In = Inside the Isles of St Francis SZ, Out = outside a SZ. Commercially and recreationally important species are flagged with an asterisk.
**Source:** DEWNR.

**Figure F.7: Lengths (mean + standard deviation) of commercially or recreationally important fishes inside and outside of the Isles of St Francis SZ**


**Note:** That no sea sweep were measured outside the SZ.
**Source:** DEWNR.

### Preliminary observations

The Isles of St Francis SZ is comprised of a mixture of habitat types. Based upon the cover of macroalgae, reefs within the Isles of St Francis SZ can be considered to be in good condition. In addition, diver and BRUV surveys indicate complex reef and seagrass communities with relatively high abundances of some reef- and seagrass-associated species. Of particular note for the rock lobster and abalone commercial fisheries in terms of lost fishing grounds is that while the SZ may be relatively large, inventory mapping indicates that only about one third of the SZ is comprised of suitable lobster and abalone reef habitat.

Based upon the diver surveys of 2009 and 2015, lobster abundance is currently low in the SZ and it appears that post-larval settlement has not occurred for several years as only 3 lobsters were detected from 2,800 $m^2$ of total reef area searched in 2009 and no lobsters were detected from 4,000 $m^2$ of total reef area searched in 2015 (data supplied by DEWNR). Inside some Tasmanian marine reserves, lobster abundances have increased to around 10 to 20 per 200$m^2$ following protection from fishing (Barrett et al. 2009). Low abundance of lobsters in and around the St Francis Isles SZ is perhaps not unexpected as commercial catch rates have declined in the region since the late 1990's and low abundances are possibly responsible for the low level of fishing effort observed in the region in recent years (see data for MFA 8, Linnane et al. 2014). Lower rates of post-larval settlement are typical for the Northern Zone in comparison with the Southern Zone of the rock lobster fishery (Linnane et al. 2014a, b). For the Isles of St Francis SZ to show the full benefits of protection from fishing there will need to be some post-larval settlement to the west coast region (note that juvenile and adult lobsters are unlikely to enter the SZ by crawling across sand habitat from isolated reef habitats outside of the SZ (DEWNR, pers. comm., August 2015). If post-larval settlement does occur in the region, then the juvenile lobsters inside the SZ will have no fishing mortality such that over time the average size and abundance of these will become greater than outside the SZ (assuming that some level of fishing continues outside and that compliance inside the SZ is effective). Increased size and abundance of lobsters inside the SZ could result in larval export to areas outside of the SZ (Bailey et al. 2012a), thereby providing further positive environmental benefits.

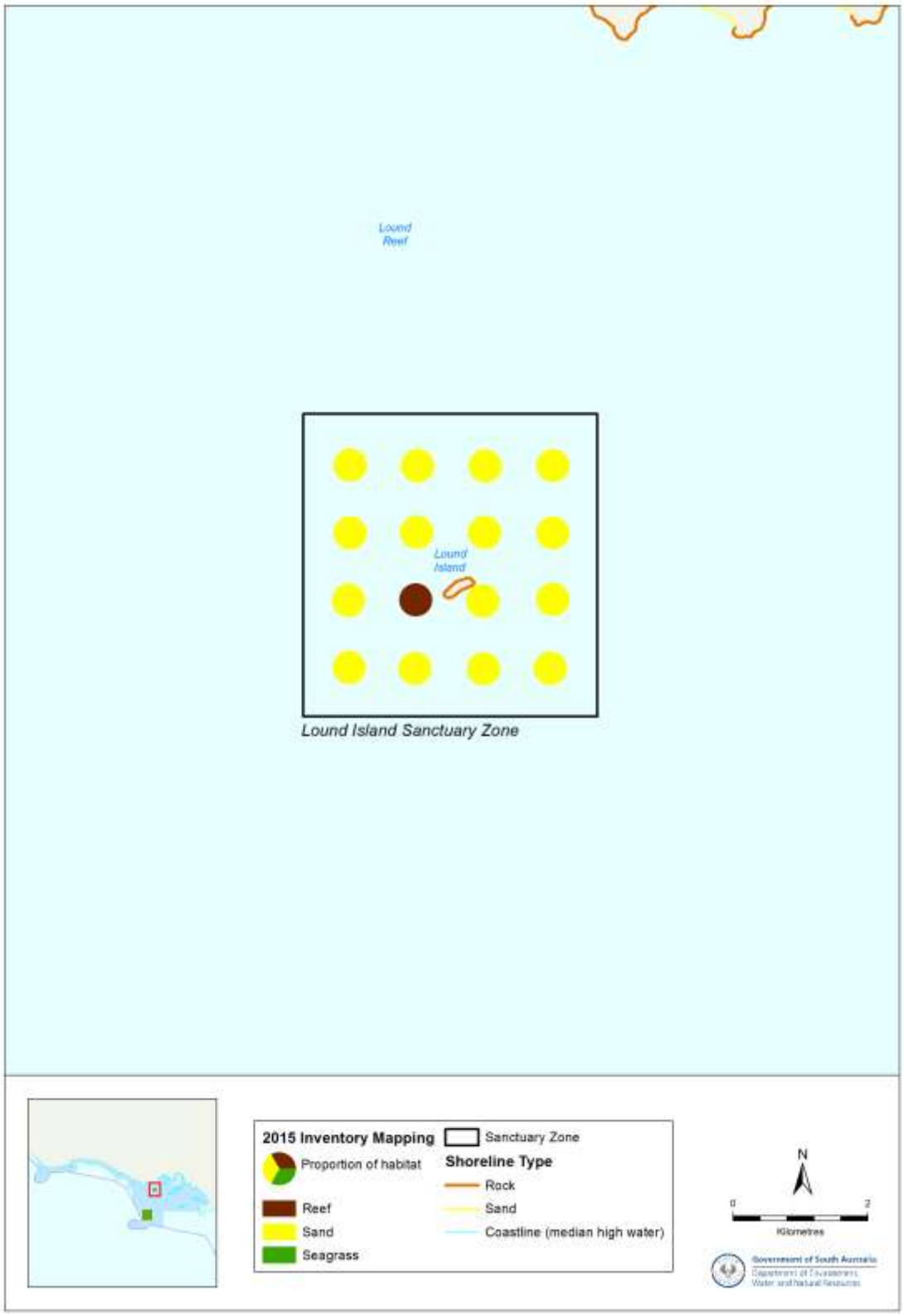
### Lound Island SZ

Inventory mapping indicates that most of the SZ is comprised of sand with a small amount of reef (Figure F.8). Of particular note for the rock lobster and abalone commercial fisheries in terms of lost fishing grounds is that very little (6 per cent) of the SZ is comprised of suitable lobster and abalone habitat. Lound Island is not currently included in the diver and BRUVS survey monitoring activities of DEWNR.

### Nuyts Reef SZ

Broad scale mapping indicates that significant areas of reef occur in the Nuyts Reef SZ (Figure F.1), however, finer scale mapping is required to verify this. At present the Nuyts Reef SZ has not been inventory mapped using video drops. Nuyts Reef is not currently included in the diver and BRUVS survey monitoring activities of DEWNR.

## Figure F.8: Inventory mapping of benthic habitats of the Lound Island Sanctuary Zone




**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 16 sites located in a 1 x 1 km grid laid across the area.
**Source:** DEWNR.

## References

Refer to Appendix H.

# Appendix G

## Environmental Indicators – Kangaroo Island

Sanctuary Zones (SZs) provide protection for habitats that in turn support various species and ecosystems. It is expected that the spatial extent and condition of these habitats will be maintained inside SZs and that this will have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). In addition, it is expected that some of the habitat-associated fishes and invertebrates will change in size and/or abundance following protection from fishing inside SZs and that this may in turn drive ecosystem changes (Bailey et al. 2012a). It is too early for any measurable ecological changes to have occurred within SZs around Kangaroo Island since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Nonetheless, it is worth presenting in the RIAS some of the baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program and to discuss preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Kangaroo Island region.

### Predicted changes after 1 October 2014

Rock lobster, greenlip abalone, and blacklip abalone, when each considered in isolation, are predicted to increase in size and abundance over the next 20 years inside the Waterfall Creek, Cape Borda, Cape du Couedic, Seal Bay, Sponge Gardens and The Pages SZs around Kangaroo Island (Bailey et al. 2012c, d, e, f). Inside those SZs, western blue groper, bight redfish, swallowtail, bluethroat wrasse, harlequin fish and sea sweep are predicted to maintain size and abundance over the next 20 years (Bailey et al. 2012 c, d, e, f). Populations of seabirds, shorebirds, marine mammals, and sharks are not predicted to change as a direct result of the SZs (Bailey et al. 2012a).

### Environmental monitoring activities

DEWNR is the lead agency responsible for monitoring environmental (and socio-economic) changes across the marine parks network. Monitoring activities are designed to test predictions of change and to assist with the assessment of the performance of the entire marine parks network (noting that all marine park management plans must be reviewed by 2022). DEWNR will therefore monitor selected SZs within the SA marine parks network in order to address the key evaluation questions that are derived from the marine park management plans and the *Marine Parks Act 2007* (DEWNR, pers. comm., August 2015) Indicators of change inside SZs include the size/abundance/diversity of fish, invertebrate and algal communities. Across the parks network, habitat mapping is also being conducted in SZs where baseline information is currently lacking. Other government agencies and non-government groups are involved in monitoring shorebirds, seabirds and marine mammals, and results from these programs will be incorporated into the DEWNR marine parks monitoring program (DEWNR, pers. comm., August 2015).

Building upon the work of Bailey et al. (2012c, d, e, f) and based upon a number of factors including the size of the SZ, life history characteristics of different species and prior level of fishing, Bryars (2013) predicted with a high level of confidence that multiple species would show a response to protection inside the Waterfall Creek, Cape Borda, Cape du Couedic, Seal Bay, Sponge Gardens and The Pages SZs. Around Kangaroo Island monitoring activities in SZs of main relevance to the RIAS have been focused on diver surveys in the Sponge Gardens, Cape Borda and The Pages SZs and Baited Remote Underwater Video System (BRUVS) surveys in the Cape du Couedic and Bay of Shoals SZs (DEWNR, pers. comm., August 2015).

### Seafloor habitats in Marine Parks around Kangaroo Island

The marine parks and SZs around Kangaroo Island have been mapped to varying degrees (Table G.1). About 22 per cent of the seafloor (or benthic) habitats of the Southern Spencer Gulf Marine Park has been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (DEWNR 2015a, b, Miller et al. 2009). However, this does not include any of the area around Kangaroo Island. About 12 per cent of the Southern Spencer Gulf Marine Park, including the north coast of KI, has been mapped at a broad scale (1:100,000) using satellite imagery (DEWNR 2015c, Edyvane 1999a, b, Figure G.1). About 17 per cent and 29 per cent of the benthic habitats of the Western Kangaroo Island Marine Park and Southern Kangaroo Island Marine Park, respectively, have been mapped at a broad scale (Figure G.2 and G.3). About 14 per cent of the benthic habitats of the Encounter Marine Park have been mapped at a fine scale, but around KI this includes only Pelican Lagoon (Figure G.4). An additional 10 per cent has been mapped at a broad scale, and the deep sea sponge communities in Backstairs Passage have also been mapped using acoustic mapping and video (Figure G.4). Between 65 per cent and 83 per cent of the four marine parks around KI are not mapped.

**Table G.1: Benthic habitat mapping in marine parks around Kangaroo Island**

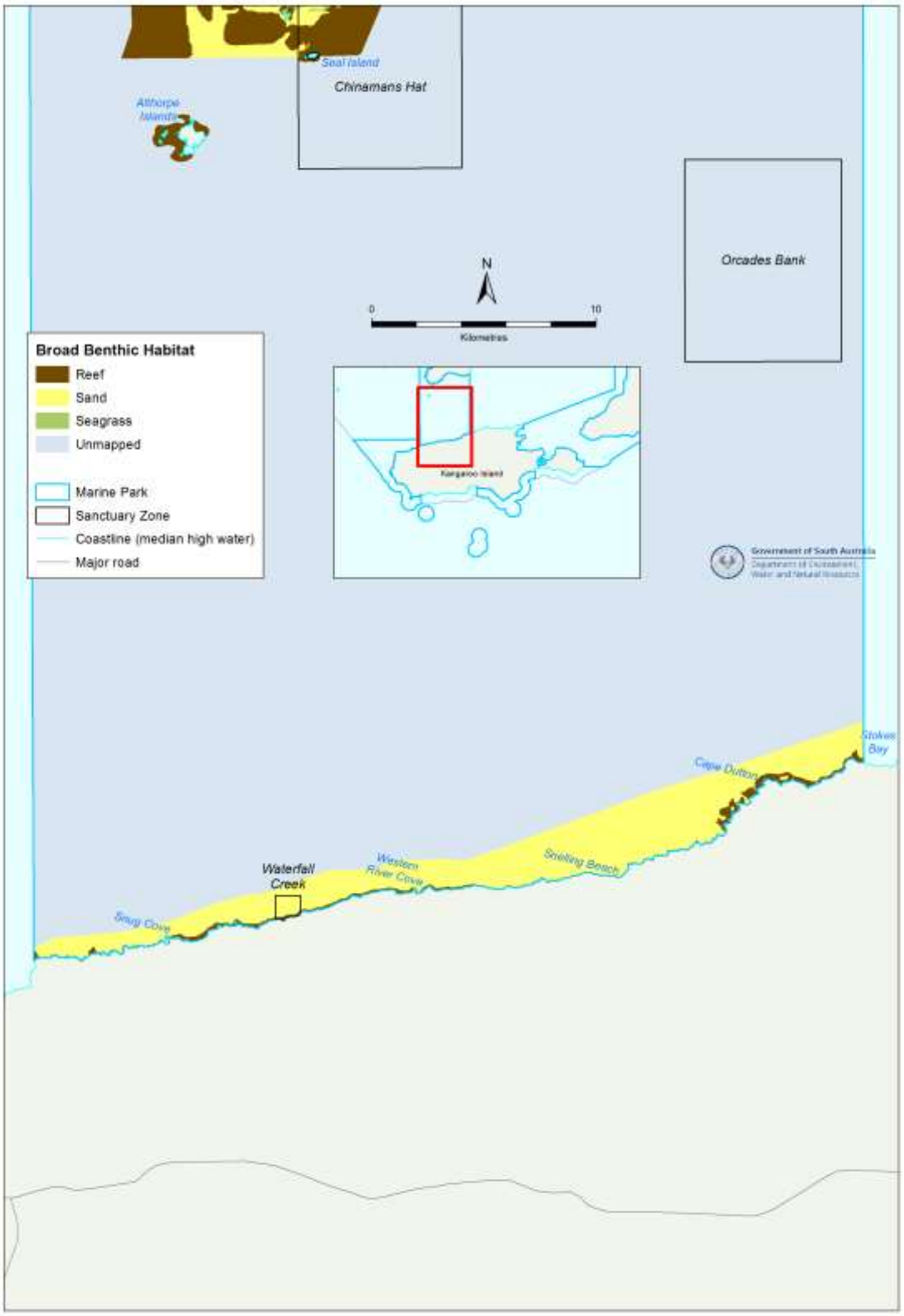
| Marine Park | Fine scale (per cent) | Broad scale (per cent) | Not mapped | SZ mapping |
|---|---|---|---|---|
| Southern SG | 22 (0 on KI) | 12 | 66 | Broad scale (Waterfall Creek) |
| Western KI | 0 | 17 | 83 | Broad scale (Cape Borda and Cape du Couedic), inventory mapping (Cape du Couedic) |
| Southern KI | 0 | 29 | 71 | Broad scale (Seal Bay) |
| Encounter | 14 (0.5 on KI) | 21 | 65 | Fine scale (Pelican Lagoon), broad scale (Sponge Gardens, Bay of Shoals), inventory (Bay of Shoals) |

**Source:** DEWNR.

The Pelican Lagoon SZ has been well mapped and includes saltmarsh, seagrass and sand habitats (Figure G.4). The broad scale mapping of the Waterfall Creek, Cape Borda, Cape du Couedic, Seal Bay and Sponge Gardens and Bay of Shoals SZs (Figures G.1, G.2, G.3 and G.4). Figure G.3 is less reliable, and The Pages SZ has not been mapped using either the broad or fine scale methods.

Additional 'inventory mapping' was undertaken at the Cape du Couedic, Sponge Gardens, The Pages (all in 2015) and Bay of Shoals SZs (in 2013) to improve our understanding of what habitats they protect (DEWNR, pers. comm., August 2015).

**Figure G.1: Benthic habitats of the Southern Spencer Gulf Marine Park with focus on marine park SZs adjacent to Kangaroo Island**

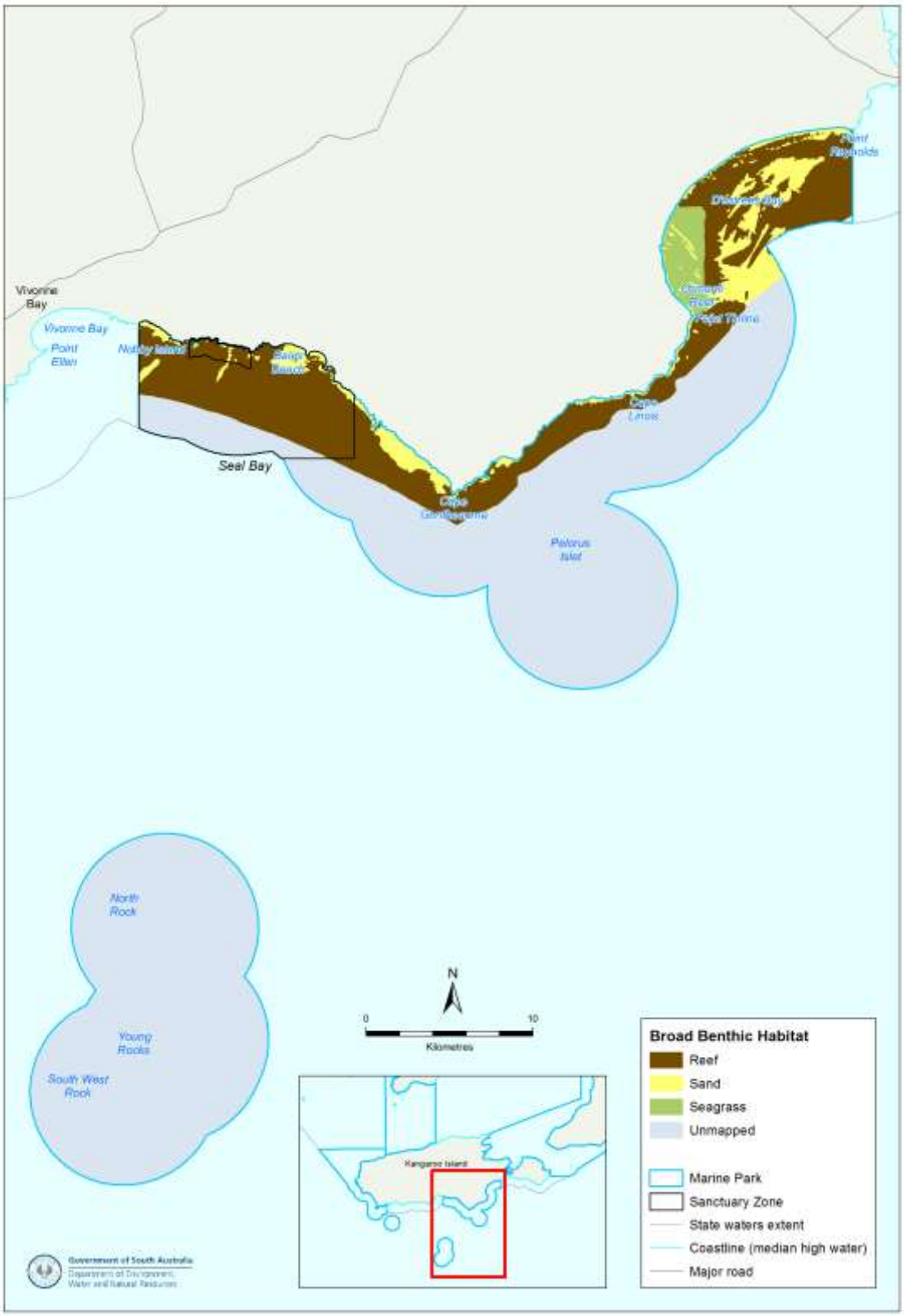



**Source:** DEWNR.

**Figure G.2: Benthic habitats of the Western Kangaroo Island Marine Park with marine park SZs**

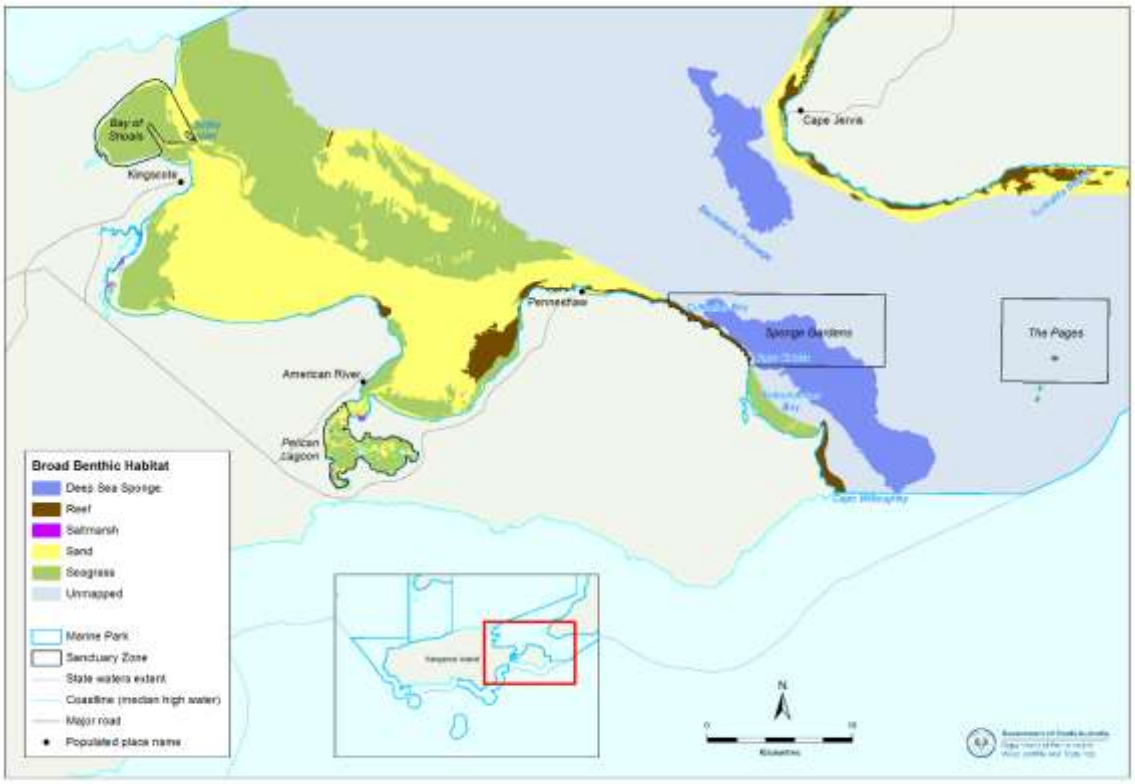

**Source:** DEWNR.

**Figure G.3: Benthic habitats of the Southern Kangaroo Island Marine Park with marine park SZs**




**Source:** DEWNR.

**Figure G.4: Benthic habitats of the Encounter Marine Park with focus on marine park SZs adjacent to Kangaroo Island**




**Source:** DEWNR.

## Cape du Couedic SZ

### Benthic habitats

Broad-scale mapping of the Cape du Couedic SZ suggests that the seafloor is dominated by reef, with some areas of sand to the north-west and north-east of the zone (Figure G.2). This was confirmed by the inventory mapping, for which 76 per cent of the sampled area was reef, and the remainder was sand in similar areas to those indicated by the broad-scale mapping (Figure G.5).

### BRUVS surveys

Fish diversity and abundance were surveyed using baited remote underwater video systems (see Cappo et al. 2003) at 4 sites inside the Cape du Couedic SZ during March 2015 (note that there were no sites outside the SZ). Across the 4 sites, usable video was obtained from 16 replicates, all located over reef. A total of 37 species were recorded during the surveys, of which 11 are considered to be of commercial or recreational importance, including yellowtail kingfish, Australian salmon, sea sweep, bight redfish, swallowtail, queen snapper and western blue groper. The most abundant species were barber perch and Australian salmon (DEWNR, pers. comm., August 2015). Figure G.6 shows the lengths of 8 commercially and recreationally important species.

### Preliminary observations

Most of the SZ is comprised of reef which is suitable habitat for rock lobster and abalone and therefore those commercial fishing sectors have lost some fishing grounds. However, catch rate data do not indicate that the reef inside the SZ was any more productive for lobster fishing than reef outside the SZ (see Section 8.4, note that equivalent data for abalone were unavailable).

BRUVS surveys indicate diverse reef fish communities including a number of commercial species. Length data suggest that fishing pressure has been relatively low as many of the site-attached fished species (viz. western blue groper, bight redfish, swallowtail, bluethroat wrasse, and sea sweep) were

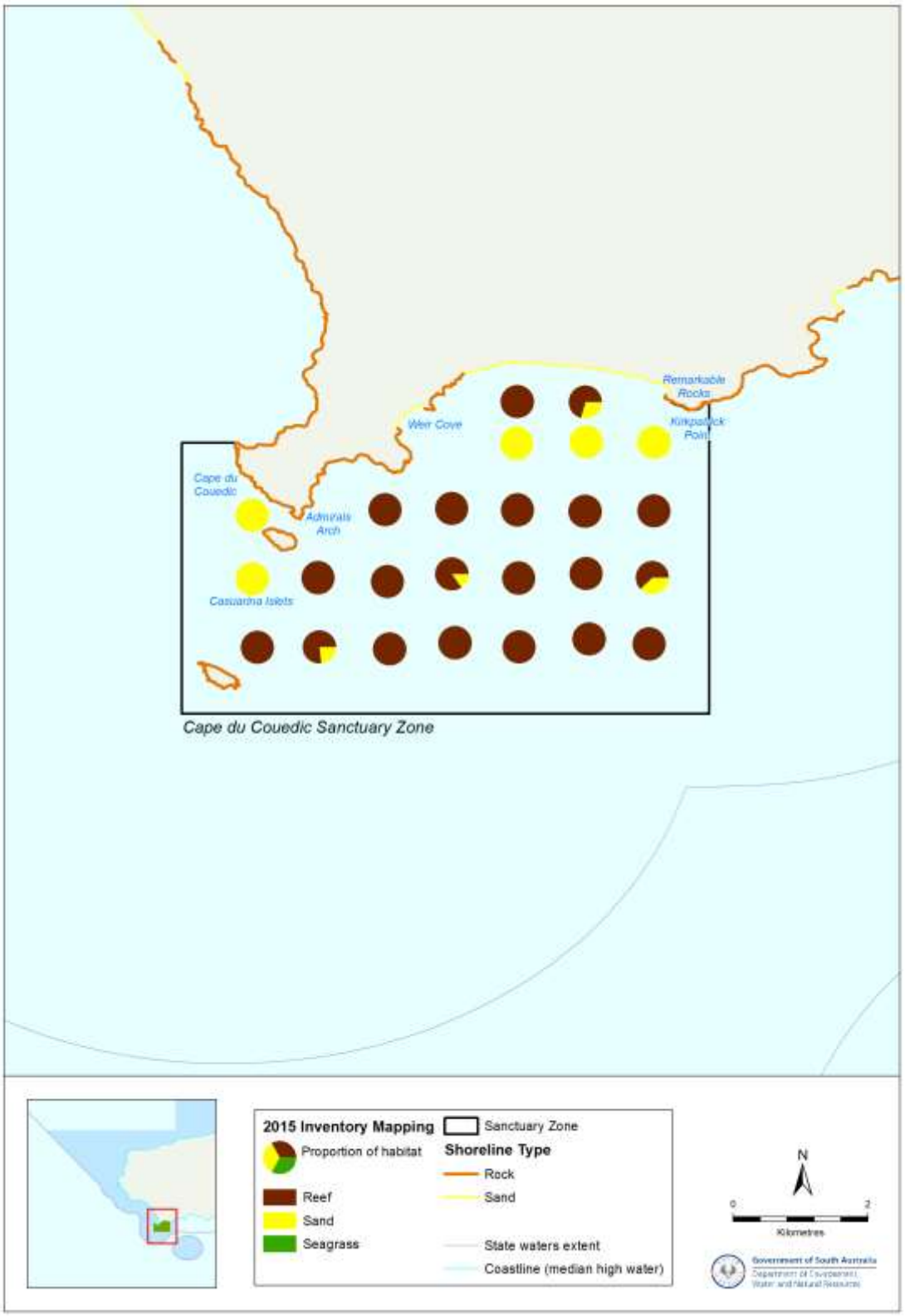
relatively large (DEWNR, pers. comm., August 2015). It is predicted that these species will maintain their size and abundance under protection inside the SZ (Bailey et al. 2012e).

**Table G.2: Species recorded during baited remote underwater video station surveys in the Cape du Couedic Sanctuary Zone**

| Scientific name | Common name |
|---|---|
| *Achoerodus gouldii* | Western blue groper * |
| *Arripis truttaceus* | Australian salmon * |
| *Austrolabrus maculatus* | Black-spotted wrasse |
| *Caesioperca rasor* | Barber perch |
| *Centroberyx gerrardi* | Bight redfish * |
| *Centroberyx lineatus* | Swallowtail * |
| *Cheilodactylus nigripes* | Magpie perch |
| *Dasyatis brevicaudata* | Smooth ray |
| *Dinolestes lewini* | Long-fin pike |
| *Girella zebra* | Zebra fish |
| *Gymnothorax prasinus* | Green moray |
| *Heteroscarus acroptilus* | Rainbow cale |
| *Jasus edwardsii* | Southern rock lobster * |
| *Lotella rhacina* | Large-tooth beardie |
| *Meuschenia flavolineata* | Yellow-striped leatherjacket |
| *Meuschenia freycineti* | Six-spine leatherjacket |
| *Meuschenia galii* | Blue-lined leatherjacket |
| *Meuschenia hippocrepis* | Horseshoe leatherjacket |
| *Meuschenia venusta* | Stars and stripes leatherjacket |
| *Mustelus antarcticus* | Gummy shark * |
| *Myliobatis tenuicaudatus* | Eagle ray |
| *Nemadactylus valenciennesi* | Queen snapper * |
| *Notolabrus parilus* | Brown-spotted wrasse |
| *Notolabrus tetricus* | Bluethroat wrasse * |
| *Olisthops cyanomelas* | Herring cale |
| *Parascyllium variolatum* | Varied catshark |
| *Pempheris klunzingeri* | Rough bullseye |
| *Pempheris multiradiata* | Big-scale bullseye |
| *Pempheris* sp. | Bullseye |
| *Pictilabrus laticlavius* | Senator wrasse |
| *Pseudocaranx sp* | Trevally * |
| *Pseudolabrus rubicundus* | Rosy wrasse |
| *Pseudophycis barbata* | Southern bastard codling |
| *Scorpis aequipinnis* | Sea sweep * |
| *Seriola lalandi* | Yellowtail kingfish * |
| *Tilodon sexfasciatus* | Moonlighter |
| *Trachurus novaezelandiae* | Yellowtail scad |
| **Number of species** | **37** |

**Note:** Commercially and recreationally important species are flagged with an asterisk.
**Source:** DEWNR.

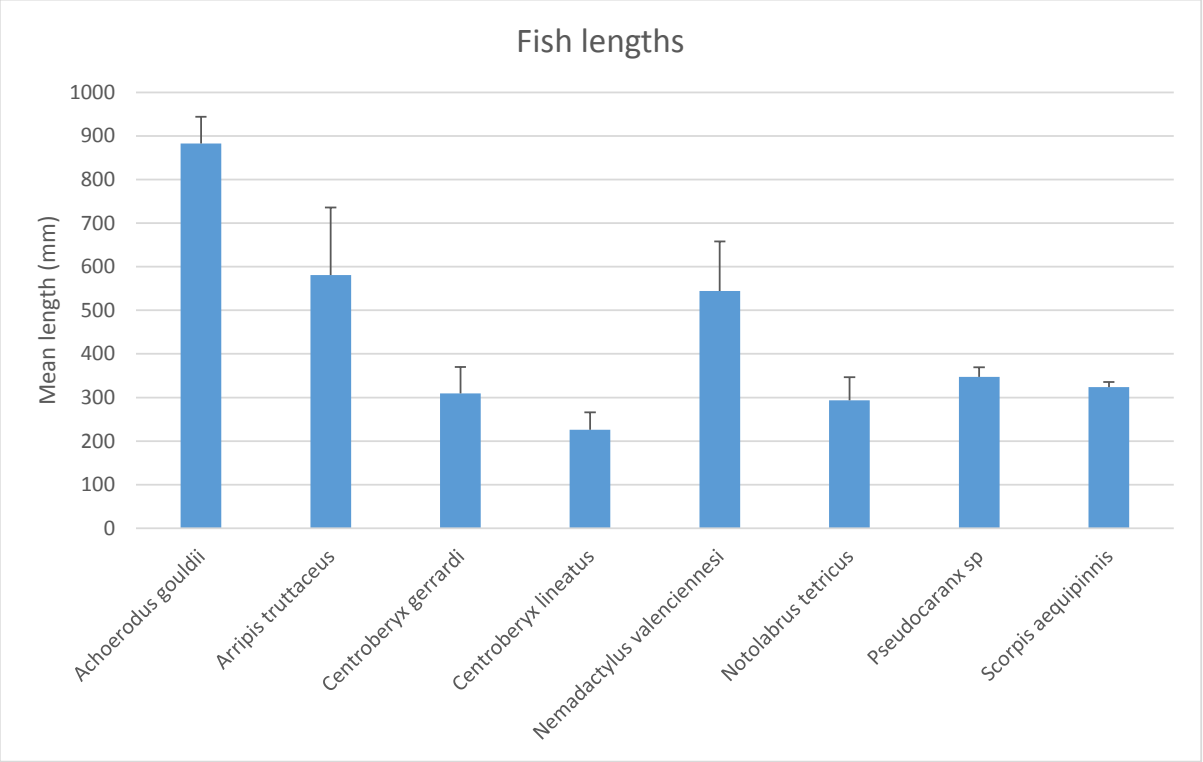
## Figure G.5: Inventory mapping of benthic habitats of the Cape du Couedic Sanctuary Zone




**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 25 sites located in a 1 x 1 km grid laid across the area.

**Source:** DEWNR.

**Figure G.6: Lengths (mean + standard deviation) of eight commercially and recreationally important fishes in the Cape du Couedic Sanctuary Zone**




**Source:** Data derived from BRUVS surveys. DEWNR.

## Sponge Gardens SZ

### Benthic habitats

Broad-scale mapping of the Sponge Gardens SZ indicates a narrow band of coastal reef (about 3 per cent of the zone) with sponge habitat in adjacent deeper water (41 per cent). The inventory mapping (Figure G.7) shows that the benthic habitat is dominated by sand (81 per cent), including the sponge habitats identified by the broad-scale mapping, i.e. the substrate underlying the sponge gardens is predominantly sand, even if the sponges are attached to hard substrate below the sand. There are isolated patches of offshore reef (totalling 18 per cent), mainly outside the areas identified as sponge habitat, and a small area (1.5 per cent) of seagrass just offshore from the coastal reef at Snapper Point.

### *Diver surveys on reef habitat*

Fish, invertebrate and macroalgal diversity and abundance were surveyed by divers at 10 sites (5 inside the Sponge Gardens SZ) at depths of 5 or 10 metres during 2005-2007 and 2012 (DEWNR and the University of Tasmania unpublished data, (Figure G.8). Sites were surveyed using the 'Marine Protected Area' technique (see Edgar and Barrett 1999). About 80 fish species, 50 invertebrate species and 170 macroalgal and sessile invertebrate species were recorded during the surveys (DEWNR, pers. comm., August 2015).

The most abundant macroalgae recorded during the dive surveys were crustose corallines, the kelp *Ecklonia radiata* and the large brown algae *Cystophora monilifera, Scytothalia dorycarpa* and *Seirococcus axillaris*. The most common mobile invertebrates were the feather star *Comanthus trichoptera*, the purple urchin *Heliocidaris erythrogramma,* the sea cucumber *Australostichopus mollis,* the velvet star *Petricia vernicina* and blacklip abalone *Haliotis rubra*. The most common fish were smaller, schooling species including the yellow-headed hulafish *Trachinops noarlungae,* slender bullseye *Parapriacanthus elongates* and pencil weed whiting *Siphonognathus beddomei,* as well as common bullseye *Pempheris multiradiata*, sea sweep *Scorpis aequipinnis*, bluethroat wrasse *Notolabrus tetricus*, zebra fish *Girella zebra* and Australian salmon (DEWNR, pers. comm., August 2015).

Figure G.9 shows baseline abundance data for 6 species that are predicted to increase or maintain abundance inside the SZ following protection from fishing. Ongoing monitoring will enable these predictions to be tested.

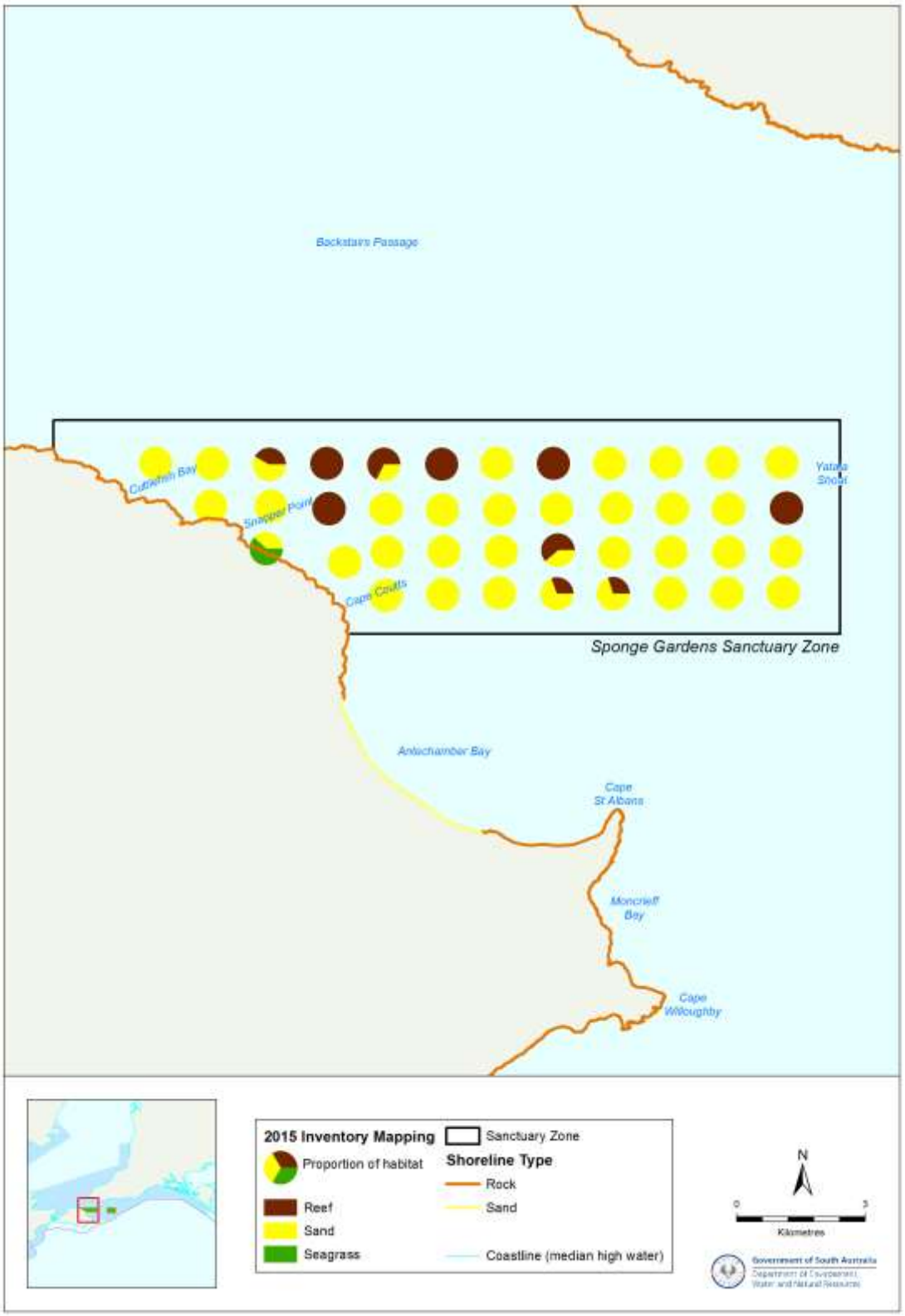
The cover of canopy-forming macroalgae is an important indicator of subtidal reef condition in South Australia (Cheshire et al. 1998, Cheshire and Westphalen 2000, Turner et al. 2007, Collings et al. 2008, Gaylard et al. 2013, Brook and Bryars 2014). The macroalgal data recorded during 2009 (DEWNR and the University of Tasmania unpublished data, Figure G.7) were used to calculate condition of subtidal reefs in or near the Sponge Gardens SZ following the methods of Brook and Bryars (2014). Reefs inside the Sponge Gardens SZ were above the threshold of 60 per cent for reefs in 'good' condition, while those outside were collectively below this threshold and their condition was therefore classified as 'caution' (Figure G.10).

***Preliminary observations***

The Sponge Gardens SZ is comprised mainly of sand habitat that supports invertebrate communities including sponges. Of particular note for the rock lobster and abalone commercial fisheries in terms of lost fishing grounds is that while the SZ may be relatively large, apart from the coastal reef there is relatively little reef habitat in the SZ (18 per cent) that would be suitable for rock lobster or abalone. The tracking work of Bryars et al. (2012a) showed that the narrow band of coastal reef provides a permanent home for the harlequin fish *Othos dentex*; this species is predicted to benefit from protection inside the SZ (Bailey et al. 2012d).

Based upon the cover of macroalgae, reefs within the Sponge Gardens SZ can be considered to be in good condition. In addition, diver surveys indicate complex reef communities with relatively high abundances of some reef-associated species (DEWNR, pers. comm., August 2015). As with some other SZs across the network, the abundance of rock lobster is low (see Section 7.5 for Isles of St Francis SZ), but it is expected that abundance (and size) will increase over time under protection inside the SZ (Bailey et al. 2012d).

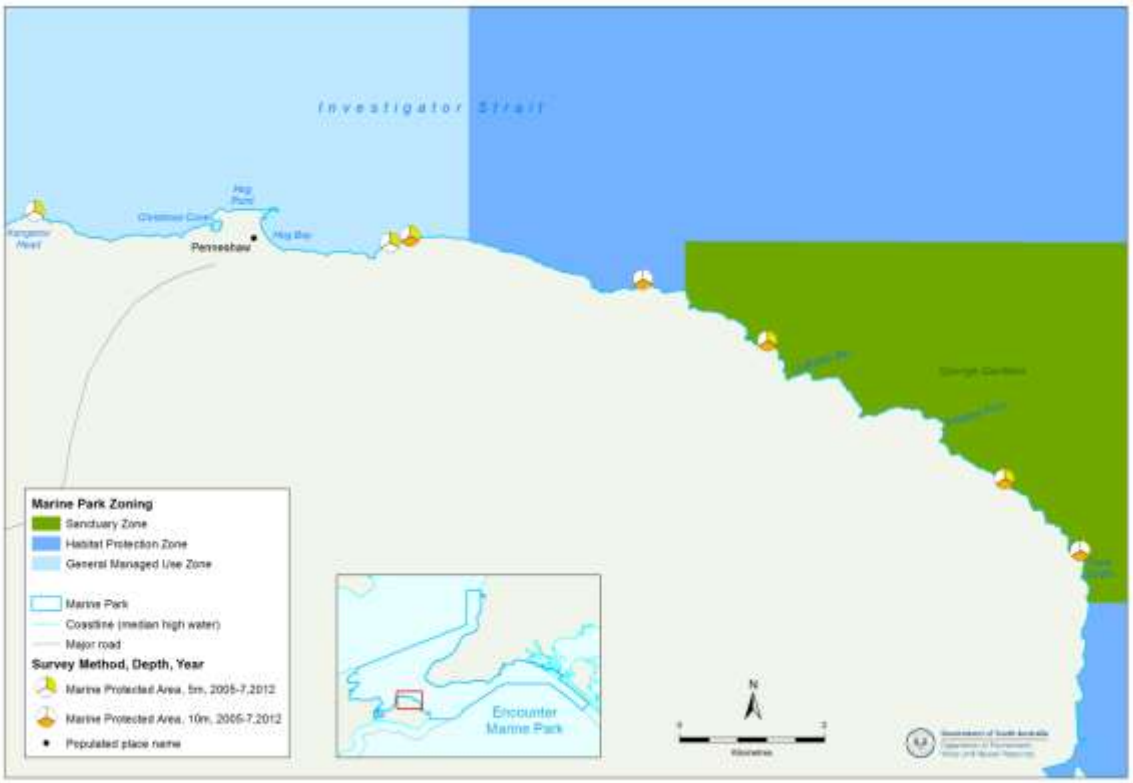
## Figure G.7: Inventory mapping of benthic habitats of the Sponge Gardens Sanctuary Zone




**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 41 sites located in a 1 x 1 km grid laid across the area.

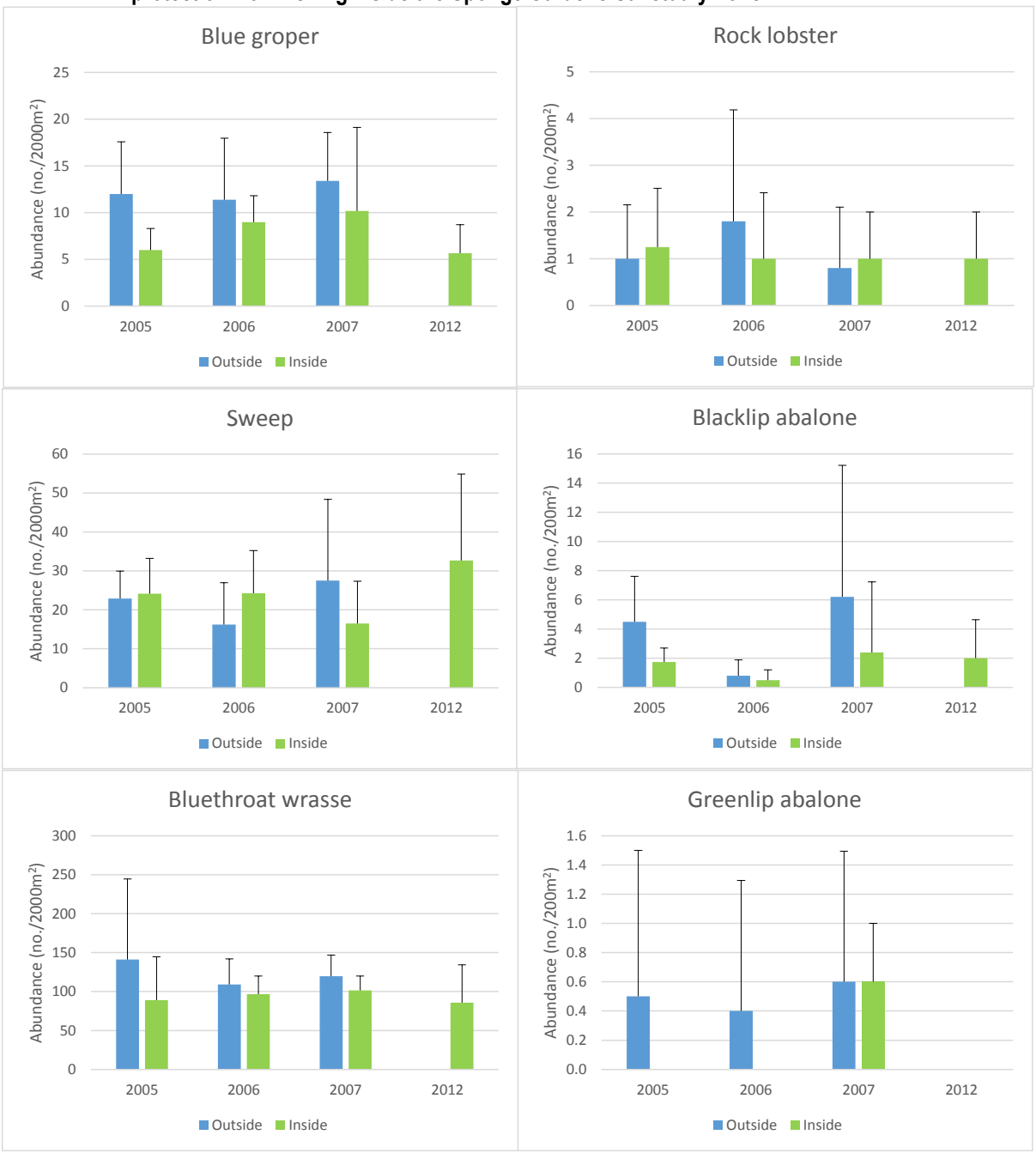
**Source:** DEWNR.

**Figure G.8: Location of diver survey sites inside and outside of the Sponge Gardens Sanctuary Zone**



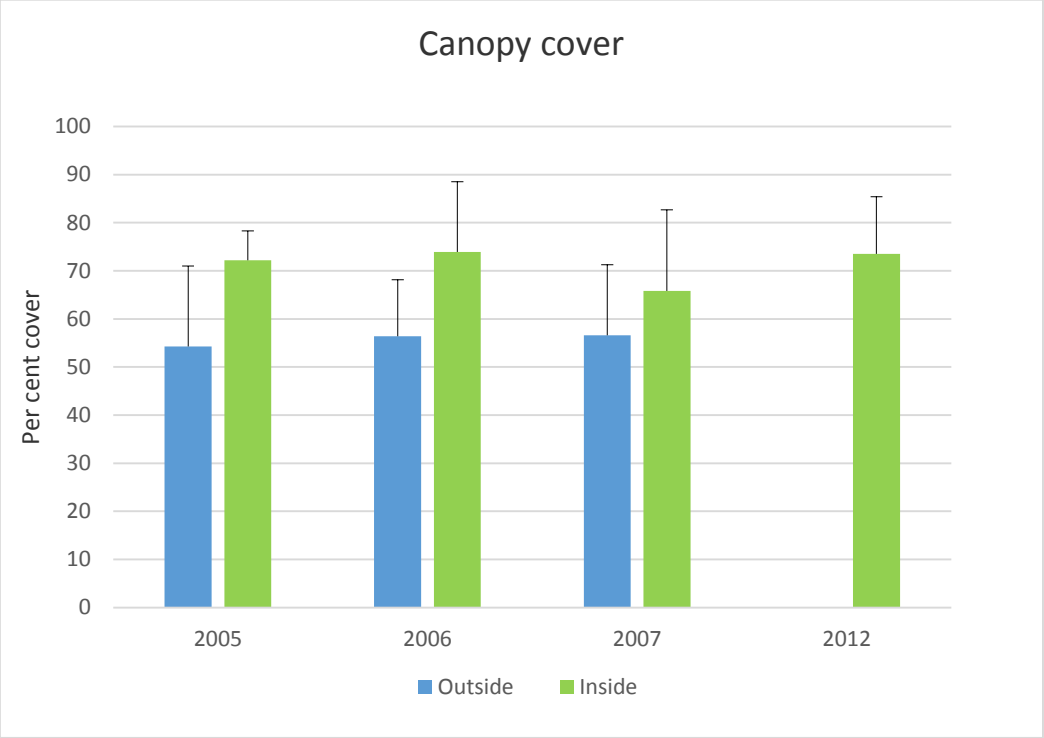

**Source**: DEWNR.

**Figure G.9: Abundance (mean + standard deviation) of selected species that are predicted to respond to protection from fishing inside the Sponge Gardens Sanctuary Zone[a]**




**Note:** a Data derived from dive surveys. No data for Outside sites in 2012.
**Source:** DEWNR.

**Figure G.10: Per cent canopy cover (mean + standard deviation) of subtidal reefs surveyed during 2005-2007 and in 2012[a]**




**Note:** a There are no data for Outside sites in 2012. Canopy cover estimates were derived from unpublished DEWNR/University of Tasmania data following the method described by Brook and Bryars (2014). Reefs with a canopy cover greater than 60 per cent are considered to be in 'good' condition (Turner et al. 2007).

**Source:** DEWNR.

## The Pages SZ

### *Benthic habitats*

Broad-scale mapping of The Pages SZ indicates only a narrow band of reef around the islands (about 0.2 per cent of the zone), with the rest unmapped. The inventory mapping (Figure G.11) shows that the previously unmapped area comprises reef (51 per cent of transect area) and sand (49 per cent). The reef areas are mainly to the north-east of North Pages Island.

### *Diver surveys on reef habitat*

Surveys of fish, mobile invertebrates and macroalgae were undertaken in 2007 using the 'Marine Protected Area' survey technique (Edgar and Barrett 1999) at a single site inside and outside The Pages SZ. About 20 fish species, 15 invertebrate species and 50 macroalgal species were recorded during the surveys. The most abundant macroalgae recorded during the dive surveys were crustose corallines, the kelp *Ecklonia radiata* and the large brown algae *Acrocarpia paniculata* and *Xiphophora chondrophylla*. The most common mobile invertebrates were blacklip and greenlip abalone and the gastropods *Turbo torquatus* and *Turbo undulatus*. The most common fish were bluethroat wrasse, sea sweep, magpie perch *Cheilodactylus nigripes,* senator wrasse *Pictilabrus laticlavius* and zebra fish *Girella zebra* (DEWNR, pers. comm., August 2015).

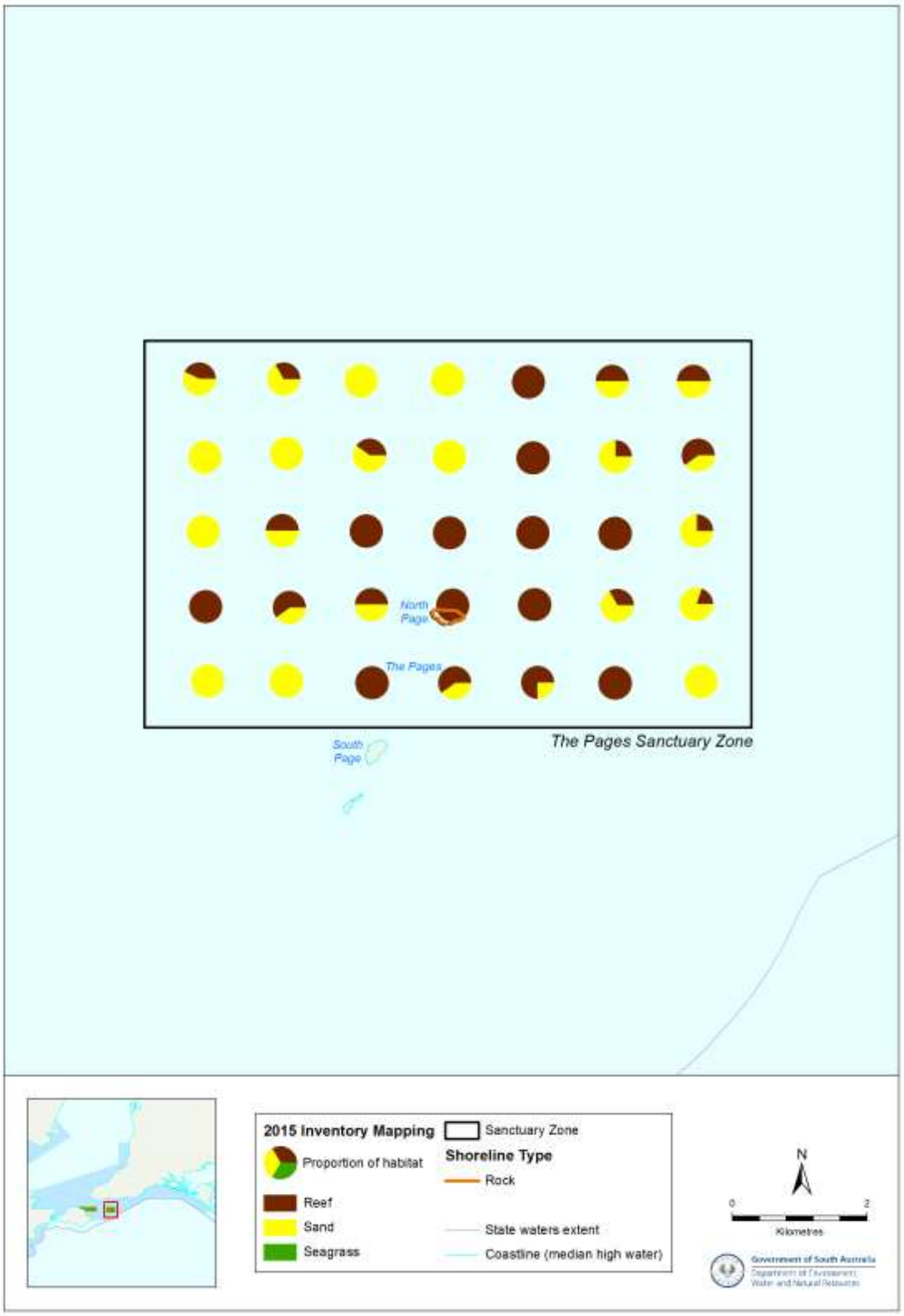
Reefs inside and outside (but nearby) The Pages SZ had canopy cover of 57 and 58 per cent, respectively, and therefore have a condition status of 'caution' (see Sponge Gardens SZ section).

### *Preliminary observations*

Around half of the SZ is comprised of reef which is suitable habitat for rock lobster and abalone and therefore those commercial fishing sectors have lost some fishing grounds. However, catch rate data do not indicate that the reef inside the SZ was any more productive for lobster fishing than reef outside the SZ (see Section 8.4, note that equivalent data for abalone were unavailable).

Diver surveys indicate complex reef communities with relatively high abundances of some reef-associated species (DEWNR, pers. comm., August 2015).

**Figure G.11: Inventory mapping of benthic habitats of The Pages Sanctuary Zone**




**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 35 sites located in a 1 x 1 km grid laid across the area.
**Source:** DEWNR.

## Cape Borda SZ

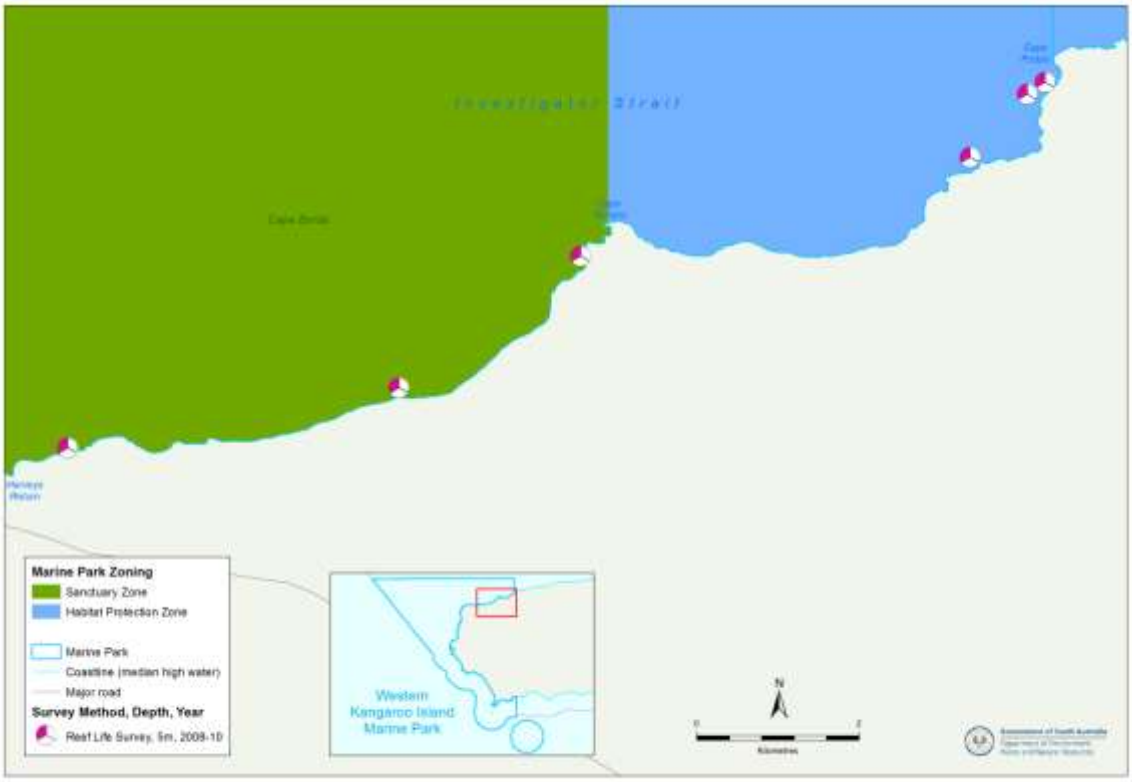
### *Benthic habitats*

Broad benthic mapping indicates a narrow band of coastal reef with sand habitat in adjacent deeper water. There is currently no inventory map available for the Cape Borda SZ.

### *Diver surveys on reef habitat*

Surveys of fish, mobile invertebrates and macroalgae were undertaken between 2008 and 2010 at 21 sites along the north coast of Kangaroo Island, using the Reef Life Survey method (Reef Life Survey 2013). The western-most 3 of these sites are within the Cape Borda SZ and another 3 adjacent and comparable sites are within the Western Kangaroo Island Marine Park (Figure G.12). The most common mobile invertebrates were the gastropod *Turbo torquatus*, the feather star *Comanthus trichoptera*, the purple urchin *Heliocidaris erythrogramma* and the velvet star *Petricia vernicina*. The most common fish were bluethroat wrasse, sea sweep, magpie perch *Cheilodactylus nigripes,* herring cale *Olisthops cyanomelas,* zebra fish *Girella zebra* and Australian herring (DEWNR, pers. comm., August 2015).

**Figure G.12: Location of diver survey sites inside and outside of the Cape Borda Sanctuary Zone**



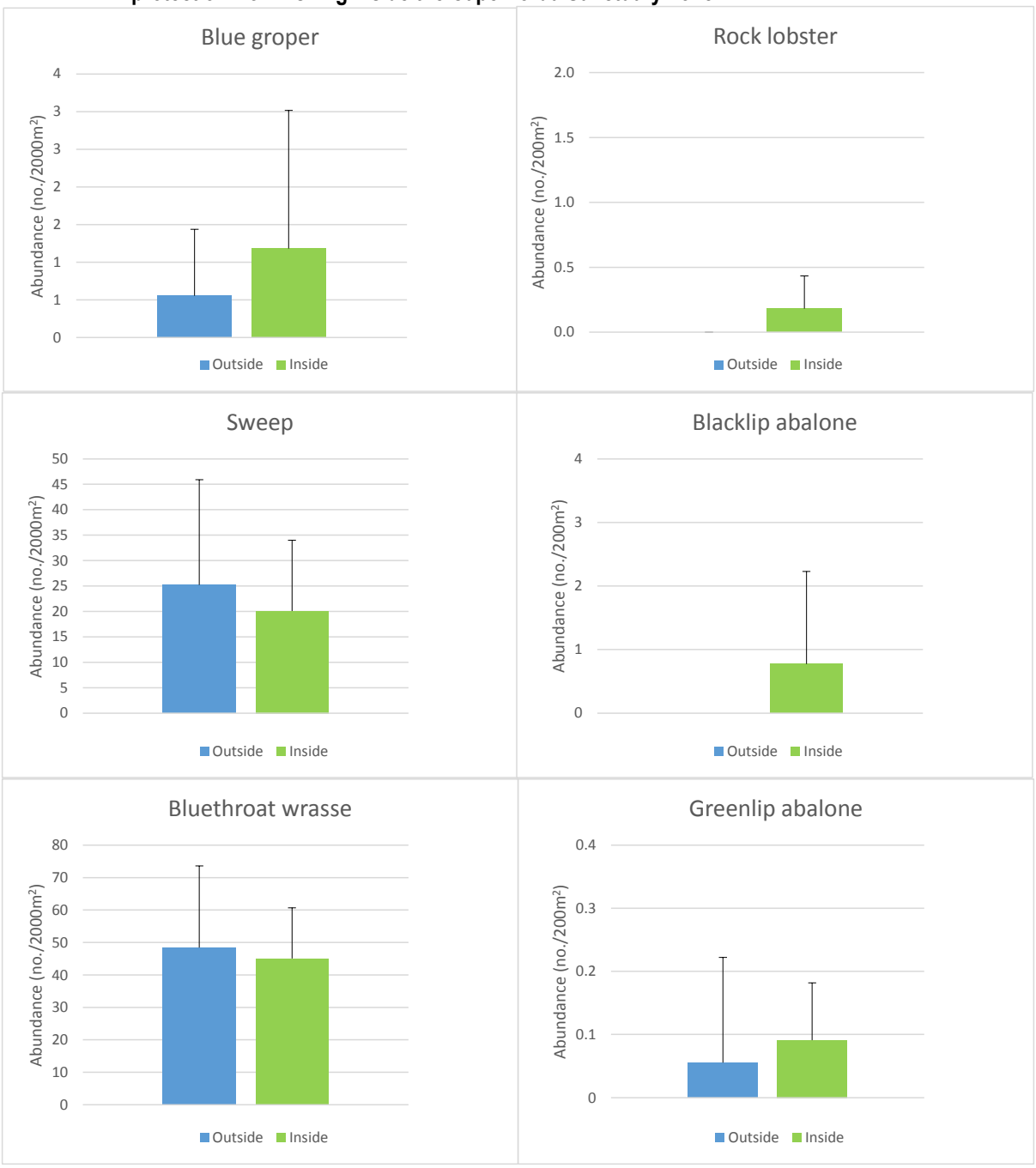

**Source:** DEWNR.

Figure G.13 shows baseline abundance data from the 6 sites (3 inside, 3 outside) for 6 species that are predicted to increase or maintain abundance inside the SZ following protection from fishing. Ongoing monitoring will enable these predictions to be tested.

### Preliminary observations

Broad scale mapping indicates that the Cape Borda SZ is comprised mainly of sand. Of particular note for the rock lobster and abalone commercial fisheries in terms of lost fishing grounds is that while the SZ may be relatively large, only a thin coastal strip is comprised of suitable lobster and abalone reef habitat. The tracking work of Bryars et al. (2012b) showed that the band of coastal reef at Harveys Return inside the SZ provides a permanent home for western blue groper; this species is predicted to benefit from protection inside the SZ (Bailey et al. 2012e).

**Figure G.13: Abundance (mean + standard deviation) of selected species that are predicted to respond to protection from fishing inside the Cape Borda Sanctuary Zone**




**Source:** Data derived from dive surveys 2008-10. DEWNR.

Diver surveys indicate complex reef communities with relatively high abundances of some reef-associated species. As with some other SZs across the network, the abundance of rock lobster is low (see Section 7.5 for Isles of St Francis SZ), but it is expected that abundance (and size) will increase over time under protection inside the SZ (Bailey et al. 2012d).

## Bay of Shoals SZ

### Benthic habitats

Broad-scale mapping of the Bay of Shoals SZ suggests that the seafloor is dominated by seagrass (Figure G.4). This was confirmed by the inventory mapping, for which 74 per cent of the sampled area was seagrass (Figure G.14).

**Figure G.14: Inventory mapping of benthic habitats of the Bay of Shoals Sanctuary Zone**


**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 61 sites located in a 0.5 x 0.5 km grid laid across the area.
**Source:** DEWNR.

## *BRUVS surveys*

Fish diversity and abundance were surveyed during two baited remote underwater video System (BRUVS) programs inside the Bay of Shoals SZ. As there are no previous BRUVS data, these data represent the baseline against which future comparisons can be made.

A total of 31 species were recorded during the surveys, of which 10 are considered to be of commercial or recreational importance, including King George whiting, Australian salmon, Australian herring, yelloweye mullet and southern sea garfish (Table G.3).

## Preliminary observations

The Bay of Shoals SZ is dominated by seagrass and many of the fishes are known to be seagrass-associated species (DEWNR, pers. comm., August 2015). Additional BRUVS surveys inside and outside the SZ will be needed to test predicted changes (see earlier).

**Table G.3: Species recorded during two BRUVS programs in the Bay of Shoals Sanctuary Zone**

| Species Name | Common name | KI | SW |
|---|---|---|---|
| *Acanthaluteres spilomelanurus* | Bridled leatherjacket | Y | Y |
| *Aldrichetta forsteri* | Yellow eye mullet * | Y | Y |
| *Aptychotrema vincentiana* | Western shovelnose ray | Y | |
| *Arripis georgianus* | Australian herring * | Y | Y |
| *Arripis spp.* | Australian salmon * | Y | Y |
| *Atherinidae* | Hardyhead | Y | Y |
| *Cyanea rosella* | Jellyfish | | Y |
| *Dasyatis brevicaudata* | Smooth stingray | Y | Y |
| *Enoplosus armatus* | Old wife | | Y |
| *Haletta semifasciata* | Blue rock whiting | Y | Y |
| *Hyporhamphus melanochir* | Southern sea garfish * | | Y |
| *Leptoichthys fistularius* | Brushtail pipefish | Y | Y |
| *Mustelus antarcticus* | Gummy shark * | Y | |
| *Myliobatis australis* | Eagle ray | Y | Y |
| *Naxia aurita* | Decorator crab | | Y |
| *Nectocarcinus integrifrons* | Red swimmer crab | | Y |
| *Neoodax balteatus* | Little rock whiting | Y | Y |
| *Paralichthyidae* | Sand flounders | | Y |
| *Pelates octolineatus* | Western striped trumpeter | Y | Y |
| *Phalacrocorax varius* | Pied cormorant | | Y |
| *Platycephalus laevigatus* | Rock flathead * | Y | |
| *Platycephalus speculator* | Yank flathead * | Y | Y |
| *Pseudocaranx spp.* | Silver/White trevally * | Y | Y |
| *Scobinichthys granulatus* | Rough leatherjacket | Y | |
| *Sillaginodes punctata* | King George whiting * | Y | Y |
| *Siphamia cephalotes* | Little siphonfish | Y | Y |
| *Sphyraena novaehollandiae* | Snook * | Y | Y |
| *Stigmatopora argus* | Spotted pipefish | Y | |
| *Trygonorrhina dumerilii* | Fiddler ray | Y | Y |
| *Unidentified fish (baitfish)* | Baitfish | Y | |
| *Urolophidae* | Stingarees | Y | Y |
| **Number of species** | | **24** | **25** |

**Note:** KI = data extracted from Lashmar et al. (2014). SW =Whitmarsh (2012). Commercially and recreationally important species are flagged with an asterisk.
**Source:** DEWNR

## References

Refer to Appendix H.

# Appendix H

## Environmental Indicators – Port Wakefield

Sanctuary Zones (SZs) provide protection for habitats that in turn support various species and ecosystems. It is expected that the spatial extent and condition of these habitats will be maintained inside SZs and that this will have positive long-term benefits for a range of species including seabirds, shorebirds, marine mammals, sharks, fishes and invertebrates (Bailey et al. 2012a). In addition, it is expected that some of the habitat-associated fishes and invertebrates will change in size and/or abundance following protection from fishing inside SZs and that this may in turn drive ecosystem changes (Bailey et al. 2012a). It is too early for any measurable ecological changes to have occurred within SZs of the Upper Gulf St Vincent Marine Park (UGSVMP) since 1 October 2014; changes may take many years and will be reliant on a number of factors including growth and recruitment rates of different species, and the success of compliance activities that prevent illegal fishing (Bailey et al. 2012a, Edgar et al. 2014). Nonetheless, it is worth presenting in the RIAS some of the baseline data and predictions on habitats and species that are being monitored as part of the DEWNR marine parks performance program and to discuss preliminary observations that are relevant to the RIAS in terms of socio-economic and environmental impacts in the Port Wakefield region.

### Predicted changes after 1 October 2014

Blue swimmer crabs, King George whiting, southern calamary and southern sea garfish, when each considered in isolation, are predicted to increase in abundance over the next 20 years inside the Clinton Wetlands SZ, with southern calamary also predicted to increase in size. Razorfish are predicted to increase in size and abundance and yellowfin whiting are predicted to increase in abundance in the Clinton Wetlands SZ (Bailey et al. 2012g). Populations of seabirds, shorebirds, marine mammals, and sharks are not predicted to change as a direct result of the SZs (Bailey et al. 2012a).

### Environmental monitoring activities

DEWNR is the lead agency responsible for monitoring environmental (and socio-economic) changes across the marine parks network. Monitoring activities are designed to test predictions of change and to assist with the assessment of the performance of the entire marine parks network (noting that all marine park management plans must be reviewed by 2022). DEWNR will therefore monitor selected SZs within the SA marine parks network in order to address the key evaluation questions that are derived from the marine park management plans and the *Marine Parks Act 2007* (DEWNR, pers. comm., August 2015) Indicators of change inside SZs include the size/abundance/diversity of fish, invertebrate and algal communities. Across the parks network, habitat mapping is also being conducted in SZs where baseline information is currently lacking. Other government agencies and non-government groups are involved in monitoring shorebirds, seabirds and marine mammals, and results from these programs will be incorporated into the DEWNR marine parks monitoring program (DEWNR, pers. comm., August 2015).
Building upon the work of Bailey et al. (2012g) and based upon a number of factors including the size of the SZ, life history characteristics of different species and prior level of fishing, Bryars (2013) predicted that razorfish (with a high level of confidence) and 5 other fished species would show a response to protection inside the Clinton Wetlands SZ. Within the UGSVMP, monitoring activities by DEWNR, in partnership with Flinders University, have been focused on the Clinton Wetlands SZ through Baited Remote Underwater Video System (BRUVS) surveys over seagrass.

#### *Seafloor habitats in the Upper Gulf St Vincent Marine Park*

About 96 per cent of the seafloor (or benthic) habitats of the UGSVMP have been mapped at a fine scale (1:10,000), by digitising aerial photographs, field surveys (for mangrove and saltmarsh), acoustic mapping and towed camera surveys (DEWNR 2015a, b, Miller et al. 2009, Figure H.1. The unmapped area includes 57 per cent of the Offshore Ardrossan SZ. The Clinton Wetlands and Middle Spit SZs have been well mapped and are dominated by seagrass. The Clinton Wetlands SZ also has mangrove, saltmarsh, seagrass and sand habitats. Additional inventory mapping has been undertaken in the

Clinton Wetlands, Middle Spit and Offshore Ardrossan SZs to improve our understanding of what habitats are being protected in those zones (DEWNR, pers. comm., August 2015).

**Clinton Wetlands SZ**

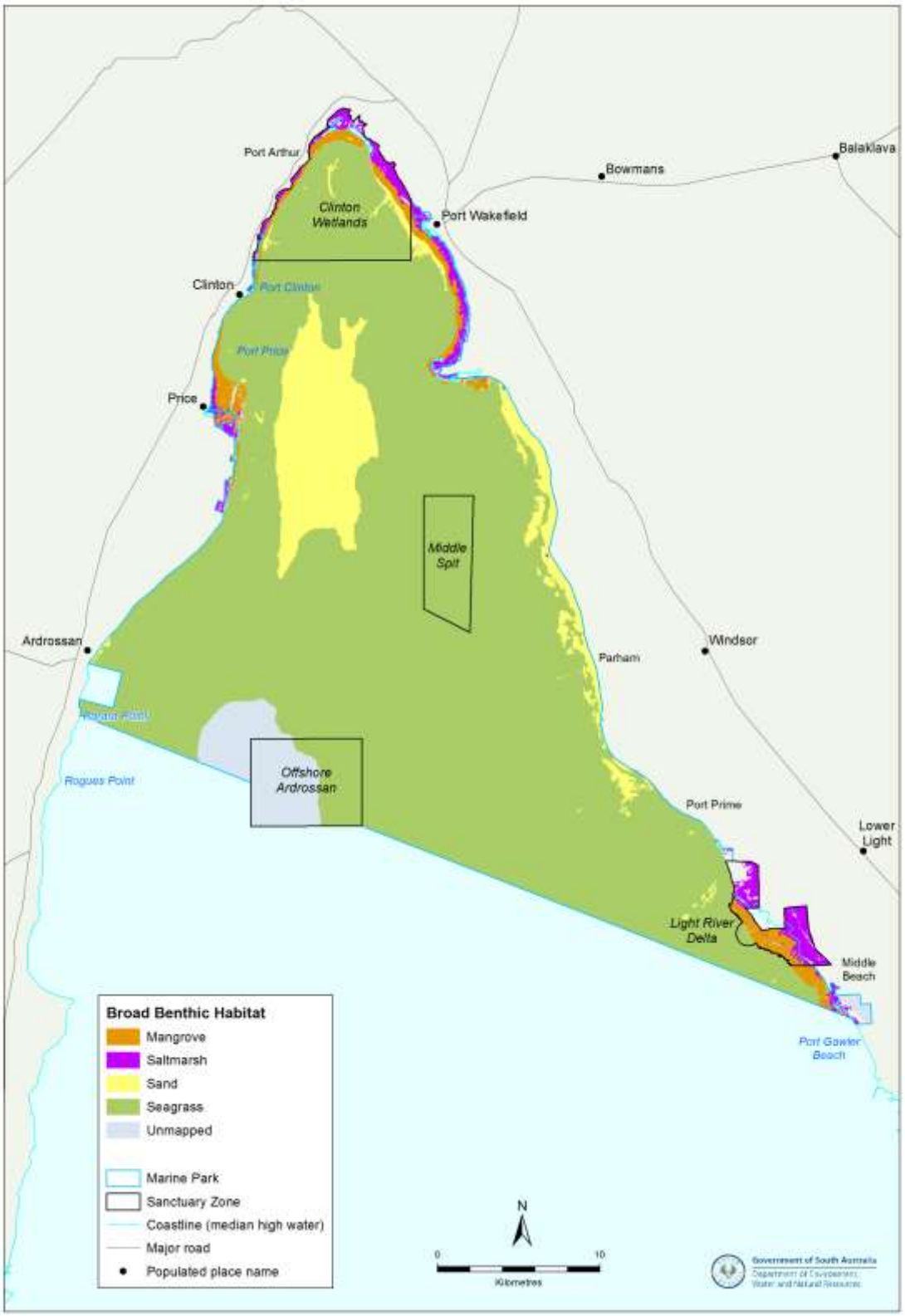
**Benthic habitats**

Fine-scale mapping of the Clinton Wetlands SZ shows that the seafloor is dominated by seagrass (Figure H.1). This was confirmed by the inventory mapping, for which 71 per cent of the sampled area was seagrass, and the rest sand (Figure H.2).

**BRUVS surveys on seagrass**

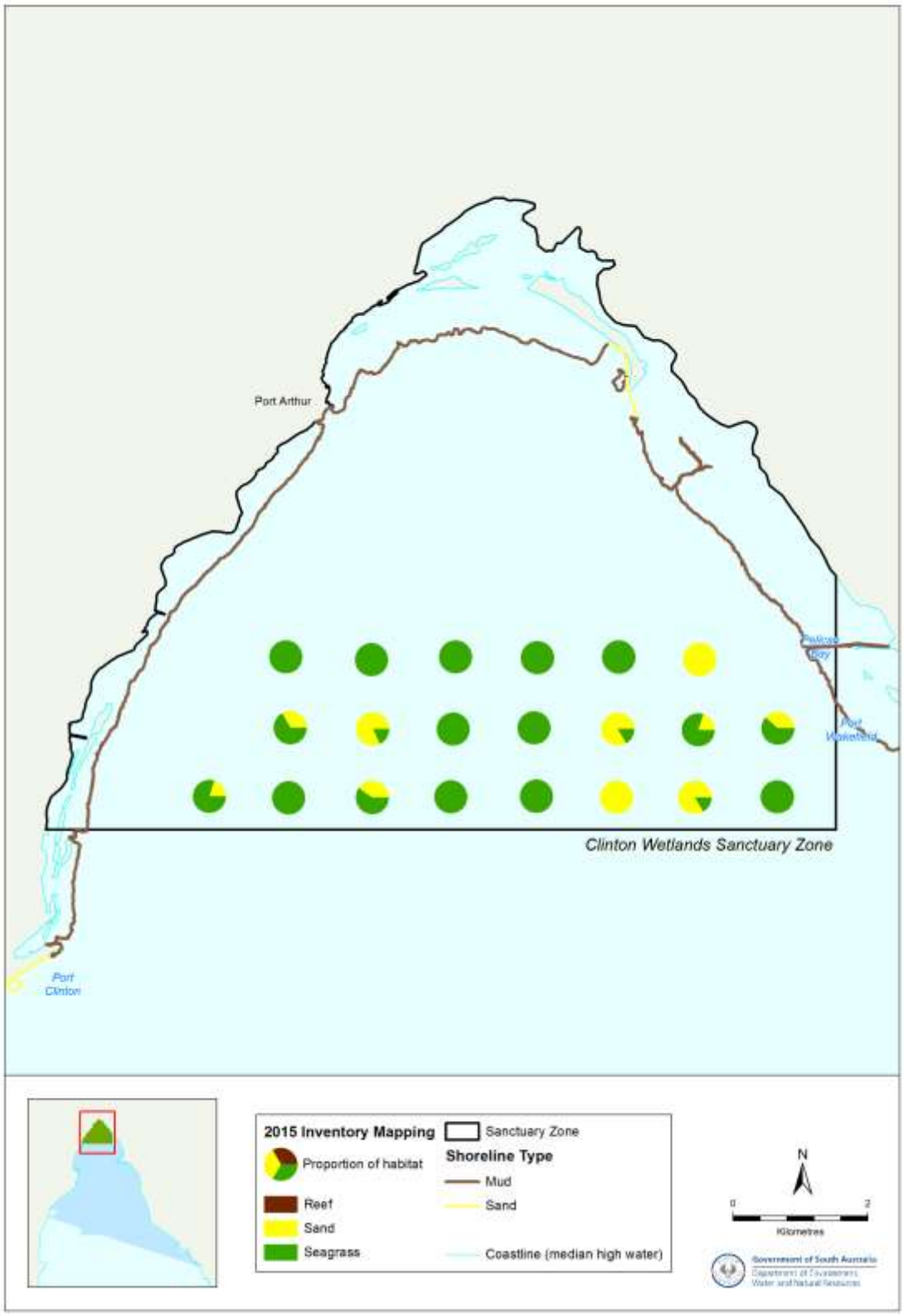
Fish diversity and abundance were surveyed using BRUVS (see Cappo et al. 2003) at 4 sites (2 inside and 2 outside the Clinton Wetlands SZ, Figure H.3) during January 2015. As there are no previous BRUVS data, these data represent the baseline against which future comparisons can be made. A total of 14 species/groups were detected (Table H.1).

## Figure H.1: Benthic habitats of the Upper Gulf St Vincent Marine Park




**Source**: DEWNR.

## Figure H.2: Inventory mapping of benthic habitats of the Clinton Wetlands Sanctuary Zone




**Note:** Pie charts display proportions of different habitats as determined from underwater video transects at 21 sites located in a 1 x 1 km grid laid across the lower part of the zone.

**Source:** DEWNR.

**Figure H.3: Location of BRUVS survey sites inside and outside of the Clinton Wetlands Sanctuary Zone**


**Source:** DEWNR.

**Table H.1: Species recorded during baited remote underwater video system surveys in the Upper Gulf St Vincent Marine Park**

| Scientific name | Common name | In | Out |
|---|---|---|---|
| *Acanthaluteres spilomelanurus* | Bridled leatherjacket | Y | Y |
| *Arripis georgianus* | Australian herring * | Y | Y |
| *Dinolestes lewini* | Long-finned pike | Y | Y |
| *Heterodontus portusjacksoni* | Port Jackson shark | Y | Y |
| *Myliobatis australis* | Eagle ray | Y | |
| *Neoodax balteatus* | Little weed whiting | Y | |
| *Ovalipes australiensis* | Sand crab * | Y | |
| *Pagrus auratus* | Snapper * | Y | Y |
| *Pelates octolineatus* | Western striped trumpeter | Y | Y |
| *Portunus armatus* | Blue swimmer crab * | Y | Y |
| *Pseudocaranx* sp | Trevally * | | Y |
| *Torquigener pleurogramma* | Weeping toadfish | Y | Y |
| *Trachurus novaezelandiae* | Yellowtail scad | Y | Y |
| *Upeneichthys vlamingii* | Blue-spotted goatfish | Y | Y |
| Number of species | | 13 | 11 |

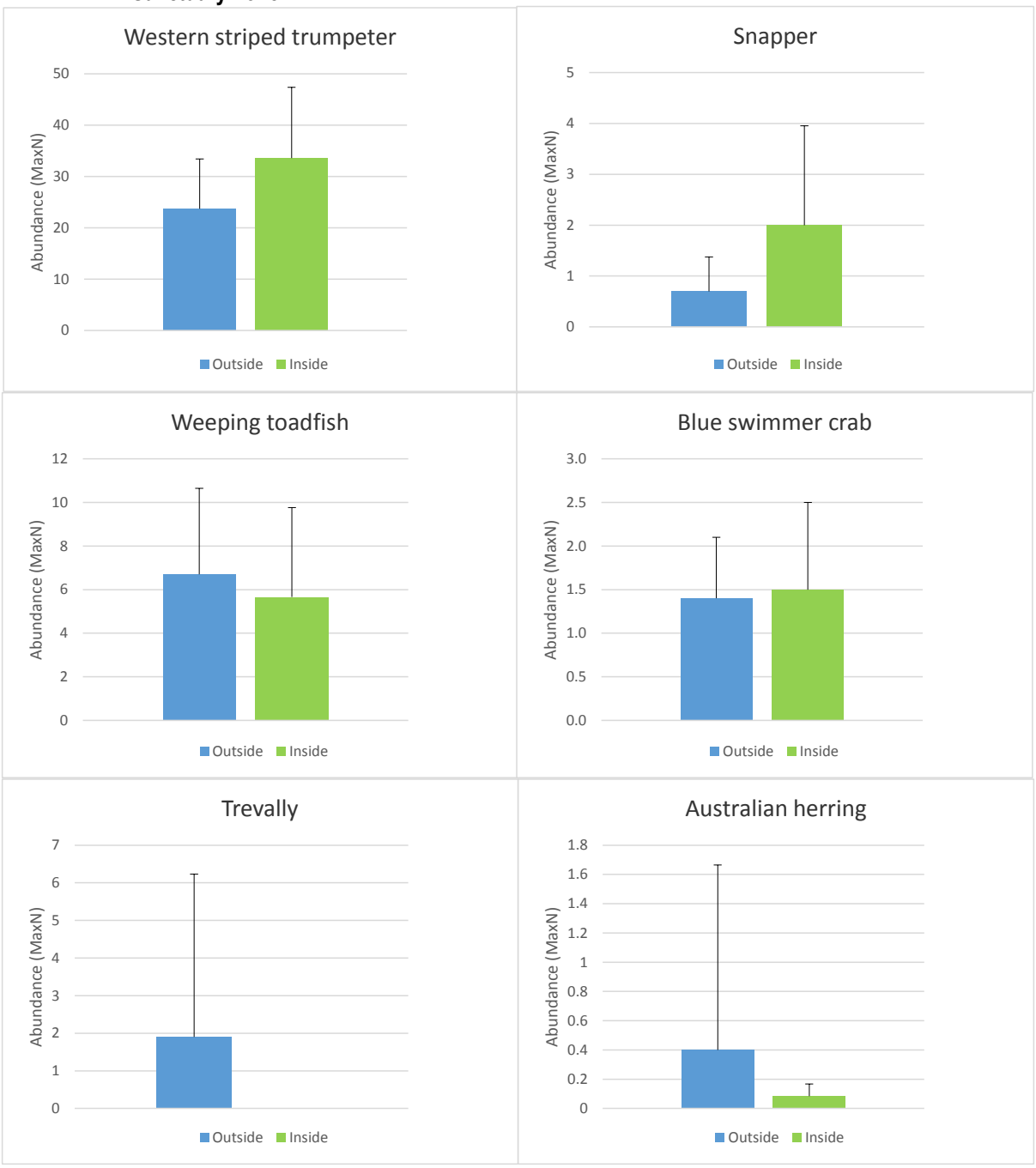
**Note:** In = Inside the Clinton Wetlands SZ, Out = outside a SZ. Commercially and recreationally important species are flagged with an asterisk.
**Source:** DEWNR.

Figure H.4 shows the two most abundant species (western striped trumpeter and weeping toadfish) and four species of commercial interest.

## Preliminary observations

The Clinton Wetlands SZ is dominated by seagrass and many of the fishes are known to be seagrass-associated species (DEWNR, pers. comm., August 2015). Additional BRUVS surveys will be needed to detect species such as garfish and King George whiting, and to test predicted changes (see earlier).

**Figure H.4: Abundance (mean + standard deviation) of 6 species inside and outside the Clinton Wetlands Sanctuary Zone**




**Source:** Data derived from BRUVS surveys. DEWNR.

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# Appendix I

## Allocation of Ports to Regions, Fisheries Administrative Data

**Table I.1: Northern Zone Rock Lobster and Western Zone Abalone Ports of Landing – PIRSA Catch Disposal Records**

| Port of landing | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Adelaide | Adelaide | Adelaide | Adelaide, Fleurieu & KI |
| North Arm | Adelaide | Adelaide | Adelaide, Fleurieu & KI |
| North Haven | Adelaide | Adelaide | Adelaide, Fleurieu & KI |
| Outer Harbour | Adelaide | Adelaide | Adelaide, Fleurieu & KI |
| Port Adelaide | Adelaide | Adelaide | Adelaide, Fleurieu & KI |
| Barkers Knoll | Fleurieu | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Cape Jervis | Fleurieu | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Goolwa | Fleurieu | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Victor Harbor | Fleurieu | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Wirrina Marina | Fleurieu | Fleurieu & KI | Adelaide, Fleurieu & KI |
| American River | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Christmas Cove | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| D' Estrees Bay | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Emu Bay | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Hanson Bay | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Kingscote | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Penneshaw | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Snellings Beach | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Snug Cove | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Stokes Bay | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Vivonne Bay | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Western River | KI | Fleurieu & KI | Adelaide, Fleurieu & KI |
| Arno Bay | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Lipson | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Port Neill | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Thuruna | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Avoid Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Billy Lights Point | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Coffin Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Farm Beach | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Fisheries Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Lincoln Cove Marina | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Little Douglas | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Point Avoid | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Port Lincoln | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Spilsby Island | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Taylors Landing | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Point Douglas | Port Augusta | East Eyre Peninsula | Eyre Peninsula |
| Port Augusta | Port Augusta | East Eyre Peninsula | Eyre Peninsula |
| Port Pirie | Port Augusta | East Eyre Peninsula | Eyre Peninsula |
| Acramans Creek | Ceduna | West Coast | Eyre Peninsula |
| Cape Adieu | Ceduna | West Coast | Eyre Peninsula |
| Ceduna | Ceduna | West Coast | Eyre Peninsula |
| Fowlers Bay | Ceduna | West Coast | Eyre Peninsula |
| Point Sinclair | Ceduna | West Coast | Eyre Peninsula |
| Port Sinclare | Ceduna | West Coast | Eyre Peninsula |
| Smoky Bay | Ceduna | West Coast | Eyre Peninsula |
| Thevenard | Ceduna | West Coast | Eyre Peninsula |
| The Bushes | Venus Bay | West Coast | Eyre Peninsula |
| Tractor Beach | Venus Bay | West Coast | Eyre Peninsula |
| Venus Bay | Venus Bay | West Coast | Eyre Peninsula |
| Streaky Bay | Venus Bay | West Coast | Eyre Peninsula |
| Sceales Bay | Venus Bay | West Coast | Eyre Peninsula |
| Anxious Bay | Venus Bay | West Coast | Eyre Peninsula |
| Baird Bay | Venus Bay | West Coast | Eyre Peninsula |
| Drummond Bay | Venus Bay | West Coast | Eyre Peninsula |
| Elliston | Venus Bay | West Coast | Eyre Peninsula |
| Port of landing | Level 1 | Level 2 | Level 3 |

| Port of landing | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Flinders Island | Venus Bay | West Coast | Eyre Peninsula |
| Halls Bay | Venus Bay | West Coast | Eyre Peninsula |
| High Cliff | Venus Bay | West Coast | Eyre Peninsula |
| Point Drummond | Venus Bay | West Coast | Eyre Peninsula |
| Port Drummond | Venus Bay | West Coast | Eyre Peninsula |
| Port Kenny | Venus Bay | West Coast | Eyre Peninsula |
| Sheringa Beach | Venus Bay | West Coast | Eyre Peninsula |
| Waterloo Bay | Venus Bay | West Coast | Eyre Peninsula |
| Yanerbie Bay | Venus Bay | West Coast | Eyre Peninsula |
| Pelican Point | SE | SE | SE |
| Policemans Point | SE | SE | SE |
| Gerloffs Bay | SE | SE | SE |
| Adjacent Parnka Pt | SE | SE | SE |
| Beachport | SE | SE | SE |
| Cape Douglas | SE | SE | SE |
| Cape Jaffa | SE | SE | SE |
| Carpenter Rocks | SE | SE | SE |
| Kingston R.M. | SE | SE | SE |
| Kingston S.E. | SE | SE | SE |
| Nene Valley | SE | SE | SE |
| Nora Creina | SE | SE | SE |
| Port Macdonnell | SE | SE | SE |
| Robe | SE | SE | SE |
| Southend | SE | SE | SE |
| Blackfellows Caves | SE | SE | SE |
| The Spit | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Ardrossan | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Balgowan | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Butterfish Bay | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Corny Point | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Edithburgh | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Fishermans Bay | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Foul Bay | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Gleesons Landing | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Marion Bay | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Minlacowlie | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Point Turton | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Pondolowie Bay | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Broughton | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Clinton | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Hughes | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Minlacowie | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Price | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Turton | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Victoria | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Vincent | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Port Wakefield | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Rogues Point | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Stansbury | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |
| Wallaroo | Yorke Peninsula | Yorke Peninsula | Yorke Peninsula |

**Table I.2: Northern Zone Rock Lobster Ports of Landing as Reported from 2009/10 to Current – SARDI Logbook Data**

| Port of Landing | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Ceduna | Ceduna | Eyre Peninsula | Northern Zone |
| Fowlers Bay | Ceduna | Eyre Peninsula | Northern Zone |
| Elliston | Venus Bay | Eyre Peninsula | Northern Zone |
| Streaky Bay | Venus Bay | Eyre Peninsula | Northern Zone |
| Venus Bay | Venus Bay | Eyre Peninsula | Northern Zone |
| Avoid Bay | Port Lincoln | Eyre Peninsula | Northern Zone |
| Coffin Bay | Port Lincoln | Eyre Peninsula | Northern Zone |
| Farm Beach | Port Lincoln | Eyre Peninsula | Northern Zone |
| Fisheries Bay | Port Lincoln | Eyre Peninsula | Northern Zone |
| Port Lincoln | Port Lincoln | Eyre Peninsula | Northern Zone |
| Corny Point | Yorke Peninsula | Yorke Peninsula | Northern Zone |
| Marion Bay | Yorke Peninsula | Yorke Peninsula | Northern Zone |
| Pondalowie Bay | Yorke Peninsula | Yorke Peninsula | Northern Zone |
| American River | Kangaroo Island | Kangaroo Island | Northern Zone |
| D'Estrees Bay | Kangaroo Island | Kangaroo Island | Northern Zone |
| Kangaroo Island | Kangaroo Island | Kangaroo Island | Northern Zone |
| Kingscote | Kangaroo Island | Kangaroo Island | Northern Zone |
| Penneshaw | Kangaroo Island | Kangaroo Island | Northern Zone |
| Vivonne Bay | Kangaroo Island | Kangaroo Island | Northern Zone |
| Cape Jaffa | South East | South East | Northern Zone |
| Robe | South East | South East | Northern Zone |

**Table I.3 Marinescale Fisheries and Charter Boat Ports of Landing Since 2009/10 – SARDI Logbook Data**

| Port of landing | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Glenelg | Adelaide | Adelaide | Adelaide |
| O'Sullivans Beach | Adelaide | Adelaide | Adelaide |
| Port Noarlunga | Adelaide | Adelaide | Adelaide |
| Port Willunga | Adelaide | Adelaide | Adelaide |
| Seacliff | Adelaide | Adelaide | Adelaide |
| West Beach | Adelaide | Adelaide | Adelaide |
| Port Adelaide | Adelaide | Adelaide | Adelaide |
| Port Gawler | Adelaide | Adelaide | Adelaide |
| St Kilda | Adelaide | Adelaide | Adelaide |
| Arno Bay | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Cowell | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Lucky Bay | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Port Neill | Cowell | East Eyre Peninsula | Eyre Peninsula |
| Avoid Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Coffin Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Farm Beach | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Louth Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Port Lincoln | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Tumby Bay | Port Lincoln | East Eyre Peninsula | Eyre Peninsula |
| Cowleds Landing | Port Augusta | Port Augusta | Eyre Peninsula |
| Merninnie Bay | Port Augusta | Port Augusta | Eyre Peninsula |
| Port Davis | Port Augusta | Port Augusta | Eyre Peninsula |
| Port Pirie | Port Augusta | Port Augusta | Eyre Peninsula |
| Whyalla | Port Augusta | Port Augusta | Eyre Peninsula |
| Chinaman Creek | Port Augusta | Port Augusta | Eyre Peninsula |
| Point Douglas | Port Augusta | Port Augusta | Eyre Peninsula |
| Port Augusta | Port Augusta | Port Augusta | Eyre Peninsula |
| Ceduna | Ceduna | West Coast | Eyre Peninsula |
| Fowlers Bay | Ceduna | West Coast | Eyre Peninsula |
| Laura Bay | Ceduna | West Coast | Eyre Peninsula |
| Smoky Bay | Ceduna | West Coast | Eyre Peninsula |
| Thevenard | Ceduna | West Coast | Eyre Peninsula |
| Baird Bay | Venus Bay | West Coast | Eyre Peninsula |
| Elliston | Venus Bay | West Coast | Eyre Peninsula |
| Port Kenny | Venus Bay | West Coast | Eyre Peninsula |
| Streaky Bay | Venus Bay | West Coast | Eyre Peninsula |
| Venus Bay | Venus Bay | West Coast | Eyre Peninsula |
| Cape Jervis | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Wirrina | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Normanville | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Encounter Bay | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Hindmarsh Island | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Victor Harbor | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| Goolwa | Fleurieu Peninsula | Fleurieu And KI | Fleurieu And KI |
| American River | Kangaroo Island | Fleurieu And KI | Fleurieu And KI |
| Kingscote | Kangaroo Island | Fleurieu And KI | Fleurieu And KI |
| Penneshaw | Kangaroo Island | Fleurieu And KI | Fleurieu And KI |
| Vivonne Harbour | Kangaroo Island | Fleurieu And KI | Fleurieu And KI |
| Beachport | South East | South East | South East |
| Blackfellows Caves | South East | South East | South East |
| Cape Jaffa | South East | South East | South East |
| Carpenter Rocks | South East | South East | South East |
| Kingston (South East) | South East | South East | South East |

| Port of landing | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| Robe | South East | South East | South East |
| Southend | South East | South East | South East |
| Port Macdonnell | South East | South East | South East |
| Port Clinton | Port Wakefield | East Yorke Peninsula | Yorke Peninsula |
| Port Wakefield | Port Wakefield | East Yorke Peninsula | Yorke Peninsula |
| Ardrossan | Port Wakefield | East Yorke Peninsula | Yorke Peninsula |
| Port Parham | Port Wakefield | East Yorke Peninsula | Yorke Peninsula |
| Port Price | Port Wakefield | East Yorke Peninsula | Yorke Peninsula |
| Port Giles | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Port Julia | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Port Vincent | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Stansbury | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Edithburgh | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Foul Bay | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Marion Bay | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Pondalowie Bay | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Port Moorowie | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Wool Bay | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Black Point | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Pine Point | South East Yorke Peninsula | East Yorke Peninsula | Yorke Peninsula |
| Port Hughes | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Tickera | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Wallaroo | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Chinaman Wells | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Balgowan | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Corny Point | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Hardwicke Bay | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Moonta Bay | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Point Souttar | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Point Turton | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Port Broughton | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Port Rickaby | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Port Victoria | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |
| Port Minlacowie | West Yorke Peninsula | West Yorke Peninsula | Yorke Peninsula |

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